PEAC
PRIVATE EDUCATION ASSISTANCE COMMITTEE
Trustee of the Fund for Assistance to Private Education

DepED
DEPARTMENT OF EDUCATION

2016

LEARNING MODULE

Science G7| Q1

Matter

PEAC
PRIVATE EDUCATION ASSISTANCE COMMITTEE
Trustee of the Fund for Assistance to Private Education

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NOTICE TO THE SCHOOLS

This learning module (LM) was developed by the Private Education Assistance Committee under the GASTPE Program of the Department of Education. The learning modules were written by the PEAC Junior High School (JHS) Trainers and were used as exemplars either as a sample for presentation or for workshop purposes in the JHS In-Service Training (INSET) program for teachers in private schools.

The LM is designed for online learning and can also be used for blended learning and remote learning modalities. The year indicated on the cover of this LM refers to the year when the LM was used as an exemplar in the JHS INSET and the year it was written or revised. For instance, 2017 means the LM was written in SY 2016-2017 and was used in the 2017 Summer JHS INSET. The quarter indicated on the cover refers to the quarter of the current curriculum guide at the time the LM was written. The most recently revised LMs were in 2018 and 2019.

The LM is also designed such that it encourages independent and self-regulated learning among the students and develops their 21st century skills. It is written in such a way that the teacher is communicating directly to the learner. Participants in the JHS INSET are trained how to unpack the standards and competencies from the K-12 curriculum guides to identify desired results and design standards-based assessment and instruction. Hence, the teachers are trained how to write their own standards-based learning plan.

The parts or stages of this LM include Explore, Firm Up, Deepen and Transfer. It is possible that some links or online resources in some parts of this LM may no longer be available, thus, teachers are urged to provide alternative learning resources or reading materials they deem fit for their students which are aligned with the standards and competencies. Teachers are encouraged to write their own standards-based learning plan or learning module with respect to attainment of their school's vision and mission.

The learning modules developed by PEAC are aligned with the K to 12 Basic Education Curriculum of the Department of Education. Public school teachers may also download and use the learning modules.

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SCIENCE 7

Module 1: MATTER

Lesson 1: Doing Scientific Investigations

Introduction and Focus Questions

Science probably began as a result of man's curiosity and sense of wonder of the universe about him. It is generated by man's urge to explore and to know- an urge that is within us all. This urge to discover and to learn allows the scientists to explain the natural world. How can a scientist explain the things that happen around us? ***Why is it important to acquire the right attitude in doing an investigation? How can we solve problems in a scientific way? When do scientific methods become valuable?***

These are some of the questions that you are going to find answers in this lesson. At the end of the lesson, you will find out the importance of scientific investigation in your life.

Lesson Coverage:

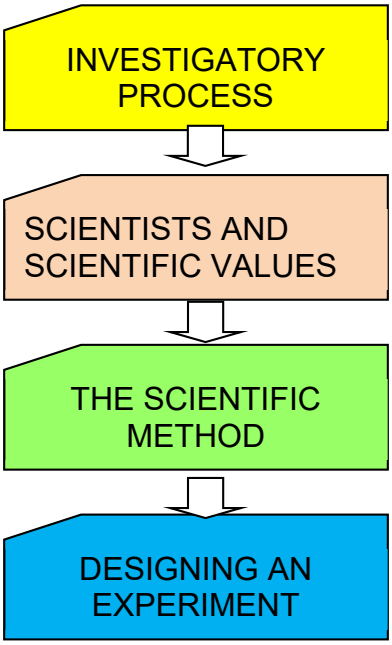
This lesson has the following topics:

Title	You'll learn to….	Estimated Time
1.1 Scientist and Scientific Values	• Discuss the importance of scientific values in decision-making and problem solving in daily life	3 sessions
1.2 The Scientific Method	• Discuss the different steps of the scientific method • Identify the components of an investigation: research problem, hypothesis, method for testing hypothesis (identifying independent/dependentvariables), and conclusions based on evidence	3 sessions

1.3 Designing an experiment	• Describe what is meant by fair test. • Recognize that the design of an investigation should show fair testing. • Conduct simple investigations using processes involving mixtures common to the locality. • Choose an interesting topic for investigation. - formulate a research problem. - formulate a hypothesis. - design a procedure to test the - hypothesis. - collect, organize and interpret data. - make conclusions based on the data, - accounting and rejecting the hypothesis. - write a brief summary of the report. - share and present the results of the investigations with other classmates or schoolmates.	7 sessions

Concept Map of the Module

Here is a simple map of the above topics you will cover:



Expected Skills

To do well in this lesson, you need to remember and do the following:

1. Read and follow the instructions very carefully.
2. Answer the pretest in order to determine how much you already know about the lessons in this module.
3. Read each topic and do activities that are provided for you.
4. Perform all the activities diligently to help and guide you in understanding the topic.
5. Open the indicated interactive simulations. Explore further and deeper as your time allows.
6. Open and view the indicated videos. Review the questions as many times as needed, as you answer the discussion questions related to them.
7. Gather the materials for the experiments and demonstrations and actually do them yourself. The actual experiments give you a richer learning experience than just in reading the texts and even watching related videos.
8. Take down notes as you go through the simulations, videos and experiments. Writing on paper or typing on your computer helps you remember and understand things easier.
9. Answer the posttest to measure how much you have learned from the lesson.
10. Good luck and have fun.

PRE-ASSESSMENT

Let's find out how much you already know about waves. Answer the pre-test below.

Instruction: Click on the letter that you think best answers the question. Please answer all items. After taking this short test, click on "Submit" to see your score. Take note of the items that you were not able to answer correctly and look for the right answer as you go through this module.

1. Dr. Gregorio Zara invented an airplane whose engine uses alcohol as fuel, which of the following attitudes does this Filipino scientist have?
   A. Creativity
   B. Honesty
   C. Hard work
   D. Perseverance

2. Which of the following is NOT considered a step of the scientific method?
   A. Observing and stating the problem
   B. Recording and analyzing data
   C. Converting all measurements to metric units
   D. Testing the hypothesis

For numbers 3-5, refer to the given situation below:

Tiffany wants to know the effect of eating sugary snacks on performance in PE class. She decides to set up an experiment to find out.

3. Which of the following groups of individuals would be in the control group?
   A. Students who take a PE class at their school.
   B. Students who take a PE class and who will not be eating sugary snacks before PE class.
   C. Students who take a PE class and who will be eating sugary snacks before PE class.
   D. Students taking any class at school eating any foods.

4. Which of the following would be the dependent variable in the experiment?
   A. Eating sugary snacks
   B. Eating food
   C. PE class performance
   D. Sports performance

5. Which of the following would be the independent variable in the experiment?
   A. Eating sugary snacks
   B. Eating food
   C. PE class performance
   D. Sports performance

6. Neal is interested in finding out if older siblings are better students than younger siblings. How should his research problem be stated?
   A. Do older students make better grades?
   B. Is there a relationship between birth order and academic achievement?
   C. Is your little sister smarter than you?
   D. Is there a correlation between age and grade point average?

7. Which of the following is a hypothesis that could be tested?
   A. The leaves of the plants in the farm are greener in colour than those at home.
   B. Robots will rule the world in the future.
   C. The plant needs to be watered at least once a week
   D. Computers are very helpful to humans.

8. Some superstitions have scientific explanations. Which of the following superstitious beliefs has a scientific basis?
   A. If you wear polka dot clothes during New Year, you will earn more money throughout the year.
   B. Your wedding will not push through if you wear your wedding gown before your wedding day.
   C. You are driving good luck away from home when you sweep the floor at night.
   D. Children should not eat jackfruit at night because they might get sick.

9. A group of students investigated how temperature affects the rate of chemical reactions. They used hydrogen peroxide, which breaks down into oxygen and water, for their experiment. The students measured how long it took to obtain 50 mL of oxygen gas from a given volume of hydrogen peroxide heated to different temperatures. Their data are shown in the table below.

Temperature (°C)	Time (minutes)
10	33
20	16
30	8
40	4
50	2

Based on the students' data, select the correct conclusion about the rate of chemical reactions.

A. Reaction rates increase as time increases.
B. Reaction rates decrease as time decreases.
C. Reaction rates increase as temperature increases.
D. Reaction rates decrease as temperature increases.

10. Who among the following individuals shows an intellectual honesty?

A. In a TV commercial for disposable diapers, the baby solves a leaking hose by wrapping his disposable diaper around the hose.
B. A science student saw a TV commercial about a detergent that cleans better than their household detergent. The student performs the same experiment to verify the claims in the advertisement.
C. A scientist was asked by his employer from tobacco-manufacturing firm to produce fraudulent data that would dispel claims of cancer being related to cigarette smoking. The scientist refused to do the data and lost his job.
D. British Levi-Montalcini was a Jewish Italian-American neurobiologist. During World War II, Jews had to go into hiding and so did Rita, but she continued to conduct experiments on chicken embryos in a homemade lab all throughout World War II.

11. Which of the following statements are true about the scientific method?
    I. Identification of the problem should also set the limits and scope of the experiment.
    II. The conclusion should always support the hypothesis.
    III. The hypothesis is an intelligent guess that can be verified or contradicted by the results of the experiment

    A. I and II
    B. I and III
    C. II and III
    D. I, II and III

12. Leonardo gave his tentative answer to the problem. Why is there a need to give hypothesis as part of the procedures in the scientific method?
    A. It is the answer to the problem.
    B. It is the source of data.
    C. It has to agree with the data.
    D. It has to be accepted or denied.

13. Bernard placed some seeds on wet cotton in a dish and labeled it *Set-up A*. Then he put the same kind of seeds in a dish with dry cotton and labeled it *Set-up B*. After two days, Bernard's seeds on *Set-up A* sprouted and on the other did not. In the situation, which of the following is the independent variable?
    A. dish
    B. cotton
    C. seed
    D. water

14. Anita, a biology student conducted an experiment to find out how light and plant fertilizer affects the growth of a particular type of plant. She grew four plants and treated them differently. After five weeks, the plants looked as shown below.

	 A	 B	 C	 D
light conditions:	dark	light	dark	light
fertilizers:	with fertilizer	with fertilizer	without fertilizer	without fertilizer

What is the dependent variable of this experiment?

A. The number of plants
B. The growth of the plants
C. the application of light
D. the application of fertilizers

15. In conducting your own scientific investigation, which one is the best attitude to take?
    A. Observe merely with the senses to gather qualitative and quantitative data.
    B. Test your hypothesis several times before drawing any conclusion to gather sufficient and conclusive data.
    C. Discard any observation that does not agree with the rest of your data to attain reliability of results.
    D. Make a conclusion right after completing the experiment to make the investigation relevant and timely.

16. The set-up of your experiment has two identical plants, one under the shade of a roof, the other in direct sunlight. Assuming all other factors constant, what could be the hypothesis of your experiment?
    A. A plant will change into a different kind of plant if placed in the shade.
    B. Sunlight will become more abundant if a plant is placed in its direct path.
    C. A plant in direct sunlight will grow faster than an identical plant placed in the shade.
    D. A plant will increase the amount of fertilizer and water in the soil if placed in direct sunlight.

17. You performed a laboratory experiment in your science class where you would do observations for two days. The following day, you and your group mates could not identify your control set-up and experimental set-up from the gathered set- ups of the class. Which of the following must you do to avoid such thing to happen again?
    A. Isolate your set-ups from the rest of the class' set-ups.
    B. Use distinct materials for easy identification.
    C. Label your set-ups appropriately.
    D. Never leave the laboratory to be able to observe their set-ups all the time.

18. You hypothesize that thick leg muscles are an inherited trait in dogs. You collect data on several dogs, and the data show that dogs that live outdoors have thicker leg muscles than dogs that live indoors. What should you conclude?
    A. Inheritance of thick leg muscles may be associated with coat thickness in dogs.

B. Dogs that inherit thick leg muscles may not survive indoors.
C. Dogs with thick leg muscles may require more exercise than dogs with thin leg muscles.
D. Inheritance alone may not account for thick leg muscles in dogs.

19. Your teacher wanted to plant santan along the driveway of the school. A gardener told him that santan is propagated better using the upper end of the stem, rather than the mature stem. Before following the gardener's advice, your teacher planted 25 upper stem and 25 mature stem cuttings of santan in a seedbed. What must have been the reason why your teacher conducted his small experiment instead of following the gardener's advice immediately?
    A. Because the gardener's did not finish a college degree.
    B. To show the gardener how to conduct an experiment.
    C. To demonstrate to students the steps of scientific method of solving a problem.
    D. So as not to waste effort, time and stem cuttings.

20. You wanted to find out if virgin coconut oil can be used as preservative for peanuts. You placed 10 peanuts each in 2 glasses. In one glass, you added enough virgin coconut oil to cover the peanuts completely. You did not put any liquid on the other glass. You then kept the two glasses on a shelf and observed them for two weeks. Which among the following is an observation that you may be derived from this experiment?
    I. Only four peanuts dried up in the glass without virgin coconut oil because of room temperature.
    II. Six peanuts did not dry up in the glass with virgin coconut oil.
    III. The duration of two weeks for this experiment is too long.
    IV. Peanuts dis not wither in virgin coconut oil because of the presence of stearic acid

    A. I only
    B. I and II
    C. II and IV
    D. IV only

Lesson 1.1: Scientist and Scientific Values

In this lesson, you shall:

- discuss the importance of scientific values in decision-making and problem solving in daily life

EXPLORE

Let's start the module by finding out how scientists conduct scientific investigation. As you go through this lesson, keep on thinking about this question: ***Why is it important to acquire the right attitude in doing an investigation?***

Activity 1.1: Murder Mystery Game

Do you like detective or mystery stories? Why do you like them? Why do you not like them? Detectives and investigators decipher the clues and try to figure out a logical explanation for what happened, and above all who did it! Or do you like to play games that make you think and figure out a strategy or an answer? Do you have the necessary skills in solving a problem? Today, you are going to play a game where you can test your skills and attitudes in answering problems.

The game consists of a set of clues to a murder. You are going to answer the following questions:

- Who was killed?
- Who was the murderer?
- What was the weapon?
- Where did the murder take place?
- At what time did the murder occur?
- What was the motive?

The clues

When he was discovered dead, Mr. Black had a bullet hole in his thigh and a knife wound in his back.

Mr. Patel shot at an intruder in the block of flats where he lived at 12:00 midnight.

The janitor reported to police that he saw Mr. Black at 12:15 a.m.

The bullet taken from Mr. Black's thigh matched the gun owned by Mr. Patel.

Only one bullet had been fired from Mr. Patel's gun.

When the janitor saw Mr. Black, Mr. Black was bleeding slightly, but did not seem too badly hurt.

A knife with Mr. Black's blood on it was found in Miss Petty's garden.

The knife found in Miss Petty's garden had Mr. Hall's fingerprints on it.

Mr. Black had destroyed Mr. Patel's business by stealing all his customers.

The janitor saw Mr. Black's wife go to Mr. Hall's flat at 11:30 p.m.

The janitor said that Mr. Black's wife frequently left the block of flats with Mr. Hall.

Mr. Black's body was found in the park.

Mr. Blacks' body was found at 1:30 am.

Mr. Black had been dead for one hour when his body was found, according to a medical expert working with the police.

The janitor saw Mr. Black go to Mr. Hall's room at 12:25 a.m.

The janitor went off duty at 12:30 a.m.

It was obvious from the condition of Mr. Black's body that it had been dragged a long distance.

Miss Petty saw Mr. Black go to Mr. Patel's block of flats at 11:55 p.m.

Mr. Black's wife disappeared after the murder.

The police were unable to locate Mr. Hall after the murder.

When the police tried to locate Mr. Patel after the murder, they discovered that he had disappeared.

The janitor said that Miss Petty was in the Entrance hall of the block of flats when he went off duty.

Miss Petty often followed Mr. Black.

Mr. Patel had told Mr. Black that he was going to kill him.

Miss Petty said that nobody left the block of flats between 12:25 am and 12:45 am.

Mr. Black's blood stains were found in Mr. Hall's car.

Mr. Black's blood stains were found on the carpet in the hall outside Mr. Patel's.

Write your answers here using the guide questions:

_____
_____
_____
_____
_____

Click here to see one possible answer:

After receiving a superficial gunshot wound from Mr. Patel, Mr. Black went to Mr. Hall's flat where he was killed by Mr. Hall with a knife at 12:30 am because Mr. Hall was in love with Mr. Black's wife.

(Note: The next page opens only after the student has answered. Next page should open showing feedback based on the student's answers)

Answer the following questions:

1. What are the skills and attitudes needed to solve the murder mystery game?
   _____
   _____
   _____
2. What values should you have in order to solve the mystery?
   _____
   _____
   _____

3. Do you believe that person's attitude affects how he/she solves a problem? Defend your answer.

   _____
   _____
   _____

4. Is it important to acquire the right attitude in doing an investigation? Explain your answer.

   _____
   _____
   _____

What do you feel in doing the activity? Are you having fun in doing the activity? Can you say that you have the right attitude in solving problems? Do you believe that having the correct values contribute to your decision-making? How can these attitudes be related to scientific values? What are the different scientific values? How can we solve problems in a scientific way? Think about these questions as you do the next activity.

End of Explore:

You gave your initial ideas on the importance of scientific attitude in solving problems. Let's now find out more about scientific values by doing the next activities.

FIRM-UP

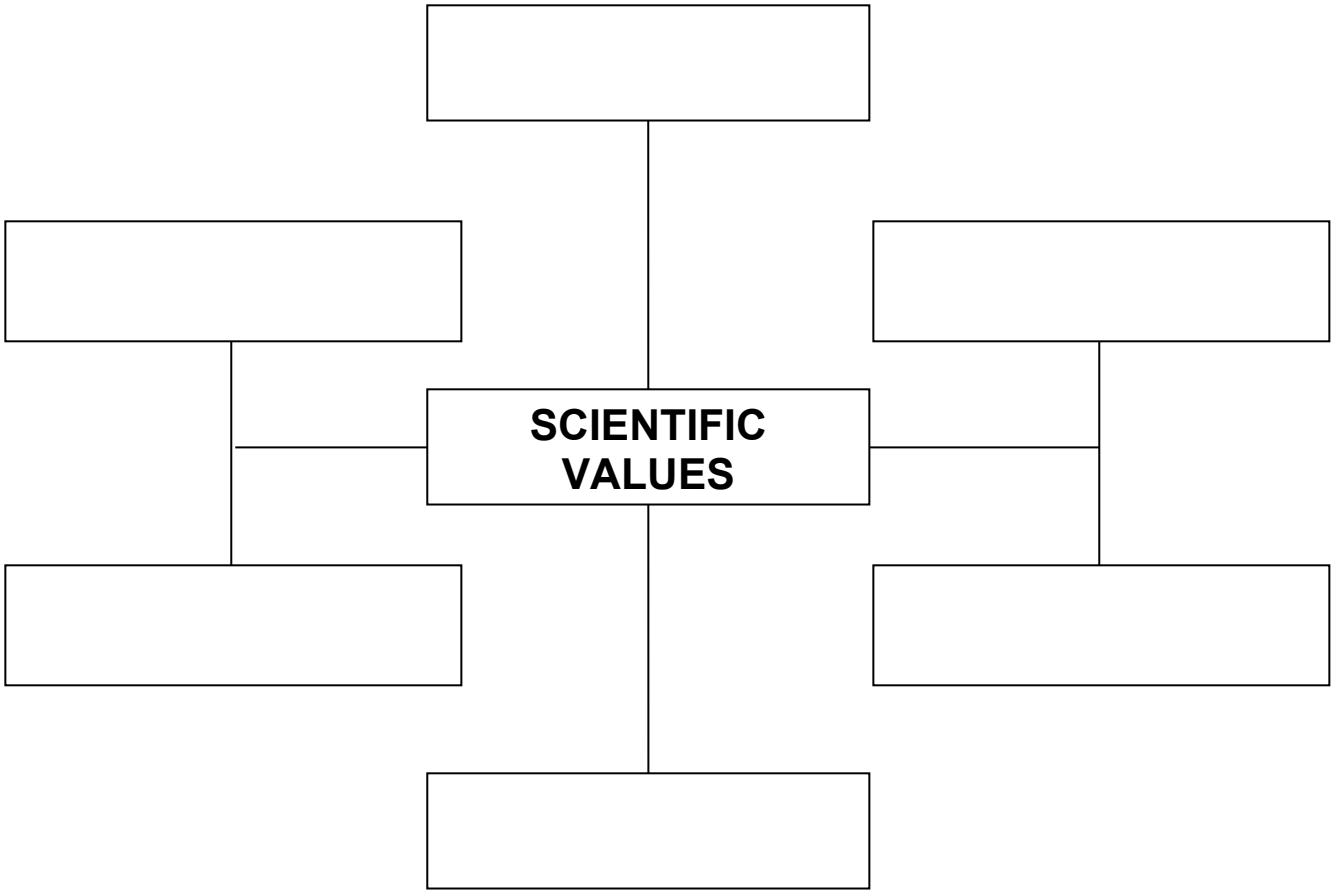
Your goal in this section is to learn and understand the different scientific values. As you go through this section, you will do the different activities to find out the answers on the following questions:

1. **What are the different scientific values?**
2. **How do scientists work to learn about the natural world and to solve problems?**
3. **Why is it important to acquire the right attitude in doing an investigation?**

Activity 1.2: Thinking Map

Complete the Thinking Map below by writing terms that you can relate with the concept of scientific values.

THINKING MAP



a) Answer the following guide questions:

1) What associations do those words have on scientific values?
_____
_____
_____

2) What values should a scientist have?
_____
_____
_____

3) Why are these values important to them?

_____
_____
_____

4) When can you say that a certain attitude or value can be considered scientific?

_____
_____
_____

b) Let us check your scientific attitude by identifying the following statements whether it is based on science or merely a superstition. Explain your answer.

1. Mang Pedro is a fisherman. He goes out to the sea every night except during full moon. He says he'll never get a good catch during full moon because the fairies are around.

_____
_____
_____

2. While cleaning the mirror, Gina accidentally broke it. Her mother scolded her because this incident would mean they would experience bad luck for 7 years.

_____
_____
_____

3. The youngest daughter of Aling Lita does not take a bath in the evening because she believes that bathing in the evening would mean losing a cup of blood from her body.

_____
_____
_____

4. Girlie and Tom were soon to wed. They agreed that Girlie would fit her wedding gown before the wedding day to check if the fit was perfect. Their parents cautioned them against it saying that the wedding would not push through if they did so.

_____
_____
_____

5. Do not sleep when your hair is wet if you do not want to lose your sense of sight.

   _____
   _____
   _____

6. Singing while cooking is prohibited because you will end up marrying a widower.

   _____
   _____
   _____

7. Taking a bath after attending a wake up to morning because this will cause you harm.

   _____
   _____
   _____

8. You are driving good luck away from your home when you sweep the floor at night.

   _____
   _____
   _____

9. Sick people going on pilgrimage to Lourdes or Fatima in order to get healed

   _____
   _____
   _____

10. An examination was scheduled for the next day. Your friend advised you to eat lots of peanuts in order to get a high score. How would you react to this advice? What will you do to prepare for the test?

    _____
    _____
    _____

What can you say about your ideas about scientific values? Are you certain of these ideas? Do you think you have the same answers with other people on these beliefs? When can you say that a certain attitude or value can be considered scientific? How can we solve problems in a scientific way? Can you identify scientific values in different situations? Do you believe that these values are necessary in decision-making? Is it important to acquire the different scientific attitudes in solving problems? You are going to perform the next activity to check further you understanding on scientific values and how to use these values to answer problems.

Activity 1.3: Story Telling: Sir Thomas Alva Edison

Do you know Thomas Alva Edison? What are his contributions in the field of science? You are going to have a close encounter of the interesting life of Sir Thomas Alva Edison and his scientific endeavor.

Study the situation in the life of Thomas Alva Edison in which you are going to answer this question: How attitudes and values affect the way people solve a problem?

2Reading

It was told that one winter, when Thomas Alva Edison was young, his mother could not find him for days. Later, he was found shivering in the barn while sitting on a basket with unhatched eggs. Asked why he was doing that, he said, "If a hen can hatch eggs by sitting on them for days, maybe I can also do it." He was brought home but after a few days he went back to the barn.

Questions to answer:

- What did Thomas Edison do inside the barn?
- Why did he do that?
- What are the desirable qualities of the young Edison?

Read the life of Sir Thomas Alva Edison:

Reading

SIR THOMAS ALVA EDISON

Born in 1847, Thomas Edison had an unusually broad forehead and his head was larger than the average, the physical appearance that, along with his uncommon behavior, convinced his mother of his extraordinarily intelligence. By age 12, he worked by selling newspapers, snacks and other items. A few

years later he published his paper, the Weekly Herald, that attracted subscribers and later on supported him financially enough to set-up a chemistry laboratory in his basement.

One day, he saved the son of the stationmaster from being hit by a train. In gratitude, the father taught him the Morse Code and the telegraph. Throughout the rest of his life Edison built various machines and equipments, including an electric vote-recording machine, the first phonograph, the first commercially practical incandescent electric light bulb, the first practical Dictaphone, mimeograph, storage battery, and developed the first Vitascope which would lead to the first silent motion pictures. By the time he was 83 years old, he already had 1,092 patents for his inventions. In 1883 and 1884, he made an impact on the world by presenting the world's first economically viable system to centrally generate and distribute heat, power and electric light. Edison became so famous that he was even asked to create defensive devices for ships and submarines during the start of the First World War. He continued to work until his death in 1931. But even until today, Thomas Edison is still remembered for his important works, being known to the world as "The Wizard of Menlo Park", The Father of the Electrical Age" and "the greatest inventor who ever lived".

Source: http://www.thomasedison.com/biography.html

Questions to answer:

1. Which traits and attitudes helped Thomas Alva Edison succeed in his scientific endeavor?

   _____
   _____
   _____

2. What makes Thomas Alva Edison a scientist?

   _____
   _____
   _____

What can you say about the life of Sir Thomas Alva Edison? Do you have a hard time identifying the different traits and attitudes of the young Edison? Are these traits and attitudes present when he was doing work with incandescent lamps? Do these traits play an important role in the discovery of the incandescent lamp? What makes him a scientist?

End of FIRM UP:
In this section, the discussion was about the importance of scientific values in doing scientific investigation. Are you clarified in the concepts of the different scientific attitude? Are your ideas correct? What concepts are still not clear to you?

Go back to the previous section and compare your initial ideas with the discussion. How much of your initial ideas are found in the discussion? Which ideas are different and need revision?

Now that you know the important ideas about this topic, let's go deeper by moving on to the next section.

DEEPEN

Your goal in this section is to take a closer look and investigate the life and work of the different scientists in the next activity for you to see the importance of the different scientific values and how these values are used in different scientific endeavors.

Activity 1.4: Science, Technology and Society: "Filipino and Foreign Scientists"

Who among the famous Filipino or foreign scientists you would like to emulate and why?

_____
_____
_____

Study the following websites
Foreign Scientists:
http://www.blupete.com/Literature/Biographies/Science/Scients.htm
Filipino Scientists:

http://inventors.about.com/od/filipinoscientists/Filipino_Inventors_and_Filipino_Scientists.htm

Complete the table below:

Foreign Scientist	Contributions	Methods Applied	Impact to society
1.			
2.			

Filipino Scientist	Contributions	Methods Applied	Impact to society
1.			
2.			

Answer the following questions:

1. What qualities of your inventor/scientist help him/her in achieving his/her goals?
2. How did these qualities help him/her?
3. What are the different ways or methods used by these scientists?
4. How did these scientists correct misconceptions and superstitions with the use of scientific method?

Go to http://www.funbrain.com/who/index.html and answer trivia on foreign scientists and open http://agham.asti.dost.gov.ph/1998/8th/fun/fun.htm to answer a short quiz about Filipino scientists.

Guide Questions:

1. What patterns or common features about the way scientists think and work do their stories show?
2. *Based from your answers in the activity, how do scientists solve problems in a scientific way?*
3. How do men benefit from these discoveries?

4. Why is it important to acquire the right attitude in doing an investigation?
5. Can you cite proofs that Foreign and Filipino inventions are of equal importance?
6. What does this information imply about the competency of the Filipinos?
7. What is the impact of this information on you?
8. Enumerate some problems encountered at school and/or home. Which methods have you used or do you propose to use to address the problems.

After reading the life and work of the different scientists, how did scientific values affect the work of scientists? If they did not have these values or methods, what would have happened? Was it easy for them? Why not? How do they overcome obstacles? If you had the same obstacles, what would you do? What would be a scientific way of dealing with the obstacles? You are going to do the next activity in order to check if you already have the desirable traits of a scientist.

Activity 1.5: Filipino Pride: Dr. Fe Del Mundo

Open the following websites:

1. Filipino Pride: Dr. Fe Del Mundo: http://www.youtube.com/watch?v=gY4xUYExAAY
2. President Benigno Aquino tribute to Dr. Fe Del Mundo: National Scientist http://www.youtube.com/watch?v=3PXeAQrVA4M

After watching the tribute to the great National Scientist, Dr. Fe del Mundo, write an essay (100-150 words) to answer this question:

Why is it important to acquire the right attitude in doing an investigation?

_____

_____

After doing the activity, do you have the traits of a scientist? What did you notice of the traits of the scientists? Can you now see the importance on **why is it important to acquire the right attitude in doing an investigation?**

End of DEEPEN:
In this section, the discussion was about the importance of acquiring the different scientific attitude.

What new realizations do you have about the topic? What new connections have you made for yourself? Can you now answer the question: **Why is it important to acquire the right attitude in doing an investigation?**

Now that you have a deeper understanding of the topic, you are ready to do the tasks in the next section.

TRANSFER

Your goal in this section is apply your learning to real life situations. You will be given a practical task which will demonstrate your understanding.

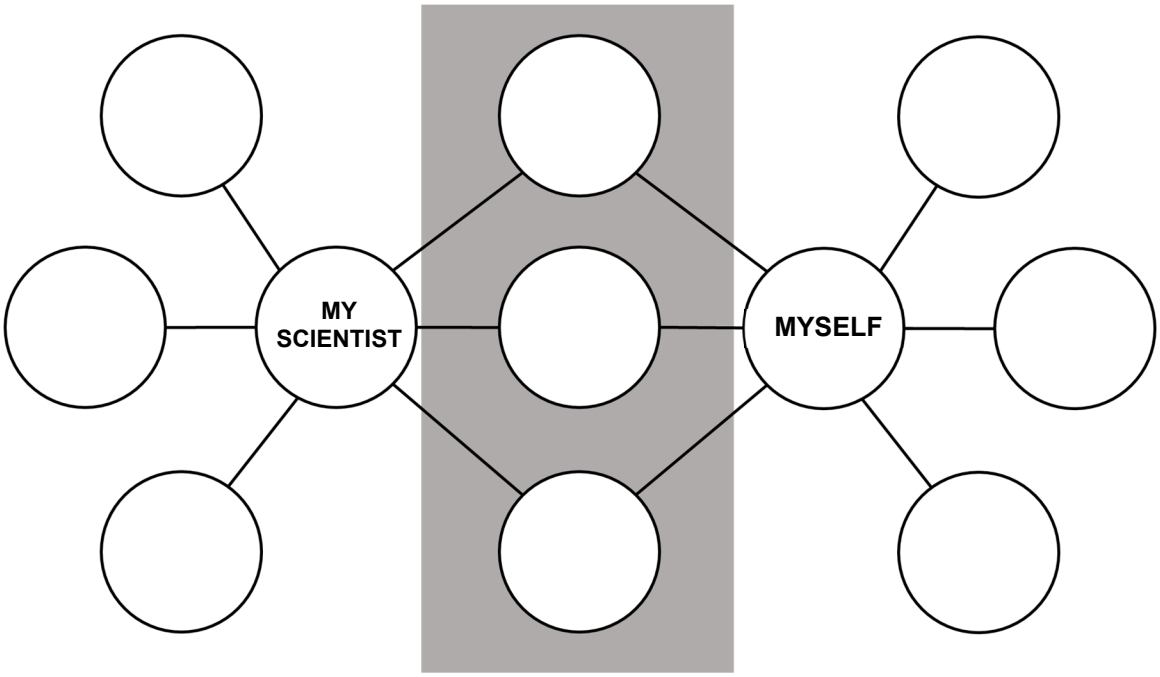
<u>Activity 1.6</u>: Graphic Organizer: Bubble Map

Answer the following questions below:

1. Identify the scientific attitudes/values demonstrated by a person who
   a) is interested to inquire or look into anything
   b) does not readily believe things he sees or hears
   c) is willing to repeat his work several times
   d) listens to the ideas of others
   e) does not claim the work of others as his own
2. Give at least three (3) qualities of scientists. Which one do you consider most important? Why?

You are going to do a bubble map activity wherein you will examine your own desirable characteristics and compare these traits with those of the scientists. You can pick out a scientist, who may be Filipino or Foreign, and identify the desirable qualities of this scientist.

BUBBLE MAP



Answer the following questions below:

1. What did you realize in doing this activity?
2. By having these desirable qualities of a scientist, how can we show these to others and inspire them as a result?
3. Share one concrete situation in your life where you have shown one of these desirable qualities.
4. You learned that some students in your school are organizing a rally against the principal for requiring male students to cut their hair short. Will you join the rally? Why or why not? What guided you in making that decision to join or not to join the rally?

What can you say about your answers in the bubble map? What are your insights and realizations when you compare your desirable traits to that of the desirable traits of the scientists? Among the desirable traits, which do you think you already have now? What traits do you need to practice or emulate? Can you use these values in finding answers to a problem? Can you be a scientist? You will do a journal writing activity to express your ideas, realizations, insights and reflections on the current situation of our Filipino scientists.

Activity 1.7: Journal Writing; Value Clarification

Open the link below to explore the work and contribution of Filipino scientists:
http://www.youtube.com/watch?v=nP-h9k52k5Q

Answer the following questions below:

1. How did the different Filipino scientist persevere in their field of interest?
2. How will you show that you are proud of Filipino scientists?
3. Do you want to become a Filipino scientist? Why or why not?
4. Some people consider Filipino scientists as inferior to their foreign counterparts. Do you agree with this? Explain your answer.
5. What should government do to help Filipino scientists and inventors?
6. What values do scientists have? What values do you have? Why do you say so? Cite situations to support your answer.

Scientific attitudes and values are important in problem solving and decision-making in daily life. Scientific attitudes, desirable qualities and values are not a monopoly of any particular race or gender. Filipino Scientists are as great as the Foreign Scientists. Why is it important to acquire the right attitude in doing an investigation? Do you have the skills and attitudes to become a great Filipino Scientist?

End of TRANSFER:
In this section, your task was to reflect if you have the necessary scientific attitude in dealing with problems. Do you see now the importance of acquiring **the right attitude in doing an investigation?**

How did you find the tasks? How did the tasks help you see the real world use of scientific values? What concepts about scientific investigation do you want to explore and study more?

You have completed this lesson. After having the right attitude in conducting scientific investigation, you are going to look into other concepts of scientific investigation in the next session to answer all your questions about the investigatory process.

Lesson 1.2: The Scientific Method

In this lesson, you shall:

- Identify the components of an investigation: research problem, hypothesis, method for testing hypothesis (identifying independent/dependent variables), and conclusions based on evidence

EXPLORE

Do we follow certain steps or rules when we solve problems? Scientists do. They use specific steps and logical approach in discovering and inventing things. We might be doing the same but not as formal as what a trained scientist does. We are not just aware that we are using even the basic steps in scientific method in our everyday life.

Let's start the module by looking at the different steps of scientific method. As you go through this lesson, keep on thinking about this question: ***What are the steps in scientific method? How can we solve problems in a scientific way?***

Let us check your ideas on the different steps of scientific method by doing the next activity.

<u>Activity 2.1</u>: Anticipation Reaction Guide: Identifying the Steps in Scientific Method

Can you answer this question correctly?

Alexander Fleming noticed that bacteria growing on a plate of agar did not grow next to a mold that was growing on the same plate. He wrote in his laboratory report: "The mold may be producing a substance that kills bacteria." This statement is best described as

A. an observation
B. a hypothesis
C. a generalization
D. a conclusion
E. an inference

Write and explain your reason below:

_____

_____

_____

_____

Are you certain with your ideas on the different steps of scientific method? You will do the anticipation reaction guide below to verify these ideas.

Read the statements at the middle column. Match each with the steps by dragging the step to the left column only marked BEFORE. Once you are finished, click on "**SUBMIT".** Check your answer by clicking on "Check". Choose from the following steps:

OBSERVATION

HYPOTHESIS

PROBLEM

CONCLUSION

INTERPRETING DATA

EXPERIMENT

COMMUNICATING THE RESULT

BEFORE	STATEMENTS	AFTER
	1. After experiment, Edwin accepts his hypothesis that an increase in the amount of fertilizer dissolved in water will mean an increase in the basicity of the solution.	

	2. Andy would like to help his dad repair their car which is running poorly. He suggests that if they change the oil of the car, then it will function properly.	
	3. After tabulating the experimental results in tables and graphs, Alex interpreted that when the mass of the moving object is kept constant, the acceleration of a moving object increases when the applied force increases.	
	4. Five plants treated with the new fertilizer were found to have strong stems while the other five plants with the old fertilizers have soft and easy to cut stems.	
	5. The scientists studying global warming want to accurately predict what the average temperature of the earth's surface will be 100 years from now.	
	6. After conducting a scientific investigation on *DURIO ZIBETHINUS* (Durian) as an effective increaser of platelet count in *ORYCTOLAGUS CUNICULUS*(European Rabbit), Therese tells her parents and teacher about her findings and prepares to present his project in Science class and in scientific community.	
	7. To identify which combination of mineral oil and “tanglad” extract will give the most soothing effect in massage, Caroline prepare 25%, 50% and 75% “tanglad” liniment mixture.	

What can you say about your answers in the ARG guide? Do you have the right ideas on the different steps of scientific method? Is scientific method always orderly? Are you certain of your answers above? What experiences do you have that you can use to defend your answers above? Are you certain that you know how to conduct scientific investigation? Is it easy to conduct scientific investigation? Are you sure that you know that you have the correct understanding of scientific method or process? Let us try to check your ideas by performing the next activity.

ACTIVITY NO. 2.2: KWL Chart.

Below is a KWL Chart. It will help you evaluate your understanding of the lessons that will be taken in this unit. You will be asked to fill in the information in different sections of this module .As of now, you are just to answer the first two columns.

The Scientific Method

What I KNOW	***What I WANT to know***	***What I have LEARNED***

SAVE

What can you say about your concepts on scientific method? Is scientific method always orderly? Do you think you have the same concepts with others? You are going to perform the next activity to find out which of your ideas are acceptable.

END OF EXPLORE:
You gave your initial ideas on the steps of scientific method. You just tried matching the given statements with the steps in scientific method. Let's now find out what the answers are by doing the next part.

FIRM-UP

In this part your task is to understand how the steps of scientific method are formulated and used in an investigation.

Reflect on these questions:

- ***What are the steps in scientific method?***
- ***How can we solve problems in scientific way?***

Keep in mind these questions as you do the different activities in this section.

ACTIVITY NO 2.3: Webpage Reading

Read this webpage
http://glencoe.com/sec/science/physics/ppp_09/animation/Chapter%201/Scientific%20Method.swf
This webpage explains the different steps in scientific method with voice and flow chart for your better understanding

From Activity no 1, analyze the relationship of the given sample and the steps in scientific method .then with your understanding of the previous webpage reading answer this worksheet below. Fill the boxes with short description of each step in the Scientific Method.

SCIENTIFIC METHOD

PROBLEM

OBSERVATION

HYPOTHESIS

EXPERIMENT

DATA

CONCLUSION

Communicate the Result

SUBMIT

Now that you have written your own ideas on the steps in scientific method, let us check if these ideas are correct by doing the situational analysis below:

Activity 2.4: Situational Analysis

Consider the Situation Below:

John watches his grandmother bake bread. He asks his grandmother what makes the bread rise.
She explains that yeast releases a gas as it feeds on sugar.

John wonders if the amount of sugar used in the recipe will affect the size of the bread loaf.

If you are John, how are you going to solve the problem scientifically? Write your answers below:

_____
_____
_____
_____
_____
_____

Open the web page below and understand the definition of Scientific Method and it steps. You can also see here if you have the correct answers on the scientific investigation conducted by John

1. http://science.pppst.com/scientificmethod.html

There are several power point presentations in this web page. Click on “The Steps in Scientific Method”. Focus on how each step is formulated. You may try to open other PPT and know more about Scientific Method.

Based from the power point presentation above, fill out on how John conducted the following the steps on scientific method:

1. Problem:

_____
_____
_____

2. Observation:

_____
_____
_____

3. Hypothesis:

_____
_____
_____

4. Experiment:

_____
_____
_____

5. Data

_____
_____
_____

8. Conclusion

_____
_____
_____

9. Communicate the Result

_____
_____
_____

After reading the power point presentation, answer the questions below:

1. What step has" if and then" statement?
2. How do you formulate problem?
3. What should be considered in designing an experiment?
4. What should be done if the experiment proved that the hypothesis is correct?
5. What step is done after experimentation?
6. *How can we solve problems in a scientific way?*

Based from the activity, are you certain on the different steps of scientific method? Is scientific method always orderly? Why is there a need to know the different steps in scientific method? Why do we have to solve problems in a scientific way? The discussion below will help you understand more the different steps on scientific method.

Activity 2.5: The Scientific Method

SCIENTIFIC METHOD is a procedure consisting of a series of steps with the goal of problem-solving and information-gathering.

You are going to use the scientific investigation conducted by John in the power point presentation presented in the previous activity to examine closely the different steps in scientific method.

The scientific method is split up into the following steps:

1. Identifying problem or question.

In this step, the researcher decides what it is that he wants to study. This may appear as a simple procedure, but it is actually very important. It identifies exactly what the researcher is to learn and it allows him to focus only on that problem.

Do you think John's scientific problem is a valid problem for conducting a scientific investigation? Why do you say so? What do you think are the characteristics of a good scientific problem?

_____
_____
_____
_____

2. Observation about the problem:

Data are gathered through the use of five senses and collecting information about the question. This will help in making a hypothesis.

Do you know the difference between observation and inference? Let us do the following activities:

The poem contains five blanks in which you are going to answer by writing the word observation or inference.

Observation and Inference
By Kathleen Carroll

An ___(1)___ is what you know
Because your senses tell you so.

"I see..," "I feel..," "I smell..," "I hear..,"
Words make ___(2)___ clear.

An ___(3)___ is a good guess
It's nothing more and nothing less.

"I think..," "It might..," and "probably.."
Shows it's an ___(4)___ , you see
Remember what I'm telling you.
An ___(5)___ you know is true.

Are you certain of your answers? Do you encounter these terms in your daily activities? What do you think is the problem why you are confused with your answers? The next activity will help you explore the concepts of observations and inferences.

Classify the following as observations or inference. Click on the correct column. Then, click on "Submit" to check your answers.

Statement	Observation	Inference
The clouds are dark.		
It is going to rain.		
The rock has sharp edges.		
The rock has holes in it.		

The rock is dark colored and has large mineral grains.		
The rock was formed near the Earth's surface.		
The candle is red.		
The candle is using oxygen.		
The flame is yellow.		
The candle is cylindrical.		
The flame is giving off carbon dioxide.		
Wax is dipping down the candle.		
The candle is 4 inches high.		

To check more of your understanding of the difference between observation and inference, log on to http://www.quia.com/jg/57288.html .Try the matching game. Ask: What new information about observation and inference did you obtain from the game?

What are the observations made by John in his scientific investigation? Do you think these observations are valid observations in answering his scientific problem? Explain your answer.

_____
_____
_____
_____

After doing the activity, are you clarified with your concepts on prediction, observation and inference? Can we solve problems using observations, predictions and inferences? When do observations, predictions and inferences become valuable? Can you now differentiate one from another? What are the significance of doing observations and inferences in solving problems in a scientific way?

3. Development of a hypothesis.

A guess made according to the background information that has been gathered. The hypothesis is not a just a simple guess to your problem. Instead, the hypothesis is an educated or

scientific guess. An important aspect of the hypothesis is that it should answer the original question, and it should be **testable.**

Webpage Reading
Open the link http://www.ehow.com/how_8647226_make-good-hypothesis.html and study the characteristics of a good hypothesis.

Answer the questions below:

1. What are the characteristics of a good hypothesis?

_____
_____
_____
_____

2. *Going back to John's investigation, will you consider John's hypothesis in his scientific investigation a correct hypothesis? Why do you say so?*

_____
_____
_____
_____

Write a testable hypothesis on the following problems:

3. What is the effect of changing the wing design of the paper airplane on its flight time?

_____
_____
_____

4. Athletes who eats breakfast perform best in their sports

_____
_____
_____

4. **Design an experiment to test the hypothesis**.

Designing an experiment whose results will either support or disprove the hypothesis. If the hypothesis is supported, then the results of the experiment will indicate that the hypothesis is correct. However, the results of your experiment can also prove that the hypothesis is wrong.

How did John design his experiment to test his hypothesis? Was the design appropriate to answer his scientific problem and prove his hypothesis? If you were John, will you do the same design? Explain your answer.

_____
_____
_____
_____

5. Collecting the data.

This may be quantitative (numbers) or qualitative. Data must be organized. Can be presented or organized into charts, tables or graph. Any pieces of information that you collect regarding the experiment are called DATA.

Discuss on how John's collect his data in his scientific investigation. What is the importance of data gathering in any scientific investigation? Will this be needed to solve problem scientifically? Explain your answer.

_____
_____
_____
_____

6. Draw Conclusions from your data.

Here, it is stated directly whether the hypothesis is accepted of rejected. If the hypothesis is accepted, it should be repeated, since one of the basic foundations of the scientific method is that it is repeatable. The more an experiment is repeated, the more valid the results are.

How did John write his conclusion in his scientific investigation? Can you say that is it a good conclusion? Why do you say so?

_____
_____
_____
_____

Use any references (books or discussion from the net) and come up with at least three guidelines on how to make a good scientific conclusion.

1. _____
2. _____
3. _____

7. Communicate the Result

Be prepared to present the project to an audience. Expect questions from the audience. There is a need to communicate the result of the scientific investigation especially in the presence of experts to verify the validity of the result.

How did John communicate his results in his scientific investigation? What do you think is the purpose of communicating the results in any scientific investigation?

_____
_____
_____

After knowing the different steps in scientific method, can you now answer the question:

How can we solve problems in scientific way?_____
_____
_____

END OF FIRM UP:
In this section, you have identified the steps in scientific method and learn some points to consider in formulating each step. Go to activity No. 1 and try to answer the last column. Do you have the same answer?

The Scientific Method

What I KNOW	***What I WANT to know***	***What I have LEARNED***

What have you realized this time? Is it important to know the different steps in scientific method? Will this help you solve problems in scientific way?

DEEPEN

Your goal in this section is to extend your understanding on the different steps of scientific method. Knowing the different steps of scientific method, will help you see the importance of why there is a need to solve problems in scientific way.

Let us check if you have the correct understanding of the different steps in scientific method by doing the next activity.

Activity No. 2.6: Interactive Video Viewing

After learning their definition and details about the steps in scientific method, you are now ready to analyze concrete examples for further understanding. Click on this webpage:

http://www.brainpop.com/science/scientificinquiry/scientificmethod/index.weml

This webpage is a subscription page but offers FREE TRIAL.
Instruction:
1. Register for the free trial.
2. Confirm registration
3. Click on "SCIENCE"
4. Click on "SCIENCE INQUIRY"
5. Click on "SCIENTIFIC METHOD"
6. Click on "PLAY THE MOVIE". There are two movies which you could view. One video is finding out the most appropriate number of times a plant should be watered and the other is finding out the things which are attracted to a magnet.

After viewing, fill up the table below:

STEPS IN SCIENTIFIC METHOD	VIDEO ON WATERING OF PLANTS	VIDEO ON MAGNET
PROBLEM		
OBSERVATION		
HYPOTHESIS		
EXPERIMENT		

DATA		
CONCLUSION		

After filling up this table, try to analyze and reflect on the following questions:

4.

1. *What is common in each step?*
2. *Is there a pattern followed in identifying each step?*
3. *What makes you think that those are the correct conclusions?*
4. *How can we solve problems in a scientific way?*

Click on "TRY THE ACTIVITIES" on the same webpage to evaluate your understanding. You may try the three activities such as:

1. *Order of Events (Unscramble the words)*
2. *Graphic Organizer (Flow Chart)*
3. *Vocabulary (Definition)*

You may want to try on some questions asked by other people about this topic, Click on Q and A.

End of Deepen

In this section, the discussion was identifying the different parts of scientific method using different samples of scientific investigation. You extend your understanding to find the answer to the question: how can we solve problems in a scientific way?

TRANSFER

Your goal in this section is apply your learning to real life situations. You will be given a practical task which will demonstrate your understanding.

Activity 2.7: Scientific Method Web Quest

Go to this website and perform the different activities on how to do the different steps in scientific method. The different website will help you to answer the given problem.

http://ph052.k12.sd.us/introscimethwq2.htm

How will you assess your understanding on scientific method after doing the web quest activity? How can we solve problems in a scientific way? When do scientific methods become valuable? Can we use scientific method to explain natural phenomena and to develop/invent useful products? Explain you answer by giving specific examples. You are going to do the next activity to enrich your skills on how to conduct scientific investigation and to see the importance of scientific method in daily life activities.

Activity 2.8 : Individual Scientific Method Exploration

You are going to observe things and processes around your home, and formulate a question to solve. Using the Scientific Method as a guide, you should develop a simple experiment and record your results. Be sure to complete each step of the scientific method in order. You should submit a written or typed report to be graded.

Remember that you have to explicitly state in your conclusions whether the hypothesis was accepted or rejected, and suggestions for further experimentation. The written report will be rated using a scoring rubric.

Scoring Rubrics for Individual Scientific Method Exploration

Grading Criteria	Superior 5	Excellent 4	Good 3	Fair 2	Poor 1
Observations					
Hypothesis					

Defined Variables					
Procedure					
Analysis					
Conclusion					

Superior – Meets all requirements; exhaustive coverage; completely understands problem and ability to apply solution; shows originality; few grammatical errors.

Excellent – Meets all requirements of task; well defined and documented; excellent understanding and ability to apply solution; shows evidence of creativity; few errors.

Good – Meets requirements; fairly well planned and documented; shows an understanding and ability to apply data to the solution of new problems; could show more evidence of creativity and more details; few grammatical/mechanical errors.

Fair – Uneven work; meets some requirements; poor coverage; little understanding and ability to apply data to problem solving; needs to improve in significant areas; many grammatical/mechanical errors.

Poor – Meets few if any requirements; little understanding and little application of solution; grammatical/mechanical errors significant.

After doing the individual scientific method exploration, how can we solve problems in a scientific way? What do you think is the purpose of solving problems? When do scientific methods become valuable?

End of Transfer

In this section, your task was to do scientific web quest and individual scientific exploration for you to see the connection of the steps of scientific method to **real world situations.**

How did you find the tasks? How did the tasks help you see the real world use of scientific method? Can you conduct your own scientific investigation?

You have completed this lesson. We are going to study on how to design an experiment for you to really understand the application of *scientific method.*

Lesson 1.3: Designing an Experiment

In this topic, you shall:

- Describe what is meant by fair test.
- Recognize that the design of an investigation should show fair testing.
- Conduct simple investigations using processes involving mixtures common to the locality.
- Choose an interesting topic for investigation.
  - formulate a research problem.
  - formulate a hypothesis.
  - design a procedure to test the
  - hypothesis.
  - collect, organize and interpret data.
  - make conclusions based on the data,
  - accounting and rejecting the hypothesis.
  - write a brief summary of the report.
  - share and present the results of the investigations with other classmates or schoolmates.

EXPLORE

Let's start the module by exploring the expected output in this lesson. As you go through this lesson, keep on thinking about this question: ***When do scientific methods become valuable?***

Scientists write experimental papers to show to other scientists what they have discovered. This paper explained the results of their experiment that supported their conclusion. These papers are even published in a science magazines or journals that they even got novel prices for their excellent contribution to science. Other scientists read the papers and make comments on the experiment and the results. If they disagree with the way the experiment was designed or the results they can do the experiment themselves and write their own paper, trying to persuade others that they are correct. In this way scientists check on each others work making sure that all results and conclusions are accurate.

Performance Task

In your "barangay", residents are complaining about the off smell coming out of the creek near a paper pulp factory. The intensity of the smell increases during rainy days. Residents are putting the blame on the paper pulp factory so they informed the chairman about this but the chairman said that there should be evidence that would prove that the factory is the one causing the problem.

As young scientist, your task is to design an experiment that would give clear idea to the residents about their problem. Write the results of your experiment in the form of an experimental paper. You should be able to convince your chairman about the result of your experiment. You should also be prepared to defend your results orally to the residents in case the result did not support their claim. ***This is to show that an experiment is not biased and should show fairness in testing.***

Your output will be judged according to the application of scientific methods, content, appropriateness, impact and practicality, of the designed experiment

RUBRIC

	EXEMPLARY 4	**SATISFACTORY 3**	**DEVELOPING 2**	**NEEDS IMPROVEMENT 1**
Introduction (Objectives and Hypothesis)	All objectives are clearly stated. The hypothesis is concise and clearly reflects the variables of the study.	All of the objectives are clearly stated. The hypothesis clearly reflects the variables of the study.	Some of the objectives are clearly stated. The hypothesis reflects a singular variable for the study.	There is no objective stated and the hypothesis does not clearly reflect the variables of the study.
Experimental Design	All materials are listed and have proper units. Procedure is detailed and appropriate with adequate number of trials. Steps are appropriately and logically arranged to test the given hypothesis. Safety measures are addressed.	Most of the materials are listed and have proper units. Procedure is detailed and appropriate with adequate number of trials. Steps are appropriately arranged to test the given hypothesis.	Some of the materials are listed and have proper units. Procedure is detailed but does not specify trials in order to test the given hypothesis.	No materials are listed. Procedure is not given.

Collection and Organization of Data	All important data are collected and are presented and organized in very readable tables/charts/graphs. Data collected are accurately related to the hypothesis.	There are a number of data collected, presented and organized in tables/charts/graphs. Data collected are accurately related to the hypothesis.	There are a number of data collected, presented and organized in tables/charts/graphs. Some data collected are somewhat related to the hypothesis.	There are no data collected, presented and organized in tables/charts/graphs.
Conclusion, Recommendations & Bibliography	All conclusions are supported by data and reflect realization of the written objectives. Recommendations are given for the improvement of the study and are consistent with the given conclusion. All sources are properly cited and listed. Some sources have very comprehensive, detailed and updated technical information which can be easily understood and applied.	Most of the conclusions are supported by data and reflect realization of the written objectives. Recommendations are given for the improvement of the study and are consistent with the given conclusion. All sources are properly cited and listed.	Some of the conclusions are supported by data and reflect realization of the written objectives. Recommendations are given for the improvement of the study but some are not consistent with the given conclusion. Only a few sources are cited.	No conclusions and recommendations are given. No sources are cited.
Content	The content of the experimental paper is complete with additional interpretation and implications of the results that reflects student's deep understanding.	The content of the experimental paper is complete, comprehensive and acceptably sufficient. All of the expected data were discussed.	The content of the experiment paper is comprehensive but insufficient. Some expected data were not discussed.	The content of experiment paper is insufficient and not comprehensive. Expected information is not discussed.

	Very comprehensive.			
Appropriateness of the designed experiment	The design of the experiment is very appropriate and the flow of the process is leading to the solution of the problem. Use of scientific process was followed and recommendations were added to completely solve the problem.	The design of the experiment is appropriate and leading to the solution of the problem. The steps in scientific process are transparently followed.	The design of the experiment is not exactly leading to the solution of the problem. Some parts are missing and the steps in scientific process are not completely followed.	The design of the experiment is not appropriate. The experiment is not leading to solve the problem
Impact of the experiment to self and the community	Establishes and communicates in an engaging and practical way the importance and relevance of the issue on personal and community levels	Establishes and communicates the importance and relevance of the issue on personal and community levels. The importance and relevance are clear.	The importance and relevance to the personal and community level are not clearly established and communicated.	Does not relate the selected issue at all to the youth or their community
PRACTICALITY of the experiment	Practicality of the suggested process is very good and justifiable Additional explanation illustrates student's deep understanding of the topic.	Practicality of the suggested process is very good and justifiable.	Practicality of the suggested process is good but not justifiable.	Practicality of the suggested process is not discussed.

In order for you to be ready on your own scientific investigation, you will do a reading on how to design an experiment.

<u>Activity 3.1:</u> Designing experiment

Open the website below and read the article to understand how experiments are design to suit with a particular problem.

http://library.thinkquest.org/J001402F/experiment.htm

After reading the text on how to design an experiment, complete the graphic organizer below:

3 THINGS YOU FOUND OUT:
2 INTERESTING THINGS
1 QUESTION YOU STILL HAVE

What are the important things to remember in designing an experiment? You are to fill the table below using the given situation to check your understanding on designing an experiment.

Situation:

Suppose you are a researcher who is interested in designing several pereximents to test the factors that affect how quickly an Alka-Seltzer ®- Brand A to Brand B- Kremil S and Brand C- Galviscon dissolves in water (solution rate)

STEP 1 – Consider Your Question or Problem

Question/Problem:

_____
_____
_____

Hypothesis

_____
_____
_____

STEP 2 – Think About All the Variables

<u>Activity 3.2</u>: Video clip: Scientific Variables

Go to this websites and study on the different scientific variables:

http://www.youtube.com/watch?v=nzfDvfoBv_g&list=UU__Oz1pXerLxn0Qpsy5wbFw&index=1&feature=plcp

After watching the video, answer the following questions:

1. Define the following
   a. Independent Variable
   b. Dependent Variable
   c. Control Variable
   d. Fair Test
2. Why should the design of an investigation show fair testing? :
3. What is the importance of knowing the different scientific variable in the conduct of your scientific investigation?
4. When do scientific variable become valuable in the conduct of scientific investigation?

Complete the table below using the situation given above:
What is the independent variable (manipulated variable) that you are testing?

_____
_____

What is the dependent variable (responding variable)?

_____
_____

What variables must be kept constant for this to be considered a “controlled variables”?

_____
_____

STEP 3 – Set-Up a Controlled Experiment

_____
_____
_____
_____
_____

STEP 4: Doing the Experiment
List the materials you will need to perform the experiment:

_____
_____
_____
_____
Outline the procedures you will follow as you conduct this experiment. Include a control group and allow adequate time to repeat the experiment to verify your results.

_____
_____
_____
_____
_____
_____
_____

After doing the activity, are you now ready to do your performance tasks. The next activities will help you on how to perform your tasks and for you to find the answer to the question: When do scientific methods become valuable?

End of Explore

You gave your ideas on how to do your performance tasks. Let's us start conducting your scientific investigation by doing the next activities.

FIRM-UP

Your goal in this section is to write and conduct your own scientific investigation. You will be guided by the different activities for you to complete the whole process. As you go through this section, find out the answers on the questions: ***When do scientific methods become valuable?***

Keep in mind this question as you do the different activities in this section.

TASK 1: FORMULATING A RESEARCH PROBLEM

Activity 3.3: Interactive experiment

You have read the steps in designing experiment. Open the following webpage and check how they follow the steps given in the article. Analyze and check if the designed experiment matches with the problem.

1. http://nationalzoo.si.edu/education/conservationcentral/walk/walk4_broadband.html Identifying a tree
2. http://nationalzoo.si.edu/Education/ConservationCentral/walk/walk1_broadband.html finding appropriate type of soil for a type of plant.

Are the designed experiments matches with the problem? Explain your answer.

_____

_____

After doing the interactive video and having ideas on the different scientific variable, fill up the table below:

	Identifying a Tree in the forest	*Matching type of soil to kind of plant*
PROBLEM		
DESCRIPTION OF EXPERIMENT *Dependent variable* *Independent variable* *Control Variable*		

How to write Research Problem:

5. Observe in your surroundings and find a question that captures your curiosity. It might be “who are more fund of going to the mall, male or female?”, “Which is healthier for dogs, table food or dog food?”, “What will be the effect of the gas car exhaust to plants?” or you could think of your own problem. You can observe from your window or go to your kitchen or anywhere in your surroundings to find for your problem.

Consider the problem:
Source: Science Research Process Handbook for INTEL-DOST-SEI by Alfonso, Caintic, Capris, Cruz, Lamorena, Lozano, Santiago

Reading 3

Response of Okra to Horse Manure and Urea: A Comparative Study

The independent variable in the above problem is the kind of fertilizer used. There are two levels of this variable: horse manure and urea. The dependent variable is the response (growth) of okra. The effect is observed in terms of plant height, time of flowering, number of pods and final weight of the plants. An extraneous variable in this study is the quality of okra seed planted in the three plots. Okra is used all throughout the experiment and the seeds used must be of the same size and age. Other extraneous variables are sources of the horse manure and the urea. They should be the same in the entire investigation.

The main problem in this study is to compare the effect of horse manure and urea on the growth of okra.

The sub-problems of this study are:

A. How will the use of horse manure and urea affect the following:
   b) height of the okra plants?
   c) time of flowering per okra plant?
   d) number of pods per okra plant?
   e) final weight of each of the okra plants?
   f) final total weight of the pods per okra plant?

B. How will the effect of horse manure and urea on the growth of okra plants differ in terms of:
   a) average height per plant;
   b) time of flowering per plant;
   c) number of pods per plant;
   d) number of leaves per plant; and
   e) total weight of plants per plot

What are things to be considered in making a research problem?

_____

_____

TASK 1 OUTPUT: WRITING YOUR RESEARCH PROBLEM OF THE PERFORMANCE TASK

TITLE:
INTRODUCTION: *- informs the reader of the problem under study. It shows the nature of scope and the problem. Its historical and theoretical background relevant to the problem.* • **BACKGROUND OF THE STUDY** *- states the rationale of the study. It explains briefly why the investigator chose this study to work on.* • **STATEMENT OF PROBLEMS/OBJECTIVES**

TASK 2: FORMULATING A RESEARCH HYPOTHESIS OF THE PERFORMANCE TASK

Activity 3.4: Video clip: Scientific Hypothesis
Go to this website to see the importance of hypothesis in scientific investigation:
http://www.youtube.com/watch?v=giC6ZYBIeFY

Writing a Research Hypothesis
In making hypothesis, follow the independent variable-dependent variable (IV-DV) format.

There are three types of presentation or writing the hypotheses:

- A null hypothesis states that there is no significant difference between or among the results of the conditions being tested
- An alternative hypothesis form states that there is a significant difference between or among the results of the conditions being tested

- A cause and effect statement states that if a certain condition (cause) is true, then a supporting observation (effect) occurs.

Example:
Source: *Science Research Process Handbook for INTEL-DOST-SEI by Alfonso, Caintic, Catris, Cruz, Lamorena, Lozano, Santiago*

Reading 4

STATED OBJECTIVE AND/OR PROBLEM	WAYS OF FORMULATING THE HYPOTHESES		
	NULL	ALTERNATIVE	CAUSE AND EFFECT
Compare the effects of horse manure and urea on the growth of okra in terms of: 1. average height per plant 2. time of flowering per plant 3. number of pods per plant 4. number of leaves per plant 5. total weight of plants per plot	There is no significant difference between the effects of horse manure and urea on the following variables: 1. average height per plant 2. time of flowering per plant 3. number of pods per plant 4. number of leaves per plant 5. total weight of plants per plot	There is a significant difference between the effects of horse manure and urea on the following variables: 1. average height per plant 2. time of flowering per plant 3. number of pods per plant 4. number of leaves per plant 5. total weight of plants per plot	If there is a significant difference between the effects of horse manure and urea, then the growth of the plants will differ significantly in terms of : 1. average height per plant 2. time of flowering per plant 3. number of pods per plant 4. number of leaves per plant 5. total weight of plants per plot

TASK 2 OUTPUT: WRITING YOUR OWN RESEARCH PAPER OF THE PERFORMANCE TASK

TITLE:
• **STATEMENT OF HYPOTHESES** • **SIGNIFICANCE OF THE STUDY** - the importance of the study is explained in this part. • **SCOPE AND LIMITATIONS** - states the coverage and extent of the study
REVIEW OF RELATED LITERATURE: - sufficient background information should be presented for readers to understand and evaluate the results of the present study. Only the most important studies and theories written on the topic should be included.

TASK 3: RESEARCH DESIGN

Activity 3.5: Planning the Research Design

The following guidelines will help you in designing your research methodology:

- Make a plan of the research design
  1. Describe research as a process.
  2. Differentiate applied and basic research
  3. Analyze experimental design (control group design)
  4. Write the time table
  5. Identify the materials and methods
  6. Write the step-by-step procedure (the experiment must be able to be repeated exactly the way the learners did it)
- Undergo a panel presentation of the research design (may be done through peer review or by inviting teachers or experts)

Study the research design of the scientific investigation *Response of Okra to Horse Manure and Urea: A Comparative Study*

Reading 5

Source: Science Research Process Handbook for INTEL-DOST-SEI by Alfonso, Caintic, Catris, Cruz, Lamorena, Lozano, Santiago

Materials and Methods on the Response of Okra to Horse Manure and Urea: A Comparative Study

To determine the effect of horse manure and urea on plant growth and development, 3 garden pots were prepare in school on an area receiving sufficient sunlight the whole day. Thirty sacks of garden soil were brought from Manila Seedling Bank. The plots (A, B, and C), each measuring 150 cm long by 60 cm wide received 10 sacks of garden soil forming an elevated height of about 30 cm. Canals were dug around the 3 plots to provide drainage. One kilo of urea was brought from an agricultural shop while one sack of horse manure was obtained from a stud farm in Los Banos, Laguna. The Bureau of Plant Industry in Manila provided one bag of “okra” seeds. The plots were watered once a day for a period of 5 days to settle the soil particles.

Meanwhile, seeds of okra were germinated in a tray lined with 3 layers of wet absorbent paper. Exactly one week after germination, the seedlings were ready for transplanting in the garden plots.

After another week, seedlings of okra were randomly selected and planted 25 cm apart in 6 rows and 3 columns in plots A, B, and C. There were 18 plants per plot or a total of 54 plants in the 3 plots. Since measurements obtained from each plant are likely to vary even if each plot was treated alike, replications in terms of having 18 plants per plot was agreed upon.

To find out how okra seedlings were affected by horse manure and urea, it was decided that plant response be measured in terms of plant height number of leaves, number of days before flowering starts, number of pods that develops and later, the total weight of the groups of plants in each of the 3 pods.

To enable the seedlings to adjust to environmental conditions, fertilizer applications were scheduled on the 4th week. However, before fertilizer treatment, initial measurements of height and leaf counts were done in all three plots. Initial data collected were summarized in Table in Results and Discussions.

Twenty grams of dried and powered horse manure was added over a diameter of about 10 cm around each of the plants in plot A while 2 grams of urea was also added around each plant in plot B in the same way. Plants in plot C were not treated with any fertilizer. All the plants were watered once a day in the morning, each plot receiving the same amount of water. One week later, fertilizer application for plots A and B was repeated to sustain the nutrient requirement of the growing plants. Measurements of okra responses to fertilizers were taken every 4 days. Data collected were religiously recorded.

For the care and the management aspects, weeds were removed on a regular basis to prevent them from competing with the plants for nutrients in the soil. Applying pesticides controlled the destructive effect of leaf-destroying insects.

Experimental data gathered on stem elongation show that as early as the last days of the 4th week, plant growth in A and B produced positive results. It was observed that more leaves developed fertilizer-treated plots than in the control plot.

At the end of 6-week experimental period, all the plants were uprooted in each of plots A, B, and C. each group was weighed to get their fresh weight and later dried. After a drying period of about a week, the dry weights of each group were taken.

Data Table 1. *Final Average Measurement Of Okra Response to Horse Manure and Urea.

Plant Responses	Horse-Manure Treated Plot A	Urea-Treated Plot B	Untreated Plot C
1. Average height per plant	32.6 cm	30.8 cm	20.6 cm
2. Average number of leaves per plant	7.2	6.7	3.6
3. Average time of flowering	26 days	24 days	38 days
4. Average number of pods per plants	6.4	5.9	3.6
5. Fresh weight per plot	82.6 kg	78.8 kg	40.6 kg
6. Dry weight per plot	13.8 kg	13.1 kg	6.8 kg

What are the important things that you will consider in making your experimental design?

_____

_____

_____

TASK 3 OUTPUT: WRITING YOUR OWN RESEARCH DESIGN OF THE PERFORMANCE TASK

TITLE:
METHODODOLOGY: - provides enough details so that a competent worker can repeat the experiments. Careful writing is critically important because the research results are to be of scientific merit. It must be productive. a) Materials/Equipment b) Treatment/General Procedure c) Flow Chart

TASK 4: CONDUCT OF THE ACTUAL EXPERIMENT (PERFORMANCE TASK)

a) You are going to perform your scientific procedures in your own house.
b) Here are the guidelines on how to conduct the actual experiment:

- be familiarized with laboratory apparatus/equipment
- demonstrate proper use of laboratory apparatus/equipment
- be aware of handling and disposal procedure while conducting the experiment
- perform the actual experiment
- collect data applying the process science skills and using qualitative and quantitative observations.

Did you enjoy the activity? Do you see significance in the things that you are doing? What do you think is the reason why do we you have to test the hypothesis? What is the purpose of conducting an experiment? Can you solve now problems in a scientific way? How? When do scientific methods become valuable in these processes? You are going to perform the next activity to see the importance of experiment in every scientific investigation.

TASK 5: DATA ANALYSIS, MAKING CONCLUSIONS AND RECOMMENDATIONS

<u>Activity 3.6:</u> Collecting, Organizing and Interpreting Data: Data Analysis

How do we present and interpret data? How will you organize collected data from an experiment?

a) You are going to do an activity to check your understanding on how to collect, gather and interpret data.

Source: Science Research Process Handbook for INTEL-DOST-SEI by Alfonso, Caintic, Catris, Cruz, Lamorena, Lozano, Santiago

Data Interpretation
Response of Okra to Horse Manure and Urea: A Comparative Study

Exercise

1. Classify the following sets of data into nominal, ordinal, ratio, interval.

A.

Section	Boys	Girls
1	20	5
2	30	4
3	15	20
4	10	30

B.

Depth of water	Dissolved oxygen
Surface	7.0 mg/l
1 m below surface	6.5 mg/l
2m below surface	6.0 mg/l

2. In the sample investigatory project, we provided the following data:
   a. Height of plant
   b. No. of leaves per plant
   c. Flowering time
   d. Number of pods produced pr plant
   e. Total weight of plants per plot

   Classify the data into normal, ordinal, interval, ratio.

3. Suppose you would like to find out the effect of different colors of light on plant growth, the following are the probable data collected
   a. Color of leaf : Green 23
      Yellow 10
      Orange 12
      Red 19

   b. Flowering time : 5 days
      6.5 days
      7 days
      8 days

   Classify the above data.

The above data do not give meaning nor explain patterns of the data. How should we give meaning of explain the gathered data?

Sample Exercise

1. What is the measure of central tendency for the following data to be collected in the sample investigatory project?
   a. Height of plant

b. Number of leaves per plant
c. Flowering time
d. Number of pods per plant
e. Total weight of plant per plot.

The measure of central tendency is not the only way to describe your data. You can also describe data with variation. *Variation* is a measure of spread within the data. It tells us how far the individual value is from the *mean* or from other measure of central tendency. What are the different measures of variation? For quantitative data you can easily compute for *range*. What is range? *Range* is the difference between the highest value and the lowest value.

Plant	Number of pods	The highest value in the sample
		data is 50 and the lowest values
1	50	is 8. the range is 42 (50-8)
2	35	
3	30	
4	29	Two groups of data may have
5	28	equivalent mean but
6	8	different range.

Answer to sample exercise: a. mean b. mode c. mode d. mode e. mean

Answer the following questions:

1. What type of graph is most appropriate for your data?
2. What conclusion or conclusions can you draw based on your data analysis and interpretation?
3. What other type of graph can be used to present your data?
4. What is the importance of organizing data in a tabular form?
5. What is the importance of organizing data in graphical form?
6. Which type of presentation is easier to interpret? Why?

7. Which type of presentation is better for showing trends? Why?
8. How would you accurately present the data recorded from your activity?

After doing the activity, you are going to do the next activity for you to practice on how to make experimental conclusions.

1. Go to this website and answer the practice with experiment conclusions http://www.getworksheets.com/samples/worksheets/science/method.html

   How do you write experimental conclusions?

   _____
   _____
   _____
   _____

2. After doing the website activity, answer the situational analysis below:

Sandy wanted to know if the boiling point of water will increase if some amount of salt will be added into it. She conducted an experiment to solve her problem. She prepared three 1000mL beakers and labeled it as beakers A, B and C. She placed 650mL water into each beaker. After that, 150 grams of salt was added to beaker A, 250 grams of salt was added to beaker B and no salt was added to beaker C. She heated the beakers with the salt solution for 15 minutes.

She got the following g data:
Trial 1: Beaker A= 105 °C, Beaker B= 110.5 °C and Beaker C= 101 °C.
Trial 2: Beaker A= 105.5 °C, Beaker B= 109 °C and Beaker C= 100 °C.
Trial 3: Beaker A= 106 °C, Beaker B= 110 °C and Beaker C= 100.5 °C.

1. What is the problem in the study?
2. Formulate a hypothesis about the problem.
3. What is the independent variable of the study?
4. What is the dependent variable of the study?
5. Give 2 constants of the study.
6. Which beaker(s) is/are considered as the control set-up?
7. Which beaker(s) is/are considered as the experimental set-up?
8. Tabulate the given data.
9. Graph the given data.

How do you find the activity? Can you now make experimental conclusions? The discussion below will help you remember important things in data interpretation, making conclusions and recommendations.

Important things to remember in data interpretation:

1. classify data collected;
2. record and organize data using graphs and tables;
3. describe data collected

- analyze data by determining if there are any trends or patterns in the data
- find out whether data support hypothesis or prediction.
- work in groups to critique tabulated /graphed data based on the experiment or investigation conducted.

General guidelines on how to make conclusions and recommendations:

1. make, write correct, relevant and valid conclusions, taking into consideration the identified research questions;
2. make useful recommendations;
3. work in groups to critique conclusions and recommendations;

Answer the graphic organizer below considering the discussion on data interpretation and making conclusion

Before and Now
Before I used to think….
Now I realize….

TASK 5 OUTPUT : DATA ANALYSIS, MAKING CONCLUSIONS AND RECOMMENDATIONS OF YUR PERFORMANCE TASK

TITLE:
RESULTS AND DISCUSSIONS b) Findings – the data may be presented in full and discussed descriptively in the test or these may be summarized in tables, pictures and graphs. The statistical test used to determine the possible significance of the findings should be described. Tables, pictures and graphs should make the presentation of the data more meaningful. c) Analysis of Data – the interpretation of the findings is discussed and the significant features shown in the tables, figures or graphs are pointed out.
CONCLUSIONS AND RECOMMENDATIONS • CONCLUSION- the general truth, implied or illustrated by the results should be clearly stated. The evidence based on the results should be summarized for each statement. • RECOMMENDATIONS- this consists of suggestions on future actions such as new direction of research or further experiments to be performed, practices that might be adapted or discarded in order to attain certain goals or objectives.
BIBLIOGRAPHY - a list of the references used in guiding the research work and writing the paper.

After doing the activity, did you see the importance why do we have to test the hypothesis? Can we get new information from the data given? Were you able to give the correct interpretations of your data? What are the things to be considered in collecting, gathering and interpreting data? When do scientific methods become valuable? How can we solve problems in a scientific way? Now, after doing the activity, you are going to recall the whole process and make an abstract for your scientific investigation.

End of Firm Up

In this section, the discussion was about the steps on how to complete your performance tasks.

Now that you know the important ideas about making a scientific investigation, let's go deeper by moving on to the next section.

DEEPEN

Your goal in this section is to take a closer look of your scientific investigation.

TASK 7: MAKING AN ABSTRACT/SUMMARY

Activity 3.7: Sample Abstract/Summary Analysis

a) You are going to analyze contents of some sample abstracts.

Reading 6

RESEARCH ABSTRACT

Response of Okra to Horse Manure and Urea: A Comparative Study

The high cost of farm inputs particularly fertilizers has deterred farmers from increasing and improving farm yield. Recycling plant and/or animal materials like dry leaves and grass, horse manure, chicken dung and their use as fertilizers by making compost may help solve the framers dilemma. This study investigated the relative effectiveness of organic (compost – horse manure and inorganic fertilizers (urea) in promoting

plant growth and development. Specifically, the study tested the following hypotheses:

a. Plants grown with horse manure and plant grown with urea exhibit similar heights, weights, time of flowering and number of pods; and
b. Plants receiving fertilizers (horse manure and urea) grow higher, weigh more, flower earlier and have more pods than plants receiving no fertilizer.

The study used okra seeds planted in 3 garden plots –

A- no fertilizer
B- with 2g urea
C- with 209g horse manure for a period of six weeks.

The data revealed no significant difference in the mean heights, weights, time of flowering and number of pods when grown with either horse manure or urea. This supports the hypothesis that plants grown with urea and horse manure will have similar effects. Likewise, plants grown with fertilizers grow significantly higher, weigh more, have more pods and flower earlier than plants without fertilizers. Further investigations maybe done for other plants. It is also necessary to determine if other types of animal manure of different ages are beneficial to plant growth over an extended period of time.

b) Read the abstract. Answer the guide questions in the activity sheet using the sample abstract given:

- Identify the following:
  a. the problem to be solved
  b. the hypothesis
  c. the basis (the rationale) for the hypothesis)
- Describe the following:
  a. the procedure to test the hypothesis
  b. the variables in the study
  c. the dependent variable/s
  d. the independent variable/s
  e. the control setup
  f. the experimental setup
- State the following:
  a. the findings of the study
  b. the conclusion
  c. the recommendation/s

TASK 7 OUTPUT: MAKING AN ABSTRACT/SUMMARY OF YOUR PEFROMANCE TASK

TITLE:
ABSTRACT: *(maximum of 250 words)*

After doing the different parts of the scientific method, what can you say about the whole process? Is it always orderly? Explain your answer. When do scientific methods become valuable? How can we solve problems in a scientific way? You are going to do the next activity to see the importance of scientific method as a process.

Activity 3.8: Quiz on Scientific Method

a) Open the link and take the quiz on scientific method:
http://www.quibblo.com/quiz/aYRyBh7/Scientific-Method-Quiz or
http://www.proprofs.com/quiz-school/story.php?title=scientific-method-retake

After doing the activity, what did you noticed of your ideas about scientific method? Are you now certain with your ideas on scientific method? Is scientific method always orderly? When do scientific methods become valuable? Were you able to see how to solve problems in scientific way in the different questions in the quiz? Is it important to solve problems in scientific way? You are going to do the next activity to enrich your skills on how to conduct scientific investigation and to see the importance of scientific method in daily life activities.

End of DEEPEN:
In this section, the discussion was about how to make an abstract and the steps of scientific method.

What new realizations do you have about the topic? What new connections have you made for yourself? Can you now answer the question: When do scientific methods become valuable?

Now that you have a deeper understanding of the topic, you are ready to do the tasks in the next section.

TRANSFER

Your goal in this section is apply your learning to real life situations. You will be given a practical task which will demonstrate your understanding.

Activity 3.9: Internet Activity: CSI (Crime Scene Investigation)

a) Do you like detective or mystery stories? We are going to do again a crime scene investigation in the net to check your understanding on how to solve problems in a scientific way. Unlike in the start of the first session, please take note on how the skills you learned in this lesson are used to find answer to the questions.

b) Go to this website:
http://www.cyberbee.com/whodunnit/crimescene.html

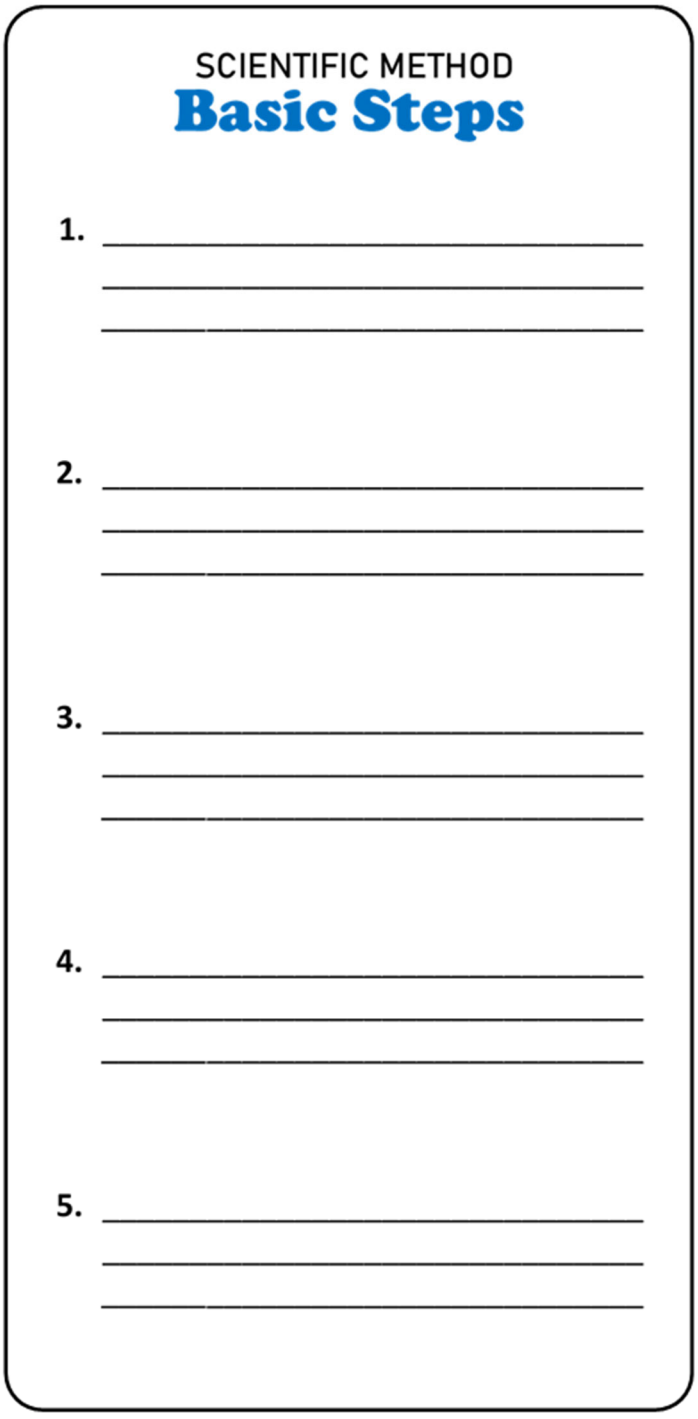
You are going to use the clues found at the crime scene, determine which of the four suspects is the "barefooted burglar"? What do you think was the motive for this crime?

Do you have the correct answer to this crime scene investigation? What are the different processes that you used to answer the problem? Are you using scientific method in this case? Is scientific method always orderly? Can we also use the scientific method to explain natural phenomena or to develop/invent useful products? Explain your answer.

Activity 3.10: Graphic Organizer on Scientific Method

a) Complete the graphic organizer of scientific method below to synthesize your ideas/concepts on scientific method:

Scientific Method Graphic Organizer



CONCLUSION

HYPOTHESIS

PROCEDURE

DATA

DATA

What can you say about your ideas on scientific method? Can you now solve problems scientifically? When do scientific methods become valuable? You will do the next activity to find out the answers to these questions.

Scientific Method Graphic Organizer

PERFORMANCE TASK:

After doing all the tasks for your performance task, how can you give your best contribution to community using scientific method/s?

a. You are going to finalize your written report for your performance tasks:
Situation:

In your “barangay”, residents are complaining about the off smell coming out of the creek near a paper pulp factory. The intensity of the smell increases during rainy days. Residents are putting the blame on the paper pulp factory so they informed the chairman about this but the chairman said that there should be evidence that would prove that the factory is the one causing the problem.

As young scientist, your task is to design an experiment that would give clear idea to the residents about their problem. Write the results of your experiment in the form of an experimental paper. You should be able to convince your chairman about the result of your experiment. You should also be prepared to defend your results orally to the residents in case the result did not support their claim. ***This is to show that an experiment is not biased and should show fairness in testing.***

Your output will be judged according to the application of scientific methods, content, appropriateness, impact and practicality, of the designed experiment

b. Generate all the saved output in lesson 3. You are going to submit a written output to your teacher using the format below:

FORMAT OF PROJECT WRITE-UP

- Title Page
- Abstract
- Acknowledgement
- Table of Contents
- Introduction
  a) Background of the Study
  b) Statement of Problem/Objective
     * General Objective
     * Specific Objective
  c) Statement of the Hypotheses
  d) Significance of the Study
  e) Scope and Limitations
- Review of Related Literature
- Methodology
  a) Materials/Equipment
  b) Treatment/General Procedure
  c) Flow Chart
- Results and Discussion
  a) Findings
  b) Analysis of Data
- Conclusions

- Recommendations
- Bibliography

c. CONDUCT OF PEER REVIEW
- It is suggested that you will ask your parents, classmates, siblings or neighbors to review you performance task output before you will submit your report to your teacher.

d. PRESENTATION OF THE PERFORMANCE TASKS
- ❖ The science congress will be done following the rationale and objectives of the performance tasks:
  - encourage learners to organize their learning experiences so that they can move from their own conduct of scientific investigation and concrete activities to independent applications where they create or produce new knowledge in science. This is to challenge learners to transfer their learning in new settings and used this creatively to generate new ideas, view things differently and reengineers processes.
  - learners shall be involved in designing, constructing, planning, producing new knowledge and/or inventing products which can contribute to the protection of the environment and sustainable use of resources.

- ❖ At the end of the presentation you should thoroughly give your ideas on the following guide questions:
  1. When do scientific methods become valuable?
  2. How can we solve problems in a scientific way?

- ❖ Your output will be rated using a rubric.

RUBRIC

	EXEMPLARY 4	SATISFACTORY 3	DEVELOPING 2	NEEDS IMPROVEMENT 1
Introduction (Objectives and Hypothesis)	All objectives are clearly stated. The hypothesis is concise and clearly reflects the variables of the study.	All of the objectives are clearly stated. The hypothesis clearly reflects the variables of the study.	Some of the objectives are clearly stated. The hypothesis reflects a singular variable for the study.	There is no objective stated and the hypothesis does not clearly reflect the variables of the study.
Experimental Design	All materials are listed and have proper units. Procedure is detailed and appropriate with adequate number of trials. Steps are appropriately and logically arranged to test the given hypothesis. Safety measures are addressed.	Most of the materials are listed and have proper units. Procedure is detailed and appropriate with adequate number of trials. Steps are appropriately arranged to test the given hypothesis.	Some of the materials are listed and have proper units. Procedure is detailed but does not specify trials in order to test the given hypothesis.	No materials are listed. Procedure is not given.
Collection and Organization of Data	All important data are collected and are presented and organized in very readable tables/charts/graphs. Data collected are accurately related to the hypothesis.	There are a number of data collected, presented and organized in tables/charts/graphs. Data collected are accurately related to the hypothesis.	There are a number of data collected, presented and organized in tables/charts/graphs. Some data collected are somewhat related to the hypothesis.	There are no data collected, presented and organized in tables/charts/graphs.
Conclusion, Recommendations & Bibliography	All conclusions are supported by data and reflect realization of the written objectives. Recommendations are given for the improvement of	Most of the conclusions are supported by data and reflect realization of the written objectives.	Some of the conclusions are supported by data and reflect realization of the written objectives.	No conclusions and recommendations are given. No sources are cited.

	the study and are consistent with the given conclusion. All sources are properly cited and listed. Some sources have very comprehensive, detailed and updated technical information which can be easily understood and applied.	Recommendations are given for the improvement of the study and are consistent with the given conclusion. All sources are properly cited and listed.	Recommendations are given for the improvement of the study but some are not consistent with the given conclusion. Only a few sources are cited.	
Content	The content of the experimental paper is complete with additional interpretation and implications of the results that reflects student's deep understanding. Very comprehensive.	The content of the experimental paper is complete, comprehensive and acceptably sufficient. All of the expected data were discussed.	The content of the experiment paper is comprehensive but insufficient. Some expected data were not discussed.	The content of experiment paper is insufficient and not comprehensive. Expected information is not discussed.
Appropriateness of the designed experiment	The design of the experiment is very appropriate and the flow of the process is leading to the solution of the problem. Use of scientific process was followed and recommendations were added to completely solve the problem.	The design of the experiment is appropriate and leading to the solution of the problem. The steps in scientific process are transparently followed.	The design of the experiment is not exactly leading to the solution of the problem. Some parts are missing and the steps in scientific process are not completely followed.	The design of the experiment is not appropriate. The experiment is not leading to solve the problem

Impact of the experiment to self and the community	Establishes and communicates in an engaging and practical way the importance and relevance of the issue on personal and community levels	Establishes and communicates the importance and relevance of the issue on personal and community levels. The importance and relevance are clear.	The importance and relevance to the personal and community level are not clearly established and communicated.	Does not relate the selected issue at all to the youth or their community
PRACTICALITY of the experiment	Practicality of the suggested process is very good and justifiable Additional explanation illustrates student's deep understanding of the topic.	Practicality of the suggested process is very good and justifiable.	Practicality of the suggested process is good but not justifiable.	Practicality of the suggested process is not discussed.

VALUES INTEGRATION:

Is the scientific method limited?

A set of ideas or opinion that you have, about happenings around you is called a bias. Explain how a bias can influence the accuracy of your judgment in this situation.

Situation:

You have a classmate who has a limited amount of money for school expenses. He is having difficulty making ends meet. It is discovered that some money from the class fund is missing from the bag of the class treasurer. One of the students seen near the area where the bag was placed was this classmate. The general suspicion falls on this classmate. How would you react to this story?

Explain how you can use the scientific method to keep an open mind.

a) You are going to make your decision using the Decision Making Chart Below
   - State the decision that needs to be made.
   - List possible alternatives.
   - List the pros and cons (the consequences) associated with each of the alternatives.
   - Compare the consequences each of the alternatives in order to make the decision (and/or evaluate the alternatives pair wise)

DECISION MAKING GRAPH

PROBLEM	GOALS

ALTERNATIVES	PROS (+), CONS (-)
	+
	-
	+
	-
	+
	-
	+
	-
	+
	-

DECISION(S)	REASON(S)

What will you feel and what will you do if you are the classmate who is the suspect of this stealing case? Explain your answer.

What is the role of scientific method in this situation? Can you now solve problems in scientific way? When do scientific methods become valuable?

End of Transfer

You have completed this lesson. Before you go to the next lesson, you have to answer the following assessments to evaluate what you learned.

POST-ASSESSMENT:

It's now time to evaluate your learning. Click on the letter of the answer that you think best answers the question. Your score will only appear after you answer all items. If you do well, you may move on to the next module. If your score is not at the expected level, you have to go back and take the module again.

1. For several years, Dennis has been studying the use of local plants as pollution indicators in mining area. What scientific attitude is manifested by Dennis?
   A. honesty
   B. humility
   C. open-mindedness
   D. perseverance

2. The following are steps of scientific method
   I. Formulation of hypothesis
   II. Identification of the problem
   III. Experimentation and data gathering
   IV. Interpretation of data and drawing of conclusion

   What is the correct sequence of the procedure?
   A. II, I, III, IV
   B. I, II, III, IV
   C. I, II, IV, III
   D. II, IV, I III

For questions 3-5, read the situations below:

Beda wants to find out if different types of wood soak up the same amount of water when wet. She plans to do the following:

I. Weigh a dry block of each type of wood.
II. Put each block into a container full of water.
III. Leave the wood in the water.
IV. Take the wood out, dry the outside of each block and reweigh.
V. Calculate the amount of water soaked up

3. To be a fair test, what variables should she control?
   I. Size of each block
   II. Time left in water
   III. Type of wood
   IV. Amount of water

   A. I and III
   B. III and IV
   C. I and II
   D. II and IV

4. In this experiment, what is the dependent variable?

A. Type of wood used
B. The amount of water soaked up
C. Time left in water
D. Dry weight of each block

5. What is the independent variable?
A. Type of wood used
B. The amount of water soaked up
C. Time left in water
D. Dry weight of each block

6. Refer to the table below:

Animal Life Span			
	Cow	Dog	Horse
Resting Heart Rate	52 beats per min	95 beats	48 beats per min
Average Life Span	18 years	16 years	27 years

Which of the following problems will be given solution by the data presented above?
A. Does the average life span proportional to heart rate?
B. Do farm animals live longer than pets?
C. Do larger animals have faster heart rates?
D. Do heart rate and resting heart rate make animal live longer?

7. Which statement is a hypothesis?
A. The mango fruit turns yellow as it ripens.
B. The yellow mango fruit is sweeter than the green ones.
C. The sweet mango fruit contains more sugar.
D. Ripe mango is softer than green mango

8. What generalization can be inferred from the table below?

Substance	Boiling Point
Carbon Tetrachloride	76.8 ºC
Ethyl Alcohol	78 ºC
Water	100 ºC
Mercury	375 ºC

A. The boiling point of water at sea level is 100 ºC
B. Mercury boils at very high temperature
C. Each substance boils at specific temperature
D. When a mixture of water and ethyl alcohol is heated, ethyl alcohol will boil ahead of water.

9. Why do fisher folks catch more fish during the new moon than during the full moon?

A. Fishers are more active during the new moon because the salt content of water is just right.
B. Fishes look for mates during the new moon.
C. Fishes go near the surface during the new moon because the water is warmer.
D. Fishes are attracted to the light from the fishing boat which fisherman makes use of during the new moon.

10. Who among the following individuals shows open-mindedness?
A. Paul is always interested in asking questions. He is also very eager to find the answer to his questions.
B. Chona respects the ideas of her colleagues even if they are very much contrary to her own beliefs.
C. Marco weighs evidences dutifully before making any conclusion or decisions. He dissects the information individually before coming to a final conclusion.
D. Monica actively participates in a task and also dutifully performs tasks assigned to her.

11. Amelia noticed that the children who eat high sugar foods are more active than those who eat low sugar foods. She wants to know if sugar could cause hyperactivity in children. What would be her first step?
A. Inform the parents that they should not allow their children to eat high sugar foods
B. Set up an experimental and control group
C. Feed number of children with high sugar food and observe their behavior
D. Construct a hypothesis that could be tested.

6.

12. You have conducted an experiment and confirmed your hypothesis. In scientific method, your next step should be
A. Reconstruct your hypothesis and start with a new problem
B. Refine your hypothesis because there might be some error that you missed
C. Perform your experiment again to prove that the results of your first supporting your hypothesis are not just by chance.
D. Look for another problem where you could use your hypothesis.

13. A sea food restaurant placed a suggestion box at their counter. When they read the costumers' suggestions, they noticed that most of them love their menu but they suggest that the restaurant serve desert (gelatin, candy or any delicacy) that could counteract the not so good smell of breath that they have

after eating sea foods. Regularly they are serving fruit gelatin but this time, they want to test gelatin with lemon grass and find out if this would be a good solution to the problem.

7. Which is the independent variable?

   A. The presence of lemon grass in fruit gelatine
   B. The odour of the breath
   C. The amount of gelatine
   D. The comments of the costumers

14. A girl had an idea that plants needed minerals from the soil for healthy growth. She placed a plant in the Sun, as shown in the diagram below.

In order to check her idea she also needed to use another plant. Which of the following should she use?

A. Dark cupboard

Sands, minerals & water

C. Sunlight

Sand only

B. Dark cubpboard

Sand and water

D. Sunlight

Sand and water

15. A scientist applied the scientific method in an experiment that he was doing. He identified the problem, formulated a hypothesis, gathered some data, and analyzed it. To his surprise, his findings did not agree with the hypothesis. He then repeated the experiment many times but the findings did not change. If you are the scientist, what should you do now?
    A. Repeat the experiment over and over until the findings agree with the hypothesis.
    B. Conclude that the data he gathered are inaccurate and erroneous.
    C. Decide that the findings in the many experiments are enough reason for him to reject the hypothesis.
    D. Conclude that the discrepancy of the hypothesis and the findings make the experiment null and void.

16. You conducted a research to determine whether noise affects the ability to solve math problems. You let one group solve math problems in a quiet room and another group solve math problems in a noisy room. The group solving problems in the noisy room completes 15 problems in one hour and the group solving problems in the quiet room completes 22 problems in one hour. In this experiment, your independent variable is _____ and the dependent variable is _____.

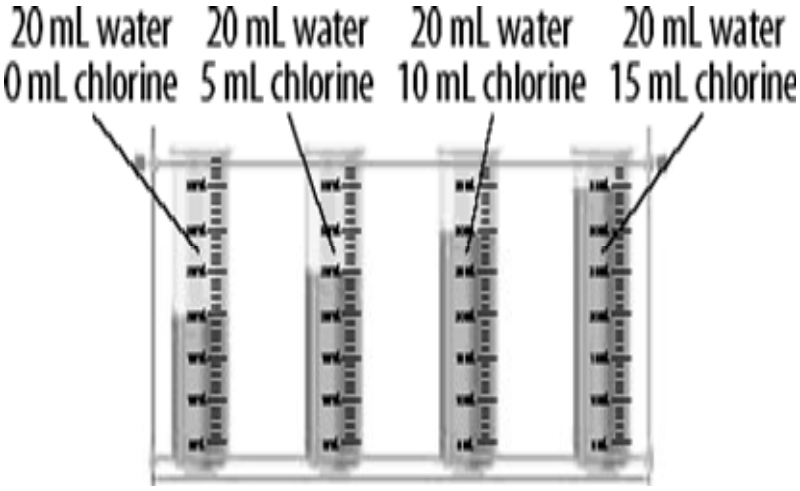
A. The number of problems solves; the difficulty of the problems
B. The number of problems solved; the noise level in the room
C. The noise level in the room; the number of problems solved
D. The noise level in the room; the difficulty of the problems

17. Lilah designed an experiment to find out which toothpaste is most effective in whitening teeth. She cut four different shells from four different clams and soaked shell in the toothpaste solution of each different toothpaste she's testing. Then she left the shells in the solution for 24 hours. If you were Lilah, which of the following should you do to improve your experiment?
    A. Use the same kind of shell clams applied to brands of toothpaste.
    B. Use two other kinds of clams to really figure out the effect of toothpaste.
    C. Repeat the method she used on different tooth like objects to make it valid.
    D. Use no water in the shell of the clams but pure toothpaste and leave it for 24 hours.

18. While on the beach side you have noticed two men dumping barrels of unknown liquid, then you have observed that the liquids spilled in the beach. You infer that it might affect the living things around the beach and might be affecting the lives of the people in the community. If you are going to respond to this situation, what investigation would you most likely to perform?
    A. Inventing a record on numerous safeguards to prevent the accident from occurring.
    B. Listing safeguards that were not in place to prevent the accident from occurring.
    C. Sampling on the effects of various elements that contaminates the beach line.
    D. Identifying the level of contamination of chemicals in sea water at the area.

19. To study some type of nocturnal animals, one set of scientists use technology that helps them see better at night. One type of device is a night-vision scope that can allow the scientists to see the animals around them nearly as if the forest were in full daylight. Other set of scientists get these nocturnal animals from the wild and made an artificial habitat for the animals in the comfort of their own labs. If you were the scientist studying these animals, which approach would you use, the first or the second?
    A. The first because the scientists can study the animals in their natural environment.
    B. The first because the approach studies the animals in their sleep.
    C. The second because the animal's behavior will be controlled in the labs.
    D. The second because it allows them to have a greater observation in the laboratory.

20. Refer to the figure below:



The test tubes in the diagram above were left at room temperature for a week to see if algae would grow. If you were the scientist doing this research in a coastal area, then what would your reason be in doing this study?

A. To determine the amount of algae present in the test tube so that people would know.
B. To verify the possible effect of chlorine to the people using it in the community.
C. To educate people on the effect of chlorine on algae in the coastal area.
D. To establish a connection between room temperature and algae in the area.

CLOSURE:

Modern science has developed a method based on a "frame of thinking" which has proven to be so fruitful that it is applied in all possible fields including human society However; this "frame of thinking" is based on several prerequisites, which lead to limits of scientific knowledge often not duly recognized. The scientific method is the complete method of creative problem solving and decision making for all fields. It is of great national importance that the scientific method, which is not just for scientists but is really a general problem solving method for everyone, be applied to all problems by all concerned

GLOSSARY

SCIENTIFIC METHOD - is a system of gathering information and testing idea.

OBSERVATION- the use of the five senses in examining nature

HYPOTHESIS- educated or scientific guess of an answer to a problem

EXPERIMENT- written and carefully followed step-by-step procedure designed to test hypothesis.

CONCLUSION- the confirmation if the hypothesis is accepted or rejected

INDEPENDENT VARIABLE – is what is manipulated or the treatment in an experiment.

DEPENDENT VARIABLE- is what is observed from the effects of the treatment in an experiment.

CONTROLLED VARIABLE – are factors that remain constant throughout an experiment. One example is setting up a duplicate experiment which does not receive the treatment

RESOURCES AND LINKS IN THIS MODULE:

References:

1. Department of Education, Culture and Sport, Science and Technology I, Guide for Teachers
2. Science Research Process Handbook for INTEL-DOST-SEI by Alfonso, Caintic, Catris, Cruz, Lamorena, Lozano, Santiago,
3. Maton ,et al, Exploring Physical Science: Prentice Hall Second Edition pages 6-19
4. TIMMS-BASED Teaching Strategies in Science and Mathematics page 88
5. Science is… by Susan Bosak
6. Introduction to Science Inquiry by Tik Liem
7. Integrated Science Laboratory Manual Vibal Publishing House by Caranto Lavisores, Royo, Pulido and Chico
8. Lomotan,et al, Connecting With Science Integrated Science

Websites:

http://www.thomasedison.com/biography.html
This site contains the biography of Sir Thomas Edison

http://www.blupete.com/Literature/Biographies/Science/Scients.htm
This site introduce students to Filipino and Foreign Scientists

http://inventors.about.com/od/filipinoscientists/Filipino_Inventors_and_Filipino_Scientists.htm
http://www.funbrain.com/who/index.html
This site contains trivia about scientist that the students may answer

http://agham.asti.dost.gov.ph/1998/8th/fun/fun.htm
This site contains a short quiz on Filipino Scientist

http://www.youtube.com/watch?v=gY4xUYExAAY
This is a you tube video of our Filipino Pride: Dr. Fe Del Mundo

http://www.youtube.com/watch?v=3PXeAQrVA4M
This is a you tube video that contains President Benigno Aquino tribute to Dr. Fe Del Mundo: National Scientist

http://www.youtube.com/watch?v=nP-h9k52k5Q
Video on Filipino scientists

http://glencoe.com/sec/science/physics/ppp_09/animation/Chapter%201/Scientific%20Method.swf
This webpage explains the different steps in scientific method with voice and flow chart for your better understanding

http://science.pppst.com/scientificmethod.html
Power Point Presentation in Scientific Method

http://www.quia.com/jg/57288.html
This site presents games that differentiate observation and inference

http://www.ehow.com/how_8647226_make-good-hypothesis.html
This is a webpage that contains the characteristics of a good hypothesis.

http://www.brainpop.com/science/scientificinquiry/scientificmethod/index.weml
Interactive video on sample situation of scientific method

http://ph052.k12.sd.us/introscimethwq2.htm
The site contains the detailed instructions for the scientific method web quest

http://library.thinkquest.org/J001402F/experiment.htm
Website that gives clues and help you in designing experiment

http://www.youtube.com/watch?v=nzfDvfoBv_g&list=UU__Oz1pXerLxn0Qpsy5wbFw&index=1&feature=plcp
Video on scientific variables

http://nationalzoo.si.edu/education/conservationcentral/walk/walk4_broadband.html
Activity in identifying a tree as a problem in scientific method

http://nationalzoo.si.edu/Education/ConservationCentral/walk/walk1_broadband.html
Activity on finding appropriate type of soil for a type of plant as an activity in scientific method

http://www.youtube.com/watch?v=giC6ZYBIeFY
This is an animated you tube vide on hypothesis

http://www.getworksheets.com/samples/worksheets/science/method.html
This is a worksheet on making conclusions

http://www.quibblo.com/quiz/aYRyBh7/Scientific-Method-Quiz
http://www.proprofs.com/quiz-school/story.php?title=scientific-method-retake
These websites contains quizzes for scientific method

http://www.cyberbee.com/whodunnit/crimescene.html

This site presents a crime scene where the students will find clues and solve the crime based from the different clues. This is a crime scene investigation activity.

BACK

Lesson 2: Diversity of Materials in the Environment

Lesson 2.1 Solutions

MODULE INTRODUCTION AND FOCUS QUESTION(S):

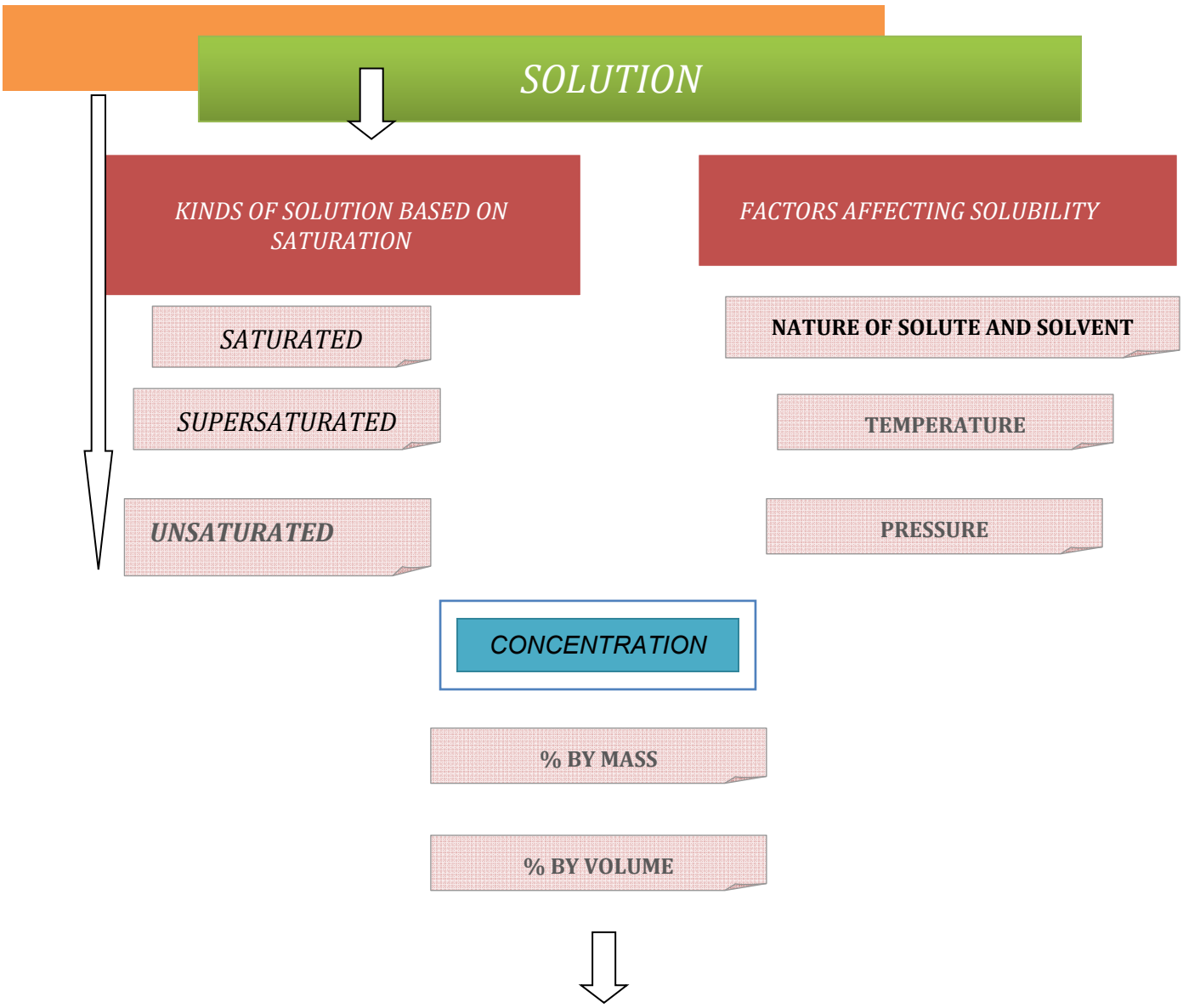
If you mix things up and they stay at an even distribution, you may say it is a solution. Have you ever thought that a solution could be in solid form? Are solutions found only in the laboratory? ***How are solutions formed? How can the knowledge of solutions help us create products useful in everyday life?***

LESSONS COVERAGE:

This lesson has the following coverage:

Topics	You will learn to.....	Estimated time
1. Nature and Types of solution	Explain how solutions are formed and differentiate the types of solution	2 hrs
2. Concentration of solution	Differentiate concentration based on percent by mass and percent by volume	3 hrs
3. Factors affecting solubility	Explain how factors affecting solubility could be used in our everyday life	4 hrs

Here is a simple map of the above topics you will cover:



To do well in this lesson, you need to remember and do the following:

1. Open the indicated website. Explore.
2. Take down notes and copy some important link so that you could go back whenever you need information given in that site.
3. Go beyond the procedure given in the net. Explore more.
4. Review videos as many times as needed
5. Do the web test for several times and don't forget to click on the correct answer for your reference.

PRE-ASSESSMENT:

Let's find out how much you already know about this module. Click on the letter that you think best answers the question. Please answer all items. After taking this short test, you will see your score. Take note of the items that you were not able to correctly answer and look for the right answer as you go through this module.

1. Sugar dissolves easily in water. Sugar is a
   a. Solute
   b. Solvent
   c. solution
   d. suspension

2. Water is a polar compound. Which of the following will readily dissolve in water?
   a. Starch
   b. Salt
   c. fats
   d. aluminium

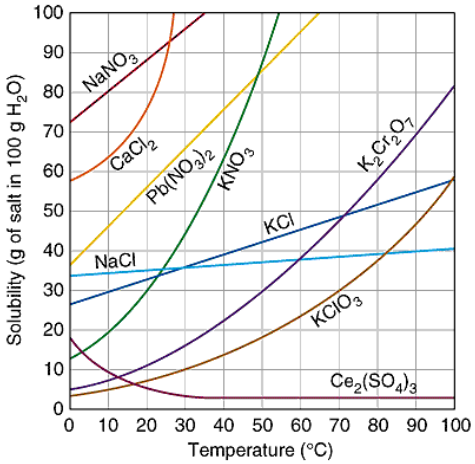
3. What is most likely to happen if more solute is added to an unsaturated solution?
   a. Added solute will no longer dissolve
   b. Crystals will form
   c. Added solute will readily dissolve
   d. Added solute will just float at the top of the solution.

4. What is the percentage by mass of a solution with 4g sodium hydroxide in 36g of water?
   a. 10% b. 11% c. 15% d. 20%

5. Rubbing alcohol is used as anti bacterial and disinfectant solution. Which of the following will best serve the purpose?
   a. 40% b. 70% c. 20% d.5%

6. Based on the solubility curve, what is the solubility of KNO_3 at 45C?
   a. 50g/100g of water
   c. 100g/75g of water

b. 75g/100g of water d. 100g/50g of water



http://www.dynamicscience.com.au/tester/solutions/chemistry/solutions/solubilitycurves.html

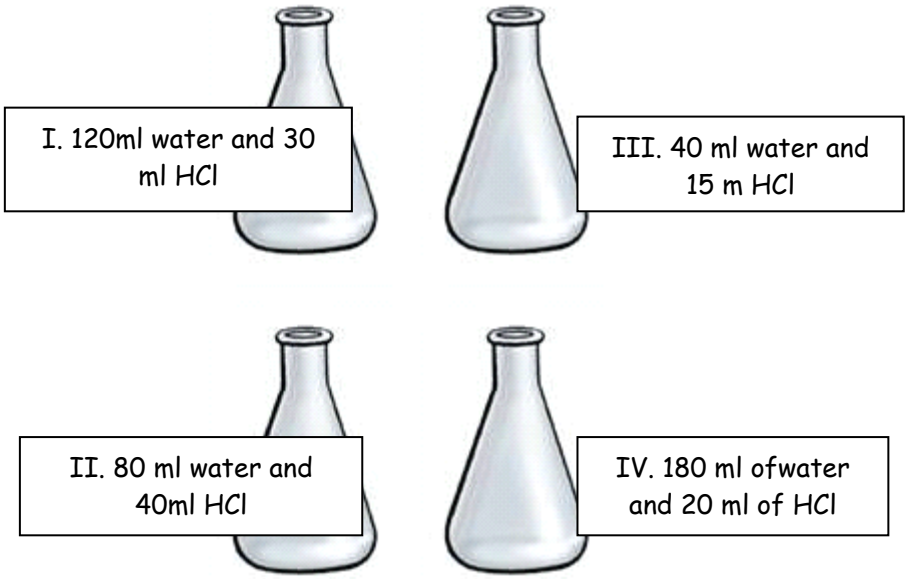
7. Which of the following will be affected by pressure as a factor affecting solubility?
   a. Salt in water
   b. Alcohol in water
   c. carbon dioxide in water
   d. carbon and iron in steel

8. An increase in temperature will
   a. Allow solution to dissolve more solid solute
   b. Prevent more solute to be dissolved in solution
   c. Increase the volume of solution
   d. Decrease the solubility of a solid solute in liquid solvent

9. A saturated solution of NaCl is prepared by dissolving 36g of NaCl crystals in 100g of water. Suppose you stirred130g of NaCl in 400g of water. What type of solution do you expect to form?
   a. saturated b. unsaturated c. supersaturated d. concentrated

10. If the addition of a crystal to an aqueous solution causes the dissolved solute to come out of the solution, the original solution is
a. saturated b. unsaturated c. super saturated d, concentrated

11. In the laboratory, there are four solutions with the following combinations of water and hydrochloric acid. What should be the order if you are to arrange them in order of increasing concentration?



a. I,II,III, and IV
b. I,IV,II and III
c. IV,I,III and II
d. IV, III,II and I

12. *The instruction given in the bottle of liquid Sosa, says remove first the water before adding sufficient amount of liquid Sosa into the clogged sink. Which of the following best explains why?*

a. Liquid Sosa reacts violently with water
b. Liquid Sosa is not effective in the presence of water
c. Water will increase the concentration of liquid Sosa so it will be less effective.
d. Water will decrease the concentration of liquid Sosa so it will be less effective.

13. It was noticed that the characterized taste of soda drinks is more enhanced when it is cold rather that if it is at room temperature. Which of the following explains why?
    a. Flavours are more stable at lower temperature
    b. The solubility of the gas component of soda drink is increased at lower temperature.
    c. The solubility of gas component of soda drink is decreased at lower temperature.

d. The concentration of flavour increases as the temperature decreases.

14. Oil when added to water, stays at the top and don't mix with water. What factor affecting solubility is involved in this example?
    a. Nature of solute and solvent
    b. Temperature
    c. Pressure
    d. Amount solute and solvent

15. You are tasked by your teacher to formulate a stain remover from locally found materials. Which raw material will you use?
    a. Alcohol and water
    b. Salt and water
    c. Calamansi juice
    d. Kerosene

16. You are a worker at a small salt factory in your town. During the rainy season ,the usual problem is the greater budget on LPG gas for evaporating sea water. Which of the following processes will you suggest to solve the problem.
    a. Boil sea water. When it is already saturated, let it cool .Then add some salt crystals to initiate crystallization.
    b. Subject the seawater to lower temperature to make it saturated. Then initiate crystallization.
    c. Add salt crystals before boiling
    d. Add sea water while boiling to increase its concentration

17. A jeweller came to your house and offered your mother some items. She said that all items are in good quality but in different carats. Your mother asked you to choose one. If the following items are of the same price, which will you choose?
    a. 10g 14K bracelet
    b. 3g 18K earrings
    c. 15g 5K Bangles
    d. 8g 14K necklace

18. The basic steps in washing our clothes are
    I. initial rinsing to remove superficial dirt

    II. application of soap for cleansing

III. final rinsing to remove soap

8.

9. In step I and III we use greater volume of water than that of step II. Which of the following best explains why?

   a. Small volume of water will make the soap solution concentrated thus, it will work efficiently in the laundry.
   b. To conserve water, you lessen its volume at the middle step.
   c. It is the instruction given in the manual
   d. It is the old practice handed over to us

19. During summer time, Danny sells iced tea and juice in their canteen. He noticed that when sugar is added to the water with ice, undissolved solids settle at the bottom of the container. Which of the following will best solve the problem?
   a. Shake well the container
   b. Stir the liquid vigorously
   c. Incorporate the sugar and iced tea in the crushed ice so that when ice melts solids also dissolve
   d. Dissolve first the sugar and tea in hot water before adding it into the water in the container.

Solubility of solid increases as temperature rises.

20. The solubility of sucrose in water at different temperatures are:

21.

. Temperature	. Solubility . (g/100g water)
13. 0◦C	14. 179.2
15. 20◦C	16. 203.9
17. 60◦C	18. 287.3
19. 100◦C	20. 487.2

What is the best interpretation that we can draw from these data?

   a. Solubility of substances increases as temperature rises.

b. All substances has highest solubility at 100◦C
c. The highest solubility of sugar in water is at 100◦C
d. Solubility of sugar in water increases as temperature rises.

EXPLORE

ACTIVITY 1: ***Anticipation Reaction Guide (ARG)***

What are your ideas when you see the word solution in chemistry? Do you think all solutions are just those placed in test tubes and flasks in the laboratory? ***How are solutions formed?*** Start the module by answering the first column of the Anticipation reaction Guide.

Instruction: Respond to each statement twice. Once before the lesson and again after reading the discussion of the lesson

- Write **A** if you **agree** with the statement
- Write **B** if you **disagree** with the statement

Response Before the Lesson	Statement	Response After the Lesson
	1. Solutions are always in the form of liquid.	
	2. A mixture of starch and water is an example of solution.	
	3. If the too much sugar was added to water, it will reach a point where it can no longer dissolve more of it.	
	4. Carbonated drinks contain gaseous solute. Gaseous solute can dissolve more easily in hot solvent than in cold one.	
	5. To prepare 100g of 20% by mass salt solution , 20g of salt should be dissolved on 200g of water	
	6. A hypothesis should be based on scientific facts.	
	7. A rubbing alcohol label that reads 70% Isopropyl Alcohol means 70% by Volume.	
	8. The statement,“ When the two solutions were mixed, they turned into	

	a solid." is an example of a hypothesis	
	9. A supersaturated when heated will for form saturated solution.	
	10. Sugar will be dissolved faster when added to an iced tea than in hot coffee.	

End of EXPLORE:

At the end of this lesson go back to this ARG and answer the third column. Compare your answer to your previous answer.
Your understanding of solution will be increased as you study the lessons and perform the activities in the FIRM UP phase .

FIRM-UP

1. Your main goal in this section is to learn and understand some key concepts by working on the following questions:

- ***How are solutions formed?***
- How do you classify solution based on concentration?
- How do saturated, unsaturated and supersaturated solution differ form one another.

Also, you will learn and understand key concepts in solution. You will differentiate solutions based on their state, saturation and concentration. But first, let us explore on what makes a solution and how they are formed

ACTIVITY NO. 2: **Web Surfing**

You will now open these websites to understand the characteristics/properties of solution. These web pages will give you a complete overview on the characteristics, properties and kinds of solution.

http://www.chem4kids.com/files/matter_solution.html

A complete overview on the characteristics and properties of solution

After reading this, try to answer these questions.

1. Can anything be made into solution?
2. Can anything change a solution?

http://www.school-for-champions.com/chemistry/solutions.htm

A presentation of different kinds of solution

After you have read this webpage, try to think of the following questions:

1. Are all solutions in liquid form?
2. Since solution is a kind of mixture, how are components of solution separated?
3. How can the knowledge of solutions help us create products useful in everyday life?
4.

Exercise No. 1: Comprehension Check:

To check your understanding on the articles that you have read about the solution, answer the following questions briefly. You can go back to specific webpage to check if you have answered the items correctly.

1. What are the two components of solution? Differentiate one from the other.

   Ans. Solvent - substance that dissolve the other substance.
   Solute - substance that is being dissolved

2. Are all solutions in liquid form? Is it possible to have a solution in solid or gaseous form? Give examples.

   Ans. No. Solution could be in a form of solid, liquid or gas

3. How do you make solutions? How are solutions formed?

   Ans. Solutions are formed by combining two substances physically.

4. What happens during the formation of solution?

Ans. The solute and solvent interact with each other until the concentration of the two substances is equal throughout the system

5. What is solubility?

Ans. Solubility is the quantity of substance dissolving in a fixed quantity of solvent to form a saturated solution under specified temperature and pressure

To further check your knowledge on the key ideas, try the TEN (10) ten item -quiz given in the same website.
http://www.chem4kids.com/files/matter_solution.html
Just click on the arrow "TAKE QUIZ ON SOLUTION". Take note of the numbers that you have not answered correctly and try again. You can repeat the quiz until you get the perfect score.

You now have initial ideas on solution, its components and classifications. But what type of solution is formed if the amount of solute and solvent are changed? How do we make solutions based on specific concentration? Let's now find out what the answer is by doing the next part.

ACTIVITY NO. 4: Web Surfing

Open this website to see video on how molecules of solute and solvent interact with each other. Molecular View of Solution Formation video explains how molecules in solution behave. Click the Zoom button after the simulated dissolution to see the molecular view.

http://www.learnerstv.com/animation/animation.php?ani=122&cat=Chemistry – shows the video on the formation of solution
After viewing the video take this comprehension check points to evaluate your own understanding

:

Exercise No. 2: Concept Check Points

Do you understand how molecules in solution interact with each other? Now match the word to complete the statements below to check some key points the video..

1. Water is a _____ molecule.
2. The positive part of water is attracted to the _____ ion of Chlorine.
3. The negative part of water is attracted to the _____ ion of sodium.
4. The interaction between the _____ and _____. causes the formation of solution.
5. The chemical name of table salt is _____

NEGATIVE **POSITIVE** **POLAR** **SOLUTE**

SOLVENT **SODIUM CHLORIDE**

KEY CONCEPTS
Questions to reflect on and answer:

1. What happens when salt is dissolved in water?
2. How do molecules of salt interact with the molecules of water?
3. Which substances form ions?

4. Which becomes a negative ion? Why do you think so?
5. Which becomes a positive ion? Why do you think so?
6. Make an illustration on how water molecules position themselves with the positive and negative ions.

From the video, you have seen the animated formation of solutions. Let us experience this in actual experiment. Do this simple experiment to deepen your understanding of how solutions are formed.

ACTIVITY NO. 5: "I Can Do it" Experiment (Preparing Solution)

Objectives:

1. You should be able to identify the substances that will dissolve and those which will not dissolve in water.
2. You should be able to prepare simple solutions from the given substances.

Materials:

Sugar
Salt
Iodine crystals
Naphthalene (alcamphor)
Water
Oil
Alcohol
Kerosene ("gaas")
test tubes
stirring rod

Procedure:

1. Place a around 3g of each sugar in four test tubes.
2. Add 10 mL of liquid substance into each test tube. Iol in the 1st, water in the 2nd, alcohol in the 3rd and kerosene in the last.
3. Stir and observe.
4. Do the same for salt, iodine crystals and naphthalene.

1. Are all solids soluble in water?
2. Which solid easily dissolve in water? In oil? In alcohol and in kerosene?
3. Which combinations are not possible to produce solution?
4. Which combination can easily be made into solution?
5. What do you think is the reason why there are solids which do not dissolve in some liquids? Can you relate it to the video that you have seen?

Data:
Complete the table by filling the boxes with soluble or insoluble

	water	oil	alcohol	kerosene
Sugar				
salt				
Iodine crystals				
naphthalene				

From the previous activity you have learned that solution is composed of solute and solvent. The amount of solute and solvent that are combined determines the kind of solution that can be formed. In the next activity, you will differentiate the three kinds of solution based on saturation.
Perform this simple experiment to further understand kinds of solution based on saturation.

ACTIVITY NO. 6: "Just Can't Get Enough" Experiment
(Preparing Unsaturated, Saturated and Supersaturated Solutions)

Objectives:
You should be able to identify the type of solution that you have prepared. (saturated, unsaturated or supersaturated)

Materials:
Sugar
Water
Glass
Table spoon
Kettle

Procedure:

1. Dissolve one table spoon of sugar in a glass of water (around 250mL) .Stir and record the time it takes for the sugar to dissolve. Is that amount of sugar easy to dissolve? What type of solution is this?
2. To the same glass, with sugar solution, add more amount of sugar. Start by adding one tablespoon. Then add more until you observe that it takes more time to dissolve more sugar into your solution. Stir. When some undissolve sugar appeared, stop adding sugar. What type of solution have you prepared?
3. Put solution in number 2 in a small kettle. Heat the solution and while heating, add more sugar. What did you observe with the dissolving time? Is it still difficult to dissolve more sugar into your solution?
4. Pour the solution from number 3 into a glass. Wait until its temperature is lowered to almost warm.
5. Drop few crystals of sugar and observe. What was formed?

1. What kind of solution is this?
2. What factors determine the kind of solution that can be formed?
3. Does temperature affects the dissolving process?
4. What relationship can you give between the temperature and the rate of dissolving?
5. Can you describe each type of solution that you have prepared?

ACTIVITY NO. 7: Concepts Reading:

Now check on this web page to have a complete understanding of saturation of solution and the kinds based on saturation

1. http://www.chemwiki.ucdavis.edu/Physical_Chemistry/Physical_Properties_of_Matter/Solutions/SOLUBILITY/Types_of_Saturation#Types_of_Saturation - kinds of solution based on saturation

1. Can a saturated solution be made into supersaturated one?
2. Can an unsaturated solution be converted to saturated one?
3. What common products that we use are examples of saturated unsaturated or supersaturated solution?

Here are some of the materials which we could classify as saturated, unsaturated and supersaturated solution. Hot cake syrup and honey are **saturated solutions of sugar.** Soak solution used in making “itlog na pula” is an example of **saturated salt solution.** Nestea Juice, Zesto, Tang and other tetra packed beverages are examples of **unsaturated solutions.** Pineapple jam used as sandwich spread is an example of **supersaturated solution** that it melts when heated but crystallized when refrigerated.

Aqueous solutions are **unsaturated** if more solute can be dissolved at the existing temperature and pressure. If the maximum amount of solute is in equilibrium with undissolved solid, the solution is

saturated. If a hot, saturated solution is prepared and allowed to cool without losing any solute, the solution is **supersaturated.**

The following are videos of preparing saturated and supersaturated solution:
http://ph.video.search.yahoo.com/video/play;_ylt=A0S00xgYomVQ9CcAlSreRwx.;_ylu=X3oDMTBrc3VyamVwBHNlYwNzcgRzbGsDdmlkBHZ0aWQD?p=saturated+solution&vid=86772B8E0D1DA9E45A2E86772B8E0D1DA9E45A2E&l=00:26&turl=http://ts4.mm.bing.net/videos/thumbnail.aspx%3Fq%3D4821887482134531%26id%3D856e78de25e73e10a7a4fc527374cc5e%26bid%3DLlrkqR0Njit3hg%26bn%3DLargeThumb%26url%3Dhttp%253a%252f%252fwww.youtube.com%252fwatch%253fv%25 Video on saturated , unsaturated and supersaturated solution.

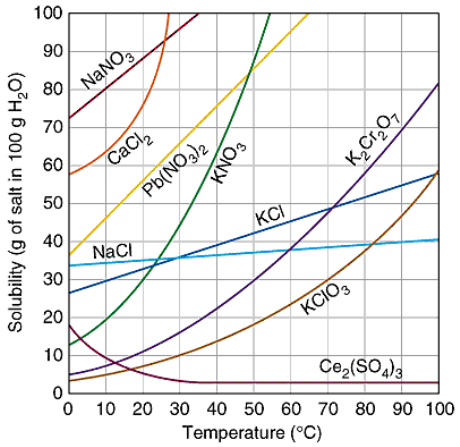
http://www.youtube.com/watch?v=xdedxfhcpWo&feature=endscreen&NR=1
http://www.youtube.com/watch?v=r0nNvsB_fOw&NR=1&feature=fvwp
preparing solution solute and solvent

You now have ideas on how the three kind of solutions based on saturation differ from one another, this time , let's see if you could prepare them using the following materials .

ACTIVITY NO. 8: Home Made Experiment

Materials:
Water
Salt
Containers
Source of heat

Based on the solubility graph, 100g of water can dissolve about 36g of salt at 30◦C.



http://www.dynamicscience.com.au/tester/solutions/chemistry/solutions/solubilitycurves.html

1. Using the given materials, table salt, water, glass containers design an experiment where in you can prepare the three types of solution which are saturated, unsaturated and supersaturated.
2. Write your detailed procedure and complete the table below.

Exercise No. 3: Comprehension Check:
Drag the statements in box to answer 2nd column and drag the words in the circles to answer the 3rd column in the table below:

This solution can still dissolve additional solvent
Solute dissolved
No more solute can be dissolve
The added crystal started the crystallization
Crystals slowly appear

Saturated

Supersaturated solution

Unsaturated solution

Data:

Solution Properties when:	**Observations**	**Type of Solution**
Less than 36 g of NaCl added to water.		
Greater than 36g of NaCl added without heating.		
The 36 g of NaCl was added with heating		
The solution was with more than 36g NaCl was cooled		
The seed crystal was added		

22. (Answers for the programmer's reference)

Data Table

Solution Properties when:	Observations	Type of Solution
Less than 36 g of NaCl added to water.	This solution can still dissolve additional solvent	unsaturated
Greater than 36g of NaCl added without heating.	No more solute can be dissolve	supersaturated
The 36 g of NaCl was added with heating	Solute dissolved	saturated
The solution was with more than 36g NaCl was cooled	Crystals slowly appear	supersaturated
The seed crystal was added	The added crystal started the crystallization	supersaturated

1. How do you go over the experiment?
2. Have you discovered the difference among the kinds of solution based on saturation?
3. Can you give a procedure or preparation that we do in our everyday life that could be compared to this process?

ACTIVITY NO. 9: **Lecture on Composition of Solution**

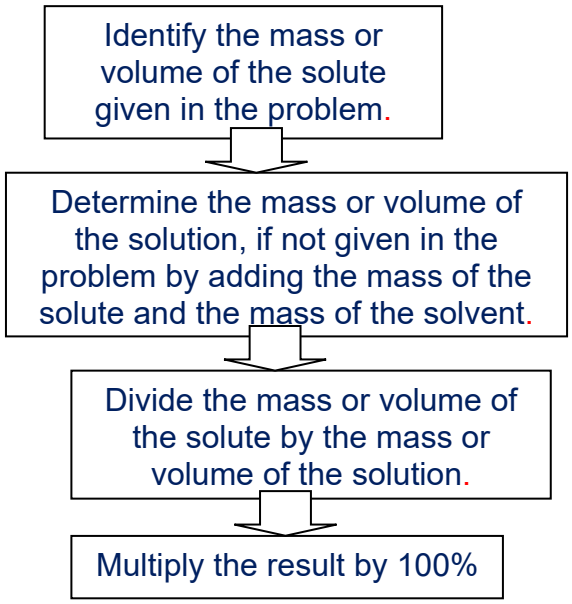
You have now differentiated a solution which is saturated, unsaturated and supersaturated. Those are just qualitative descriptions of a solution's concentration. To give you the exact idea on how concentrated a solution is, let us take the next activity. You will read and understand this concepts and procedure on how to calculate concentration of solution.

Composition of solution

Reading 1

23. Once you have identified the solute and solvent in a solution, you are ready to determine its concentration. Concentration may be expressed several different ways, using **percent composition by mass and percent composition by volume .**

To calculate for the percent by mass or volume of a given solution, follow these steps:



1. Mass Percent (% m/m)

% by mass = (mass of solute/ mass of solution) x 100%

This is the mass of the solute divided by the mass of the solution (mass of solute plus mass of solvent), multiplied by 100.

Sample problem No. 1
Determine the percent composition by mass of a 100 g salt solution which contains 20g salt.

Solution:
Given:
Mass of solute = 20g
Mass of solution = 100g

% by mass = 20g
---------- X 100%
100g
= 20% NaCl solution

Sample problem No. 2
What is the concentration of a solution in % by mass if it contains 25g of sugar in 150g of solution?
Given:
Mass of solute = 25g
Mass of solvent = 150g

% by mass = 25 g/ 150g x 100%
= 16.67%

2. Volume Percent (% v/v)

24.

25. % by volume = (volume of solute/ volume of solution) x100%

Sample problem no. 2
What is the concentration of a solution with 40ml of ethanol mixed with 180ml of water?
% by volume= 40ml/40ml+180ml x 100%
= 40ml/120ml x100%
= 33.33%

Applications:
% by mass is the basis in Karat of gold jewelry.
Sample problem no. 3
How many grams of pure gold is in 10.5g 18Karat gold necklace?
18K/24K is to X/10.5
75% = x/10.5
X = 10.5(0.75)
= 7.875g

Note that volume percent is relative to volume of solution, not volume of *solvent*. For example, wine is about 12% v/v ethanol. This means there are 12 ml ethanol for every 100 ml of wine. It is important to realize liquid and gas volumes are not necessarily

additive. If you mix 12 ml of ethanol and 100 ml of wine, you will get less than 112 ml of solution.

As another example. 70% v/v rubbing alcohol may be prepared by taking 700 ml of isopropyl alcohol and adding sufficient water to obtain 1000 ml of solution

A solution can also be classified as diluted or concentrated. One, with more solute, is concentrated like dissolving a ten spoons of sugar in a glass of water. On the other hand , one with more solvent is diluted like when we dissolve a teaspoon of salt in a glass of water . This is just to describe a solution qualitatively. But to describe a solution quantitatively, we used concentration like % by mass or % by volume.

Let's us now see if you have understood concepts in concentration of solution. Try solving for this practice problems in the worksheet.

Exercise No. 4 Worksheet on Concentration of Solution

Practice Problems: Solve the following problems. Write your complete solution on the space provided.

1. What is the percentage by mass of a solution with 30.0g salt dissolved in water to make 650.0g 0f solution?

(30/650) X 100% = 4.6%

2. What mass of glucose is needed to make 200g of 15% by mass solution?

(0.15 x 200) = 30g

3. What volume of HCl is needed by 300ml of water to produce 5% solution?

(0.05 x 300) = 15mL

4. How do you prepare 2 L of dish washing liquid which is 10% concentration by volume?

Add 200mL of dishwashing liquid to 1800mL of water.

5. How many grams of pure gold is in 5.9g 14K gold bracelet? How many grams are the metal added?

14/24= 0.583333 x 100% = 58.33%
5.9g x .5833 = 3.44g of metal added

1. Does a 30g solid makes a big percentage of solution?
2. Have you identified the mass of the solute from a given mass of solution and its percent by mass?
3. Does a 14k gold jewelry worth buying after you have discovered the amount of the other metal added?
4. How does your knowledge of concentration of solution help you decide which jewelry is better?
5. **How can the knowledge of solutions help us create products useful in everyday life*?***

End of FIRM UP:

In this section, the discussion was about types of solutions and theirconcentration. After you have gone into this section, have you answered the question, **" How are solutions formed?"** Go back to the previous section and compare your initial ideas with the discussion. How much of your initial ideas are found in the discussion? Which ideas are different and need revision?
Now that you know the important ideas about this topic, let's go deeper by moving on to the next section.

DEEPEN

Your goal in this section is to take a closer look at some aspects of the topic like solubility of solutions and the factors that affect solubility.
In the next activity you will perform experiment temperature as factor affecting solubility and also preparing supersaturated solution. **How can the knowledge of solutions help us create products useful in everyday life?**

ACTIVITY NO. 10: Video viewing

To have a deeper understanding of the previous topic and connect it to the next one let us have this next activity

1. http://www.youtube.com/watch?v=0hfd6KwZLPM video on saturated , unsaturated and supersaturated solution
2. http://www.youtube.com/watch?v=xTIzMaSDZ3k&feature=related

video on Crystallization of supersaturated sodium thiosulfate

1. Can a saturated solution reproduce its solute?
2. What kind of solution has the ability to crystallize and form again the solid solute?

If you know the answer then you, are ready to go to the next section. In this part your goals are:

- To define solubility and understand why solubility differs for each individual substance
- To determine what factors could affect solubility of a solution

6. Water is considered universal solvent. But are all solids soluble in water? Let's find out by doing the next activity.

ACTIVITY NO. 11: VIDEO VIEWING

Click on the following webpage to deepen your understanding of solubility.

1. http://www.youtube.com/watch?v=IKimraU21ws&feature=related

26. solubility of some substances in water

1. Are all substances soluble in water?
2. What makes them insoluble? Soluble in water?
3. **How can the knowledge of solubility of solutions help us create products useful in everyday life?**

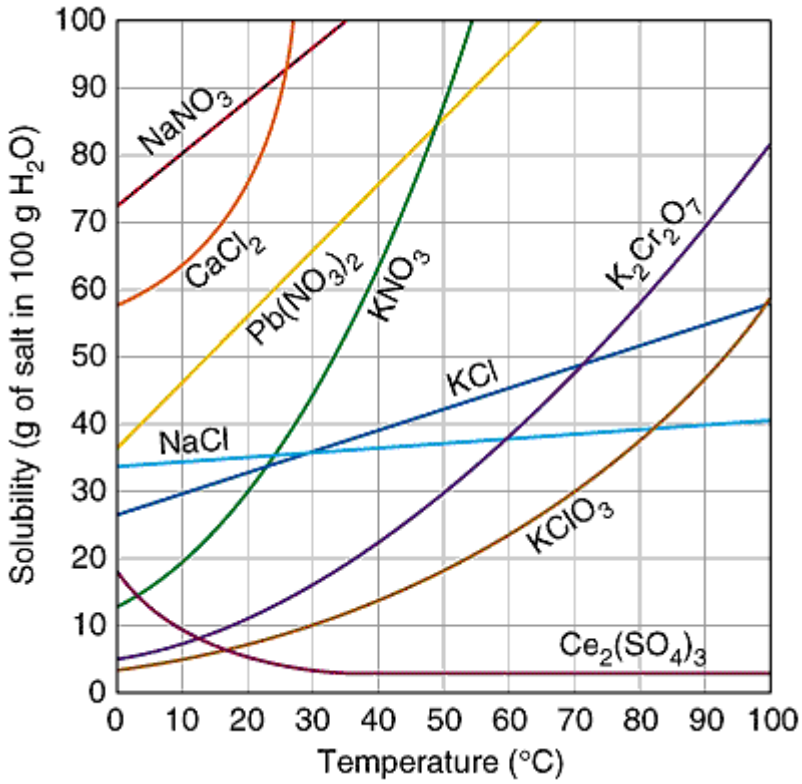
Exercise No. 5: Comprehension Check

Answer the following questions:

1. If the solubility of sugar in water is 200g. How much sugar will be dissolved in 250 mL of water at a given temperature?
2. What is the standard volume of water used to determine the solubility of different substances?
3. If a certain solute is insoluble in water, what is its solubility?
4. Why do we have to state the temperature when giving solubility?
5. Which is more soluble in water , salt or sugar? Why?

Since you already have idea on what solubility is, let us go over the solubility of different substances and try to compare them. Your goal this time is to analyze the graph showing the solubility of different substances. Guide questions are given for reflection.

ACTIVITY NO. 12: **GRAPH ANALYSIS**



http://www.dynamicscience.com.au/tester/solutions/chemistry/solutions/solubilitycurves.html

Based on the graph and using 40◦C , fill up the table below by inputting your answers. .

Solute	Mass of Solute Dissolved	Mass of Solvent	Solubility	Rank
1. NaCl	28g	100g	28g/100g	3rd
2. KCl	40g	100g	40g/100g	2nd
3. $KclO_3$	16g	100g	16g/100g	5th
4. $K_2Cr_2O_7$	22g	100g	22g/100g	4th
5. $Pb(NO_3)_2$	75g	100g	75g/100g	1st

You will also answer the following:

1. The solute with the highest solubility is _____ $Pb(NO_3)$

2. The solute with the lowest solubility is _____ $KClO_3$

3. The solute that is very much affected by temperature is
All are affected by temperature

4. The solute that is not very affected by temperature
NaCl

5. Describe the solubility graph of
a. KCl

b. KNO_3

They have the equal solubility at 100◦C

What have you realized by doing this activity? Are all substances soluble in water at the same amount at a given temperature? To support what you have learned in the previous activity, let us open this website and perform this interactive experiment.

ACTIVITY NO.13 : INTERACTIVE EXPERIMENT:

Open this website.
http://www.sciencekids.co.nz/gamesactivities/reversiblechanges.html

Learn about reversible & irreversible changes by testing what happens to different substances as you experiment with them in this fun interactive activity. Find out what substances dissolve in water and lots of other interesting chemistry related facts.

1. Can all substances be turned back to their original form after they mix with water or will they stay that way forever?
2. Try dissolving flour, sugar and sand in a beaker of water, what happens?
3. Is it what you expected?
4. Is melting ice an irreversible change? How about cooking an egg?

Challenge yourself to answer these questions and more with this cool science game.

Interactive Dissolving

5. What do you think are the materials that will dissolve in water to produce solution?
6. What materials will not dissolve but will just settle at the bottom of the container?
7. What material will not even mix with water and stay separated from water?

Procedure:

1. Click on the DISSOLVING box.
2. Choose on the following

a. sugar b. Sand c. Salt d. Coffee e flour

3. Drag one of these materials into the beaker with water.
4. Observe and answer the following

a. Which material dissolved and which of them does not.
b. Which changes the color of the solution?
c. Which changes the color of the solution then after sometime settle at the bottom.
d. Which does not even mix with water?

ACTIVITY NO. 14: Video Viewing

There are different factors that could affect solubility of a solute in a solvent. Let's find out by viewing this webpage

http://www.youtube.com/watch?v=4cr9w23GcTs&feature=related
video on factors affecting solubility

After viewing this video, try to answer these questions:

1. What are the factors that could affect solubility?
2. How does temperature affects the solubility of a solid solute dissolved in liquid solvent?
3. Is the trend the same as in gaseous solute?
4. How does pressure affects solubility? Of liquid ?of gas? Of solid?
5. How can we make us of the knowledge of these factors in improving our daily life?

You can go back to the video webpage to check your answer for this section. If you have answered them all correctly, then you are ready to go to the next activity where your knowledge of solution can be applied. Let's see what products in our daily life activity uses the concepts that we have learned.

ACTIVITY NO. 15: FONDANT MAKING

Click on this web. Observe how this fondant is being prepared and how it is used.

http://www.youtube.com/watch?v=uEwt8Q5jaA4&feature=related

Fondant Making video

After watching this video, reflect on the following questions:

1. Are concepts on solution illustrated in the video?
2. What parts of the video is similar to the activities that you have performed in this lesson?
3. What concepts of solution are applied here?
4. How can the knowledge of solutions help us create products useful in everyday life?
5. What other products that we used in our everyday life are prepared using the concepts of solution?
6. **How can the knowledge of solutions help us create products useful in everyday life?**

27.

Can you make your own fondant at home? You can try doing it and sure, it will be more fun.

End of DEEPEN:

In this section, the discussion was about solubility of solution. What are the factors that affect solubility of solution.
What new realizations do you have about the topic? What new connections have you made for yourself?
Now that you have a deeper understanding of the topic, you are ready to do the tasks in the next section.

TRANSFER

Your goal in this section is apply your learning to real life situations. You will be given a practical task which will demonstrate your understanding.

TASK

Performance task:

Your place is one of the biggest banana producing barangay in the region. Every year, the harvest of banana is very abundant that some spoiled banana fruits were just thrown into the garbage. As a nutritionist, you are requested by the chairman to make a power point presentation to be used in a seminar which will be participated by housewives and interested women in the community .The presentation will be about **making products like delicacies, soap, etc which we can use in our daily life activity out of banana** to be able to minimize its disposal and at the same time increase livelihood of the community.

Your presentation should include procedures in making the product, documentation of the process and expected profitability. It will be evaluated based on **content, practicality and use of visual materials.**

RUBRIC for the Power Point Presentation

	4	3	2	1
	Excellent	**Satisfactory**	**Developing**	**Needs improvement**
CONTENT	The content of the power point presentation is complete with additional information that reflects student's deep understanding. Very comprehensive.	The content of the power point presentation is comprehensive and acceptably sufficient. All of the expected information were discussed.	The content of the power point presentation is comprehensive but insufficient Some expected information were not discussed.	The content of the power point presentation is insufficient and not comprehensive. Expected information were not discussed.
USE OF VISUAL MATERIALS	Contain pictures or video of the actual process and complete description or explanations were provided. Additional details or tips to improve products were included.	Contain pictures or video of the actual process and complete description or explanations were provided	Contain pictures or video of the actual process but description or explanations were not provided.	Does not contain pictures or video of the process
PRACTICALITY OF RECOMMENDATIONS	Practicality of all suggested processes were discussed and encouragement to do the process is emphasized. Additional information like tips on how to increase profit without sacrificing the quality of the product were added.	Practicality of all suggested processes were discussed and encouragement to do the process is emphasized. .	Practicality of some the suggested processes were discussed but does not give encouragement.	Practicality of the suggested processes were not discussed

End of TRANSFER:

How did you find the performance task? How did the task help you see the real world use of the topic?
At this point, you are almost complete with this topic but you have go back and answer the last column of the ARG and compare your prior knowledge to what you have learned from this module.
How many items have the same answer?

CLOSURE:

SELF REFLECTION
Complete the table below to reflect on your experience in the entire module.

My most important learning	*Most difficult part of the lesson*	*Most enjoyable activity*

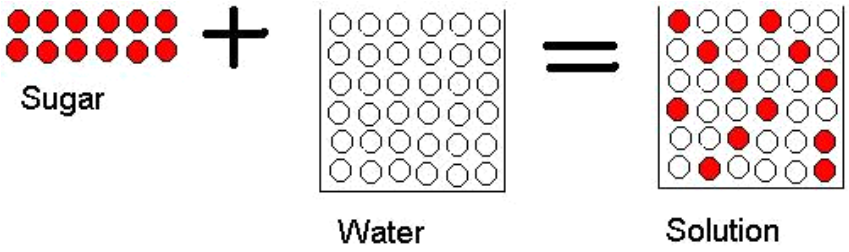
Before you go to the post test, open this web page and have a self check of your understanding of solution.
http://glencoe.mcgraw-hill.com/sites/0078617677/student_view0/chapter3/section2/self-check_quiz-eng_.html

POST-ASSESSMENT:

It's now time to evaluate your learning. Click on the letter of the answer that you think best answers the question. Your score will only appear after you answer all items. If you do well, you may move on to the next module. If your score is not at the expected level, you have to go back and take the module again.

1. Naphthalene, commonly known as "alcamphor" ,can be dissolved in benzene,. From this information, one can conclude that
   a. naphthalene and benzene are both solutes
   b. naphthalene is the solute, and benzene is the solvent
   c. benzene is the solute, and naphthalene is the solvent
   d. naphthalene and benzene are both solvents

2. Refer to this illustration.



http://www.lcc.ukf.net/KS3Chem/mixtures.htm

The illustration shows that:

   a. Water molecules are greater that the sugar molecules therefore, water is the solute.
   b. Sugar molecules are fewer than the molecules of water therefore sugar is the solute.
   c. Sugar molecules are evenly distributed in water
   d. In sugar solution, the molecules of sugar can still be identified from the molecules of water

   28.

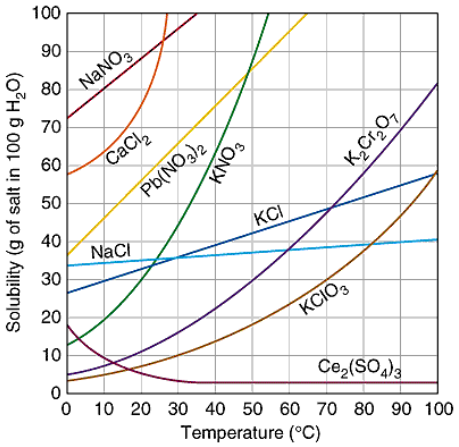
3. A solution is said to be supersaturated if
   a. It can still dissolve more solute
   b. It has reached its maximum amount of solute that it can dissolve thus it can no longer accommodate more solute.

c. It has amount of solute more than what it can dissolve and was heated to dissolve the added solute.
d. Its amount of solvent is greater than the amount of solute

4. Tincture of iodine is a solution of iodine in alcohol. In a 30g bottle ,it is stated that it is 2% by mass solution, How many grams of iodine is present in this given volume?
   a. 6g b. 0.6g c. 12g d. 60g

5. A solution is saturated at 25 g per 100g of H_2O. If 25 grams is dissolved in 100g of H_2O, it is:
   a. Unsaturated
   b. Saturated
   c. Supersaturated
   d. Diluted

6. Based on the solubility curve, the solubility of KCl at 50C is around ____g per 100g of water.



http://www.dynamicscience.com.au/tester/solutions/chemistry/solutions/solubilitycurves.html

   a. 20g b. 30g c. 40g d. 50g

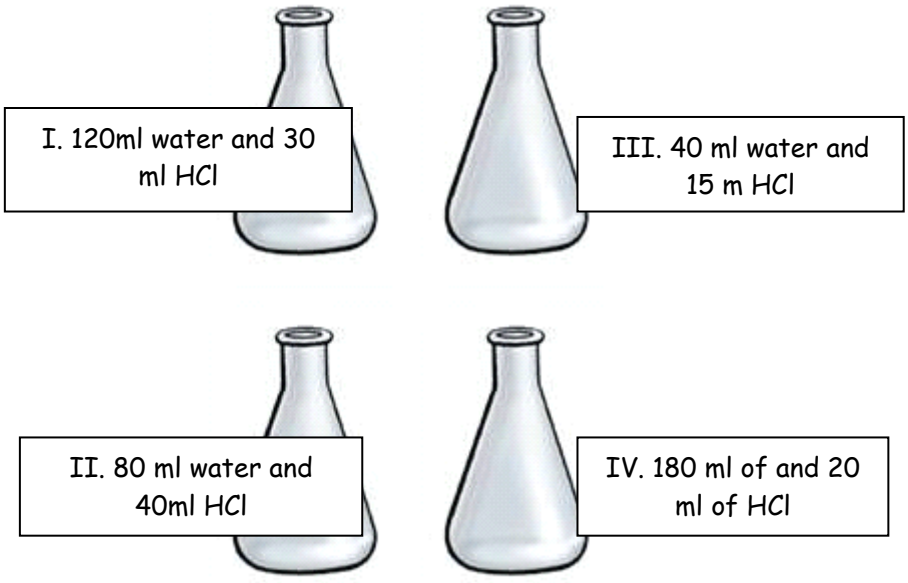
7. Which of the following factors affecting solubility explains why crystals of iodine do not dissolve in water but dissolve in alcohol?
   a. Temperature c. nature of solute and solvent
   b. volume d. pressure

8. Increasing the pressure will also increase the solubility of a gas being dissolved in a liquid. Which of the following solutions is affected by pressure?
   a. Iced tea
   b. Carbonated drinks
   c. sea water
   d. rubbing alcohol

9. A saturated solution can hold 15 grams of solute per 100g of H2O. Suppose you stir 45g of the solute in 500g of water, what type of solution will you produce?
   a. Saturated
   b. Unsaturated
   c. concentrated
   d. supersaturated

10. Which statement is NOT true about solutions?
   a. They always exist in one phase only therefore, it is homogeneous.
   b. They can be in a form of solid, liquid or gas.
   c. They are composed of two components, solute and solvent
   d. They are always affected by pressure.

11. In the laboratory, there are four solutions with the following combinations of water and hydrochloric acid. What should be the order if you are to arrange them in order of decreasing concentration?



   a. II, III, I, and IV
   b. IV, I, III and II

c. IV, I, III and II
d. IV, III, II and I

12. The instruction given in the bottle of liquid Sosa, says remove first the water before adding sufficient amount of liquid Sosa into the clogged sink. Which of the following best explains why?
    a. Liquid Sosa reacts violently with water
    b. Liquid Sosa is not effective in the presence of water
    c. Water will increase the concentration of liquid Sosa so it will be less effective.
    d. Water will decrease the concentration of liquid Sosa so it will be less effective.

13. Which of the following is the fastest way to dissolve a solid in a liquid?
    a. stir equal amounts of solid and liquid vigorously
    b. all amount of solid in a lot of the liquid
    c. mix a lot of the solid in the liquid
    d. heat and stir the liquid and solid mixture

14. When placed in one container, gasoline stays at the top and don't mix with water. What factor affecting solubility is involved in this example?

    a. Nature of solute and solvent
    b. Temperature
    c. Pressure
    d. Amount solute and solvent

15. In a jewelry shop, the following items are on sale at the same price. If you are you to select the one which you think has the highest amount of pure gold, which is the best choice?
    a. 10g 14K bracelet
    b. 5g 18K earrings
    c. 15g 5K Bangles
    d. 8g 14K necklace

16. Joy is working at a local candied fruit factory. She noticed that when sugar is added to the water in candy making process , there remain undissolved particles that settle at the bottom of the container. Which of the following will best solve the problem?
    a. Shake the mixing container very well.

b. Stir the liquid vigorously.
c. Incorporate the sugar with other ingredients,add water then stir.
d. Dissolve first the sugar in hot water before adding it into large amount of water in the container.

17. Analyn wants to surprise her parents on their wedding anniversary. She cooked Beef stew (Caldereta) . After putting all the ingredients, she tasted the mixture and found out that it is salty. Which of the following would be the best solution to Analyn's problem?
    a. Add more water into the mixture and let it boil again until the desired taste is attained
    b. Remove some spice, add water then boil again.
    c. Remove the beef cubes, wash them and put them back into the mixture.
    d. Remove the sauce and replace it with water

18. Which of these can make a solid substance dissolve faster in a liquid?

    a. use larger lumps of solid in a small volume of liquid
    b. cool the solid-liquid mixture
    c. stir the mixture regularly
    d. use a little solid at a time to a large volume of liquid

19. In an educational tour at a cola company, Ben noticed that the newly filled up cola bottles from the conveyor are already cold. Which of the following best explains this?
    a. Cola are being prepared for distribution so it is good to have them cold.
    b. The gaseous component of the cola drink is more soluble at lower temperature.
    c. Flavor of cola drink deteriorates at temperature higher than room temperature.
    d. The higher the temperature the more soluble are the gaseous components of cola drink.

20. There is a typhoon advisory in your place. As a precaution, your mother asked you to remove some products in your sari sari sari to avoid having them in contact with water. Which of the following will you fist take to your safe room?
    a. sugar
    b. Oil

c. eggs
d. Canned goods

GLOSSARY

Solution: A solution is a homogeneous mixture of two or more substances. A solution may exist in any phase.

Solvent: constituent of a solution that acts as a dissolving agent. In solutions of solids or gases in a liquid, the liquid is the solvent. In all other solutions (i.e., liquids in liquids or solids in solids) the constituent that is present in larger quantity is considered the solvent.

Concentration of a solution is defined as the amount of solute present in a given quantity of solvent. Very often scientists speak of concentrated solutions, dilute solutions, or very dilute solutions, but these designations give only a rough relative qualitative idea of concentration.

Solubility is a measure of the maximum amount of solute that can be dissolved in a given amount of solvent to form a stable solution. The composition of many solutions cannot be varied continuously because there are certain fixed limits imposed by the nature of the substances involved

Unsaturated solution is one where the amount of solute is less than the maximum amount that a solvent could dissolve. More solute can be dissolve at existing temperature and pressure.

Saturated solution is one where the maximum amount of solute is in equilibrium with undissolved solid.

Supersaturated solution is a saturated solution which is prepared and allowed to cool without losing any solute.

WEBSITE RESOURCES AND LINKS IN THIS MODULE:

Properties of Solution
http://www.chem4kids.com/files/matter_solution.html
complete overview on the characteristics and properties of solution.

http://www.school-for-champions.com/chemistry/solutions.htm
kinds of solution

Formationof solution
http://www.learnerstv.com/animation/animation.php?ani=122&cat=Chemistry
shows the video on the formation of solution

http://www.saskschools.ca/curr_content/science10/unita/redon13.html
kinds of solution based on saturation

Kinds of solution
http://ph.video.search.yahoo.com/video/play;_ylt=A0S00xgYomVQ9CcAlSreRwx.;_ylu=X3oDMTBrc3VyamVwBHNlYwNzcgRzbGsDdmlkBHZ0aWQD?p=saturated+solution&vid=86772B8E0D1DA9E45A2E86772B8E0D1DA9E45A2E&l=00:26&turl=http://ts4.mm.bing.net/videos/thumbnail.aspx%3Fq%3D4821887482134531%26id%3D856e78de25e73e10a7a4fc527374cc5e%26bid%3DLIrkqR0Njit3hg%26bn%3DLargeThumb%26url%3Dhttp%253a%252f%252fwww.youtube.com%252fwatch%253fv%25 Video on saturated , unsaturated and supersaturated solution.

http://www.youtube.com/watch?v=xdedxfhcpWo&feature=endscreen&NR=1
http://www.youtube.com/watch?v=r0nNvsB_fOw&NR=1&feature=fvwp
preparing solution solute and solvent

Crystallization of supersaturated solution
http://www.youtube.com/watch?v=0hfd6KwZLPM video on saturated , unsaturated and supersaturated solution
http://www.youtube.com/watch?v=xTIzMaSDZ3k&feature=related
video on Crystallization of supersaturated sodium thiosulfate

Solubility
http://www.youtube.com/watch?v=IKimraU21ws&feature=related
solubility of some substances in water

Solubility some materials
http://www.sciencekids.co.nz/gamesactivities/reversiblechanges.html
interactive experiment on solubility

Factors affecting solubility
http://www.youtube.com/watch?v=4cr9w23GcTs&feature=related
video on factors affecting solubility
Solubility Curve
http://www.dynamicscience.com.au/tester/solutions/chemistry/solutions/solubilitycurves.html

Fondant Making video
http://www.youtube.com/watch?v=uEwt8Q5jaA4&feature=related
Fondant Making video

Quiz on solution
http://glencoe.mcgraw-hill.com/sites/0078617677/student_view0/chapter3/section2/self-check_quiz-eng_.html
quiz on solution

http://encyclopedia2.thefreedictionary.com/Solution+(chemistry)
Definition of terms

Lesson 2.2: Matter (Substances and Mixtures, Elements and Compounds, Metals and Non-Metals)

MODULE INTRODUCTION AND FOCUS QUESTION(S):

You have probably seen, touched, and tasted hundreds of different things in your life. You have touched wood, steel, ice and many more. In fact, all of the objects around you which have a mass and occupy space are made of matter. Have you ever wondered what these entire things are made of? ***What is matter? Why there are different forms and what causes these changes?*** Why does it exist? What are the properties of pure substances and mixtures? Why is saltwater a mixture and not a pure substance? How are elements and compounds alike? How are they different?

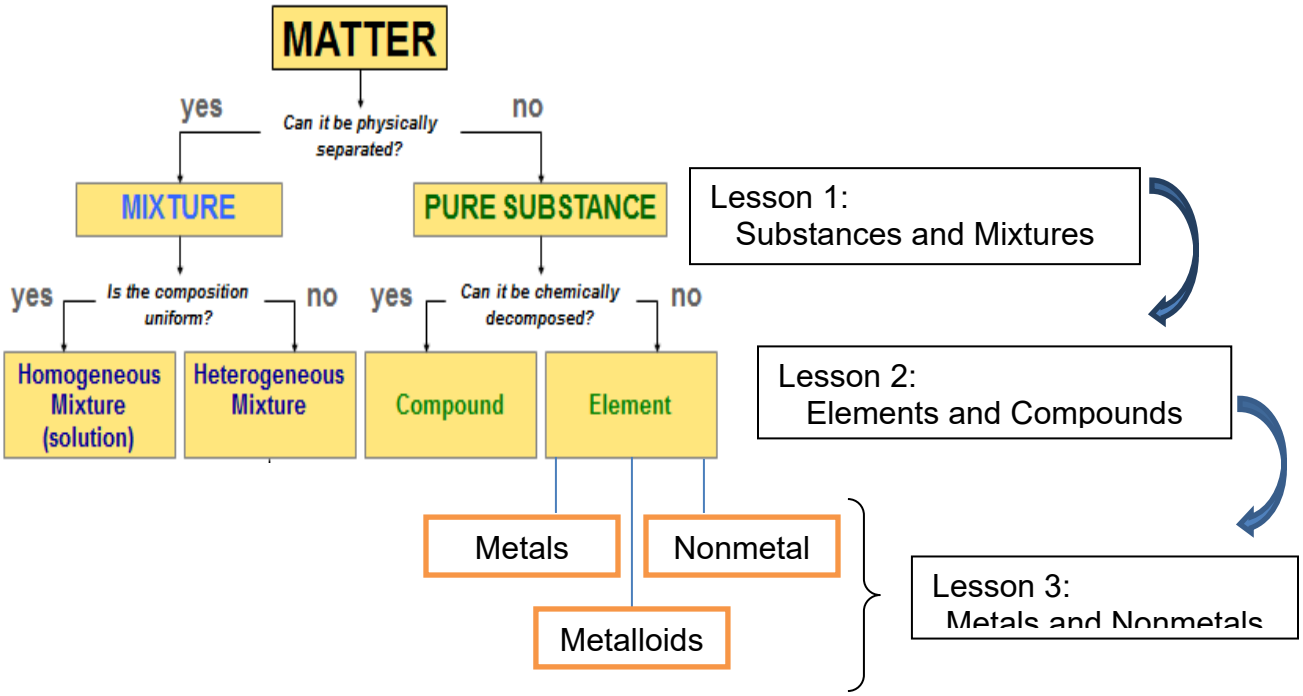
Do you know that there are a lot of things that you can learn about matter? Thus, this module is formulated to help you in defining matter and in classifying different kinds of matter. It also aims to guide you in determining the changes that matter undergoes and in identifying its characteristics. You will also learn how nature of matter is significant in making our lives better.

Lesson 2.2.1	Substances and Mixtures What is the difference between a substance and a mixture?
Lesson 2.2.2	Elements and Compounds Why are elements and compounds considered to be a pure substance?
Lesson 2.2.3	Metals and Non-metals? How does a metal differ from a non-metal?

In these lessons, you will learn the following:

Lesson 2.2.1	Recognize that a substance has a unique set of properties. Investigate the properties of mixtures of varying concentrations (use water and sugar).
Lesson 2.2.2	Recognize that substances are classified into elements and compounds. Recognize that compounds consist of specific elements in a definite composition (e.g., H_2O and H_2O_2; different compounds of C, H, O).
Lesson 2.2.3	Demonstrate the different properties of metals and nonmetals (e.g., luster, malleability, ductility, conductivity). Recognize the elements considered as metals and those that are nonmetals.

Here is a simple map of the above lessons you will cover:



Adapted source:
https://docs.google.com/viewer?a=v&q=cache:2Ba08LGgPNEJ:www.unit5.org/chemistry/UPDATE%2520WEB4-08/Matter%2520and%2520Energy/Matter%2520and%2520Energy%2520PP/Classification%2520of%2520Matter.ppt+classification+of+matter&hl=tl&gl=ph&pid=bl&srcid=ADGEESgvF6D1sxE1_-X08MP1NCybvGaHc5q4rojqRL2u9Y2sho7KdWJCFua9KHECWs5gF_IAjPLvf-ivQAiASZCnsg9LitJlS53E9j1ByVpqzZ-Sjvwsc3Rrz_stFDEVSWWq8ahT27Cc&sig=AHIEtbRckOJJxW8JnhMyq8v-NxtCSdhrAg

To do well in this module, you need to remember and do the following:

1. Take the pre-test before proceeding to the lessons. The test will give you an idea of how much time you will allot for each lesson.
2. Read the instructions carefully and follow the precautionary measures.
3. Open the indicated interactive simulations. Go beyond the given instructions and questions. Explore further and deeper as your time allows.
4. Open and view the indicated videos. Review the videos as many times as needed, as you answer the discussion questions related to them.
5. Before doing the activity, make sure that all the materials needed are already prepared Gather the materials for the experiments and demonstrations and actually do them yourself. The actual experiments will give you a richer learning experience than just reading the texts and even watching related videos.
6. Take down notes as you go through the simulations, videos and experiments. Writing on paper or typing on your computer helps you remember and understand things easier.

PRE-ASSESSMENT

Let's find out how much you already know about this module. Encircle the letter that you think best answers the question. Please answer all items. After taking this short test, you will see your score. Take note of the items that you were not able to correctly answer and look for the right answer as you go through this module.

1. A heterogeneous mixture differs from a solution because
   A. a heterogeneous mixture is always solid.
   B. a heterogeneous mixture consists of solids and liquids.
   C. the different components can be easily identified in a heterogeneous mixture.
   D. a heterogeneous mixture can be separated by physical means (changes), whereas a solution can only be separated by chemical means (changes).

2. Which of the following best describes a gas?
   A) The molecules are closely spaced but have no long-range order.
   B) The material has a fixed volume and a fixed shape.
   C) The material has a fixed volume but has no definite shape.
   D) The molecules are moving quickly and are widely spaced.

3. Which of the following contains three elements?
   A) Argon, Magnesium, Phosphorus
   B) Brass, Phosphorus, Potassium
   C) Chlorine. Air, Nitrogen
   D) Petrol, Alcohol, water

4. Renz is investigating the properties of several substances. He prepared a beaker containing substances J, K, and L and filtered the contents through a funnel into a flask. What term best describes substances J, K, and L inside the beaker before Renz poured them through the filter paper?

   A mixture B solution C compound D pure substance

5. Which of the following statements is true of a compound?
   A) Its constituents can be separated by physical methods.
   B) Its constituents are present in fixed proportions.
   C) Its properties are similar to those of its constituents.
   D) It contains two or more elements.

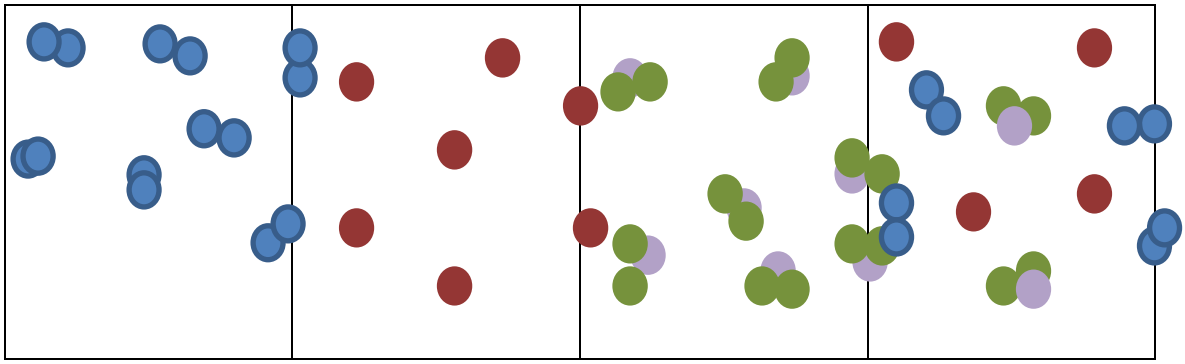
6. When green copper (II) carbonate is heated, a black solid X and a colorless gas Y are formed which of the following describe X and Y?

   X Y

A) Element compound
B) Compound Element
C) Compound Mixture
D) Compound Compound.

7. Which one of the following sets contains an element, a mixture and a compound?
   A) Air, pure water, sodium chloride
   B) Copper, air, copper (II) sulfate
   C) Magnesium, lead, sulfate
   D) Pure water, sulfate, magnesium

8. Which of the following boxes represents a compound?



A B C D

C) Molecules of a compound
A) Molecules of an element
B) Atoms of an element
D) Mixture of an elements and compound

9. Which of the following observations most strongly suggest that a solid element X is a non-metal?
   A) X reacts vigorously with chlorine.
   B) X is a conductor of electricity.
   C) X has more than one valence.
   D) X forms an acidic oxide.

10. What are metalloids?
   A) elements found in asteroids
   B) elements that are larger than nonmetals
   C) elements that have properties different than either the metals or the nonmetals
   D) elements that have some properties like metals and some like nonmetals

Periodic Table

	s-block		Transition Elements d- block										p-block					Nobel Element
Group	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1 H 1.0079																	1 He 4.0026
2	3 Li 6.941	4 Be 9.0122											5 B 10.811	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180
3	11 Na 22.990	12 Mg 24.305											13 Al 26.982	14 Si 28.086	15 P 30.974	16 S 32.066	17 Cl 35.453	18 Ar 39.948
4	19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.867	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.845	27 Co 58.933	28 Ni 58.693	29 Cu 63.546	30 Zn 65.409	31 Ga 69.723	32 Ge 72.64	33 As 74.922	34 Se 78.96	35 Br 79.904	36 Kr 83.798
5	37 Rb 85.468	38 Sr 87.62	39 Y 88.906	40 Zr 91.224	41 Nb 92.906	42 Mo 95.94	43 Tc(98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
6	55 Cs 132.91	56 Ba 137.33	57 - 71 La-Lu	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
7	87 Fr (223)	88 Ra (226)	89 -103 Ac-Lr 104	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (277)	109 Mt (268)	110 Ds (281)	111 Rg (272)	112 Cn (285)						
Lanthanide			57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97	
Actinide			89 Ac (227)	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)	

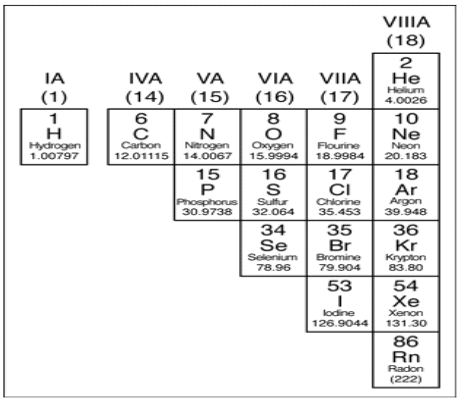
Adapted source: http://www.buzzle.com/articles/metalloids-in-the-periodic-table.html

11. Which of the following describes a nonmetal?
    A) good conductor of heat
    B) ductile
    C) malleable
    D) poor conductor of electricity

12. Which of the following elements should exhibit some metallic properties and some nonmetallic properties?
    A) Zn B) Ga C) Si D) C

13. The chemical element that is most abundant in the human body is
    A) nitrogen. B) iron C) carbon. D) oxygen.

14. Which statement is NOT true of nonmetals?
    A) They have characteristics of both metals and nonmetals.
    B) Many are gases at room temperature.
    C) They have low conductivity.
    D) There are fewer nonmetals than metals.



The nonmetals in the periodic table.

Adapted source:
http://www.google.com.ph/imgres?imgurl=http://media.wiley.com/Lux/93/168193.image1.jpg&imgrefurl=http://www.dummies.com/how-to/content/the-periodic-table-metals-nonmetals-and-metalloids.html&h=400&w=311&sz=41&tbnid=squRXCIj_SP99M:&tbnh=82&tbnw=64&prev=/search%3Fq%3Dnonmetals%2Bin%2Bthe%2Bperiodic%2Btable%26tbm%3Disch%26tbo%3Du&zoom=1&q=nonmetals+in+the+periodic+table&usg=__UlopxRVUafZfvgCl8uxXD10flxc=&docid=0fmB9Q4qfm4hSM&hl=tl&sa=X&ei=4RTKT8KLNIKKmQX1sPDyDg&ved=0CGsQ9QEwBQ

15. Most metals in nature are found combined with other elements. These compounds containing metals are called
A. alloys. B. heavy metals. C. minerals. D. metallurgists.

16. When magnesium (Mg) metal is burned in the presence of oxygen (O_2), magnesium oxide (MgO) is produced. The properties of magnesium oxide are different than the individual properties of magnesium and oxygen because magnesium oxide is
A) a solution. B) a mixture. C) a compound. D) an element.

17. Which class of elements *best* conducts electricity?
A) metals
B) nonmetals
C) semimetals
D) noble (inert) gases

18. Which of the following can be beaten into thin sheets?
A. Zinc B. Phosphorus C. Sulfur D. Oxygen

19. Read the following statements carefully and select the correct statements about the physical and chemical properties of metals-
I. All metals are ductile
II. Generally metals are ductile
III. Metals which are more reactive than hydrogen react with acids to release hydrogen gas.
IV. All metals react with acids to release hydrogen gas.

The correct statement of the above are
A. 1 and IV B. I and III, C. II and III D. II and IV

20. Correct the statement by substituting the x and y with correct option.
X can't be drawn into wires because it is not Y in nature.

	X	Y
A	Coal	Ductile
B	Copper	Malleable
C	Aluminum	Ductile
D	Coal	Malleable

Lesson 2.2.1: Substances and Mixtures

In this lesson, you shall:

- differentiate the unique properties of matter, in terms of substances and mixtures.
- describe the difference between pure substances (elements and compounds) and mixtures.
- demonstrate the classification of matter

EXPLORE

In this lesson, we will focus on the following questions: What is the difference between substances and mixtures? What are the properties of pure substance and mixture?

1.1 Classifying Matter Activity:

Open the page below to know about the classification of matter: Do the activity contained in this site.
www.asminternational.org/content/docs/classifyingmatteractivity.pdf -

Guide questions:

1. How is a compound different from an element?
2. What happens to the properties of original components in a mixture or compound after they've been combined?
3. When you perform the activity, do the part of components in a mixture or compound change or are they fixed?
4. What have you learned about the activity?
5. How can your understanding of the changes in properties of matter become beneficial?

1.2 KWHL Chart

Before you begin with this module, fill in the first column of the KWHL Chart below. It will help you check your understanding of the lessons in this unit. You will be asked to fill in the information in different sections of this module. Write the answers in your notebook.

Matter (Diversity of materials)			
What you KNOW	What you WANT to know	HOW will you find out	What I have LEARNED

As you proceed with the rest of the activities, always have these questions in your mind, what is matter? Why does matter have different forms and properties? How can your understanding of the changes in properties of matter become beneficial?

End of EXPLORE:

You just tried finding out about diversity of material and recognize how substances and mixtures manifest a unique set of properties. You also gave your initial ideas on why matter has a unique property. Let's now find out more about diversity of matter by doing the next activities

Your understanding of changes in properties of matter will be increased as you study the lessons and perform the activities in the FIRM UP phase

FIRM-UP

Your goal in this section is to learn and understand some key concepts, by working on the following questions:

- What is the difference between physical property and chemical property?
- How do the properties of pure substances differ from those of mixtures?
- How will you distinguish homogenous mixture from heterogeneous mixture?

1.3 Physical and Chemical Changes

What is matter? Why does matter have different forms and properties? How can matter be changed? How would you tell if matter has undergone a physical or chemical change? How do humans use matter and the elements every day? How can your understanding of the changes in properties of matter become beneficial in human, in industries and in the environment?

Click this website and perform the activity in this file and then answer the process questions. http://isite.lps.org/gcooper/web/documents/PhysandChemPropLab.pdf

Process Questions:

1. What is physical change? Chemical change?
2. What happens when salt was mixed with water?

3. What causes a physical change from one state of matter to another?
4. How would you know if matter undergoes physical or chemical change?
5. What are the evidences of physical and chemical changes?
6. When a candle burns both physical and chemical changes occur. What are these changes?
7. Why are there different forms and what causes these changes? How do changes in matter affect our everyday life?

Check for Understanding. In this check for understanding you will identify the condition of a given statement either physical change or chemical change. This will enhance your comprehension about the nature of the diversity of matter in the environment. This will prepare you for the unit test after the next modules.

Change	Physical Change	Chemical Change
Sugar dissolves in ethanol.		
Hydrochloric acid reacts with magnesium to produce hydrogen gas.		
A pile of leaves is burned.		
Water boils to form steam.		
Water is heated and changed to steam.		
A car fender gets rusts.		
Ethyl alcohol evaporates.		
Ice cube melting.		
Lemon juice converts milk to curds and whey.		
A female mosquito uses your blood as food from which she produces her eggs.		

TEACHER TALK:

Remember that the physical properties of a substance are those properties that can be observed and measured without changing the composition of the substance. Because they depend on there being no change in composition, physical properties can be used to describe and identify substances.

The chemical properties describe how matters undergo change its composition and produced new substances of different chemical composition.

Recheck your answers in the above table. What do you notice about your answers? How did you do with this quiz? If you did well, continue to the next part. If not, go back and find out from the reading and activities the reason for the correct answers.

1.4 Mixtures vs. Pure Substances

This lesson will help the students encounter and study many of the properties of matter and how matter can change from one form to another. Through their study of mixtures and pure substances, students will further refine their understanding of matter. They will also explore and develop an appreciation of how various types of matter are important in their daily lives. How can your understanding of the changes in properties of matter become beneficial?

Open this video site: Keep them in mind as you watch the video:
http://www.youtube.com/watch?v=4lUHd9vc5es This website features the classification of matter according to pure elements and mixtures.

Open and read this web page:
http://www.mcgrawhill.ca/school/learningcentres/file.php/9780070726901/olc2/dl/699403/2_3.pdf This website classifies some common materials as either mixtures or pure substances.

Open this website to enhance more about mixtures and pure substances. Click on the link to mixtures versus pure substances – student doc. Do the activity contained in this site: http://www.pdesas.org/module/content/resources/14015/view.ashx. Answer the following questions below:

Guide Questions:

1. Compare your products and classifications with other groups. How many mixtures were there? How many pure substances were there?
2. Which products were easy to classify? Which ones were hard? Explain.
3. How does a mixture differ from a pure substance? Why there are different forms of matter and what causes these changes? How do changes in matter affect your everyday life?

End of FIRM UP:

In this section, you have performed activities and read about how materials be classified as pure substances and mixtures. How would you distinguish between pure substances and mixtures? How would you create a way to organize a relationship between mixtures and pure substances? How can your understanding of the changes in properties of matter become beneficial?

Now that you know the significant ideas about the topic, let's go deeper by moving on to the next section.

DEEPEN

Your goal in this section is to extend your understanding by investigating and viewing video clips whether unknown substances are either pure substances or mixtures through means of experimentation.

Here you will see some demonstrations on how the properties of mixtures of varying concentrations introduced.

1.5 Activity Pure Substance or Mixture?

Open the web page below about science habit of mind; perform the activity contained in this site. Then answer the process questions below.
https://docs.google.com/viewer?a=v&q=cache:MQOBw5InK-EJ:www.lesley.edu/soe/middleschool/teacher-resources/content/science-activity-properties-matter.pdf+laboratory+Activities:+pure+substances+and+mixtures&hl=tl&gl=ph&pid=bl&srcid=ADGEESgX4nLgun8SBHAgw6cko5A2yNobPcXlrdJVSFFWPChiA--YU3IYWadioN33OzUzIDLTcgqS4Lc-nJ7_zYHsibeoJloWDeGlVcyBM9vnXSX2KchL8Up2JI5XI1HmGmW3okp3DCXb&sig=AHIEtbTRs5Uv-4Pvnu_ksA46cGRPWuNfKg

Guide Questions

1. What is a pure substance?
2. Compare and contrast mixtures with pure substances.
3. How can you distinguish between pure substances and mixtures?
4. What does it mean if the sample is made of only one substance or more than one substance?
5. Can you think of some mixtures and pure substances you encounter in your every-day life? Why there are different forms of matter and what causes these changes? How do changes in matter affect your everyday life?

1.6 Video:

How can matter be described, classified and changed? How do interactions of matter affect your life? How does understanding of the changes in properties of matter become beneficial?

Open this video: http://www.youtube.com/watch?v=kPRPU1OioDE It may help anyone studying to differentiate between pure substances and mixtures: high school, and beyond!

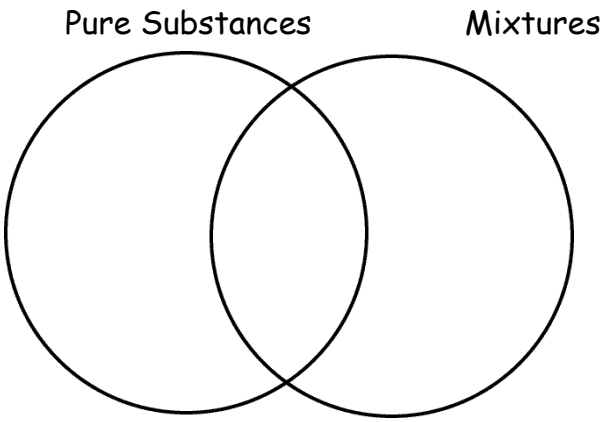
http://www.youtube.com/watch?NR=1&feature=endscreen&v=SwZj84J_KOw Interactive teaching: understanding the diversity of matter according to pure substances and mixtures

Review the videos; stop it every now and then so you can take down notes. When done, answer the following questions.

A. As you review the video, classify the following as pure substances or as mixtures:

Material	pure substances	Mixtures
air		
gasoline		
grain alcohol		
water		
sugar		
gold		
mercury		
oxygen		
salt water		

Directions: Fill in the Venn diagram to compare and contrast pure substances and mixtures.



Check my Answer:

Content of a Check my Answer button

Pure substances: contain one type of particle
Mixtures: contain many different types of particles
Pure substances AND Mixtures: both are made of matter, both can be in the form of a solid, liquid, or gas

Let's go back to the KWHL Chart. Now fill out the second and third columns. Write the answers in you notebook

Matter (Diversity of Materials)			
What you KNOW	What you WANT to know	HOW will you find out	What I have LEARNED

Process Questions:

1. Based on your understanding, how will you categorize substances as pure or mixture?
2. How is the term “pure” used in everyday life? How is this different from how it is used in science?
3. What are the most important mixtures and pure substances you come in contact with each day? Why do you think they are important?
4. Do you think your understanding of how the term pure is used in science will change how you use it in everyday life? Why or why not?
5. How do interactions of matter affect your life? How does the understanding of the changes in properties of matter become beneficial?

Now that you have a deeper understanding of the topic, you are ready to do the tasks in the next section.

End of DEEPEN

In this section, you saw demonstrations on how pure substances and mixtures differ from each other. You then inferred and classified the nature of materials from the desired result.

What new realizations do you have about the topic? What is the significance of this topic to your life?

In your notebook, write a brief reflection on your experience about the implication of the diversity of materials (pure substances and mixtures) in the environment. Why there are different forms and what causes these changes? Do you think understanding the changes in properties of matter is beneficial in human and in an environment? Why or why not?

Now that you have a deeper understanding of the topic, you are ready to do the tasks in the next section.

TRANSFER

Your goal in this section is apply your learning to real life situations. You will be given a practical task in this section.

1.7 Webpage activity: Create your own Cola:

In this web page, you'll investigate the concept of mixtures. Click this site and do the activity: http://serc.carleton.edu/sp/mnstep/activities/20108.html. Keep in mind the following questions

Guide Questions:

1. What are the materials used for making a cola?
2. Is scientific investigation important to investigate the concept of mixtures and concentration? Why or why not?
3. What are the various sources of error that must be accounted for in an experiment?
4. In your own opinion, what are the advantages and disadvantages of producing cola beverage?
5. Can you think of some mixtures you encounter in your every-day life that is beneficial to you? Why there are different forms of matter and what causes these changes? How do changes in matter affect your everyday life?

CHECK – UP TEST
Let's do a comprehensive check what you have learned. This will help you prepare for the unit test after the next modules.

1. A homogeneous liquid which cannot be separated into components by distillation but can be decomposed by electrolysis is classified as a/an _____.
   A. element
   B. mixture
   C. solution
   D. substance

2. A sample of a salt and water solution is homogeneous throughout. Is this sample a mixture or a pure substance?
   A. a pure substance, since it is the same throughout
   B. a mixture, because it can have a variable composition
   C. a pure substance, because it has a definite composition
   D. a mixture, because it has a fixed, definite composition

3. An unknown, clear liquid is given to you in a beaker. You transfer the liquid from the beaker to a clean, empty test-tube, and begin to heat it. After a while,

you see vapors rising from the test-tube, and pretty soon, all that's left are a few crystals of salt stuck to the edges. How would you classify the material?

A. element
B. mixture
C. compound
D. colloid

4. An unknown material underwent electrolysis and decomposed to hydrogen and oxygen. How would you classify the material?

A. element
B. mixture
C. solution
D. substance

5. You are a chemist turned businesswoman. You have been invited by a group of small scale business owners to discuss to them how to prepare your famous brand of perfume. Which of the following is a more appropriate form of your presentation?

A. a seminar
B. a how-to-do demonstration
C. a flow chart discussion
D. a scientific and technical paper

6. It is often difficult to decide if a change is physical or chemical, so a certain clues will help you decide if a chemical change has occurred. Which of the following statements below does NOT possess a chemical change?

A. A change in color and/or odor
B. The release or absorption of energy
C. A change can be reversed easily
D. The formation of a solid in a liquid

7. Which of the following is NOT a potential sign of chemical change?

A. release of gas
B. evaporation of water
C. change of color
D. production of gas

8. Which of the following is NOT a physical property of iron?

A. melting point
B. ability to rust
C. color
D. conductivity

9. How does a physical change differ from a chemical change?

A. New volumes are created in a physical change.
B. New materials are produced in a physical change.
C. The composition is unchanged in a physical change.
D. The change is reversible in a physical change.

10. Which of the following does not involve a chemical change?

A. cube of sugar in hot coffee
B. tarnishing silver
C. exploding dynamite
D. burning fire

Lesson 2.2.2 Elements and Compounds

In this lesson, you shall:

- Recognize that substances are classified into elements and compounds.
- Recognize that compounds consist of specific elements in a definite composition (e.g., H_2O and H_2O_2; different compounds of C, H, O).

EXPLORE

Are you ready to learn more about the diversities of matter and how substances be classified as elements and compound? Let's explore in the previous lesson, you learned how human affected with the diversity of materials. In this lesson we focus on the following questions: What is a matter? Why are there different forms? How are the different forms classified?

2.1 Picture Analysis:

Open and read this website to understand the picture of elements and compounds.
Adapted source: www.ivy-rose.co.uk/Chemistry/GCSE/Elements-Mixtures-Compounds.php

2.2 Activity: Elements and Compounds

This activity help you the process of exploring matter into the categories of element, and compound. The distinctions among these categories will become increasingly clear as you study and perform the activity.

Go to this site where you'll explore on elements and compounds:
http://www.its-about-time.com/pdfs/acact1.pdf

From the experience of the activity, think the following questions:

1. In your own words, explain the difference between an element and a compound.
2. Why are symbols useful in describing chemical elements?
3. What are the symbols for the following elements: carbon, copper, gold, and helium?
4. What information does a chemical formula of a compound provide?

End of EXPLORE

In this lesson you explored how forms of matter can be classified as elements, and compounds. You learned about how to decompose a substance like water into the two elements from which it is composed and practice safe laboratory techniques. You may also have more questions in your mind on how to organize matter intensely into the categories of element and compound.

In the next activities, you will see and use video clips and laboratory activities that can enhance you learning for elements and compounds.

FIRM-UP

Your goal in this section is to learn and understand these key concepts:

- Substances have an invariable composition and are composed of either elements or compounds.
- Elements combine in a definite ratio to form a compound.

Keep in mind these questions as you do the next activities:

- What are the characteristics of elements, and compounds? Give examples.
- Explain how elements can be identified.
- What are the ways an element can be classified according to their properties?
- Identify the differences between an element and a compound.
- How significant are the elements and compounds to your health, industries and the environment?

2.3 Web-page reading: Elements and Compounds

You saw in the first lesson the properties of pure substance and mixtures. In this lesson, read the following pages to review some ideas and ready you for further for this new lesson.
http://www.chem1.com/acad/webtext/pre/matter.html

Do you understand how useful the dimensions in classifying matter? Why are there different forms of matter and what causes these changes? How do changes in matter affect your everyday life?

Open this video: http://www.brightstorm.com/science/biology/chemical-basis-of-life/elements-compounds/

Below is the KWL chart. Fill in the table after you watch over the video:

What I KNOW	What I want to LEARN	What I have LEARNED

Read this webpage and answer the questions in your notebook:
http://www.chemprofessor.com/matter.htm this website is to enhance you understanding about the lesson on the classification scheme of matter.

Then go on to read this page:
http://www.chemteam.info/Matter/ElementsAndCompounds.html in this web page it will lead into discussing elements and compounds as a general classification scheme for all matter.

1. What is your idea about “an element is to a compound as bricks are to a house”
2. What are your insights about the analogy between mixture and compounds?
3. How do elements and compounds affect life and nonlife in the environment?
4. Do you have similar characteristics of the compound or element in the community?
5. Why there are different forms of matter and what causes these changes?

CHECK – UP TEST
Let’s do a comprehension check on what you just read. Click on your best answer.

1. All living things contain which element?
   A. helium
   B. sodium
   C. copper
   D. carbon

2. The chemical element that is most abundant in the human body is
   A. nitrogen.
   B. iron.
   C. carbon.
   D. oxygen.

3. The chemical formula for water, H_2O, means that each water molecule contains
   A. two hydrogen atoms and two oxygen atoms.
   B. two hydrogen atoms and one oxygen atom.
   C. two hydrogen atoms and zero oxygen atoms.
   D. one hydrogen atom and two oxygen atoms.

4. A group of atoms that acts as a unit is called a(n)
   A. mixture.
   B. molecule.
   C. element.
   D. compound.

5. Which of the following statements is true?
   A. Elements are the only kind of matter that can be properly classified as pure substances.
   B. Only pure matter is classified as a substance, which includes only elements and compounds.

C. All mixtures can easily be identified as impure, since the components are always easily recognizable.
D. All solutions consist of a solid dissolved in a liquid.

Let's now find out in the next part what the answers to these questions are.

2.4 Elements, Compounds and Mixtures: Interactive simulation exploration

How does understanding of the changes in properties of matter become beneficial?

Recall what you did in the previous lesson about pure substance and mixtures.

Open this interaction simulation:
http://video.sunflowerlearning.com/browse/productvideos/video/ecm. This site establishes the differences between substances: elements, compounds, and mixtures.

http://www.youtube.com/watch?v=XLk7BM0m2ao&feature=endscreen&NR=1
This site recognizes that compounds consist of specific elements in a definite composition

As you explore the simulation, keep in mind these guide questions:

1. How elements are made of one type of atom?
2. Why different elements are made up of different atoms?
3. How atoms rearrange in chemical reactions?
4. How compounds are made of atoms combined in a fixed ratio?
5. Draw the differences between pure substances and mixtures
6. Create pictures of common mixtures such as air and salt water.

Again note down answers in your notebook.

2.5 Photo Gallery: Elements in the Human Body

Read the page below, explore the page, and find out the different elements that are significant in human body.
http://chemistry.about.com/od/periodictableelements/ig/Elements-in-the-Human-Body/

Process Questions:

1. Create a time line that shows the discovery dates of the researched elements.
    a) What was the date of the element's discovery?
    b) Which scientist or scientists discovered the element?

c) Where was the element discovered?
d) Under what circumstances was it discovered?

2. What are the contributions of these elements in industries, and in environment?
3. What would the world be like without elements?
4. What do you think is the most important known element?
5. Can you think of some elements you encounter in your every-day life that is beneficial to you? Why there are different forms of matter and what causes these changes? How do changes in matter affect your everyday life?

Again note down answers in your notebook.

2.6 Web page reading: Human Biology - Food and Digestion

Students will answer the questions below before going to read the website. The goal is to learn and understanding some key concepts, by performing on the following questions. Write down your initial answers in your notebook.

1. How does the elements and compounds useful to our body and to our daily functions?
2. Where can you find the different elements in real life?
3. How a balanced diet is essential to a healthy organism?
4. How do elements and compounds affect your life? How does understanding of the changes in properties of matter become beneficial?

Open and read this web page:
http://www.biology-online.org/7/6_food.htm. This site feature foods contain compounds and elements that are useful to our body and our daily functions.

After reading the website the students will compare their ideas in their notebook those ideas found in the website.

Process Questions:

1. How is food broken down and digested by the human body?
2. What are the advantages and disadvantages of the compounds and elements for optimal conditions of your body?
3. How can your understanding of the changes in properties of matter become beneficial for humans, in industries and to the environment?
4. How does the change of properties matter affect the survival of living organisms and the quality of the environment?

2.7 "How Stuff Works" about Elements, Compounds, and Mixtures: This activity will present the basic properties and characteristics of elements,

compounds and mixture. How does understanding of the changes in properties of matter become beneficial?

Read this webpage:
http://www.lasd.k12.pa.us/LHS/FacultyStaff/Classrooms/coover/PSci/04/04%20Text.pdf This website offers not only about mixtures but also about the elements and compounds that can form mixtures.

Then watch this video
http://videos.howstuffworks.com/discovery/29395-assignment-discovery-elements-compounds-and-mixtures-video.htm this website offers matter can be separated into three groups: elements, compounds and mixtures. From there, it just keeps getting broken down to the subatomic level and beyond.

CHECK-UP TEST:

Check your comprehension through the following questions: Let's review the idea found in the website you just read. Click on your answers to the following questions. This will help you prepare for the unit test after the next modules.

1. Which of the following substances can be separated into simpler substances only by chemical means?
   A. sodium
   B. salt water
   C. water
   D. gold

2. Which of the following best describes chicken noodle soup?
   A. element
   B. mixture
   C. compound
   D. solution

3. Which of the following does not describe elements?
   A. all the particles are alike
   B. can be broken down into simpler substances
   C. have unique sets of properties
   D. can join together to form compounds

4. The smallest unit of an element that maintains the properties of that element is a(n)
   A. molecule.
   B. atom.
   C. substance.
   D. compound.

5.Which of the following is an element?
   29. A. salt
   30. B. iron
   C. nylon
   D. sand

2.8 Word Game: Elements and Compounds

This word game will enrich your critical thinking on the topic elements and compounds. In this game, you'll guess the word and analyze the clue properly. How does understanding of the changes in properties of matter become beneficial?

Open this website to enhance your learning on the topic. http://www.what2learn.com/games/play/4931/ Elements and compounds Alien Abduction Hangman. Word-game: where you have to guess a given word. As you explore the animation: Keep in mind these questions:

1. What is your main obligation for grandma in the activity?
2. What is the significance of this game to the topic?
3. How will you relate this game to you as a student?

http://mint.ua.edu/games/chemical-mixup/ an interactive flash game designed to help you improve your basic chemistry skills!

2.9 Hands-on Activity: Elements, Compounds, or Mixtures

This hands-on activity will help the students have a better understanding of different types of materials as pure substances and mixtures and distinguishes the homogenous and heterogeneous mixtures by discussing some material they use in their daily life. How does understanding of the changes in properties of matter become beneficial?

Open this webpage and do the activity below: https://docs.google.com/viewer?a=v&q=cache:JnhUCdjjlvIJ:www.learnnc.org/lp/media/lessons/annachilds1172004903/Students.doc+elements+compounds+and+mixtures+activities+CANDY+ACTIVITY+WORKSHEETS&hl=en&gl=ph&pid=bl&srcid=ADGEESh6YDVrfOdYv1JdjVTpauziiMggLSkg-_d5tqPXWoMvzlfCacxPMt4PvBG2KUuRRFGgDjaK4JbMzfFo0r7UoPXL2UMWedETGU0Q7pMI2pw1p9wdvGlnQd67A0ecOPA4uMlEs2Lk&sig=AHIEtbT8y1s4HK3LYAcpNvuEQmynyE0OgQ this website will visualize the difference in composition of elements, compounds, and mixtures

End of FIRM UP:

In this section, you have further explored the diversity of matter using Hands-on activities and game. You observed that pure substances have an invariable composition to form a compound.

So now, in your own words, what is the difference between elements, compounds, and mixtures? “How can your understanding of the changes in properties of matter become beneficial in human, in industries and in the environment?”

If you have difficulty explaining, go back to the reading and webpages in this section.

Now that you know the significant ideas about the topic, let's go deeper by moving on the next section.

DEEPEN

Your goal in this section is to take a closer look at some aspects of the topic. Here you will complete two worksheets that will check on your understanding of the elements, compounds, and mixtures (*Homogeneous* and *Heterogeneous*).

2.10 Worksheet I: Poem Analysis This activity will help you to enhance your learning about the topic. It will strengthen your skill in comprehension and deepen your understanding regarding the changes in properties of matter to real life situation. Why are there different forms? How are the different forms classified? How does understanding of the changes in properties of matter become beneficial?

Open and read this this website http://www.evanschemistrycorner.com/WS/MatterWS/WS1-7-2_Elements_Compounds_and_Mixtures.pdf this site feature the relationship of elements, compounds, and mixtures

Open this website, read the *poem* then answer the questions below based on the poem.
https://docs.google.com/viewer?a=v&q=cache:Ws8p7AOJkYcJ:maplewood.isd622.org/files/maplewoodmiddleschool/files/ledermann/poem%2520sheet.pdf+Elements,+Compounds,+and+Mixtures+by+Evan+P.+Silberstein&hl=tl&gl=ph&pid=bl&srcid=ADGEESi1fbsLO0Vzf3XHmqaFAfKBt-Siool8xUvRRhXaZ2hEn-9IrJGM5BiGI02BrlG9ImaFvhBtUxOKipf88YTA73BSWsXRBiarrZKzpPvKLmSFqP-eVHBTai8o3-sf-H2Cku6sko6Y&sig=AHIEtbTorBChn4QCrmSm08Fk4R1G4Dv98Q

2.11 Worksheet II: Elements, Compounds & Mixtures
This activity will help you to assess your learning on how far you understand the topic. You will classify each of the following substances as; an element (E), a compound (C), a homogeneous mixture (hom), or a heterogeneous mixture (het). How does the understanding of the changes in properties of matter become beneficial?

Open this website read the webpage then answers the questions:
http://doclike.net/Read/_dp.d3d3LmRvY2Nhc2FncmFuZGUubmV0_dp..sl_Chem+1+Files.sl_Chem+1+Chapter+03+Folder.sl_Chem+1+Chapter+03+Worksheets.sl_Elements-Compounds-Mixtures+WS.pdf

How did you do with this assessment? If you did well, continue to the next part. If not go back and find out from the readings the reason for the correct answer.

End of DEEPEN:
In this section, you have completed two worksheets, a) Poem analysis and b) classifying different substances as elements, compounds, and mixtures. You strengthened your understanding of the properties of matter.

What are your insights about the topic? What new connections have you made for yourself?
Why there are different forms and what causes these changes? Why does classifying matter help us learn about the world around us? How do changes in matter affect our everyday life?

Now that you have a deeper understanding of the topic, you are ready to do the tasks in the next section.

TRANSFER

Your goal in this section is apply your learning to real life situations. You will be given an activity which will demonstrate your understanding.

2.12 Net Surfing: http://inquirychemistry.com/files/HSUnit04Aug0806.pdf this website offers the classification of matter according to its composition.

Process questions: Write down your answers in your notebook.

1. Can elements and compounds affect society?
2. What are the relationship among a mixture, pure substance, element, and compound?
3. How are the classifications of matter related to one another?
4. How does the change of properties matter affect the survival of living organisms and the quality of the environment?

2.13 Activity: In this activity the learner will apply and demonstrates understanding of changes in properties of matter and their benefits to one's health and the environment. How does understanding of the changes in properties of matter become beneficial? Why are there different forms? How are the different forms classified?

- Ask students a presentation on issue related to the properties of matter that affects the one's health and the environment. Ask students to report the causes of litter and where does it come from? Discuss the harmful effects litter has on our community. What impact does it have on human health and environment? Ask students to represent their work through picture exhibits.

- Ask the students to take a walk around the school grounds. Observe and record any type of waste found in the surrounding air, land, or water. Discuss their feelings about the trash and the effects it would have on the environment. Ask the students why preventing and reducing litter is important to the community and the environment. Why should people care?

- Have each student formulate a Segregation Plan or Recycling Plan that will help address the litter problem that might be used to help reduce waste in their community. Each student should write a brief summary to explain his/her plan, how it would work, and how it would reduce or help address the litter problem. They should explain why it would help reduce waste and the responsible behavior individuals might use to minimize waste's negative effects.

- Students should be able to list reasons why waste is harmful, what causes it, and express the personal desire and specific responsible behaviors he/she can exhibit to prevent litter or help clean it up.

- Have students' research types of waste and write reports about the negative effects on the environment and how waste could be prevented or reduced. Ask the students share their report to the class. Evaluation should include purposes, content and organization in dealing to the issue.

Here's a rubric by which your report shall be scored:

Criteria	Commendable 4	Promising 3	Developing 2	Beginning 1
Purposes.	The report explains the key purposes of the plan and carryout schemes that will help address the litter and student's reflects deep understanding	The report explains all of the key purposes of the plan.	The report explains some key of the purposes of the plan but not quite complete.	The report does not refer to the purposes of the plan
. Content	demonstrates thorough knowledge . of content	demonstrates considerable knowledge . of content .	demonstrates some . knowledge of content	demonstrates limited . knowledge of content

. Organization .	. Presentation is carefully organized and provides convincing evidence to support conclusions .	. Presentation provides evidence which support conclusions.	. Presentation has some lapses on the coherence of the evidence to support conclusions	. Presentation has no evident organization to support conclusion

End of TRANSFER
In this section, your goal was to formulate a segregation plan or recycling plan to provide deeper justifications as to how this diversity of materials affects the survival of living organisms and the quality of the environment.

How did you find the Activity? How did this activity help you further understand oft the changes in properties of matter become beneficial in human, and in environment? What are your insights and values learned? Write down your reflections on your notebook.
You have completed this lesson. Before you go to the next the next lesson, you have to answer the following posttest. If pass this test, you may move on to the next lesson. If you do not pass the test, you may go back and review the lesson and take this text again.

2.14 CHECK – UP TEST

Answer this check-up test. This will help you prepare for the unit test after the next modules.

1. Which of the following statements is true?
   A. Elements are the only kind of matter that can be properly classified as pure substances.
   B. Only pure matter is classified as a substance, which includes only elements and compounds.
   C. All mixtures can easily be identified as impure, since the components are always easily recognizable.
   D. All solutions consist of a solid dissolved in a liquid.

2. Which of the following is the best statement about molecules?
   A. Compounds are made of molecules, which consist of two atoms joined together.
   B All matter is made of molecules, which consist of identical atoms joined together.
   C. Molecules cannot be split apart.
   D. Molecules are particles of compounds, and consist of two or more atoms joined together.

3. Just a few years ago, nearly all paint contained a lead compound. Today, very few household paints contain lead. Based on class discussions, which of the following is probably the reason for the change?
   A. Lead has become a rare metal, and too expensive to put in paint.
   B. The extra process to remove lead from paint saves money.
   (c) It has been found that lead, as a heavy metal, is dangerous to our health.
   (d) Paint without lead is easier to use and lasts longer.

4. Passing electricity through water causes the H_2O molecules to decompose into its elements. The word equation that best describes this chemical change is
   A. hydrogen + oxygen -----> water
   B. water -----> hydrogen + oxygen
   C. water -----> steam
   D. water -----> hydrogen + nitrogen

5. The gas that makes up about 20% of our atmosphere is
   A. oxygen. B. carbon dioxide. C. hydrogen. D. nitrogen.

6. On bags of fertilizers, there are usually three numbers, such as 20-10-10, that represent the proportions of the three primary elements that plants need as nutrients. What are these three primary elements, in the same order as the numbers on the bag?
   A. nitrogen, phosphorus, and potassium
   B. nitrogen, potassium, and sodium
   C. carbon, oxygen, hydrogen
   D. hydrogen, oxygen, carbon

7. A pure substance that cannot be decomposed into anything simpler by chemical or physical means is called a (an) _____.
   A. compound B. element C. isotope D. mixture

8. Shiny dark violet crystals in a dry and clean test tube, when heated, produced dark violet fumes which turned into fine shiny dark violet crystals at the upper colder part of the test tube. How would you classify the violet crystals?
   A. colloid C. element
   B. compound D. mixture

9. A white crystalline solid, when heated, turned to caramel like form and color and produced white vapor. How would you classify the material?
   A. colloid C. element
   B. compound D. mixture

10. You are a sales representative of a new vitamin. You were invited by the branch manager of a certain drugstore to explain to them the composition and effects to the body of the said vitamin before they purchase, how will you know that you have a good presentation?
    A. vocabulary, use of scientific terms, visual aids
    B. purpose, content, and organization
    C. mechanics, use of references, speaking voice
    D. organization, props, time limit

Lesson 2.2.3 Metals and Nonmetals

In this lesson, you shall:

- Demonstrate the different properties of metals and nonmetals (e.g., luster, malleability, ductility, conductivity).
- Recognize the elements considered as metals and those that are nonmetals

Keep in mind the following questions as you move on:

- What are the differences between the metals and nonmetals?
- How significant are metals and nonmetals to life?
- What are the lists of elements belonging to periodic table groups? How can you use physical properties to identify a substance as a metal, nonmetal or metalloid?
- How does understanding of the changes in properties of matter become beneficial?

EXPLORE

Let continue with Lesson 3 of this module. In the previous lesson, you learned how elements interact with each other. In this lesson, we will focus on the following questions:

- How do the properties of metals and nonmetals affect our daily lives?
- How are metals and nonmetals useful in our daily lives?
- How does understanding of the changes in properties of matter become beneficial? Why there are different forms and what causes these changes? Why does classifying matter help us learn about the world around us? How do changes in matter affect our everyday life?

3.1 Metal or Nonmetal Activity: This activity is an introduction to the lesson of metals and nonmetals. Most students will not be familiar with the periodic table and will need to understand how it is organized in order to be able to use it successfully.

Open this site and do the activity contained in this site.
https://www.fsd1.org/schools/southside/smagee/Documents/Graded%20Assignments/Metal%20or%20Nonmetal%20Activity.pdf

After doing the activity, answer the following questions:

1. What are your new learning and realizations about the activity?
2. What properties distinguish metals from nonmetals?
3. Why does classifying matter help us learn about the world around us?

End of EXPLORE

At the start of this lesson, you explored about major categories elements of the periodic table. You now may have new ideas and insights about metal and nonmetals. You may also have questions after the activity.

In the next activities, you will read more about the topic.

FIRM-UP

Your goal in this section is to learn, understand, and recognize the role of elements in life processes.

3.2 Open and read this web page on metals and nonmetals:

45. http://chemistry.about.com/od/periodictableelements/a/Metals-And-Nonmetals.htm this website distinguishes the differences between Metals and Nonmetals

What new learning did you get from the readings? What are still unclear?

Let's go back to the KWHL Chart. Now fill-out the fourth column. Write the answers in your notebook.

Matter (Diversity of Materials)			
What you KNOW	What you WANT to know	HOW will you find out	What I have LEARNED

3.3 Webpage reading: Periodic Table Study Guide to examine some elements observe their properties. Using these observations, students will confirm the common properties of metals, nonmetals and metalloids. How does understanding of the changes in properties of matter become beneficial?

Go to this site where you'll see major categories of elements are the metals, nonmetals, and metalloids
http://chemistry.about.com/od/k12gradelessons/a/periodictable_3.htm this website classifies elements according to their properties

Think through the following questions:

1. What are the properties of metals and nonmetals?
2. Are metals and nonmetals helpful or harmful to you?
3. How can your understanding of the changes in properties of matter become beneficial?

3.3 Metal vs Non-Metal lab: You will identify the properties of metal, and non-metals.

You will examine 6 elements to determine listed properties. After you have identified the elements you will categorize the elements as more like carbon, or more like iron.

This activity is to help you understand the arrangement of elements in the periodic table (Metal, Metalloid, and Non-metal)

PROPERTY	DEFINITION	Iron	Carbon	Lead	Aluminum	Sulfur	Copper	Oxygen	Zinc
		Fe	C	Pb	Al	S	Cu	O	Zn
COLOR	Based on appearance, what color is the object?	Silver	Black						
LUSTER	Is it shiny? Does it reflect the light?	Yes	No						
BRITTLENESS	How easily does it break/crumble?	No	Yes						
MALLEABILITY	Can it be hammered into a different shape without breaking?	Yes	No						
MAGNETISM	Does it attract a magnet?	Yes	No						
ELECTRICAL CONDUCTOR	Does the light bulb come on?	Yes	No						
	MORE LIKE IRON?	√							
	MORE LIKE CARBON?		√						
METAL									

Adapted source:
https://docs.google.com/viewer?a=v&q=cache:H0xj7i895yAJ:www.trinity.edu/org/hhmi/Outreach/ALI_Resources/ALI%2520UbD/7th%2520Grade%2520UbD%2520-%2520First%2520Grading%2520Period.doc+performance+task+for+metals+and+nonmetals&hl=en&gl=ph&pid=bl&srcid=ADGEESg6lDmnuVK73vgB6sYGPvT5tFI7c9JYBVpJ-s0H-6VXwq9qxyoOwl_WMWtoEplcPqID9uUqrpFRRNXukePooBntDPWQrHxmmfvGU4G6qyxUsQ2c9D5QafZyHmcFEhUh5E3veDxl&sig=AHIEtbT0b10orPkmiTeLZQgOxKApsTw5dg

Questions:

1. How could everyday chemical phenomena be used to solve mysteries in everyday life?
2. Why are there obvious and non-obvious properties of elements?
3. What causes elements to display everyday chemical phenomena?
4. Why periodic table is considered a living document?
5. Why do we use properties to arrange elements on the periodic table? What do the properties say about the nature of matter in everyday life?

3.4 Open this web video to know more about different metal, nonmetal and Semi-metal (metalloid): http://www.periodicvideos.com/

Take down notes specially details that will help you answer these questions.

1. How does a metal and nonmetal work?

2. Why do you need these metals and nonmetals in your daily life?
3. How does understanding of the changes in properties of matter become beneficial?

End of FIRM¬UP

In this part of the lesson, you learned about how to classify, categorize, introduce the arrangement and discuss common properties of an element as a metal, nonmetal or semimetal in the periodic table.

You may try looking at other related websites to help further clarify your understanding.

In the next part, you'll do something that will bring you into a useful understanding of what you've been learning so far.

DEEPEN

Your goals in this section are to demonstrate the different properties of metals and nonmetals (e.g., luster, malleability, ductility, conductivity) and recognize the elements considered as metals and those that are nonmetals.

Here you will read about physical properties between metals and nonmetals and perform laboratory activity to develop your skills.

3.5 ACTIVITY: Pursuit of the properties of Metals and Nonmetals

How does the understanding of the changes in properties of matter become beneficial to people and the environment?

Your goal in this section is to take a closer look at some aspects of the topic.

http://metals.about.com/gi/dynamic/offsite.htm?site=http://school.discoveryeducation.com/lessonplans/programs/metalsandnonmetals this website enhances the understanding of the differences in the physical properties between metals and nonmetals

Data Sheet: Pursuit of the properties of Metals and Nonmetals

Record your observations in the spaces provided in the table below:

Sample Number	Color	Luster	Malleability	Conductivity	Reaction with acid	Classification
1.						
2.						
3.						
4.						

5.						
6.						
7.						

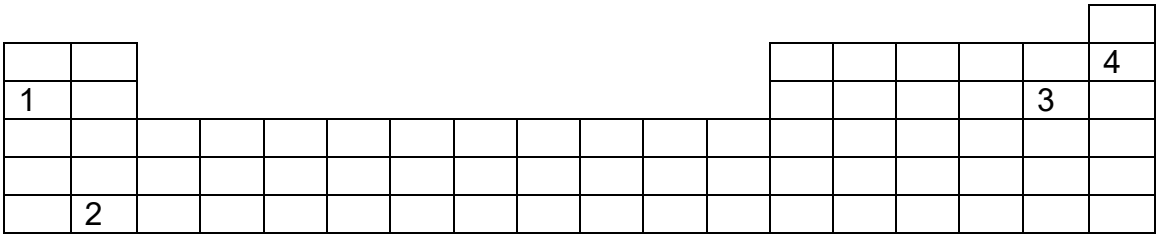
CHECK-UP TEST

Check your comprehension from the readings and Laboratory Activity. Click the letter that corresponds to your best answer.

1. Which of the following cannot be a property of a metal?
   A) It conducts an electric current.
   B) It reacts with muriatic acid.
   C) It has a metallic lustre.
   D) It has an extremely low melting point

2. Which of the elements in the table below possess the properties of shininess, electrical conductivity and malleability?

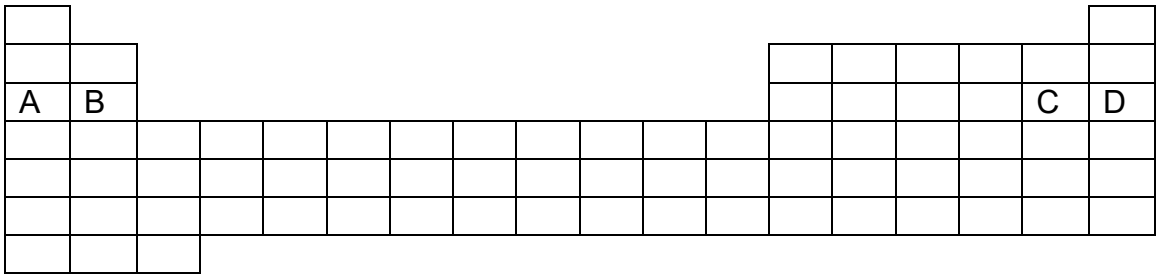
46.



A) 1 and 2 B) 1 and 4 C) 2 and 3 D) 3 and 4

3. An element is analyzed in the laboratory. It is a gas at room temperature that reacts strongly with metals. To which family in the table below does this element belong?

47.



Answers: A] Sodium (Na) Group I : The Alkali Metals
B] Magnesium (Mg) Group II : The Alkaline Earth Metals
C] Chlorine (Cl) Group VII : Halogens Group
D] Argon (Ar) Group VIII : Noble Gases Group

4. Which of the following lists consists only of metals?
   A. aluminum, cobalt, mercury, sodium, zinc
   B. chromium, copper, silver, sulfur, tin

C. carbon, gold, iron, lead, mercury
D. carbon, iodine, phosphorus, sulfur, tellurium

5. Which of the following lists of properties is characteristic of metals?
   A. Shiny, malleable, do not conduct heat and electricity.
   B. Shiny, malleable, conduct heat but not electricity.
   C. Shiny, brittle, conduct heat and electricity.
   D. Shiny, malleable, conduct heat and electricity.

End of DEEPEN:
In this section, you strengthened your understand that every element is classified as a metal, nonmetal or semimetal (metalloid) based on its individual properties.

What are your realizations about the topic? What new connections have you made for yourself? Why there are different forms and what causes these changes? Why does classifying matter help us learn about the world around us? How do changes in matter affect our everyday life?

Now that you have a deeper understanding of the topic, you are ready for the task in the next section.

TRANSFER

Your goal in this section is apply your learning to real life situations. You will go to make a feeding program includes preparation of mixture of different known concentrations in most efficient way without sacrificing its quality to sustain quality life.

3.6 PERFORMANCE TASK:

In this module's closing session, your final task is to apply in your Barangay. You observe that malnourished cases have been increasing due to unknown causes. As the SK chairman, together with health barangay nutritionist was asked to make a feeding program for the barangay officials. The program would be used to facilitate possible answers on the issue of malnourished children. The program includes preparation of mixture of different known concentrations in most efficient way without sacrificing its quality to sustain quality life. Your program contains identifying the causes of malnourishment, formulating an output of the study by presenting the findings/data results and recommending precautionary and health measures. The program will be evaluated according to its content, practicality, organization, delivery and use of visual aids.

Rubrics for the Performance Task:

	OUTSTANDING (4)	COMMENDABLE (3)	DEVELOPING (2)	BEGINNING (1)
Content	Demonstrates full knowledge (more than required) with explanations and elaboration.	Demonstrate knowledge of required content	Demonstrate partial knowledge of required content and is able to answer only basic questions.	Does not have grasp of information and cannot answer questions about subject.
Practicality	Materials list is reasonable and creative given resources.	Materials list is reasonable given resources.	Materials list is not reasonable given resources.	Materials list is not reasonable.
Organization	Information in logical, interesting sequence which audience can follow.	Information in logical sequence which audience can follow.	Difficult to follow the presentation because the sequence is not well organized.	No sequence and evidence of information.
Delivery	Speaks clear and correct, precise pronunciation of terms.	Speaks clear and pronounces words correctly.	Shows incorrect pronunciation of terms and has difficulty projecting one's voice.	Speaks mumbles, Incorrect pronunciation of terms and unable to project one's voice.
Use of Visual Aids and Technology	Visuals Aids and Technology are evident to reinforce screen text and presentation.	Visuals Aids and Technology related to text and presentation.	Visuals aids and technology rarely support text and presentation.	No visuals aids and technology used to support the presentation.

Before you go to the post-assessment, write a reflection in your synthesis journal about your experiences in the entire lessons. You may choose to answer one, or all of these guide questions:

1. What is the most important learning you encountered from the entire lessons?
2. Which of the lessons you find more challenging and engaging? Difficult and frustrating?
3. Aside from the performance task that you performed, what other task you would like to work on in the future that could be beneficial in human and in environment?

End of TRANSFER:

In this section, your task was to really apply your learning to real life situation. Through this feeding program it strengthen the partnership of the community with the school toward a sustainable development of harmonious relationship of the people and building up well-rounded and refined residents among the kids in the future.

Can you answer confidently the following question?

1. Why does classifying matter help us learn about the world around us?
2. Why there are different forms and what causes these changes?
3. How do changes in matter affect our everyday life?

If not yet, then you may to go back to the readings or you may look at other related websites to help further clarify your understanding or interview a nutritionists or chemists.

You have completed this lesson. Before you go to the next lesson, you have to answer the following post assessment. If you pass this test, you may move on to the next back lesson. If you do not pass this test, you may go back and review the lesson and take this test again.

POST ASSESSMENT:

1. Which of the following statements is true?
   A. Elements are the only kind of matter that can be properly classified as pure substances.
   B. Only pure matter is classified as a substance, which includes only elements and compounds.
   C. All mixtures can easily be identified as impure, since the components are always easily recognizable.
   D. All solutions consist of a solid dissolved in a liquid
2. Why is tap water or salt water classified as a mixture, even though it is clear and colorless?
   A. If you hold it very close to your eyes, you can see the different particles moving around inside the water.
   B. Any kind of matter that contains more than one element is a mixture.
   C. It contains at least two different substances or particles, and can be separated by physical means.
   D. The particles all combine in such a way that the only way they can be separated is by a chemical reaction.
3. Substances composed of two or more atoms are:
   A. elements. B. compounds. C. pure substance D. mixtures.
4. Which of the following is the best statement about molecules?
   A. Compounds are made of molecules, which consist of two atoms joined together.
   B. All matter is made of molecules, which consist of identical atoms joined together.
   C. Molecules cannot be split apart.
   D. Molecules are particles of compounds, and consist of two or more atoms joined together.
5. Which substance in the following list is a compound?
   A. salt B. carbon C. coffee D. paint

6. Each night you measure your height just before going to bed. When you arise each morning, you measure your height again and consistently find that you are 1 inch taller than you were the night before but only as tall as you were 24 hours ago! Is what happens to your body in this instance best described as a physical change or a chemical change?
   A) physical change because water expands as it freezes
   B) chemical change because it involves changes in your bone structure
   C) physical change because it readily reverses
   D) chemical change because it involves your body

7. Which of the following lists consists *only* of metals?
   A. aluminum, cobalt, mercury, sodium, zinc
   B. chromium, copper, silver, sulfur, tin

C. carbon, gold, iron, lead, mercury
D. carbon, iodine, phosphorus, sulfur, tellurium

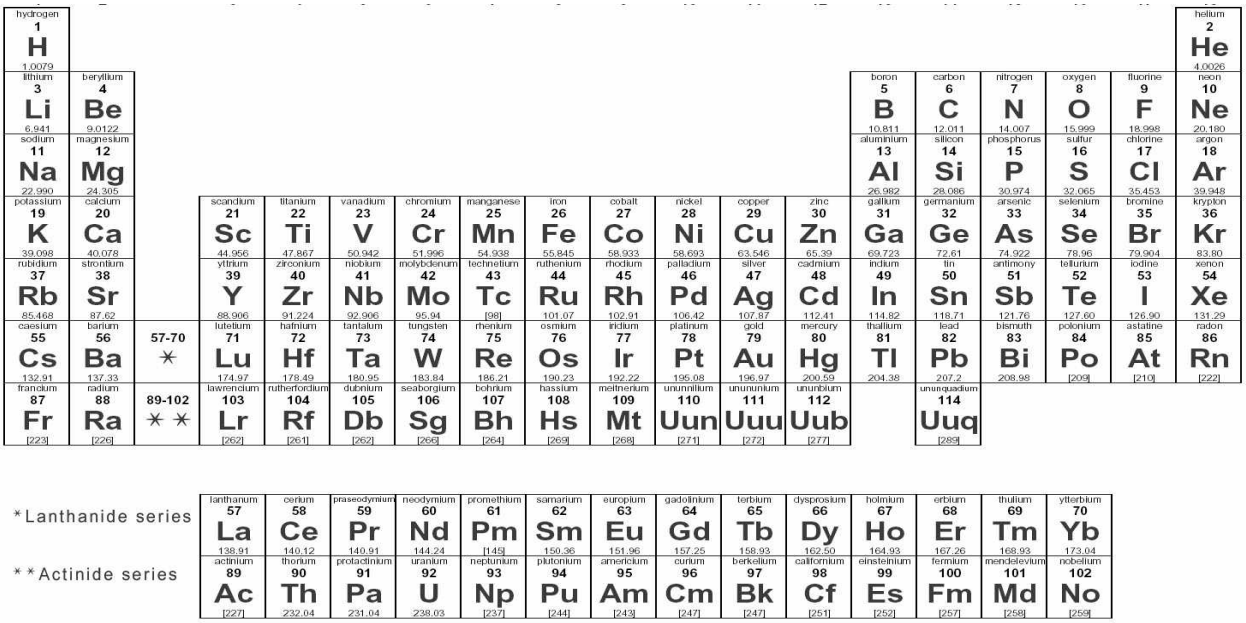
8. Which of the following lists of properties is characteristic of metals?
A. Shiny, malleable, do not conduct heat and electricity.
B. Shiny, malleable, conduct heat but not electricity.
C. Shiny, brittle, conduct heat and electricity.
D. Shiny, malleable, conduct heat and electricity.

9. Just a few years ago, nearly all paint contained a lead compound. Today, very few household paints contain lead. Based on class discussions, which of the following is probably the reason for the change?
A. Lead has become a rare metal, and too expensive to put in paint.
B. The extra process to remove lead from paint saves money.
C. It has been found that lead, as a heavy metal, is dangerous to our health.
D. Paint without lead is easier to use and lasts longer.

10. When homemade ice cream is made, salt is added to the ice that surrounds the ice cream chamber. Which property of salt is important when making ice cream?
A Salt conducts electricity in water.
B Salt dissolves in water.
C Salt lowers the freezing point of water.
D Salt adds flavor to the ice cream mixture.

11. A metal spoon was left in a pot of boiling soup. The cook burned a finger by touching the spoon. Why did the finger get burned?
A The metal spoon conducted heat to the cook's hand.
B The metal spoon conducted electricity to the cook's hand.
C The metal spoon chemically reacted with the cook's hand.
D The metal spoon insulated the cook's hand.

12. The mixture which cannot be separated by mechanical means is
A. sand and gravel
B. salt and brown sugar crystal
C. coffee grounds and tea leaves
D. brown sugar crystals and water



Adapted source:
http://www.google.com.ph/imgres?imgurl=http://www.bpc.edu/mathscience/chemistry/images/periodic_table_of_elements.jpg&imgrefurl=http://www.bpc.edu/mathscience/chemistry/history_of_the_periodic_table.html&usg=__IDv0OneOfYpiOSRSKXeBqL5sF-g=&h=858&w=1457&sz=216&hl=tl&start=5&zoom=1&tbnid=CzVvAR9uUE0qFM:&tbnh=88&tbnw=150&ei=pW7PT6W9KMjnmAXOr6DFCg&prev=/search%3Fq%3Dperiodic%2Btable%2Bof%2Belements%26hl%3Dtl%26sa%3DX%26biw%3D1024%26bih%3D451%26tbm%3Disch%26prmd%3Dimvnsa&itbs=1

13. Based on their location in the figure above, oxygen and selenium have
    A. the same number of neutrons.
    B. the same conductivity.
    C. similar properties.
    D. the same number of electron orbitals.

14. On bags of fertilizers, there are usually three numbers, such as 20-10-10, that represent the proportions of the three primary elements that plants need as nutrients. What are these three primary elements, in the same order as the numbers on the bag?
    A. nitrogen, phosphorus, and potassium
    B. nitrogen, potassium, and sodium
    C. carbon, oxygen, hydrogen
    D. hydrogen, oxygen, carbon

15. The manager of a textile factory said it is too expensive to treat liquid wastes so he suggested digging a hole near the factory where the wastes can be stored. Is this environmentally safe?
    A. YES! The liquid will pass through the layers of the soil and becomes clean.
    B. YES! The liquid will become less hazardous with time.
    C. NO! The liquid wastes will combine to the groundwater.
    D. NO! The liquid can be recycled.

16. Phoenix, an unnamed spacecraft went to Mars to determine if life exits here. What one test do you think was performed in order to get the answer?
    A. Test for presence of atmosphere
    B. Test for presence of carbon dioxide
    C. Test for presence of oxygen
    D. Test for presence of water

17. Sugar is soluble in water. What will most likely happen to its molecules once they had dissolved?
    A. The molecules will spread throughout the liquid.
    B. The molecules will sink to the bottom.
    C. The molecules will no longer exist.
    D. The molecules will float on top

18. Different samples of a given material (A) were collected from different sources. All samples were found to have the same 4:1 mass ratio of copper-to-oxygen. What kind of materials is A?
    A. A is an element.
    B. A is a compound.
    C. A is a colloid.
    D. A. is a mixture.

19. Margarine is a mixture of compounds. Each compound has the general formula $C_xH_yO_z$ where x, y, and z can be a variety of numbers. Which is the same for all sample of margarine?
    A. The elements present
    B. Softening temperature
    C. Solidification temperature
    D. The percentage composition of the compounds

20. You are an expert nutritionist. You were tasked by the barangay officials to present a plan for a feeding program. The program would be used to facilitate possible answers on the issue of malnourished children. The program includes preparation of mixture of different known concentrations in most efficient way without sacrificing its quality to sustain quality life. How will you present your scheme in a comprehensive way?
    A) vocabulary, use of scientific terms, visual aids
    B) organization, props, time limit, collaboration
    C) mechanics, use of references, speaking voice
    D) organization, content, visuals, evidence/source

GLOSSARY

Compounds – a combination of two or more elements which are chemically bonded

Conductivity – the ability of a substance or solution to conduct electricity / heat.

Ductility – the property of a material to be stretched into a wire or tube without breaking (pliable or bendable)

Elements – pure substances composed of only one type of atom

Heterogeneous mixture – a mixture of substances in which the separate components are visible

Homogeneous mixture – a mixture in which the composition is uniform.

Malleable – the property of a material to be hammered into a thin sheet without breaking (pliable or bendable)

Metals - are opaque, lustrous elements that are good conductors of heat and electricity. Most metals are malleable and ductile and are, in general, denser than the other elemental substances.

Metalloid – an element which has properties of both metals and non-metals

Mixture - is a combination of two or more substances that are not chemically united and do not exist in fixed proportions to each other.

Nonmetal - is an element on the periodic table that does not have the properties of a metallic element, such as malleability. Nonmetals are usually found in nature as gases or weak, brittle solids. All group 17 and 18 elements are nonmetals, as well as hydrogen, carbon, nitrogen, oxygen, phosphorous, sulfur, and selenium.

WEBSITE RESOURCES AND LINKS IN THIS MODULE

Lesson No. Activity/ Assessment/ Short Description
Website link
1.1
Classifying Matter Activity

www.asminternational.org/content/docs/classifyingmatteractivity.pdf -
The perfect introductory activity to teach elements, compounds, and mixture

1.4
Mixtures vs. Pure Substances

http://www.youtube.com/watch?v=4lUHd9vc5es
This website features the classification of matter according to pure elements and mixtures.

http://www.mcgrawhill.ca/school/learningcentres/file.php/9780070726901/olc2/dl/699403/2_3.pdf
This website classifies some common materials as either mixtures or pure substances.

1.6
Video: Pure Substance vs Mixture

http://www.youtube.com/watch?v=kPRPU1OioDE
It may help anyone studying to differentiate between pure substances and mixtures: high school, and beyond!

http://www.youtube.com/watch?NR=1&feature=endscreen&v=SwZj84J_KOw
Interactive teaching: understanding the diversity of matter according to pure substances and mixtures

1.7
Create your own Cola
http://serc.carleton.edu/sp/mnstep/activities/20108.html.
Making your own Cola - Investigating Mixtures. It will investigate the concept of mixtures and concentrations.

.
2.1
Web-page reading: Elements and Compounds

http://www.chem1.com/acad/webtext/pre/matter.html
http://www.brightstorm.com/science/biology/chemical-basis-of-life/elements-compounds/

Elements and compounds are differentiated by their composition. It features chemical identities and properties of the elements when it will form a compound.

http://www.chemteam.info/Matter/ElementsAndCompounds.html
In this web page it will lead into discussing elements and compounds by first considering a general classification scheme for all matter.

2.2
Elements, Compounds and Mixtures: Interactive simulation exploration

http://video.sunflowerlearning.com/browse/productvideos/video/ecm.
Demonstrate the differences between substances: elements, compounds, and mixtures.

http://www.youtube.com/watch?v=XLk7BM0m2ao&feature=endscreen&NR=1
Recognize that compounds consist of specific elements in a definite composition

2.3
Photo Gallery: Elements in the Human Body

http://chemistry.about.com/od/periodictableelements/ig/Elements-in-the-Human-Body/
99% of the mass of the human body is made up of only six elements: oxygen, carbon, hydrogen, nitrogen, calcium, and phosphorus. Every organic molecule contains carbon. Since 65-90% of each body cell consists of water (by weight), it isn't surprising that oxygen and hydrogen are major components of the body.

Web page reading: Human Biology - Food and Digestion

http://www.biology-online.org/7/6_food.htm
This site will feature foods contain many compounds and elements that are useful to our body and our daily functions. Food is what is required by humans to grow and survive, and provide a 'fuel' for the energy needed in our biological reactions.

2.5
“How Stuff Works” about Elements, Compounds, and Mixtures

http://www.lasd.k12.pa.us/LHS/FacultyStaff/Classrooms/coover/PSci/04/04%20Text.pdf
This website offers not only about mixtures but also about the elements and compounds that can form mixtures.

http://videos.howstuffworks.com/discovery/29395-assignment-discovery-elements-compounds-and-mixtures-video.htm
This website offers matter can be separated into three groups: elements, compounds and mixtures. From there, it just keeps getting broken down to the subatomic level and beyond.

2.6
Word Game: Elements and Compounds

http://www.what2learn.com/games/play/4931/
"Elements and compounds" Alien Abduction Hangman. Word-game where you have to guess a given word.

http://mint.ua.edu/games/chemical-mixup/
an interactive flash game designed to help you improve your basic chemistry skills!

2.7
Hand-on Activity: Elements, Compounds, or Mixtures?

https://docs.google.com/viewer?a=v&q=cache:JnhUCdjjlvIJ:www.learnnc.org/lp/media/lessons/annachilds1172004903/Students.doc+elements+compounds+and+mixtures+activities+CANDY+ACTIVITY+WORKSHEETS&hl=en&gl=ph&pid=bl&srcid=ADGEESh6YDVrfOdYv1JdjVTpauziiMggLSkg-_d5tqPXWoMvzlfCacxPMt4PvBG2KUuRRFGgDjaK4JbMzfFo0r7UoPXL2UMWedETGU0Q7pMI2pw1p9wdvGlnQd67A0ecOPA4uMlEs2Lk&sig=AHIEtbT8y1s4HK3LYAcpNvuEQmynyE0OgQ
Visualize the difference in composition of elements, compounds, and mixtures

2.8
Worksheet I: Poem Analysis

http://www.evanschemistrycorner.com/WS/MatterWS/WS1-72_Elements_Compounds_and_Mixtures.pdf
This activity will help you to enhance your learning about the topic. It will strengthen your skill in comprehension and deepen your understanding regarding the changes in properties of matter to real life situation. Hence, how these changes become beneficial in human, in industries and in the environment by analyzing the poem.

2.9
Worksheet II: Elements, Compounds & Mixtures

http://doclike.net/Read/_dp.d3d3LmRvY2Nhc2FncmFuZGUubmV0_dp..sl_Chem+1+Files.sl_Chem+1+Chapter+03+Folder.sl_Chem+1+Chapter+03+Worksheets.sl_Elements-Compounds-Mixtures+WS+key.pdf
This activity will help you to enhance your learning about the topic. It will strengthen your skill in comprehension and deepen your understanding regarding the changes in properties of matter to real life situation. Hence, how these changes become beneficial in human, in industries and in the environment by analyzing
2.10
Net Surfing:
http://inquirychemistry.com/files/HSUnit04Aug0806.pdf
This website offers the classification of matter according to its composition.

3.1
Metals and Nonmetals
http://chemistry.about.com/od/periodictableelements/a/Metals-And-Nonmetals.htm
This website distinguishes the differences between Metals and Nonmetals

3.2
Webpage reading: Periodic Table Study Guide
http://chemistry.about.com/od/k12gradelessons/a/periodictable_3.htm
This website classifies elements according to their properties

3.3
Metal vs Non-Metal lab
https://docs.google.com/viewer?a=v&q=cache:H0xj7i895yAJ:www.trinity.edu/org/hhmi/Outreach/ALI_Resources/ALI%2520UbD/7th%2520Grade%2520UbD%2520-%2520First%2520Grading%2520Period.doc+performance+task+for+metals+and+nonmetals&hl=en&gl=ph&pid=bl&srcid=ADGEESg6lDmnuVK73vgB6sYGPvT5tFI7c9JYBVpJ-s0H-6VXwq9qxyoOwI_WMWtoEpIcPqID9uUqrpFRRNXukePooBntDPWQrHxmmfvGU4G6qyxUsQ2c9D5QafZyHmcFEhUh5E3veDxl&sig=AHIEtbT0b10orPkmiTeLZQgOxKApsTw5dg

3.4
Web video different Metal, Nonmetal and Semi-metal (metalloid):
http://www.periodicvideos.com/
Video to know more about different metal, nonmetal and Semi-metal (metalloid)
3.5

ACTIVITY: Pursuit of the properties of Metals and Nonmetals
http://metals.about.com/gi/dynamic/offsite.htm?site=http://school.discoveryeducation.com/lessonplans/programs/metalsandnonmetals
This website enhances the understanding of the differences in the physical properties between metals and nonmetals

Lesson 2.3: Acids and Bases

LESSON INTRODUCTION AND FOCUS QUESTION(S):

Acids and bases have use in more places than just a scientific laboratory. Acids and bases come into play in everyday life in everything from digestion of the foods you eat to the medicine you take and even cleaning products you use. Without acids and bases, many of the products you use today would not have much use.

Have you ever wondered how certain characteristics of acids and bases benefit human beings?

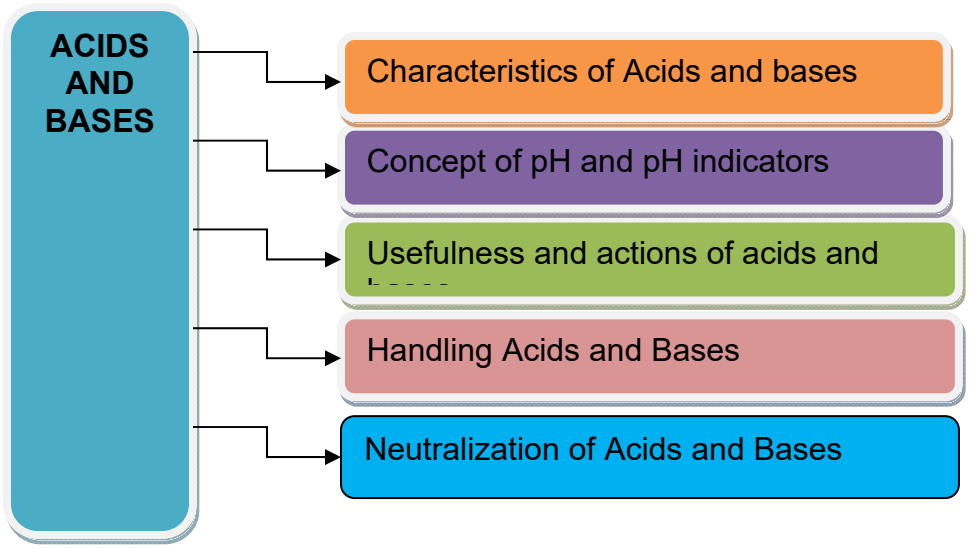
You will find answer to this question as you go along with the activities in this module.

LESSON COVERAGE:

In this lesson, you will learn the following:

1. Describe common acids and bases
2. Recognize the concept of ph
3. Investigate the properties of acids using indicators
4. Investigate action of acids on metals and building materials
5. Practice safe handling of acids and bases
6. Investigate neutralization of acids and bases

Here is a simple map of the above lessons you will cover:



To do well in this module, you need to remember and do the following:

1. Look up the meaning of words you do not know.
2. Complete all the exercises.
3. Take notes on the benefits and harmful effects of acids and bases.

PRE-ASSESSMENT:

Let's find out how much you already know about this module. Click on the letter that you think best answers the question. Please answer all items. After taking this short test, you will see your score. Take note of the items that you were not able to correctly answer

1. If a pinch of baking soda is added to vinegar, what will happen to its potential hydrogen (pH)?
   a. The pH will remain the same.
   b. The pH will increase.
   c. The pH will decrease.
   d. The pH will become basic.

2. Why does a person take antacid when experiences hyper acidity?
   a. Antacid neutralizes the acid in the stomach.
   b. Antacid calms down the stomach.
   c. Antacid prevents ulcer.
   d. Antacid decreases the pH of stomach.

3. As an environmental scientist, you are asked to investigate the reason why plants in *Barangay Luntian* are withering. Based on our study, sulfur-containing gases are emitted by factories have caused the plants to wither. Which of the following is the best thing to do after the results have been reported to your boss?
   a. Report the factories to the police
   b. Organize an anti pollution rally in the *barangay*
   c. Present the data gathered to the city health office and discuss the effects of the factories to the plants
   d. Present the data gathered to the city health office and encourage them to cancel the permit to operate of the factories.

4. What happens to the red litmus paper when put in the basic solution?

a. Remains the same
b. Turns colorless
c. Turns to blue
d. Turns to violet

5. Sandra is bitten by an insect. Which of the following compounds can she apply on the insect bite to prevent itch?
   a. Magnesium chloride
   b. Magnesium sulfate
   c. Sodium acetate
   d. Sodium bicarbonate

6. An example of a strong acid is
   a. carbonic acid
   b. citric acid
   c. concentrated acetic acid
   d. nitric acid

7. A given substance is an acid if its solution is water and
   a. changes litmus paper to red
   b. has a ph above 7
   c. has a soapy feeling
   d. reacts with all glass.
   48.

8. Which is more basic?
   a. pH=12
   b. pH=13
   c. pH=2
   d. pH=7

9. Which of the following statements is **TRUE** concerning acids and bases?
   a. acids and bases don't react with each other
   b. acids mixed with bases make stronger acids
   c. acids mixed with bases make stronger bases
   d. acids mixed with bases neutralize each other

10. Acids react with
    a. bases to produce salts and water.
    b. neither bases, salts, nor water.
    c. salts to produce bases and water.
    d. water to produce bases and salts.

11. The characteristic property of an acid is due to the presence of _____.
    a. hydride ions
    b. hydroxyl ions
    c. hydronium ions
    d. oxide ions

12. A strong acid in solution is _____.
    a. mostly molecules
    b. mostly ions
    c. both molecules and ions
    d. mostly water

13. A weak acid in solution is _____.

    a. mostly molecules
    b. mostly ions
    c. both molecules and ions
    d. less water

14. The pH of a carbonated drink is _____.

    a. less than 7
    b. more than 7
    c. equal to 7
    d. approximately 7.8

15. An acid is _____.

    a. a proton donor
    b. a proton acceptor
    c. electron donor
    d. electron acceptor
    49.

16. The drying of milk of lime (white washing) is due to the action of _____.

    a. oxygen in air
    b. nitrogen in air
    c. CO_2 in air
    d. hydrogen in air

17. A salt derived from a strong base and a weak acid will give a salt that is _____.
    a. acidic
    b. basic
    c. neutral
    d. volatile

18. When litmus is added to a solution of borax it turns_____.
    a. red
    b. pink
    c. remains colorless
    d. blue

19. What happens when acids and bases are combined?
    a. No reactions will occur.
    b. There will be neutralization.
    c. Stronger base will be produced
    d. Stronger base will be produced.

20. Which of these choices is considered a Bronsted-Lowry base?
    a. Proton Donor
    b. Proton Acceptor
    c. Electron Acceptor
    d. None of the Above

EXPLORE

This phase assesses your basic foundation on Acid and Bases. Activities below will help you gain a better understanding on the basic characteristics of acids and bases.

As you proceed to the rest of the activities, think about the possible answer to the question,

How are acids and bases beneficial to human beings?

Let us begin by finding out what you think are the characteristics of acids and bases.

Activity 1

1	Baking soda is	☐ acid ☐ base	because	
2	Vinegar is	☐ acid ☐ base	because	
3	Soap is	☐ acid ☐ base	because	
4	Toothpaste is	☐ acid ☐ base	because	
5	Orange juice is	☐ acid ☐ base	because	

CHECK

1	Baking soda is	☐ acid ☒ base	because	**Note: Answer may be:** feel slippery, change litmus blue, and become less basic when mixed with acids
2	Vinegar is	☒ acid ☐ base	because	**Note: Answer may be:** taste sour, are corrosive to metals, change litmus red, and become less acidic when mixed with bases

			base		
3	Soap is		acid	because	**Note: Answer may be:** feel slippery, change litmus blue, and become less basic when mixed with acids
		x	base		
4	Toothpaste is		acid	because	**Note: Answer may be:** feel slippery, change litmus blue, and become less basic when mixed with acids
		x	base		
5	Orange juice is	x	acid	because	**Note: Answer may be:** taste sour, are corrosive to metals, change litmus red, and become less acidic when mixed with bases
			base		

Based on your answers from the activity, can you now differentiate acid from base? Fill in the boxes below and write your general observations about acid and base.

ACID	BASE

You have just been introduced to different samples of acids and bases around you along with their differences. Activity number 2 will let you know more about the other characteristics of acids and bases which include their individual strength. You will learn more about them next activity.

Activity 2

Directions:
Rank the following materials based on the strength of acid and base. Number 1 is the highest and 5 is the lowest.

Note: As you proceed to the rest of the activities, think about the following question: **How are acids and bases beneficial to human beings?**

Acid	Rank	Base	Rank
banana		shampoo	
vinegar		toothpaste	
calamansi		bath soap	
apple		laundry soap	
mayonnaise		chlorine	

Questions:

1. How did you rank the materials under acid?
2. How about materials under base?
3. Why did you rank them that way?

Different samples of acids and bases may have different taste, odor or even feel. This what makes the substances around you unique.

You have now learned the basic characteristics of acids and bases. But there might be some other things that you would want to know about them. Write your other thought and insights about acid and base in the table provided below.

Activity 3

Directions: Answer the first three columns of the KWHL chart.

Topic: Acids and Bases			
K	**W**	**H**	**L**
What do you know?	What do you want to find out?	How can you find out what you want to learn?	What did you learn?

You have just explored your prior knowledge on acids and bases. The things that you know or want to know about acids and bases can be strengthen through the varied activities found in the next phase. The activities will guide and direct you as you seek answer to your inquiries about the topics. Keep in mind the question: **How are acids and bases beneficial to human beings?**

The next part of this module will help you gain a better understanding on the lesson as you do varied activities that will be introduced.

FIRM-UP

This phase will help you increase your understanding about Acid and Bases.

As you proceed to the rest of the activities, think about the following question: How are acids and bases beneficial to human beings?

Before we proceed to the basic discussion on acid and base, check out the video in these links.

Acid and base: Introduction
http://www.youtube.com/watch?v=RF40cI2O16U
http://www.youtube.com/watch?v=DQk7f6DksN8&feature=related

Red Cabbage pH Indicator:

http://www.youtube.com/watch?v=6fc8KBz_l9s&feature=related

Acids and Bases

Acids and bases are two classes of chemical compounds that display generally opposite characteristics. Samples of acids are all around us. Listed below are the common household acids and bases.

Table 1: Characteristics of acids and bases

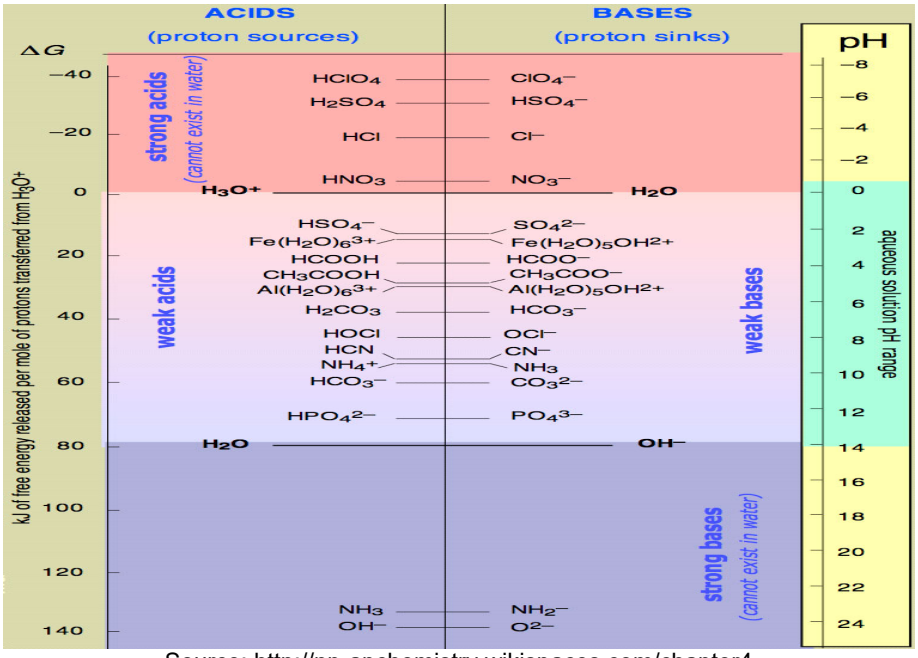
Acids		
Acetic acid	$HC_2H_3O_2$	Vinegar (aqueous solution)
Acetylsalicylic acid	$HC_9H_7O_4$	Aspirin
Ascorbic acid	$H_2C_6H_6O_6$	Vitamin C
Citric acid	$H_3C_6H_5O_7$	Lemon juice, citrus fruits
Hydrochloric acid	HCl	Gastric juices (digestive fluid in stomach)
Sulfuric acid	H_2SO_4	Batteries
Bases		
Ammonia	NH_3	Household cleaners (aqueous solution)
Calcium hydroxide	$Ca(OH)_2$	Slaked lime (used in mortar for construction)
Magnesium hydroxide	$Mg(OH)_2$	Milk of magnesia (antacid and laxative)
Potassium hydroxide (also called caustic potash)	KOH	Soft soap
Sodium hydroxide	NaOH	Drain and oven cleaners

Acids and bases can be distinguished from one another by being familiar with their properties.

Table 2 Properties of Acids and Bases

Acids	Bases
turn litmus red	*turn litmus blue*
often react with some metals to produce hydrogen gas	*feel slippery*
often sour	*taste bitter*

The diagram below shows the relative strengths of common acids and bases



Source: http://np-apchemistry.wikispaces.com/chapter4

The activity below will help you increase your awareness on acids and bases around you.

Activity 1: Acids and Bases Around You

Directions: Look around you and identify the materials that are acidic and basic. List them down in the table below.

Examples of acids and bases	
Acids	Bases

You have just identified some acidic and basic compounds. You can now test whether the examples that you have written in activity 1 are real acids or bases. This will be done by testing their pH. Potential of hydrogen (pH) measures the acidity or alkalinity the material.

The next activity will let you do pH testing to find out whether your samples are real acid or base.

Activity 2: pH Testing

Directions I:
Prepare little diluted samples of the materials that you identified in activity 1. Get several strips of litmus paper both pink and blue. Quickly dip each color of litmus to every sample and see the changes in color. Illustrate your set up and prepare a report sheet of your observations.

Directions II:
Prepare little diluted samples of the materials that you identified in activity 1. Predict the strength of acid and base in your sample materials and arrange them according to increasing pH value. Test the actual strength of acid and base in your samples using the pH meter. If pH meter is not available, use the pH paper. Take note of pH of each sample. Compare the results to your predicted pH values. Prepare a graphical presentation of the actual data gathered.

Activity 3: pH Testing, the Organic Way

Directions:
Get extracts from natural indicators such as eggplant skin, *mayana* leaves and violet-colored *camote* (sweet potato) leaves. Any alternatives will do. Add a few drops of your sample of acids and bases on the extracts. Observe what happens. Prepare a report sheet on this activity.

Samples	Natural Indicator	Observation

Now that you already know how to test whether a certain material is an acid or base, you may now do further investigations and explorations on acids and bases by trying it on other sample materials. Try it on the sample from Activity 1 of EXPLORE and validate whether your answers are true. You may also use other plants that you think have the potential of becoming a natural pH tester.

1	Baking soda is	☐ acid ☐ base	because	
2	Vinegar is	☐ acid ☐ base	because	
3	Soap is	☐ acid ☐ base	because	
4	Toothpaste is	☐ acid ☐ base	because	
5	Orange juice is	☐ acid ☐ base	because	

Activity 4: Concentrations and the pH Value

Directions:
Prepare different concentrations of acidic and basic solutions. Measure the pH value of each. Organize the data gathered and explain how the different concentrations of solutions affect the pH value.

Samples of acids and bases	pH Value

Questions:

1. How do different concentrations of solutions affect the pH value?
2. What is the advantage of getting the pH value of a certain substance?
3. How then are certain characteristics of acids and bases of benefit to human beings?

You have just learned varied ways from which you could test the acidy or basicity of a certain substance.

The next activity will let you discover the implications of acids and bases in the surroundings.

Activity 5: The Action of Acids and Bases

Directions:
Prepare samples of acids and bases. Gather materials that you can put into the acid or base. These materials may include a piece of wood, steel wool, stone, and leaf. Illustrate the set ups and prepare a report of your observation.

Material	Acid used	Base used	Observation

Note: *Consult the teacher first if you want to test other materials for they may be reactive in either acid or base. Make sure that you follow the proper ways of handling chemicals as you do this activity.*

You have just learned the actions or acids and bases on materials. The next activity will let you increase you awareness on the possible impact of acids and bases on human beings.

Activity 6: The Action of Acids and Bases

Directions: Identify some characteristics of acids and bases that make them beneficial and harmful to human beings. You may use reference materials such as books and on line materials to learn more about the effects of various acids and bases particularly on health and wellness of human beings. Tabulate your results and prepare a generalization.

Acid / Base	Benefit to Humans	Harmful effects on Humans	Reference

Generalization:

How are certain characteristics of acids and bases of benefit to human beings?

_____
_____
_____
_____

Now that you learned both good and bad effects of acids and bases, you will then answer the question:

What would happen if acid and base are combined?

Find the answer in the next activity.

Activity 7: Combining Acid and Base

Directions:
A. With the assistance of your teacher, prepare samples of sulfuric acid (H_2SO_4) and sodium hydroxide (NaOH). Be careful in handling these chemicals for they can irritate or burn your skin when exposed. Combine the two chemical compounds and observe what happens. Write your observations.

My Observations
_____
_____
_____
_____
_____
_____
_____
_____
_____

B. With the help of your teacher, interpret the chemical reaction below based on your observations in the activity.

$H_2SO_4 + 2NaOH \rightleftarrows 2H_2O + Na_2SO_4$

Interpretation
_____
_____
_____
_____

Questions:

1. Explain the relation of the neutralization process to stomach ulcer.
2. Is it advisable to drink softdrinks in the morning? Why?
3. Cite a practical example from which you could apply the concept of neutralization.
4. How do human beings benefit from the neutralization process?

You have just learned the major characteristics of Acids and Bases. Knowing their unique characteristics can help you gain a better understanding on how can they be able to benefit human beings.

This is the end of the firm up phase. The next phase of this module will guide you as you gain a deeper understanding of acid and base.

DEEPEN

This phase will let you have a much deeper understanding about Acid and Bases.

As you proceed to the rest of the activities, think about the following question:

How are acids and bases beneficial to human beings?

Answer this question as soon as you are done with the activities below.

Directions: Answer number one and choose a task from numbers 2-4.

1. Go back to the explore phase and answer the 4th column of the KWHL chart.

Topic: Acids and Bases			
K	**W**	**H**	**L**
What do you know?	What do you want to find out?	How can you find out what you want to learn?	What did you learn?

ENRICHMENT ACTIVITIES

2. Get a news clipping about the accident caused by a highly concentrated substance. Note: You may go online and search for a news article. Place the article in the WORD File. Express your feelings about the news as it relates to acid and base.
3. Discuss with your parents and other members of your household the proper ways of handling acids and bases in your home. You may take photos of the household example of acid and base and give comments on their basis characteristics including proper ways of handling them.
4. Design an experiment that will let you test, analyze and interpret the strength of acid and base of the substance. Note: Use materials that are safe enough to be used even without adult's supervision. Upload your output in the separate Word File.

How are acids and bases beneficial to human beings?

_____

_____

_____

_____

_____

_____

_____

_____

TRANSFER

This phase will have you apply your understanding of acids and bases in creating new knowledge in science that benefits human beings.

The activity below will let you apply your understanding on

How certain characteristics of acids and bases beneficial to human beings?'.

SITUATION

TASK

You are an expert in soil chemistry. You have noticed that the plants in your backyard are withering. Similarly, your neighbors are having the same problem with their plants. Your initial impression about the cause of the problem is the quality of soil perhaps the soil is too acidic or too basic. Design an experiment that will let you test your initial impression about the soil. You will present the experimental design to your neighborhood association and discuss some possibilities from which you could help the neighborhood solve this problem as you apply your understanding on acids and bases.

- Your experiment design needs to demonstrate your understanding of acids and bases
- Your work will be judged by your neighbors (classmates).
- Your product meets the following standards:
  50.

  - Organization
  - Content knowledge
  - Visuals
  - Mechanics
  - Delivery(result)
- Write in your journal your feelings about your output and the question, ***How are certain characteristics of acids and bases beneficial to human beings?***

51. RUBRIC: PRESENTATION

	Criteria				Points
	Beginning (1)	Developing (2)	Satisfactory (3)	Excellent (4)	
Organization	Audience cannot understand presentation because there is no sequence of information.	Audience has difficulty following presentation because student jumps around.	Student presents information in logical sequence which audience can follow.	Student presents information in logical, interesting sequence which audience can follow.	____
Content Knowledge	Student does not have grasp of information; student cannot answer questions about subject.	Student is uncomfortable with information and is able to answer only rudimentary questions.	Student is at ease with content, and is able to discuss important aspects of the concept.	Student demonstrates full knowledge (more than required) with explanations and detailed elaboration.	____
Visuals	Student used no visuals.	Student occasionally used visuals that rarely support text and presentation.	Visuals related to text and presentation.	Student used interesting and elaborate visuals to reinforce screen text and presentation.	____

Mechanics	Student's presentation had four or more spelling errors and/or grammatical errors.	Presentation had three misspellings and/or grammatical errors.	Presentation has no misspellings and/or grammatical errors.	Presentation has no misspellings or grammatical errors. Language used was vivid and interesting.	____
Delivery	Student mumbles, incorrectly pronounces terms, and speaks too quietly for students in the back of class to hear.	Student incorrectly pronounces terms. Audience members have difficulty hearing presentation.	Student's voice is clear. Student pronounces most words correctly.	Student used a clear voice and correct, precise pronunciation of terms. Student showed strong presence.	____
				Total---->	____

POST-TEST:

1. What happens to acetic acid solution if a pinch of sodium bicarbonate is mixed with it?
    a. The pH will remain the same.
    b. The pH will decrease.
    c. The pH will increase.
    d. The pH will become basic.

2. You consulted a doctor about your abdominal pain. The doctor said you are experiencing hyperacidity due to stress and you were advised to take antacids whenever there is pain. What do you think is the action of antacid?
    a. Antacid calms down the stomach.
    b. Antacid prevents ulcer.
    c. Antacid neutralizes the acid in the stomach.
    d. Antacid decreases the pH of stomach.

3. Your science teacher asked you to investigate a problem in your locality. You have noticed that many plants are starting to die. Your initial impression made you think that rainwater caused the plants to wither therefore you decided to test it. Based on our study, sulfur-containing gases are emitted by factories have caused rain to become acidic therefore damaging the plants. Which of the following is going to be your first step in helping solve this problem?
    a. Organize an anti-pollution rally your locality
    b. Present the data gathered to the city health office and encourage them to cancel the permit to operate of the factories
    c. Present the data gathered to your teacher and ask for ideas on how to start solving this problem
    d. Report the factories to the police

4. What happens to the pink litmus paper when put in an acidic solution?
    a. Remains the same
    b. Turns colorless
    c. Turns violet
    d. Turns blue
5. Which of the following compounds is a good ingredient for anti itch cream?
    a. Magnesium chloride
    b. Magnesium sulfate
    c. Sodium acetate
    d. Sodium bicarbonate

6. What will happen to acetic acid solution' pH if a pinch of sodium bicarbonate is added on to it?
    a. The pH will remain the same.

b. The pH will increase.
c. The pH will decrease.
d. The pH will become basic.

7. How do antacids help people suffering from hyper acidity?
   a. Antacid neutralizes the acid in the stomach.
   b. Antacid calms down the stomach.
   c. Antacid prevents ulcer.
   d. Antacid decreases the pH of stomach.

8. As an environmental scientist, you are asked to investigate the reason why plants fishes in the river nest to the rubber factory are dying. Based on our study, there is presence of chemical compounds that makes the river very acidic. These chemical compounds are being released by the factory to the river. Which of the following is the best thing to do after the results have been reported to your boss?
   a. Report the factories to the police
   b. Organize an anti pollution rally in the *barangay*
   c. Present the data gathered to the city health office and discuss the effects of the factory to the fish.
   d. Present the data gathered to the city health office and encourage them to cancel the permit to operate of the factory.

9. What happens to the red litmus paper when put in the basic solution?
   a. Remains the same
   b. Turns colorless
   c. Turns to blue
   d. Turns to violet

10. Sandra is stung by a bee. Which of the following compounds can she apply on the insect bite to prevent itch?
    a. Magnesium chloride
    b. Magnesium sulfate
    c. Sodium acetate
    d. Sodium bicarbonate

11. Which of the following is an example of a strong acid?
    a. carbonic acid
    b. citric acid
    c. concentrated acetic acid
    d. dilute nitric acid

12. A given substance is an acid if it
    a. changes litmus paper to red.

b. has a ph above 7.
c. has a soapy feeling.
d. reacts with all metals.

13. Which is more basic?
a. pH=12
b. pH=11
c. pH=2
d. pH=7

14. Which of the following statements is true concerning acids and bases?
a. acids and bases don't react with each other
b. acids mixed with bases make stronger acids
c. acids mixed with bases make stronger bases
d. acids mixed with bases neutralize each other

15. Acids react with
a. bases to produce salts and water.
b. neither bases, salts, nor water.
c. salts to produce bases and water.
d. water to produce bases and salts.

16. Which of the following is present among acids?
a. hydride ions
b. hydroxyl ions
c. hydronium ions
d. oxide ions

17. What may be the pH of a carbonated drink?
a. less than 7
b. more than 7
c. equal to 7
d. approximately 7.8

18. An acid is _____.
a. a proton donor
b. a proton acceptor
c. electron donor
d. electron acceptor

19. When red litmus is added to a solution of laundry soap it turns_____.
a. blue
b. pink
c. red
d. remains colorless

20. Acids have a pH of _____ 7.
    a. Equals to
    b. Greater than
    c. More or less than
    d. Less than

Glossary of terms

Acid
a sour-tasting compound that releases hydrogen ions to form a solution with a pH of less than 7, reacts with a base to form a salt, and turns blue litmus red.

Alkali
One of a class of caustic bases, such as soda, potash, ammonia, and Lithia, whose distinguishing peculiarities are solubility in alcohol and water, uniting with oils and fats to form soap, neutralizing and forming salts with acids, turning to brown several vegetable yellows, and changing reddened litmus to blue.

Antacid
A drug that reduces or neutralizes stomach acid.

Base
a compound that releases hydroxyl ions to form a solution with a pH greater than 7, reacts with acids to form salts, and turns red litmus paper blue

Litmus
a powdery substance obtained from lichens, which turns red in acids and blue in bases.

Neutralization
make something neither acid nor alkaline: to render a substance neither acid nor alkaline

Websites

Interactive activity
http://pbskids.org/zoom/games/kitchenchemistry/virtual-start.html
http://sv.berkeley.edu/showcase/flash/juicebar.html

Interactive Quiz
http://www.funtrivia.com/playquiz/quiz2568731d68e40.html
http://www.chem4kids.com/extras/quiz_reactacidbase/index.html

Neutralization of Acid and Base
http://www.youtube.com/watch?v=Jq4o3wr4jcU&feature=related

Acid and base: Introduction
http://www.youtube.com/watch?v=RF40cI2O16U
http://www.youtube.com/watch?v=DQk7f6DksN8&feature=related

Red Cabbage pH Indicator:
http://www.youtube.com/watch?v=6fc8KBz_I9s&feature=related

The pH Scale
http://www.youtube.com/watch?NR=1&feature=fvwrel&v=M8tTELZD5Ek

pH Testing Your Body
http://www.youtube.com/watch?v=HGxO7HFZKkM&feature=related