

Earth Science for Stem

Quarter 1 – Module 13: Different Types of Waste



Earth Science for STEM
Alternative Delivery Mode
Quarter 1 – Module 13: Different Types of Waste
First Edition, 2021

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Earth Science for STEM

Quarter 3 – Module 13:

Different Types of Waste

Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

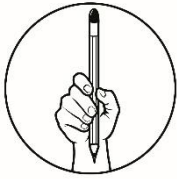


What I Need to Know

This module was designed and written with you in mind. It is here to help you master the nature of Biology. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

After going through this module, you are expected to:

1. define waste,
2. classify kinds of waste,
3. describe how people generate different types of waste, as they make use of various materials and resources in everyday life and
4. cite several measures of waste management.



What I Know

Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. Which of these terms refer to the unwanted substances needed to disposed?
 - A. compost
 - B. plastic
 - C. solid waste
 - D. waste
2. Approximately, how many years does it take for a plastic bottle to break down?
 - A. 150
 - B. 450
 - C. 700
 - D. 1000
3. Containers, jars and bottles are examples of what type of waste?
 - A. hazardous waste
 - B. liquid waste
 - C. organic waste
 - D. solid waste
4. Which of the following is an example of hazardous waste?
 - A. bottle
 - B. batteries
 - C. meat
 - D. paper
5. Farmers regularly used pesticides in their farms; they considered pesticides as what type of waste?
 - A. agricultural waste
 - B. fishery waste
 - C. industrial waste
 - D. municipal waste
6. Jose is an advocate of proper waste disposal and encourages other students to practice recycling. Will you help Jose identify which of the following items can be recycled?
 - A. aluminum cans
 - B. card boards
 - C. paper cups
 - D. All of the above

7. People in the community strictly followed the local government ordinances when it comes to waste management. Which color of garbage bag do they use for non-recyclable waste?
- A. black
 - B. blue
 - C. green
 - D. yellow
8. In the XYZ power plant, dissolution of radioactive nuclides is processed and filtered to the atmosphere. What type of waste is being generated by the power plant?
- A. biomedical waste
 - B. gaseous waste
 - C. liquid waste
 - D. solid waste
9. Substances that are unsafe to use commercially are considered hazardous. Which of the following is NOT a property of hazardous waste?
- A. corrosive
 - B. malleable
 - C. reactive
 - D. toxic
10. When classifying waste at home, Jana knows that _____ is a solid waste and _____ is a liquid waste.
- A. bottle, detergent
 - B. can, plastic bag
 - C. bottle, tin can
 - D. egg shell, steel
11. What type of waste is commonly found in coastal and estuarine areas?
- A. E-waste
 - B. fishery waste
 - C. municipal waste
 - D. radioactive waste
12. What is E-waste?
- A. eco-friendly waste
 - B. hazardous chemical waste
 - C. obsolete electronically waste
 - D. waste from nuclear power plant

13. In times of Covid-19 pandemic, many people used facemasks to protect themselves. As a responsible citizen, disposable facemasks should be put in a _____ container.
- A. hazardous waste
 - B. liquid waste
 - C. organic waste
 - D. solid waste
14. Dealing with waste management is a very important task because of the _____.
- A. infrastructure consideration
 - B. large volume of waste produced in the community
 - C. environmental pollution
 - D. all of the above
15. Which is the appropriate definition of hazardous waste?
- A. Only liquid wastes that is considered toxic and chemically reactive
 - B. Only solid waste that is considered toxic and chemically reactive
 - C. Any solid, liquid or gaseous waste that is considered toxic and chemically reactive
 - D. Only gaseous waste that is considered toxic and chemically reactive

Lesson 13

How People Generate Different Types of Waste

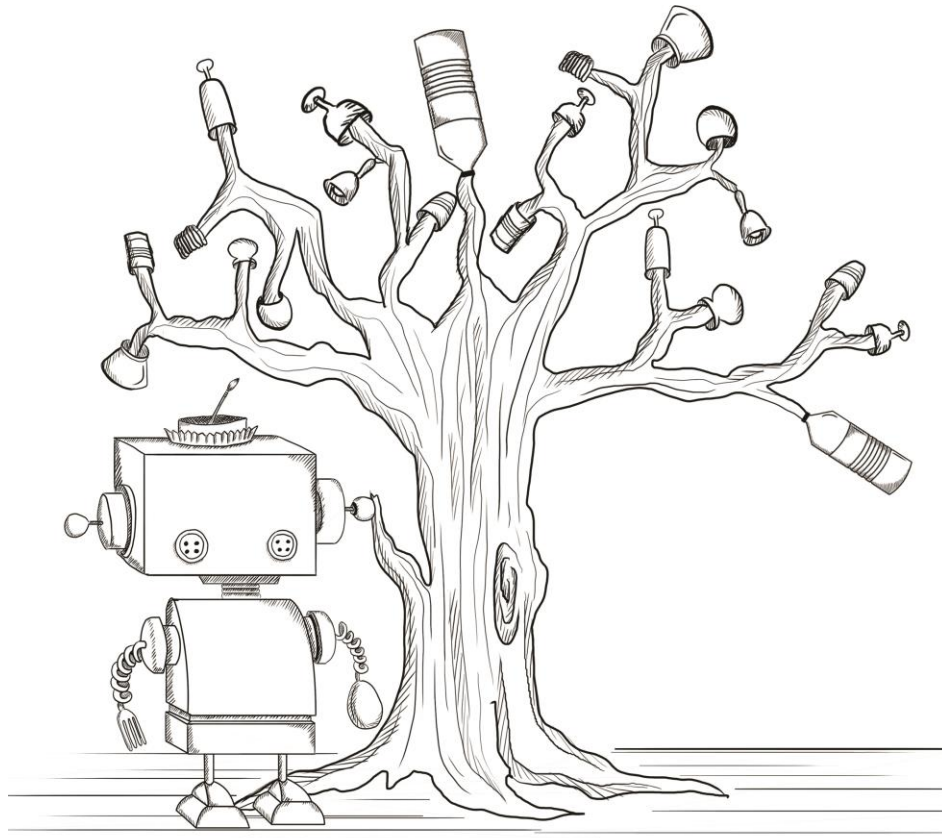


Figure 1

Waste is an issue in different parts of the world since waste quantities are generally growing. Waste is generated by human activities in all economic sectors and is definitely regarded as an unavoidable by-product of economic activities. The generation of waste reflects loss of materials and energy and imposes economic costs on society for its collection, treatment and disposal.

In the Philippines, solid waste management remains a major challenge especially in urban areas like Metro Manila. Improper waste disposal, inefficient, waste collection, and lack of disposal facilities are among the dominant concerns in the country. Unless these are addressed, the waste generated from various sources will continually lead to health hazards, and serious environmental impacts such as ground and surface water contamination, flooding, air pollution and spread of diseases.



What's In

Read the paragraph and answer the given questions below. Write your answer on a separate sheet.

People depend on many things to satisfy their needs. They often buy packed foods, bottled drinks, canned foods, medicines, plastics, batteries, petroleum, gadgets, furniture, equipment, vehicles, and many more. These things will expire and turn out to waste in due time. These wastes can be as small as an atom and as large as a truck. Such objects are no longer useful, unwanted, defective, old, worthless, and toxic. How are these wastes classified? As an individual and responsible citizen, how are you going to get rid of these wastes?

Types of Waste

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Waste management

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____



Notes to the Teacher

It is important to use variety of approaches and activities that will keep the learners interested. It is also vital to track the progress of the learners and ask yourself whether you are meeting their needs.



What's New

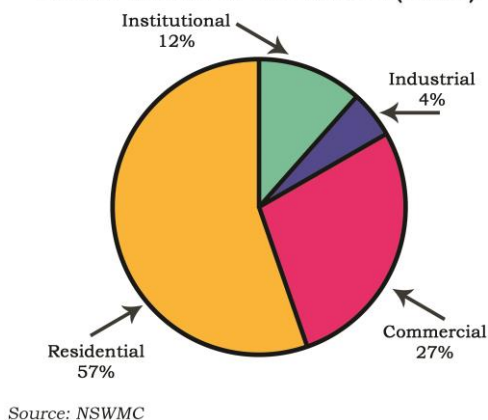
Based on the activity on page 5, different types of waste and several ways on waste management were highlighted. Define the following terms in your own words and write the answer in your notebook.

1. composting - _____
2. Landfill - _____
3. 3 Rs - _____
4. Biodegradable waste - _____
5. non-biodegradable waste - _____

Waste generations by residents in the Philippines, especially in the urban areas have accelerated recently due to fast pace industrialization, urbanization and population growth. Since incineration of solid waste is not allowed under Republic Act 9003 or also known as the “Ecological Solid Waste Management Act of 2000,” enacted on January 26, 2001; for the safety of human health and protection of environment, land filling and the 3 Rs integrated waste management method (Reduce, Reuse and Recycle) are the main types of solid waste management in the country. The law also requires mandatory segregation of solid waste into containers labelled as: *compostable, recyclable, non-recyclable, and special use*.

The National Solid Waste Management Commission (NSWMC) calculated that from 37, 427.46 tons per day in 2012, the country’s waste generation steadily increased to 40,087.45 tons in 2016. On the average, each person in the country produces about 0.5 kilogram and 0.3 kilogram everyday in the urban and rural areas respectively. For Metro Manila, it is estimated that 8,636 tons of garbage is generated per day. Approximately, 0.7 kilogram of waste per person per day is added to the country’s waste due to its more modernized lifestyle. The household is the major source of waste in the Philippines at 74 percent.

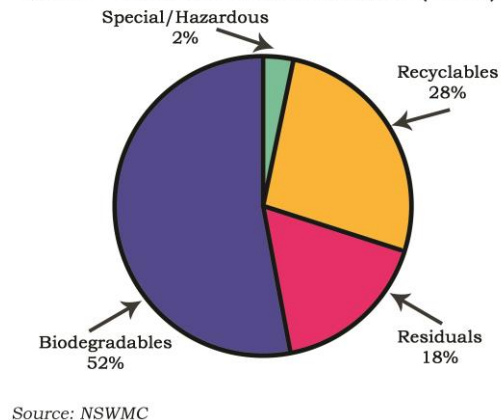
SOLID WASTES SOURCES (2013)



Source: NSWMC

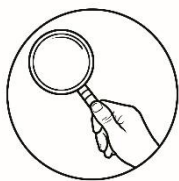
Figure 2

SOLID WASTES COMPOSITION (2015)



Source: NSWMC

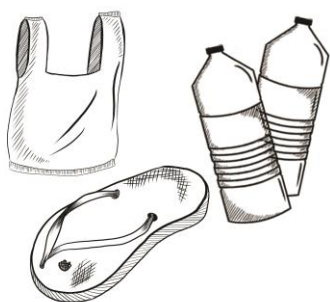
Figure 3



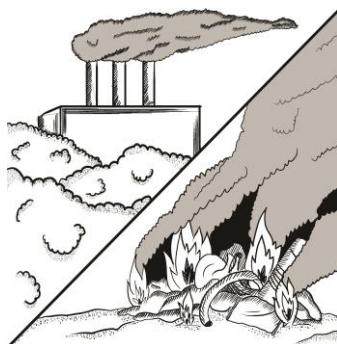
What is It

Waste Defined

The United Nations Environment described wastes as unwanted or unusable materials which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law.



Solid Waste



Gaseous Waste



Liquid Waste

Kinds of Waste

There are different kinds of wastes generated by the people around the world.


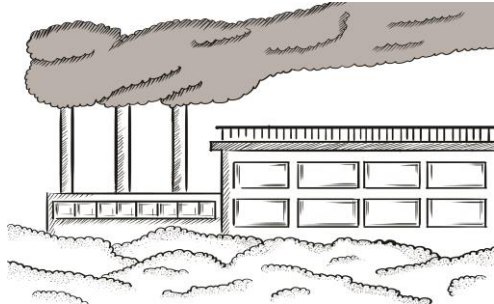
- A. **Solid Waste.** This type of wastes is in solid form like domestic, commercial and industrial wastes such as plastics, styrofoam, papers, scrap iron, and sludge from a wastewater treatment plant or air control facility.
- B. **Liquid Waste.** This type of wastes is in liquid form such as chemicals, oils, and waste water from ponds and manufacturing industries. It includes sewage as well as wastewater from industrial processes and agricultural processing.
- C. **Gaseous Waste.** This type of waste is in gaseous form which usually originates from chopping and dissolution operations. As an example, volatile radionuclides are discharged to the stack after scrubbing with sodium hydroxide and filtration through charcoal filter devices. Electrostatic precipitation, wet scrubbers and gaseous waste treatment are some ways of minimizing gaseous waste.

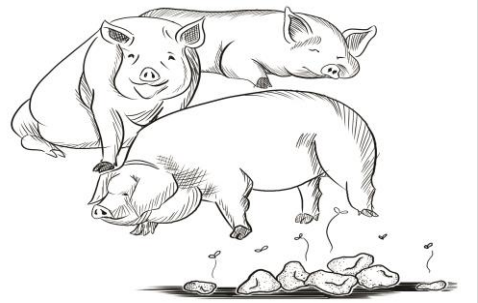

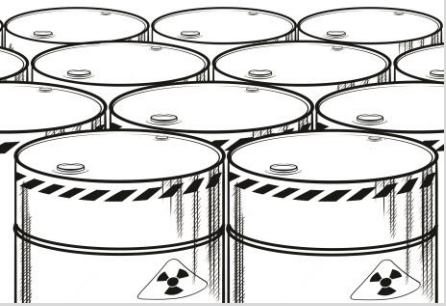
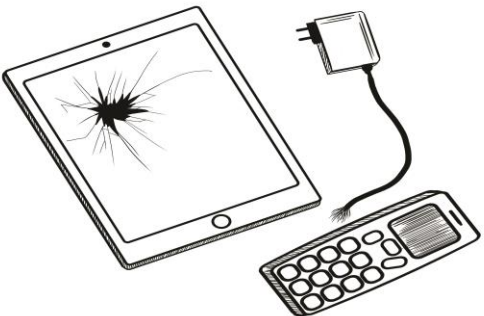

Table 1. Classifications of Waste

Biodegradable	Non-biodegradable	Hazardous	Non-hazardous
These wastes can be degraded: Examples: paper woods fruits	These wastes cannot be degraded: Examples: bottles plastics machines cans	Substances unsafe to use commercially, agriculturally or economically and have the following properties: ignitability, corrosivity, reactivity, and toxicity	Substances safe to use commercially, industrially, agriculturally, and economically. These substances usually create disposal problems.

The main objective of waste management is to reduce the quantity and type of hazardous substances used to avoid adverse impact on human health and environment. Transformation of waste into usable secondary products can be done through recycling, reusing, repurposing, reducing, and recovering. Thus, the waste generated from different industries and societies must be classified in order to apply the correct form of management.

Table 2. Wastes According to Generation (Origin)

<p>Municipal Solid Wastes</p> <p>Solid wastes that include household garbage, rubbish, construction and demolition debris, sanitation residues, packaging materials, trade refuges, and others managed by any municipality.</p>	 <p>A black and white line drawing showing a street scene with a brick wall on the right. In the foreground, there is a large pile of trash, including plastic bags, cardboard boxes, and other debris. A trash can is visible near the wall.</p>
<p>Industrial Wastes</p> <p>Liquid and solid wastes that are generated by manufacturing and processing units of various industries like chemical, petroleum, coal, metal, gas, sanitary, and papers.</p>	 <p>A black and white line drawing of an industrial facility. It features several tall smokestacks emitting thick plumes of smoke or steam that rise into the air. The facility itself has multiple rectangular buildings or storage tanks.</p>

<p>Agricultural Wastes</p> <p>Wastes generated from farming activities. These substances are mostly biodegradable.</p>	
<p>Fishery Wastes</p> <p>Waste generated due to fishery activities like fish viscera, fish bones, and scales. These are extensively found in coastal and estuarine areas.</p>	
<p>Radioactive Wastes</p> <p>Wastes containing radioactive materials. These are commonly by-products of nuclear processes. Sometimes industries that are not directly involved in nuclear activities may also produce some radioactive waste such as radio-isotopes and chemical sludge.</p>	
<p>E – Wastes</p> <p>Electronic wastes generated from any modern establishments. They may be described as discarded electrical or electronic devices. Some electronic scrap components such as CRTs may contain contaminants such as lead, cadmium, and beryllium or brominated flame retardants.</p>	
<p>Biomedical Wastes</p> <p>Solid or liquid wastes including containers, intermediate or end products generated during diagnosis, treatment, and research activities of medical sciences.</p>	

Several wastes disposal practices in the country include concentrate and contain or also known as isolation specifically for solid waste. Landfills and dumps minimize the impact of waste in the environment. Landfill is a place to dispose waste material by burying or covering over with soil and becoming an extending usable land after a few years. Dump is an excavated piece of land for waste storage and regulated by the government. A dump is smaller than a landfill. Other useful options are composting, resource recovery and energy recovery.



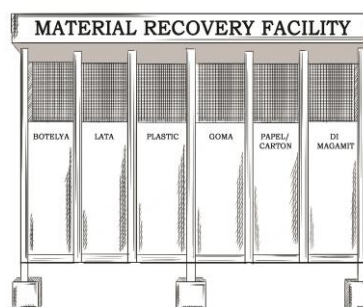
A. Landfill



B. Dump



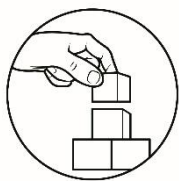
C. Compost Pit



D. Material Recovery Facility (MRF)

The 3 Rs of Waste Management

Reduce	Reuse	Recycle
<p>The best way to manage waste is not to produce it:</p> <ul style="list-style-type: none"> - Avoid disposable goods <i>e.g. Paper plates, napkins, razors and lighters</i> - Avoid over-packaged goods <i>e.g. foil, paper, and plastics</i> 	<p>It makes economic and environmental sense to reuse products:</p> <ul style="list-style-type: none"> - Reuse products for the same purpose 	<p>A series of steps that takes a used material and processes --- remanufactures and sells it as a new product.</p>



What's More

Activity 1

Copy and complete the table by classifying the types of waste produced in the community. Refer to the word pool. Suggest measures of waste management under each column. Write your answers on a separate sheet.

detergent paint can grease trap diaper methane
 piped water sewage chlorofluorocarbon (CFC)
 scrap metal waste water

Solid waste	Liquid waste	Gaseous waste
Ways of Waste Management		

Activity 2

A. Match the example of wastes in column A to its classification in column B and proper waste disposal practices on column C. Write your answer on a separate sheet of paper.

Column A	Column B	Column C
1. wash water from the factory	A. agricultural waste	A. 3R's
2. old newspaper	B. biomedical waste	B. resource recovery
3. animal manure	C. e-waste	C. donate
4. syringe	D. fishery waste	D. energy recovery
5. obsolete laptop	E. industrial waste	E. composting
	F. municipal solid waste	F. dump

B. Fill in the blanks with the correct term to complete each statement. Write the answer on a separate sheet of paper.

1. There are three kinds of waste generated by people all over the world namely, _____, _____, and _____.
2. Waste can be classified as _____, _____, _____, and _____.
3. Solid wastes managed by the local government can be classified as _____.
4. Wastes that serve as end-products of farming can be classified as _____.
5. Solid or liquid wastes generated from hospitals and other medical facilities can be considered _____.

Activity 3

Title: Recycle, Reuse, Recover All You Can at Home

Collect materials which are no longer useful, unwanted, old, and worthless at home. Convert these waste materials to a more useful one. Make a 3 minute *Do It Yourself* -Video showing how these worthless objects turn useful again.

My “Do It Yourself” way is about.....

Rubric:

Category	Beginning (2 pts)	Developing (3 points)	Accomplished (4 points)	Exemplary (5 points)
Overall DIY video (3 min)	The project reflects beginning understanding on the practice of waste management at home	The project reflects developing understanding on the practice of waste management at home	The project reflects accomplished understanding on the practice of waste management at home	The project reflects excellent understanding on the practice of waste management at home
Reflection	The student reflection shows cases of a low level of insight into how learning occurred and how it transformed learned concepts.	The student reflection shows cases of a moderate level of insight into how learning occurred and how it transformed the learned concepts.	The student reflection shows cases of a high level of insight into how learning occurred and how it transformed the learned concepts.	The student reflection shows cases of an excellent level of insight into how learning occurred and how it transformed the learned concepts.

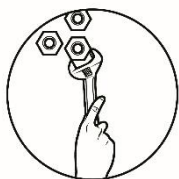


What I Have Learned

A. Copy and complete each scenario with the appropriate text given in the box below.

Material Recovery Facility	hazardous	compost pit
agricultural	solid	fishery

1. Romeo is a Grade 11 senior high school student at ABC Integrated School. He participates in the Waste Management Program every first Friday of the month. He knows that old batteries, cellular phones, and printer cartridges contain toxic substances that may damage the ocean and landfills. Based on Romeo's knowledge, the mentioned solid wastes are also _____ wastes.
 2. Romeo is also an incredible mentor to his community. He takes pride in teaching others to classify waste according to origin so they can properly dispose of it. He presented graphs and data of the animal waste produced in the region specifically in their locality. He emphasized that animal manure is an example of _____ waste.
 3. As an environment advocate, Romeo also initiated the coastal clean-up drive in a public beach resort. A lot of _____ waste near the shore is filled up. The household garbage commonly found were used diapers, tin cans, plastics, and bottles.
 4. When Romeo is at home, he regularly segregates waste according to its kind. He puts the recyclable materials in the Barangay's _____. On the other hand, he makes sure that all organic matter will be used as soil conditioner and placed in a _____ at the backyard.
- B. Cite some practical ways to help manage the wastes at home and as a responsible individual how can you make a difference? Answer the question in a maximum of five sentences in a separate sheet of paper.



What I Can Do

Activity 1 “The Pen is Mightier than the Sword.”

Directions: As a learner, you are challenged to advocate Zero Waste Management in your locality. You are tasked to search for a short article or produce a photo story on waste management and paste the article or a photo story on a short bond paper. Post this output outside your house, barangay hall or in any place that passers can recognize it. Take a photo while posting your output and send it to your online Portfolio/GC.

Rubric:

Category	5 points	4 points	3points
Content knowledge	Contain exceptional ideas	Contain very satisfactory ideas	Contain satisfactory ideas
Image and communication	Highly engaging for the audience	Appropriate for the audience	Inappropriate to the audience
Information	Complete	Partly complete	incomplete



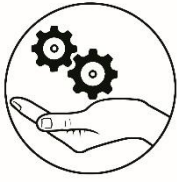
Assessment

Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. What methods of waste disposal are approved by the Philippine Republic Act 9003?
 - A. attenuation and composting
 - B. incineration and pyrolysis
 - C. landfills and 3 Rs
 - D. incineration and burning
2. Paints, solvents, and cleaning agents are examples of _____.
 - A. hazard waste
 - B. liquid waste
 - C. organic waste
 - D. solid waste
3. Which of the following is an improper way of disposing waste materials?
 - A. recycling and reusing waste materials
 - B. using waste food to make compost
 - C. burying waste materials in landfills
 - D. burning rubbish in the open
4. Which type of waste includes viscera, scales, and fish bones?
 - A. agricultural
 - B. biomedical
 - C. fishery waste
 - D. municipal solid waste
5. Which of these places contribute a lot to the country's waste?
 - A. Region I
 - B. Region III
 - C. Region IV
 - D. National Capital Region
6. Maria religiously practices segregation of waste at home. Which of these is CORRECTLY done by Maria?
 - A. animal manure has its own septic tank
 - B. burning of organic waste
 - C. use the seashore as dumpsite
 - D. throwing tin cans in the river

7. Mrs. De Chavez plans to renovate her ancestral house. She knows that construction and demolition debris can be collected by the local garbage collectors because _____.
- A. It is municipal solid waste.
 - B. It is an organic waste.
 - C. It can be burned.
 - D. It is non-recyclable.
8. Which of these groups of people contribute a lot in the production of waste?
- A. People in urban places
 - B. People in rural areas
 - C. People lives in the mountain
 - D. People in a faraway island
9. When waste materials are corrosive, chemically reactive, and flammable, they are considered _____.
- A. Biomedical waste
 - B. Biodegradable waste
 - C. Hazardous waste
 - D. Non-biodegradable waste
10. Which of these practices adhere to the 3Rs waste management?
- A. Using disposable paper plates
 - B. Using aluminum foil for food
 - C. Using zip lock bag for sandwiches
 - D. Using dish cloth in the kitchen
11. Wash water and rain are classified as liquid waste, while carbon dioxide and carbon monoxide are gaseous waste.
- A. The first statement is true while the second is false.
 - B. The first statement is false while the second is true.
 - C. Both statements are true.
 - D. Both statements are false.
12. Approximately, how many kilograms of waste are produced by an individual in the country per day?
- A. 1 kg
 - B. 1.5 kg
 - C. 0.5 kg
 - D. 0.7 kg
13. Which groups of wastes belong to industrial waste?
- A. coal, petroleum, metals
 - B. old CPU and flash drive
 - C. radio isotopes and chemical sludge
 - D. woods, manure, papers

14. When classifying waste at home, Jerry knows that _____ is a liquid waste and _____ is a solid waste.
- A. bottle, detergent
 - B. can, plastic bag
 - C. detergent, paper towel
 - D. egg shell, ceramic vase
15. Carlos regularly used compost in his vegetable farm; he considered compost as what type of waste?
- A. agricultural waste
 - B. non-biodegradable waste
 - C. organic waste
 - D. radioactive waste



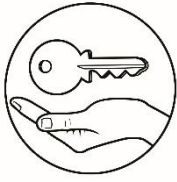
Additional Activities

“Practice Makes it Perfect”

Directions: Search for an article from newspapers or journals describing the best practices on how other countries properly dispose of their waste materials. Paste the article on a short bond paper and write a five-sentence reflection about the article.

Rubric:

Category	5 points	4 points	3points
Content	Contain exceptional practices	Contain very satisfactory practices	Contain satisfactory practices
Information	complete	partly complete	incomplete
Reflection	reflection shows a high level of insight.	reflection shows a moderate level of insight.	reflection shows cases of a low level of insight.



Answer Key

<p>What's More</p> <p>Activity 1</p> <p>Solid – paint can, diaper, scrap metal</p> <p>3R's, Compost, source of energy</p> <p>Liquid – detergent, piped water, sewage, waste water, grease trap</p> <p>Energy source, 3R's</p> <p>Gaseous – CFC & methane</p> <p>Activity 2</p> <p>E, F, A, B, C</p> <p>Filter device, Electrostatic precipitation and wet scrubbers</p> <p>Gaseous waste treatment system</p>	<p>What's In</p> <p>6 types of waste</p> <p>solid waste, liquid waste, gaseous waste, biodegradable, non-biodegradable</p> <p>6 waste management</p> <p>compost, landfill, recycle, reduce, reuse, incineration</p>	<p>What I Know</p> <ol style="list-style-type: none"> 1. D 2. D 3. D 4. B 5. A 6. D 7. B 8. B 9. B 10. A 11. B 12. C 13. A 14. D 15. C
<p>Assessment</p> <ol style="list-style-type: none"> 1. C 2. B 3. D 4. C 5. D 6. A 7. A 8. A 9. C 10. D 11. C 12. C 13. A 14. C 15. C 	<p>What I Have Learned</p> <ol style="list-style-type: none"> 1. Hazardous 2. Agricultural 3. Solid 4. MRF 5. Compost pit 	<p>What's More</p> <p>Activity 3</p> <ol style="list-style-type: none"> 1. solid, liquid and gaseous 2. biodegradable, non-biodegradable, non-hazardous, non-hazardous 3. municipal solid waste 4. agricultural waste 5. biomedical waste

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