



NATURE



HEROES



Module: Plastic, Environment & You
PRIMARY SCHOOL EDITION



Module: Plastic, Environment & You - Primary School Edition

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All information contained in this publication is correct as at September 2019.

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MODULE INTRODUCTION

The key to having a perfect life is cleanliness which includes good personal hygiene and keeping the environment clean. We have the responsibility to keep our surroundings clean and to conserve the beauty of nature.

Plastic has made our life convenient and it is used for many applications due to its unique properties such as being durable, lightweight, easy to mould and others. Instead of having to rely solely on natural resources, technological advancement and innovation have expanded plastic's application to various fields such as transportation, medical and manufacturing. However, plastic like any other materials must be managed responsibly so that it does not impact the environment negatively.

The **Plastic, Environment & You** module is designed to equip everyone with useful information on plastic and effective solid waste management practices and it highlights the importance of playing our roles in tackling issues related to the environment.

The module can be used in teaching and learning as well as during co-curricular activities. The module can also be used as a source of reference for activities related to the environment.

Each topic in this module should be used extensively as Cross-Curricular Elements. Teachers are encouraged to use the video and interactive content as teaching aids.

CHAPTER 1 | CLEANLINESS AND THE ENVIRONMENT

Key Notes

- i) Hygiene and cleanliness are fundamentals of a healthy and thriving community.
- ii) Each of us is responsible in ensuring that our surroundings are clean.
- iii) Littering can cause pollution and damage the environment.



LEARNING OUTCOMES

At the end of the lesson, pupils will be able to:

Define the importance of cleanliness

Identify the effects of littering to the environment

Understand the role of individuals in ensuring that the environment is not polluted



1.1 Cleanliness

Cleanliness is the state of keeping yourself free from dirt, trash, odour and others. Cleanliness should start with you, followed by your surroundings and the environment.

Keeping yourself clean and taking care of your personal appearance are of utmost importance as cleanliness starts with you.

Next, you must ensure that your surroundings such as the area of your house, schools, playground and others are kept clean.

A clean environment requires maintaining the balance between human and the environment and is not limited to the aesthetic or physical aspects.

Each of these aspects are interrelated. Hence, it is important for us to practise cleanliness to ensure that we are living in harmony with the community and the environment.

Hygiene is derived from the Greek word *hygienos* which means health and personal hygiene.

1.2 Personal Hygiene

The fundamental of cleanliness is taking care of ourselves. Our routine normally will start with personal hygiene such as:

- taking a bath at least twice daily.
- brushing teeth at least twice daily.

This is followed by other routines such as:

- tidying up the bed and cleaning the room.
- tidying up the dining table and washing the dishes.

Personal hygiene practices improve our appearance and personality, and this fosters confidence that will enhance our social life. Individuals with good personal hygiene have a habit of making sure that their surroundings are kept clean regardless of where they are. It is important to have these traits embedded in us, but we must equally care for our surroundings and the environment.



Begin your day by keeping your bedroom tidy and clean

1.3 Clean Environment

The mentality and irresponsible behaviour of individuals who litter contribute to the increasing environmental pollution. Litter also affects our health as it will attract pests which in turn carry vector borne diseases such as dengue, malaria, leptospirosis, cholera and so on.

Littering pollutes the environment and affects the ecosystem. When it rains, rubbish will be washed into drains and will cause clogging resulting in flash floods. Littering also contributes to marine litter.

1.4 Our Responsibility

A sustainable future is only attainable if we start taking actions today. We have an obligation to ensure that the environment and its resources can be enjoyed by future generations.

It is our responsibility to ensure that:

- personal hygiene is practised for human interaction.
- the surroundings are kept clean for human and environment interaction.

We must achieve this balance to ensure good health and a harmonious life.

1.4.1 Keeping the Environment Clean

We can keep our environment clean through activities such as:

- *gotong-royong*.
- unclogging drains.
- disposing litter into garbage bins.
- organising environmental cleanliness awareness programmes.
- practising the 3Rs (Reduce, Reuse, Recycle).



Keeping the environment clean is our responsibility

1.4.2 Managing Solid Waste

Managing solid waste involves the separation of waste at the disposal stage followed by the practice of 3Rs (Reduce, Reuse, Recycle).

This will ensure that excessive wastage can be minimised hence reducing the amount of waste at the landfill.

The practice of 3Rs helps reduce waste at the landfill thus minimising environmental pollution for a healthy environment.



LITTERING



Littering has negative effects on the environment.

Clogged
drains



Polluted
rivers



Marine
litter



Breeding
pests



Environmental issues will not arise if we all play a role in keeping the environment clean.

Keeping the environment clean is our responsibility and we should not entrust others or rely solely on the local authorities to do so.

Understanding the importance of personal hygiene and keeping the environment clean will ensure environmental sustainability.

Myth 1:

Plastic pollutes the environment.

Fact:

The environment is polluted due to irresponsible individuals who litter and do not manage their waste properly.



Watch video at 'MENU > RESOURCES > REFERENCES ' in the interactive module to understand the habit of littering.



ACTIVITIES

1) CHECKLIST

Pupils are required to prepare the following checklist:

- a) Daily hygiene routine.
- b) School cleanliness routine.

a) DAILY HYGIENE ROUTINE CHECKLIST

Steps:

- i) Pupils create and record their hygiene routine from Monday to Sunday.
- ii) Pupils discuss in class about their hygiene routine in the following week.
- iii) Pupils provide reasoning on the importance of personal hygiene and relate it to personal health, and the necessity for a clean environment.

Name :

Class :

Date :

Please tick (✓) accordingly.

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Brushing Teeth							
Wake up							
After meal							
Before bed							
Bathing							
Morning							
Evening							
Night							
Washing Hands							
Before meal							
After meal							
After play time							
After using the washroom							
Others							
Washing hair							
Clipping nails							
Wearing clean clothes							

b) SCHOOL CLEANLINESS ROUTINE CHECKLIST

Steps:

- i) Pupils list out activities that can be done to maintain school cleanliness.
- ii) Tick (✓) the appropriate box in the checklist.
- iii) Pupils discuss in class about their routine and its effects on their surroundings and learning environment the following week.

Activity	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Picking up rubbish							

QUESTIONS

PART A

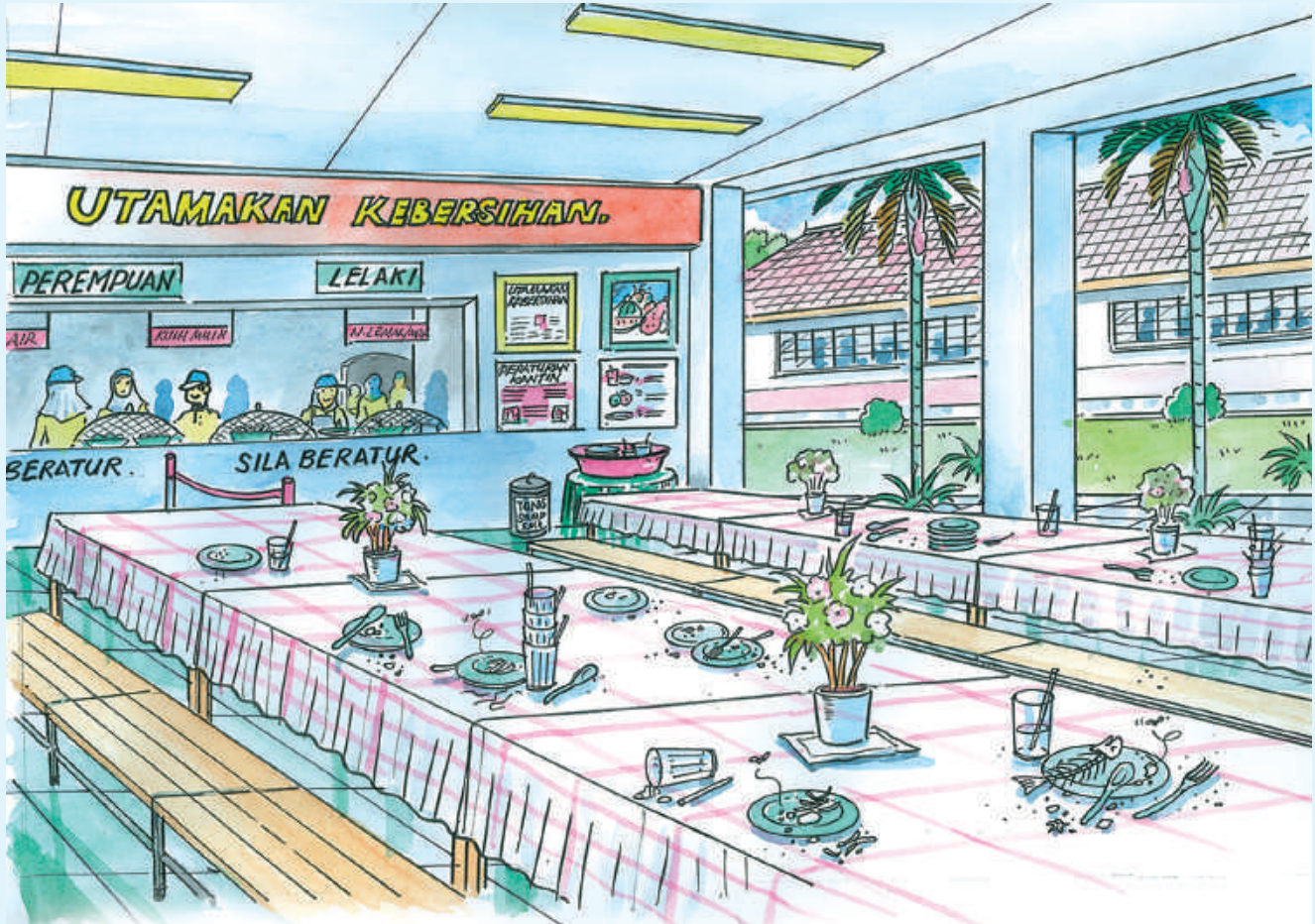


Figure 1

Figure 1 shows a dirty canteen. Describe ways to keep the canteen clean.

PART B

Questions 1 to 4 are based on Figure 2 below. Choose the correct answer.



Figure 2

A clean and tidy.

B keep the environment clean

C litter.

D keep ourselves clean.

- 1 We must take a bath at least twice a day to
- 2 We must make sure that our bedroom is always
- 3 We should manage our waste properly and do not
- 4 We must to prevent vector borne diseases from spreading.

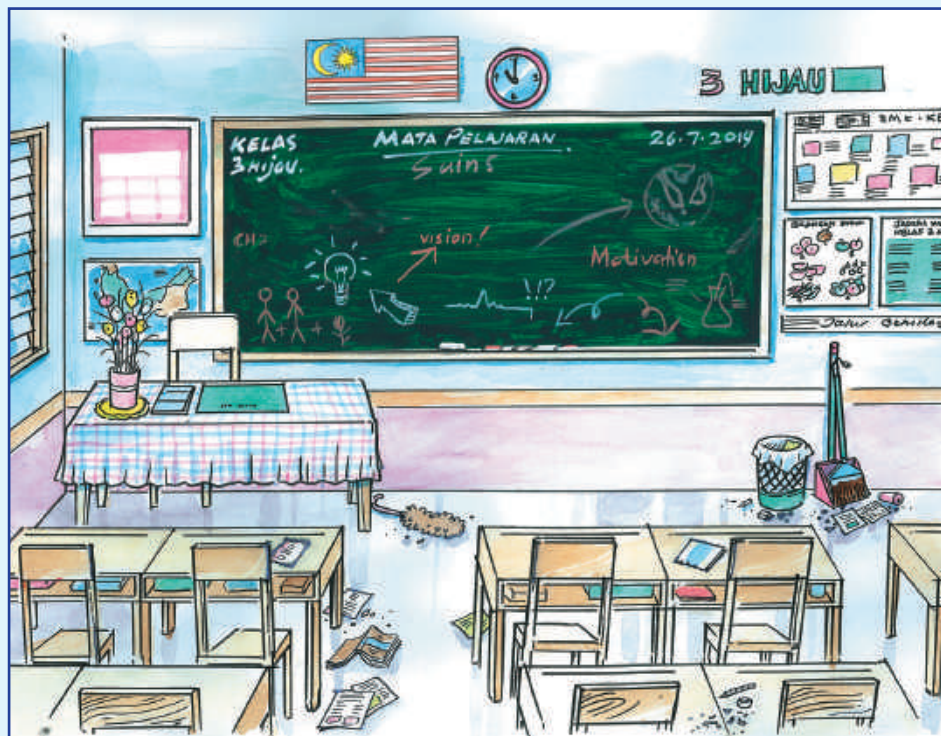


Figure 3

5 Figure 3 shows a dirty classroom. What should be done to ensure the classroom is kept clean?

- P Clean the writing board
 - Q Arrange tables and chairs neatly
 - R Pick up trash and throw it into the bin
 - S Water the flowers on the teacher's table
- A P and R
 - B Q and R
 - C Q, R and S
 - D All of the above

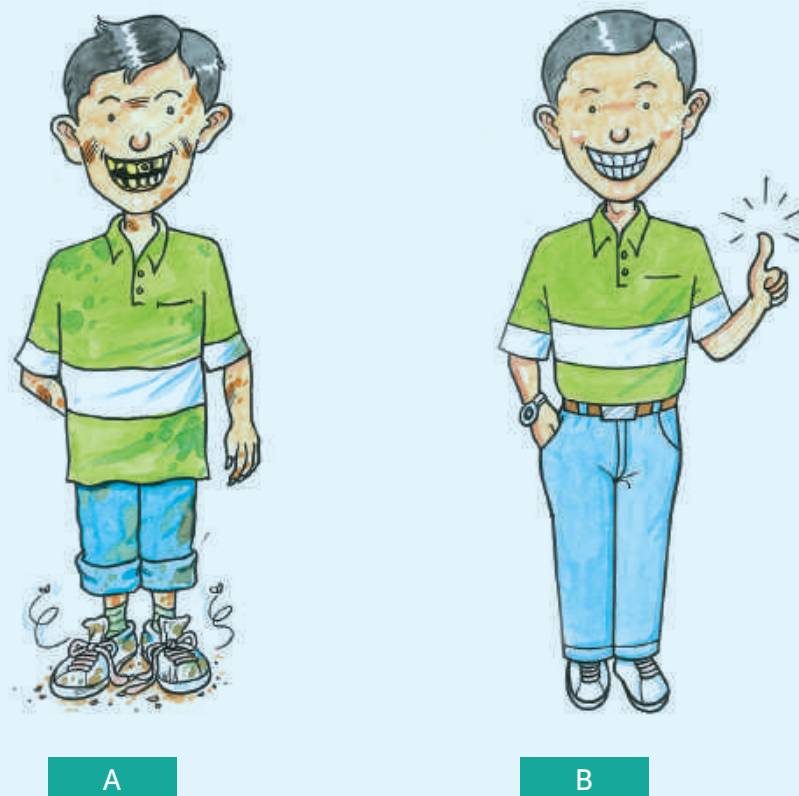


Figure 4

6 Figure 4 shows a pupil in two different situations, A and B. What routine should be taken for A to become like B?

- H Take a bath
 - I Brush teeth
 - J Buy new clothes
 - K Put on clean clothes
- A H and I
 B H and J
 C H, I and K
 D All of the above

7 Which of the following are the correct steps to manage waste?

- P Collect and put the waste near the bin.
 - Q Mix food waste, cans and bottles in a plastic bag.
 - R Throw waste into recyclable or non-recyclable bins.
 - S Separate waste according to types such as food waste, plastic and glass.
- A P and Q
 B P and S
 C Q and R
 D R and S

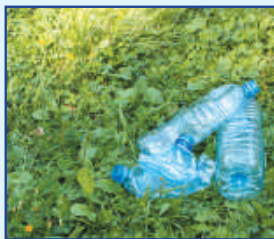


Figure 5

8 Figure 5 shows a situation on a beach. What is the effect of this situation towards the environment?

- A Air pollution
- B Global warming
- C The increase in marine litter
- D The increase in greenhouse gasses

9 The most common waste found on streets, beaches and public parks are:



K



L



M



N

- A K and L
- B L and M
- C K, M and N
- D All of the above

10 Littering will cause:



W



X



Y



Z

- A W and X
- B X and Y
- C W, X and Y
- D All of the above

ANSWER SCHEME

PART A

Ways to maintain cleanliness:

- throw trash into the appropriate bin
- keep table clean
- put the dishes in the appropriate place
- line up while purchasing your food

PART B

1 D

2 A

3 C

4 B

5 A

Cleaning the writing board, picking and throwing trash into the bin are among the cleanliness practices for schools.

6 C

Take a bath, brushing teeth and wearing clean clothes are personal hygiene practices.

7 D

Separating waste at source by category namely recyclable and non-recyclable is a major step towards proper waste management.

8 C

The problem of increasing marine litter occurs because of human activity that litters everywhere.

9 D

Mineral water bottles, sweet wrappers, plastic for drinks and newspapers are the most common litter found in open places such as public parks, beaches and streets.

10 C

Littering has negative effects on the environment and contributes to an increase in marine litter, clogged drains and breeding of pests.

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CHAPTER 2 | HUMAN'S LIFESTYLE

Key Notes

- i) Each product used in our lives has a different lifespan.
- ii) We should spend wisely to avoid wastage. Buy what you need, not what you want.
- iii) Waste should be managed properly to ensure the environment's sustainability.



LEARNING OUTCOMES

At the end of the lesson, pupils will be able to :

Understand
product
lifespan

Identify the
relationship
between human's
lifestyle and
waste

Practise
proper waste
management



2.1 Products Around Us

Activities in our daily lives involve the use of a wide variety of products, tools and equipment that provide convenience and fulfil our needs. Modern technology allows us to communicate easily and provides access to affordable products, goods and equipment.

Examples of everyday products in our daily lives include:

Plastic Food containers and drinking bottles	Metal Pots and pans	Glass Glasses, glass jugs and bottles
		
Rubber Rubber bands	Aluminium Aluminium canned drinks and foil paper	Paper Newspapers, magazines and cardboards
		

2.2 Products to Solid Waste

Products are made from different materials such as plastic, metal, glass, rubber, cotton and wood, depending on the uses and properties.

Each of these products has a different lifespan. Some can be used for a long time such as kitchen cabinets and electronic products, whilst others such as food products, bath products and personal care products, have shorter lifespans. We tend to buy more products with a shorter lifespan.

Widespread choices, easy availability and affordable options, make us buy compulsively without thinking about the effect on waste generation. More often we buy to fulfil whims and trends, and not out of necessity. For example, we tend to buy more food at the night market, and we go for shopping sprees during the sales period. The excess purchases will result in the generation of more waste. This would lead to more waste in landfills.

**Think before you buy!
Buy what you need, not what you want!**



Be sure to only buy goods that are necessary

2.3 Proper Solid Waste Management

A product will become waste when it is no longer needed and disposed. Examples of waste are broken toys, food waste, shabby clothes, old newspapers and others.

Individuals must choose to manage waste effectively in order to reduce the amount of waste in landfills. We should separate waste at the source, reduce consumption, reuse and recycle.

What can you do?



Reuse



Separate waste for recycling



Avoid wastage



Throw rubbish into the bin

Myth 2:

Plastic is the only material that releases toxic gases in open burning.

Fact:

Other materials will also release toxic gases in open burning. The Environmental Quality Act 1974 prohibits open burning at all premises.



All products will become solid waste when it is no longer needed



Lifespan

Short

Shorter lifespan and purchased more often

Long

Can be used for a long time



Reuse



Separate waste



Avoid wastage



Throw rubbish into the bin



ACTIVITIES

1) VIDEO SESSION

Pupils watch the video of "Let's Clean Up, Nature Heroes!".

Pupils discuss the lessons learned from the video.

Guide for discussion:

- i) What are the moral values from the video?
- ii) What are the effects of littering?
- iii) How can we help to reduce environmental pollution?

Note: Retrieve the video from "VIDEO" folder located in the USB flash drive.

2) GROUP ACTIVITY

- a) In groups, pupils list products in their surrounding and identify the products according to the type of materials.

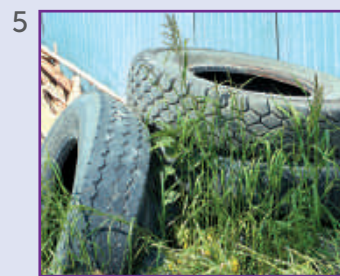
Product	Materials				
	Plastic	Paper	Glass	Metal	Rubber
Water bottle	x				
Newspaper		x			

- b) Pupils make inferences on the use of materials to produce the products.

QUESTIONS

For questions 1 to 5, please choose A, B or C for the correct answer based on the pictures given.

- A Reuse
- B Recycle
- C Reuse and Recycle

☐☐☐☐☐

6 Marine litter is currently a major problem. Marine litter consists of:



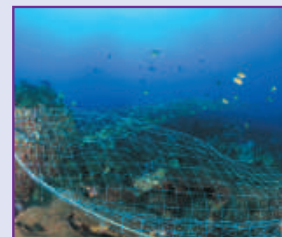
J



K



L



M

- A J and K
- B J, K and L
- C J, K and M
- D All of the above



Figure 1

7 Figure 1 shows a landfill full of solid waste. Which of the following are correct statements about solid waste in landfills?

- P Excessive buying will result in generating more waste.
- Q Reuse and recycling can reduce the amount of waste in landfills.
- R The more waste generated, the more waste will end up in landfills.

- A P only
- B Q only
- C P and Q
- D All of the above

- 3Rs
- Plant trees
- Save electricity
- Use public transport

8 The activities above are carried out to

- A reduce haze.
- B improve air quality.
- C reduce marine litter.
- D reduce ozone depletion.

Questions 9 and 10 refer to the objects below.



9 Which of these objects are made of natural materials?

- A Pail and tent
- B Tent and clay vase
- C Wood furniture and pail
- D Wood furniture and clay vase

10 Which of these objects are made of synthetic materials?

- A Pail and tent
- B Tent and clay vase
- C Wood furniture and pail
- D Wood furniture and clay vase

ANSWER SCHEME

1 C

Plastic bottles can be reused and recycled.

2 B

Newspaper should be recycled.

3 B

Beverage cans should be recycled.

4 C

Grocery plastic bags can be reused for other uses such as bin liners or be recycled.

5 A

Tyre can be reused for other uses.

6 C

Marine litter is any waste from human activities found in the sea, such as cans, plastic bottles and fishing nets that are discarded.

7 D

All of the statements are correct.

8 D

Activities such as planting trees, saving electricity, 3Rs and using public transportation could prevent ozone layer depletion caused by carbon emissions.

9 D

Wood furniture and clay vase are produced from natural materials such as teak wood and clay.

10 A

Pail and tent are made of plastic.

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CHAPTER 3 | ALL ABOUT PLASTIC

Key Notes

- i) Plastic products are made from materials obtained through several stages of processing crude oil and natural gas.
- ii) Plastic can be classified into thermoplastic and thermoset.



LEARNING OUTCOMES

At the end of the lesson, pupils will be able to:

Understand the history of plastic inventions

State the plastic production process (from raw materials to plastic)

Identify the types of plastic



3.1 What is Plastic?

Plastic is a synthetic polymer. Plastic complements our lives in areas such as safety, medical, transportation and telecommunications. Plastic has unique characteristics that allow it to be used widely in various fields.

3.2 The History of Plastic Inventions



3.3 Plastic Processing Flow Chart

Production of Plastic from Crude Oil/Natural Gas



Crude oil/natural gas (100%)



Fractional distillation



Manufacture of petrochemical products



Plastic (4%)



Only 4% of crude oil and natural gas are used to produce plastic.

3.4 Plastic Molecules

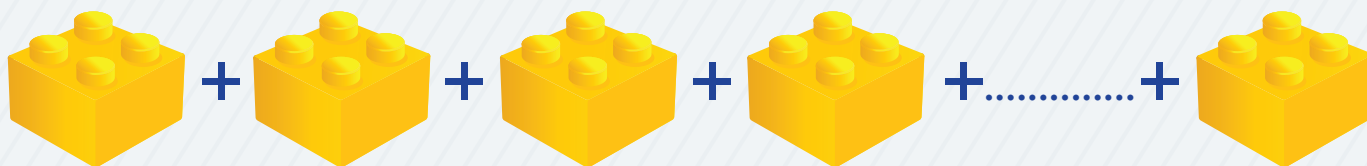
Plastic is a synthetic polymer made from crude oil or natural gas, which has gone through several stages of processing. The synthetic polymer is formed through a process called polymerisation, where monomers react together to form a polymer chain.



Do you know?

“Plastic is a synthetic polymer. It’s almost the same as the resin found in plants.”

A polymer is a large molecule made up of chains of linked repeating sub units, which are called monomers.



Do you know?

“PETRONAS Chemicals Group Berhad (PCG) is the largest polymer producer in Malaysia. PCG polymer plants are located in Kertih, Terengganu and Pengerang, Johor.”

3.5 Categories of Plastic

Plastic can be categorised as:

Thermoplastic	Thermoset
Can be remoulded when heated at a certain temperature	Cannot be remoulded

Examples:



Polyethylene terephthalate



Polypropylene



Polypropylene and Polyethylene



Bakelite



Melamine



Epoxy

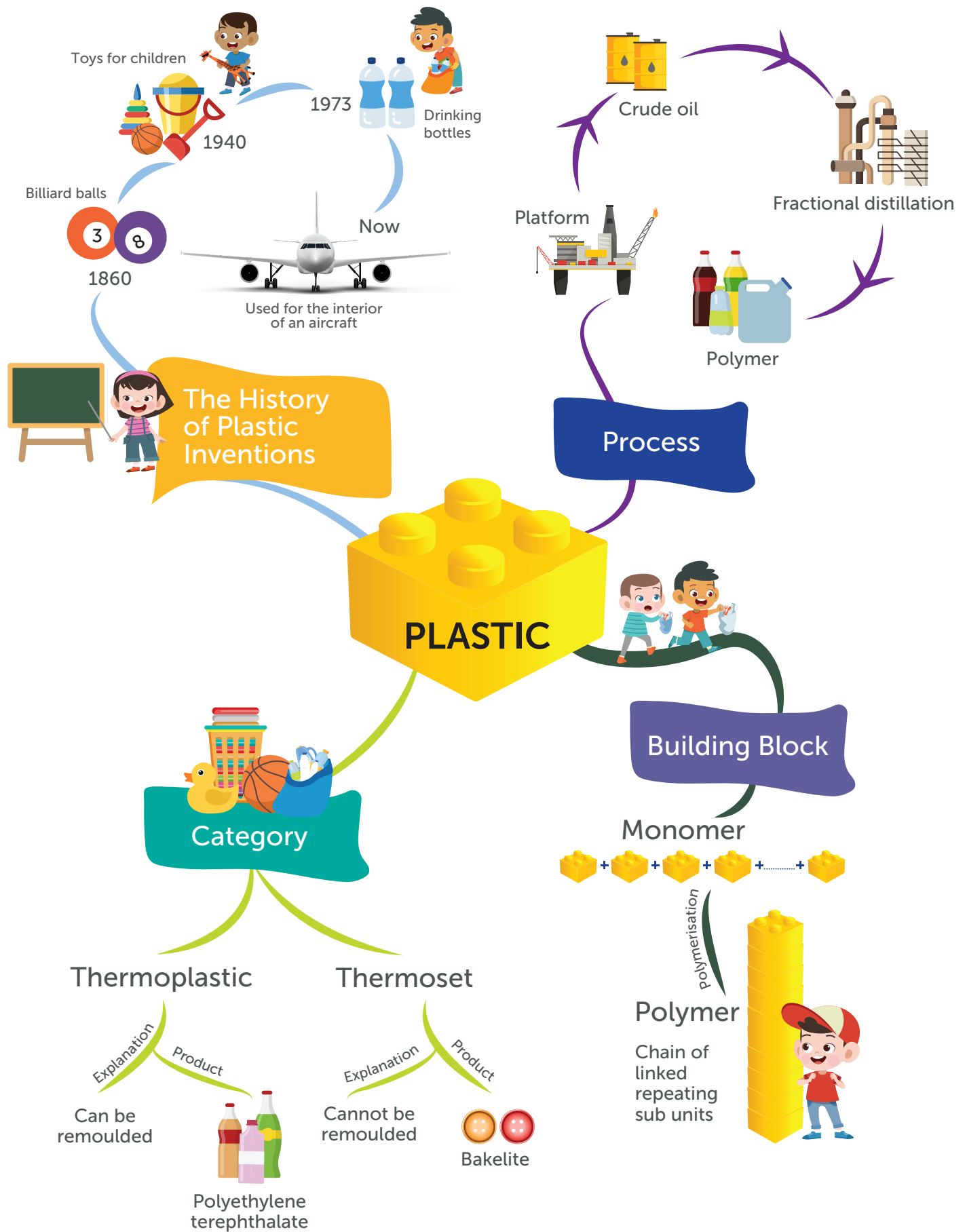
Myth 3:

The number imprinted under plastic food containers, drinking bottles or cups refers to the quality of plastic - the greater the number, the higher the quality of plastic.

Fact:

Plastic products are labelled with different numbers. The numbers are codes to represent different types of plastic which will be separated for the purpose of recycling.





ACTIVITIES

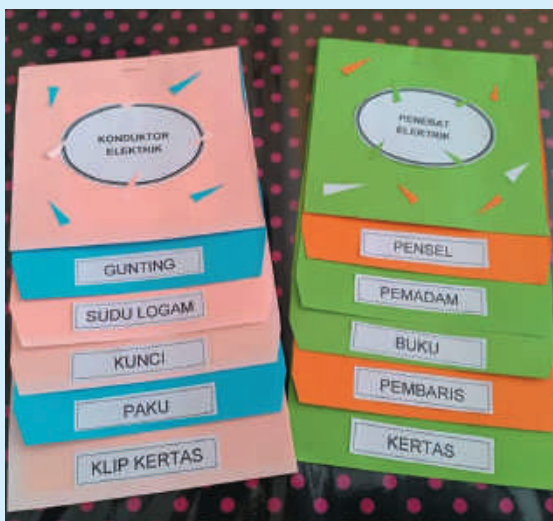
1) PROJECT: CREATIVE BOOK

(examples: foldable book, box book, digital book, scrapbook and others)

Pupils gather information on plastic products/containers to be presented in the form of a creative book.








Steps:

- i) Pupils form groups to carry out the project.
- ii) Find information and pictures on:
 - a) Product's name
 - b) Product's characteristics
 - c) Product's properties
 - d) Compare and contrast the product's characteristics and properties
- iii) Project is presented according to pupils' creativity.



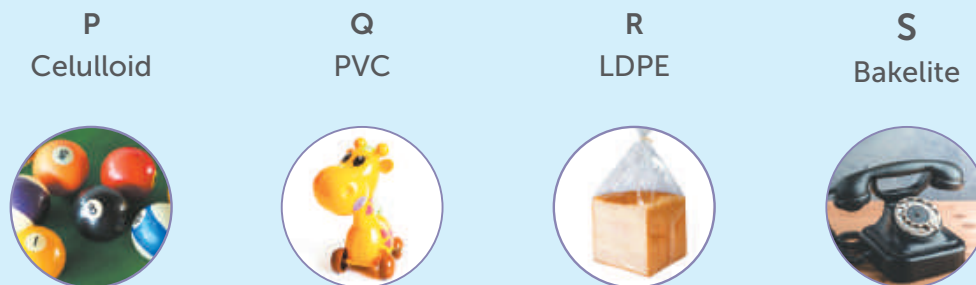
2) KNOW YOUR CODING

Based on observation, pupils identify plastic products based on the following codes.

Code	Product
	
	
	
	
	
	
	

QUESTIONS

1 The following information shows the different types of plastic.



Please choose the correct sequence that shows the development of plastic.

- A P, Q, R, S
- B P, S, Q, R
- C Q, P, R, S
- D S, P, R, Q

2 Figure 1 represents polymerisation process.

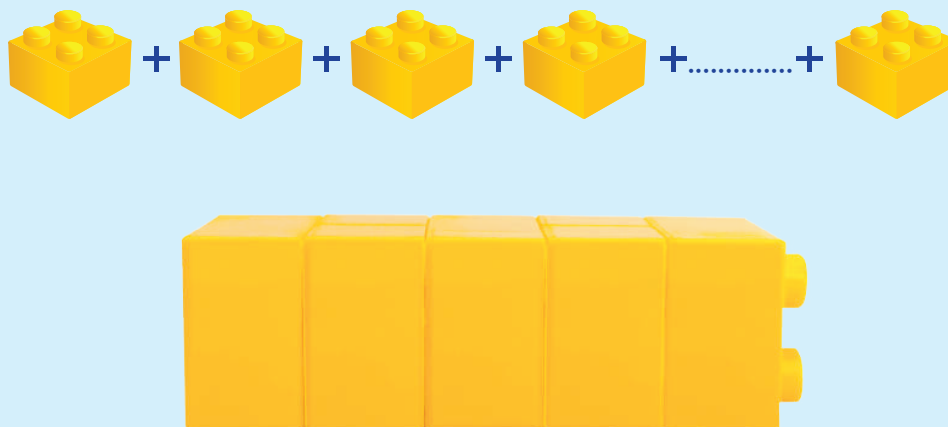


Figure 1

Polymerisation process is the combination of

- A polymers to form a monomer.
- B repetitive monomers to form a polymer.
- C molecules to produce synthetic material.
- D polymers and monomers to produce plastic.

3 Figure 2 shows the production of plastic from crude oil/natural gas.

Production of Plastic from Crude Oil/Natural Gas








Figure 2

The sequence for plastic production is:

- A Crude oil/natural gas → fractional distillation → manufacture of petrochemical products → plastic
- B Crude oil/natural gas → manufacture of petrochemical products → fractional distillation → plastic
- C Crude oil/natural gas → manufacture of petrochemical products → plastic → fractional distillation
- D Fractional distillation → manufacture of petrochemical products → plastic → crude oil/natural gas

For questions 4 to 10, choose the correct answers based on the given pictures.
Write A or B in the appropriate box.

- A Thermoset
- B Thermoplastic

4	<div>Can be moulded repeatedly if heated at a certain temperature.</div> <div><input type="checkbox"/></div>	5	<div>Cannot be remoulded.</div> <div><input type="checkbox"/></div>	6	 <div><input type="checkbox"/></div>	7	 <div><input type="checkbox"/></div>
8	 <div><input type="checkbox"/></div>	9	 <div><input type="checkbox"/></div>	10	 <div><input type="checkbox"/></div>		

ANSWER SCHEME

1 B

The history of plastic inventions began with celluloid in 1860, followed by bakelite in 1907, PVC in 1940 and LDPE was introduced in 1980. Plastic innovation has made our life convenient and its usage has expanded widely in many fields.

2 B

Polymerisation is the process of repeated monomers combined to form a polymer.

3 A

Plastic production process begins with the drilling of crude oil/natural gas, fractional distillation process followed by the manufacture of petrochemical products before they are made into plastic.

4 B

Thermoplastic can be moulded repeatedly when heated at a certain temperature.

5 A

Thermoset cannot be remoulded.

6 A

Shirt buttons are made from bakelite, a type of thermoset.

7 A

Epoxy is a type of thermoset.

8 B

Drinking bottles are made from polyethylene terephthalate, a type of thermoplastic.

9 B

Food containers are made of polypropylene, a type of thermoplastic.

10 A

Melamine plates are made of melamine, a type of thermoset.

CHAPTER 4 | PLASTIC IN DAILY LIFE

Key Notes

- i) The widespread use of plastic in the fields of manufacturing, communications, medical, transportation and others are attributed to its unique properties.
- ii) Recycling or reusing plastic is the ideal life cycle of plastic products.



LEARNING OUTCOMES

At the end of the lesson, pupils will be able to:

Identify the
unique properties
of plastic

List the use and
importance of
plastic in various
fields

Understand the
life cycle of plastic



4.1 Plastic Properties

Plastic is unique and has advantages compared to other materials. Among the properties of plastic are:

Lightweight



Plastic is lighter.

Barrier Properties



Plastic packaging keeps food fresh and allows food to be stored for a longer period of time.

Durable



Plastic does not break easily.

Thermal Insulator



Plastic is a good thermal insulation material. It can maintain temperature for a long period of time.

Non-corrosive



Plastic is non-corrosive and does not rust.

Flexible



Plastic's flexibility allows it to be used for various complex applications.

4.2 Use of Plastic in Various Fields

Due to the different properties of plastic, it has been extensively used in various fields. With the advancement of technology, the usage of plastic ranges from daily activities up to complex applications.

Plastic and Transportation

Property	Applications	Advantages
<ul style="list-style-type: none">• Lightweight	<ul style="list-style-type: none">• Interior of an aircraft• Structure of an aircraft	<ul style="list-style-type: none">• Moves further and faster• Saves fuel consumption



Property	Applications	Advantages
<ul style="list-style-type: none">• Durable	<ul style="list-style-type: none">• Car bumper	<ul style="list-style-type: none">• Impact resistance• Reduces the impact during a collision



Plastic and Sports

Property	Applications	Advantages
<ul style="list-style-type: none">• Flexible• Durable	<ul style="list-style-type: none">• Football• Cone• Sport shoes• Synthetic grass	<ul style="list-style-type: none">• Saves on maintenance cost



Plastic and Medical

Property	Applications	Advantages
<ul style="list-style-type: none">• Chemical resistance• Barrier properties	<ul style="list-style-type: none">• Blood bag• Syringe• Mask	<ul style="list-style-type: none">• Reduces contamination• Safe



Plastic and Electronics

Property	Applications	Advantages
<ul style="list-style-type: none"> • Thermal insulator • Electrical insulator • Lightweight 	<ul style="list-style-type: none"> • Kettle • Cable • Laptop 	<ul style="list-style-type: none"> • Safe • Easy to carry



Plastic and Packaging

Property	Applications	Advantages
<ul style="list-style-type: none"> • Barrier properties • Flexible • Lightweight • Transparent 	<ul style="list-style-type: none"> • Bread bag • Wrapper for sweets • Wrapper for fruits 	<ul style="list-style-type: none"> • Keeps food fresh longer • Made into various forms and sizes • Visible



“Plastic is light, flexible, durable, with good barrier properties and safe, making it adaptable and useful in various fields”.

4.3 Life Without Plastic

Imagine your life without plastic:



Easily damaged and rusty playground equipment that poses a danger to children.



Book cover easily torn and not durable.



Food becomes perishable and easily contaminated because there are no barrier properties.

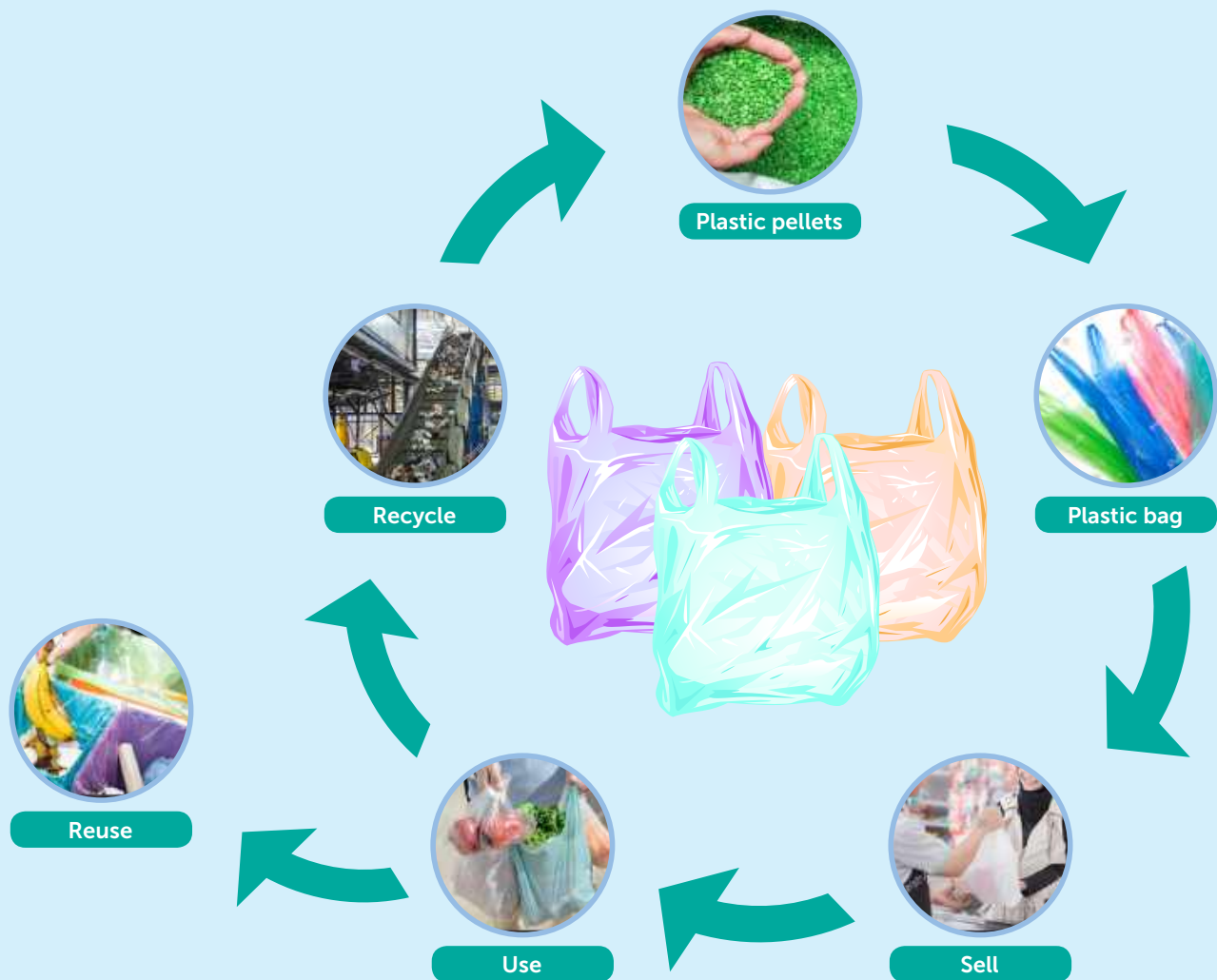


Bucket is heavy and not durable.

4.4 Life Cycle of Plastic

Every product has its life cycle. It is important to understand the life cycle to ensure the sustainability of our environment and to be a smart consumer.

Here is an example of the life cycle of a plastic bag:



Based on the life cycle above, used plastic bags can be reused or recycled. Disposal is the last resort. Reusing and recycling must be practised in the management of all types of plastic.

Myth 4:

Water in plastic bottles that are left in the car is not safe to drink because of chemical leaching from plastic at high temperature.

Fact:

Plastic has a high melting point of 180°C - 200°C which is not attainable inside a car, therefore there is no chemical leach. Water in bottles might get contaminated due to the transference of bacteria from the mouth when drinking.

Source : International Bottled Water Association

Watch video at ' MENU > RESOURCES > REFERENCES ' in the interactive module to learn more about the usage of plastic bottles in treating water for drinking.



ACTIVITIES

1) VIDEO SESSION ABOUT PLASTIC

Pupils watch the video of "Fantastic Plastic".

Pupils discuss the lessons learned from the video.

Guide for discussion:

- i) What are the properties of plastic that allow it to be widely used in various industries?
- ii) Discuss the uses of plastic in our daily life.

Note: Retrieve the video from "VIDEO" folder located in the USB flash drive.

2) LIFE WITHOUT PLASTIC

- a) Pupils are required to imagine a world without plastic. List non-plastic products and state the advantages and disadvantages of the products in the table below.

Non-Plastic Product	Advantages	Disadvantages
Glass cup	Heat resistant	Fragile

- b) Pupils will be divided into groups to debate on 'LIFE WITHOUT PLASTIC'.

QUESTIONS



Figure 1

1 Figure 1 shows different plastic products. Plastic is unique and has advantages compared to other materials. Which of the following are properties of plastic?

- W Durable
 - X Lightweight
 - Y Barrier properties
 - Z Chemically reactive
- A W and X
B X and Z
C W, X and Y
D All of the above



Figure 2

2 Based on Figure 2, the following are advantages of plastic barrier properties except

- A make strawberries rot slowly.
- B ensure the strawberries' freshness.
- C delay changes of strawberries' texture.
- D increase sweetness of the strawberries.



Figure 3

3 Based on Figure 3, choose the correct statement about plastic properties.

- A Plastic ensures water is clean.
- B Plastic maintains temperature for a long time.
- C Plastic makes it safe for water to be carried around.
- D Plastic ensures everyone's access to water at cheaper rates.

Property	Advantages
• Lightweight	<ul style="list-style-type: none"> • Move further and faster • Fuel efficient

4 The above information indicates the plastic properties and its advantages which is useful for

- A medical.
- B agriculture.
- C electronics.
- D transportation.

5 Why is plastic a suitable material for the electrical and electronic fields?

- A Transparent
- B Electrical insulator
- C Electrical conductor
- D Reactive to chemicals

6 Half drank water in a plastic bottle left in a car might not be safe for drinking again due to

- A exposure to sunlight.
- B plastic endangers health.
- C plastic will deform under the sun.
- D the transfer of bacteria from mouth into the water.

Refer to Figure 4 for questions 7 to 10.

Figure 4 shows the life cycle of a plastic bag. Complete the life cycle.

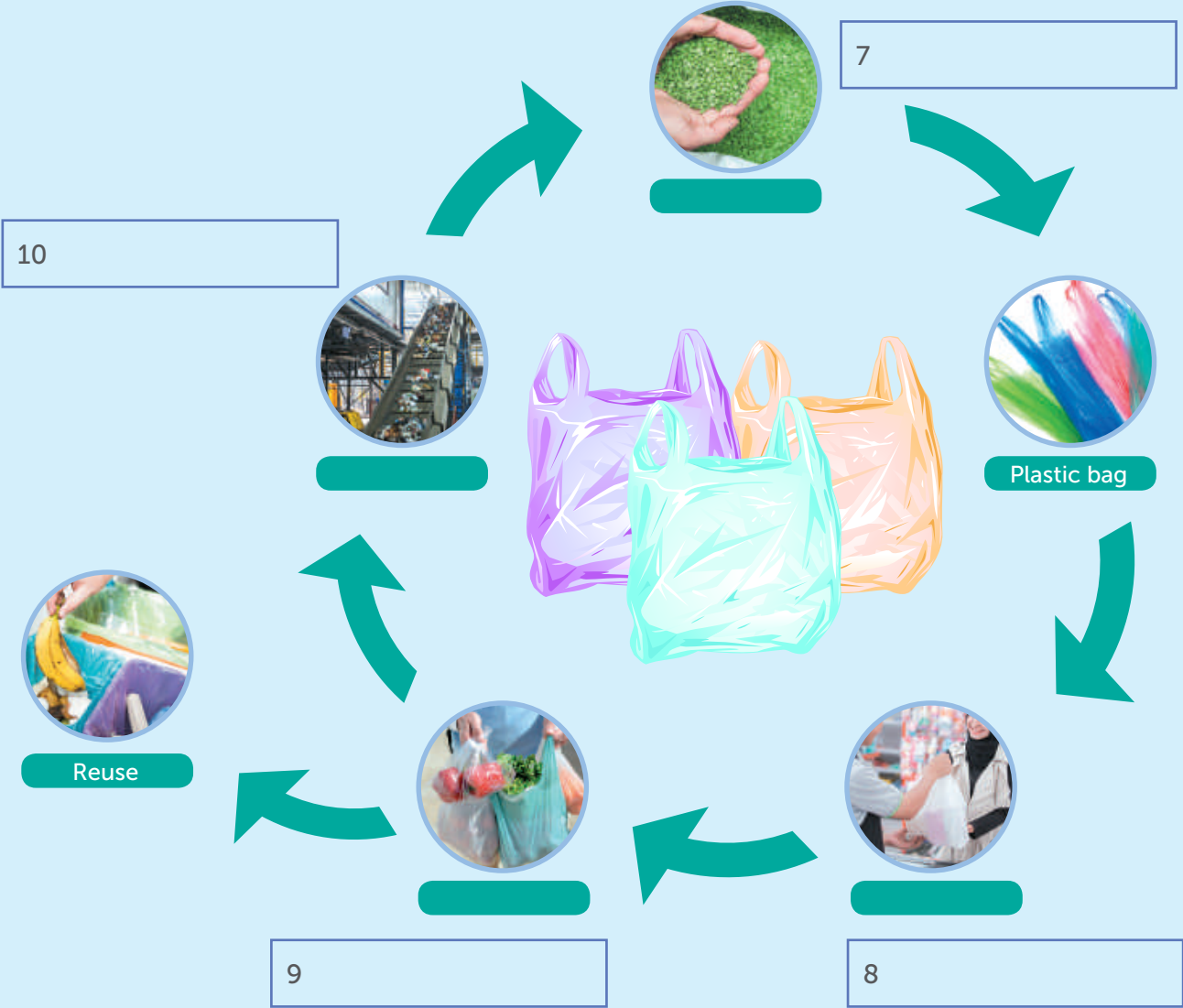


Figure 4

- A Use
- B Sell
- C Recycle
- D Plastic pellets

ANSWER SCHEME

1 C

Plastic has unique properties such as lightweight, good barrier properties and durable. Hence, it is widely used for a variety of products.

2 D

The barrier properties of plastic can ensure the freshness of food and allow it to be stored for a longer period.

3 B

Thermal insulation properties of plastic maintain the temperature for a long period of time thus enabling the water to remain cold.

4 D

The transportation industry requires materials that can help increase speed, fuel efficiency, safety and reduce the risk of impact during accidents. Plastic have properties that improve the efficiency and safety of the vehicle.

5 B

Electronics require insulated materials, safe to use and easy to carry. Plastic meets these needs because it has electrical insulation properties.

6 D

Plastic has a high melting point of 180°C - 200°C which is not attainable inside a car, therefore there is no chemical leach. Water in bottles might get contaminated due to the transference of bacteria from the mouth when drinking.

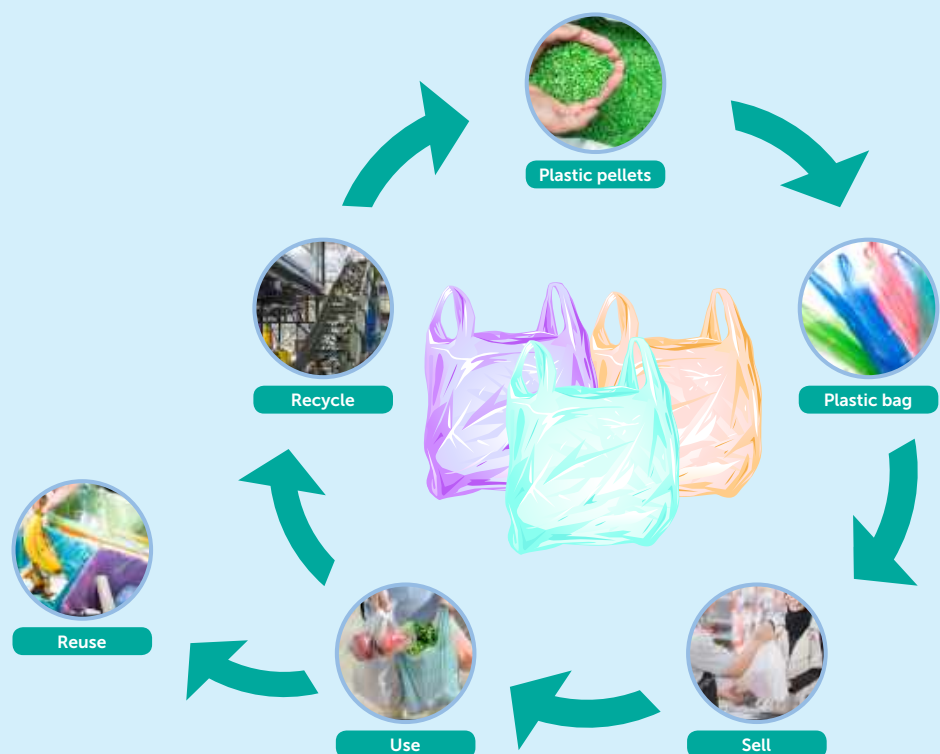
The life cycle of a plastic bag is as follows:

7 D

8 B

9 A

10 C



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CHAPTER 5 | SOLID WASTE MANAGEMENT

Key Notes

- i) The largest composition of solid waste in Malaysia is food waste.
- ii) Solid waste is divided into two categories, which are recyclable and non-recyclable.
- iii) Separation of waste at source is essential to reduce waste in landfills.



LEARNING OUTCOMES

At the end of the lesson, pupils will be able to:

Identify the types of solid waste

Understand the waste management system in Malaysia

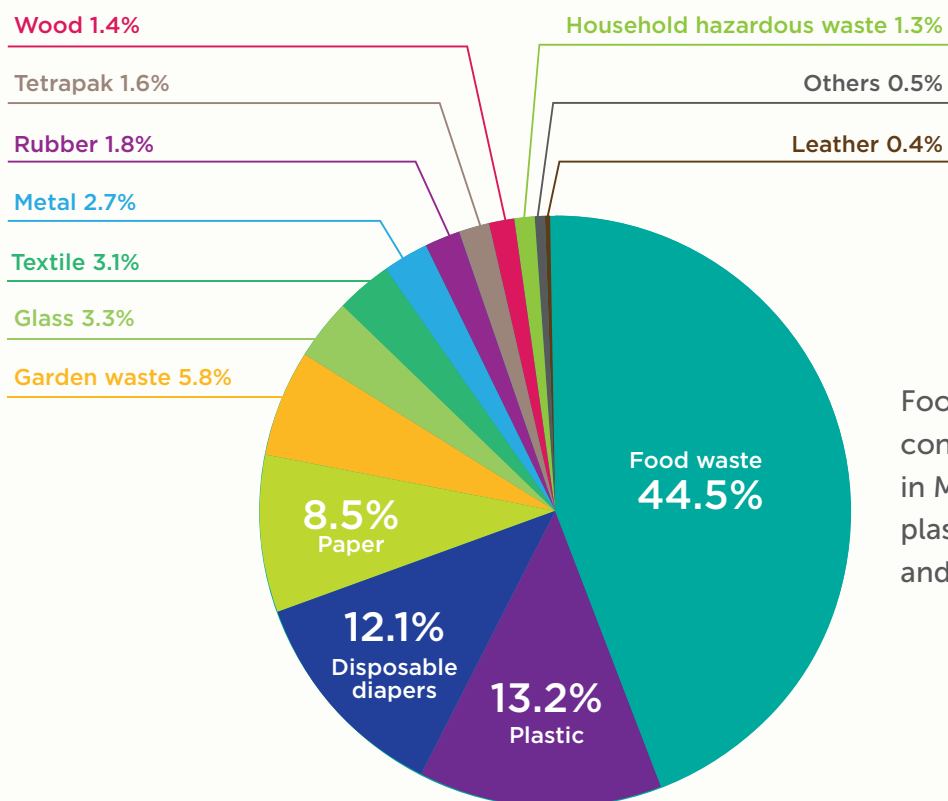
Understand the importance of waste separation at source



5.1 Solid Waste

Solid waste is any scrap material that must be disposed because it is broken, worn out, contaminated or damaged. Solid waste comprises food waste, plastic, garden waste, rubber, paper, metal, textiles and glass. Typical sources of solid waste are from homes, schools, business premises and industries.

5.2 Types and Composition of Solid Waste in Malaysia



Food waste is the largest contributor of solid waste in Malaysia followed by plastic, disposable diapers and paper.

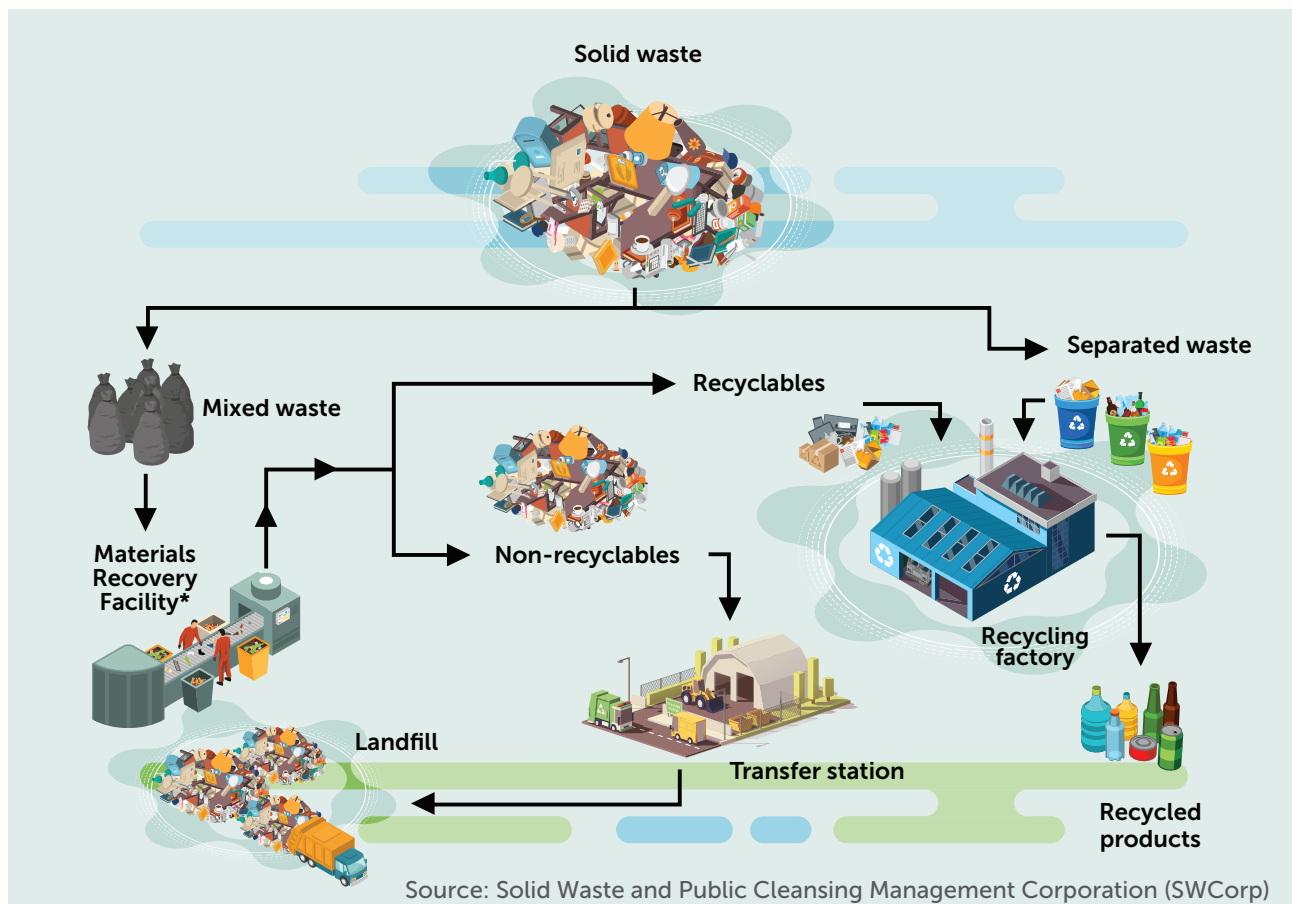
Source : Compendium of Malaysian Waste Management (Solid Waste and Public Cleansing Management Corporation (SWCorp), 2019)

5.3 Solid Waste Categories

Solid waste is divided into two categories:



Recyclables will be sent to a recycling centre to be converted into new products while the non-recyclables will be disposed of in a landfill.



* Collected solid waste is still mixed waste due to low level of awareness on waste separation of recyclables and non-recyclables. Therefore, recyclables will be recovered from the mixed waste at the Materials Recovery Facility before the waste is disposed at landfills.

5.4 Separation at Source

Separation at source refers to the separation of recyclable and non-recyclable waste beginning at homes, schools, business premises and others. Separation at source is important as it will reduce the amount of waste going to landfills and at the same time increase recycling rate.



Do you know?

“3,000 tonnes of wasted food is thrown in landfills every day in Malaysia.”

Source : Solid Waste and Public Cleansing Management Corporation (SWCorp), 2017

Littering is one of the causes of environmental pollution. Using a bin and separating waste at source will ensure that waste is sent to the landfill or recycled. The concept of 'Let's Comply & Intervene' aims to encourage people not to litter.



Firdaus is eating a banana.



Firdaus throws the peel on the sidewalk.



Mei Ling tells him to pick it up and throw the peel into the bin.

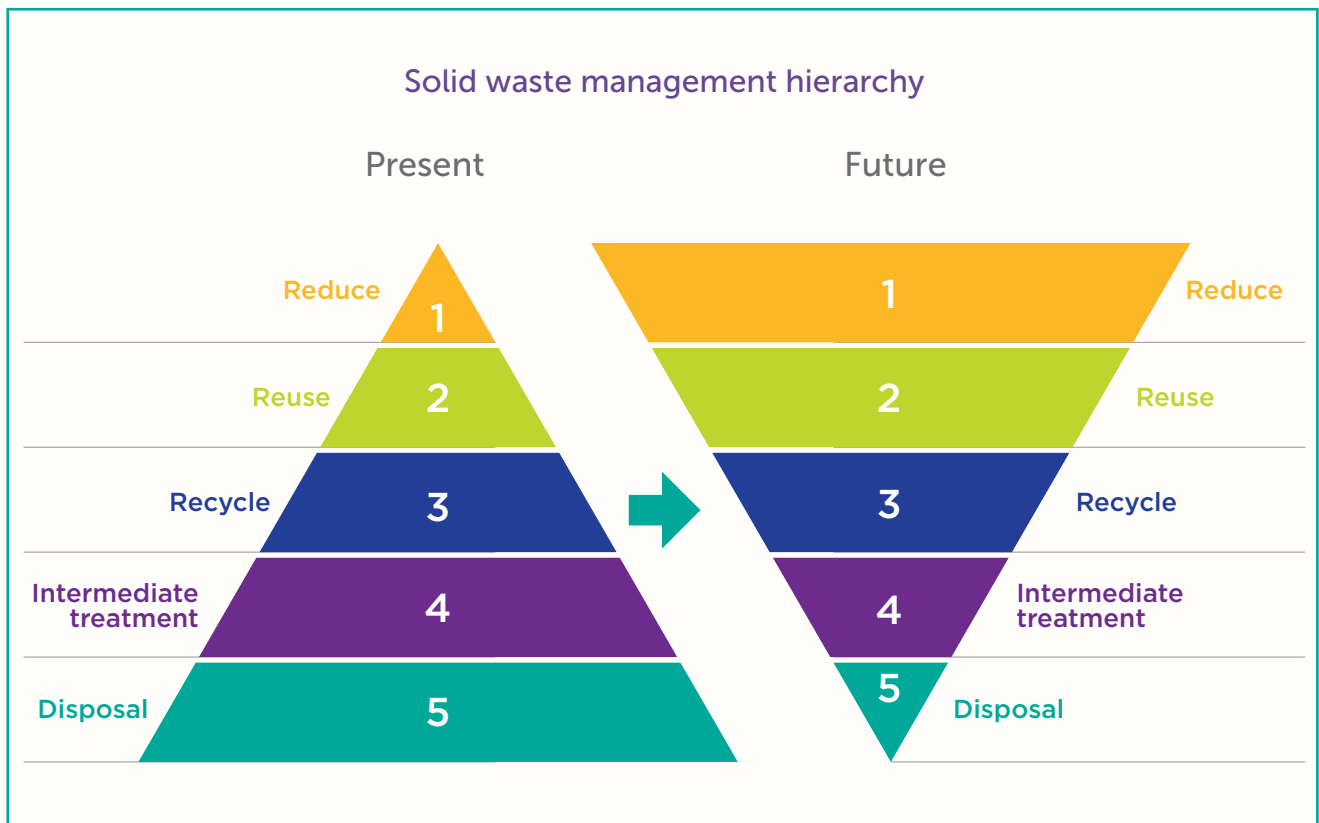


Firdaus picks up the peel and throws it into the bin.

The illustration above explains how to practise the concept of 'Let's Comply & Intervene' in your daily life. We should stop the bad habit of littering and encourage people around us to keep the environment clean.

5.5 Solid Waste Management in Malaysia: The Way Forward

Solid waste management hierarchy below indicates an order of preference for action to reduce and manage waste.



Source : Ministry of Housing and Local Government (KPKT)

At the current time, 3Rs has not been fully implemented. Solid waste separation at source is still not a part of the Malaysian culture. Hence, the solid waste management system in our country is focused more on the disposal stage.

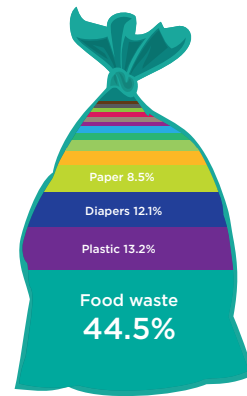
The public must change their lifestyle by adopting the 3Rs and make reduce, reuse and recycle a part of our culture. This will result in reducing the amount of waste going to landfills.

Myth 5:

Solid waste in Malaysia comprises mostly plastic.

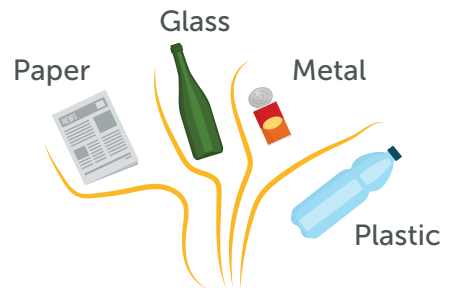
Fact:

Almost half of the total solid waste in Malaysia is food waste.



Types and Composition of Solid Waste in Malaysia

Solid Waste Management Hierarchy



Recyclables

Categories



Non-recyclables

Separation at Source

Reduce the amount of waste going to landfills

Increase the rate of recycling

Do not litter



ACTIVITIES

1) IDENTIFY SOLID WASTE AT SOURCE!

Pupils list solid waste at source and identify the waste into recyclables or non-recyclables.

Complete the following table.

Solid waste	Source	Recyclables	Non-recyclables
Drinking can	House	√	

2) GROUP DISCUSSION

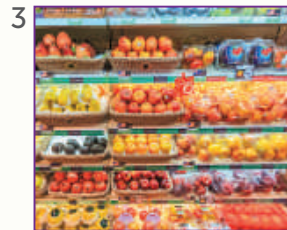
Based on the information from the table, pupils discuss on how to further manage solid waste at source systematically.

QUESTIONS

For questions 1 to 8, choose the correct answers based on the given pictures. Write A or B in the appropriate box.

- A Recyclables
- B Non-recyclables


☐

☐

☐

☐

☐

☐

☐

☐

Food waste, plastic, garden waste, rubber, paper, metal, textiles and glass

9 What is the type of waste based on the information above?

- A Solid waste
- B Toxic waste
- C Chemical waste
- D Radioactive waste

10 The process of separation of waste at source refers to

- A separating waste to be burned.
- B waste separation to be buried in the ground.
- C waste collection for ease of cleaning workers.
- D separating waste into recyclables and non-recyclables.

ANSWER SCHEME

1 B

2 A

3 B

4 A

5 B

6 A

7 A

8 B



9 A

Food waste, plastic, garden waste, rubber, paper, metal, textiles and glass are solid waste.

10 D

The process of separation of waste at source refers to the separation of waste that can be recycled and cannot be recycled.

CHAPTER 6 | 3Rs: OUR RESPONSIBILITY

Key Notes

- i) The main thrust of the National Solid Waste Management Policy (Amendment) 2016 is the reduction of solid waste through the 3Rs.
- ii) Reduce means buying only what is needed to avoid wastage and reduce the amount of solid waste generated.
- iii) Reuse means using a product that can be reused again.
- iv) Recycle means to separate and collect recyclable waste that can be converted into new products.



Reduce



Reuse



Recycle

LEARNING OUTCOMES

At the end of the lesson, pupils will be able to:

State the meaning of 3Rs (Reduce, Reuse, Recycle)

Understand the advantages of 3Rs

Understand the concept of recycling



6.1 Concept of 3Rs

Reduce

To reduce
consumption

Reuse

To reuse
products that can
be used again

Recycle

To recycle products
into new materials

Why 3Rs? Improper waste management will lead to the increase of solid waste going to landfills. The rise in the amount of waste at landfills will shorten its lifespan as it reduces the amount of space at the landfill. This will result in more landfills being built to accommodate the ever increasing solid waste.

3Rs will help reduce the amount of solid waste being sent to landfills. It also helps in reducing air and water pollution that adversely affects the environment. The effective implementation of 3Rs is important to reduce the dumping of waste in landfills.

Malaysians produce more than 38,000 tonnes of solid waste per day.
Only 1/3 of the total solid waste is recycled and
the remaining ends up in the landfills.

Source : Modul Latihan Kelab Kitar Semula Sekolah
(Solid Waste and Public Cleansing Management Corporation (SWCorp), 2018)

6.2 Reduce

Reduce means to take action to reduce the generation of waste before and during the use of products. For example, we buy only what is needed to avoid wastage and optimise the use of products. This will indirectly minimise the amount of waste generated and sent to landfills.



Make a shopping list of what is needed to be purchased

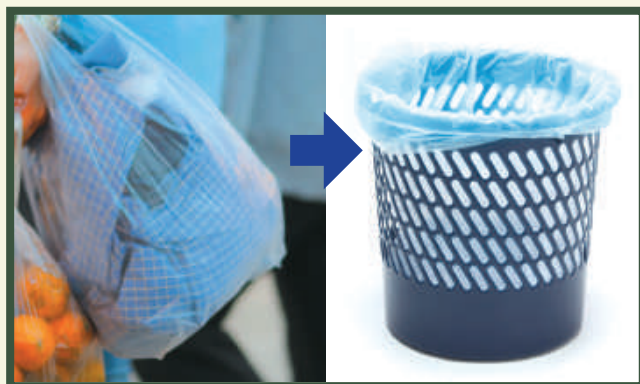


Avoid food wastage

6.3 Reuse

Reuse means to reuse a product or part of the product to prevent it from being disposed. Repeated use of a product will extend a product lifespan and reduce waste generation in our daily life.

The following are some examples of how we can reuse a product and prevent it from being disposed.



Reuse a carrier bag as a bin liner



Reuse water bottle as a pot for plants

6.4 Recycle

Recycling requires you to separate and collect recyclable waste so that it can be converted into new products. Solid waste such as glass, metal, plastic and paper that are separated and collected are sent to a recycling centre to be processed into new products that generate income.

Recycling produces recycled materials. These materials can be used as an alternative to existing raw materials used in the production of new products, hence it will reduce dependency on natural resources.

Separation at source is necessary for recycling to be effective. The separation of solid waste allows recyclables to be segregated thus reducing the amount of solid waste sent to landfills.

Examples of recycling bins in Malaysia:



Type: Paper

All types of paper products such as newspapers, magazines, books, sheets of paper, catalogues, brochures, calendars, cards, envelopes and cardboard boxes.

Excluding tissue paper, carbon paper, waxed paper, aluminium foil and plastic-coated paper.



Type: Glass

All types of glass products such as soft drink bottles, food jars, vitamin bottles and cosmetic bottles.

Excluding crystals, mirrors, windows, glass used in automobiles, porcelain, ceramic, metal, laboratory equipment and the jar or bottles used to contain toxic substances.



Type: Aluminium, steel and plastic

Soft drink cans, food containers, plastic bags, bottles, detergent bottles and vitamin bottles.

Excluding paint containers, containers used for toxic materials and laboratory equipment.

Source : National Solid Waste Management Department (JSPSN)

Recycling bins are identified by their labels and not solely by their colours.

Recycling process for plastic bottles:



Do you know?



“ A **Waste To Energy (WTE)** plant is a solid waste management system that treats and converts waste to an energy source that can be used to generate electricity and heat. ”

Source : Ministry of Housing and Local Government (KPKT)

6.5 Advantages of 3Rs

- Reduce pollution and protect the environment
- Reduce solid waste going to landfills
- Reduce dependency on natural resources
- Change of lifestyle
- Saves money

6.6 3Rs and Plastic

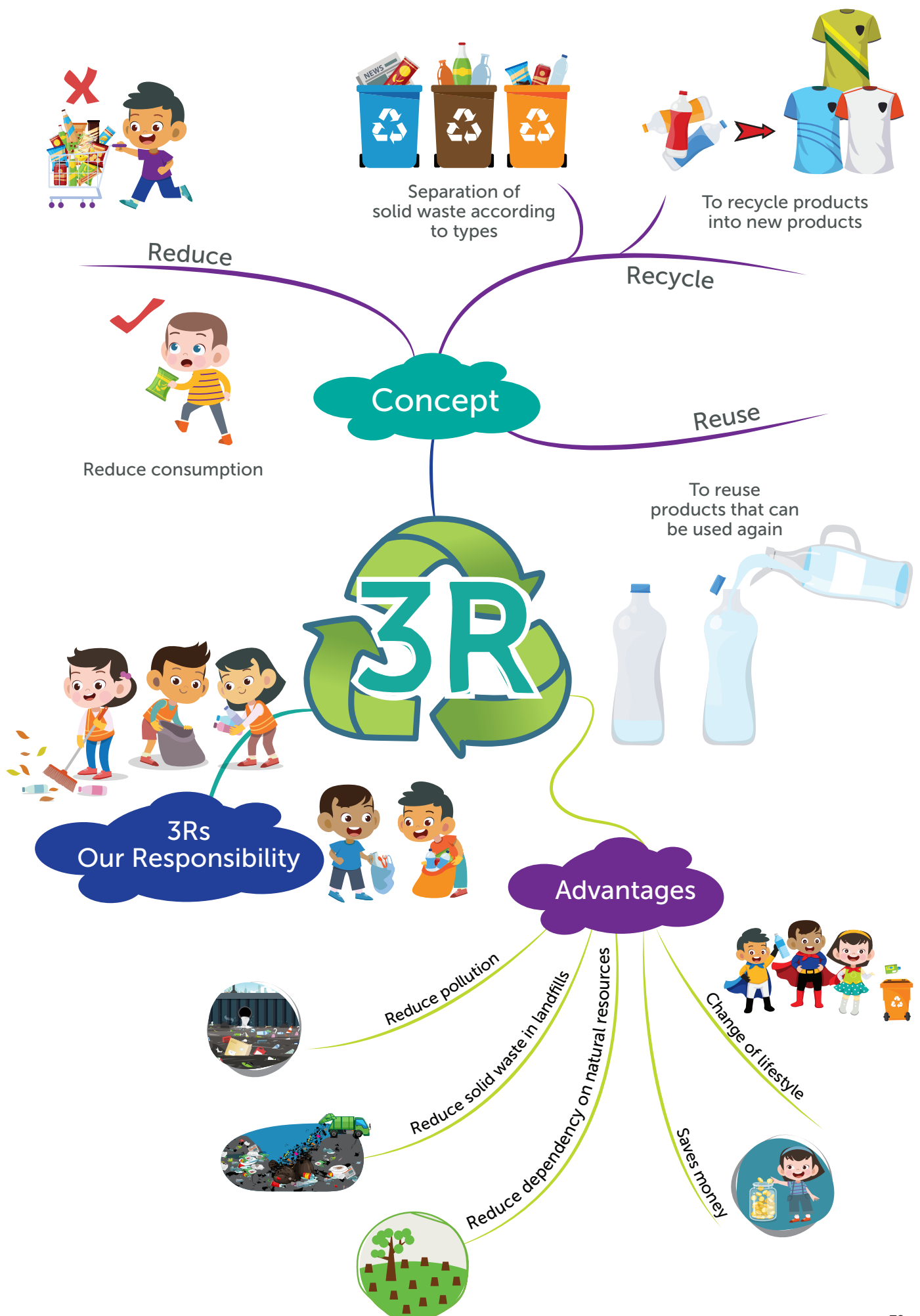
As stated in Chapter 5.2, we have learned that plastic waste is the second largest contributor to the composition of solid waste in Malaysia. Plastic waste must be managed properly just like any other waste. Plastic waste can be reduced by adopting 3Rs in our daily life.

Myth 6:

Plastic bags cannot be recycled.

Fact:

Most plastics, including plastic bags can be recycled to produce new products.



ACTIVITIES

1) VIDEO SESSION ABOUT 3Rs

Pupils watch the video of "3Rs Nature Heroes".

Pupils discuss the lessons learned from the video.

Guide for discussion:

- i) What is the importance of 3Rs?
- ii) Discuss how you can apply 3Rs in your daily activities.

Note: Retrieve the video from "VIDEO" folder located in the USB flash drive.

2) ACTIVITY ON WASTE SEPARATION

- Pupils are given explanation on composting of food waste.
- Cut out the pictures and paste on the appropriate category.

3Rs	Composting



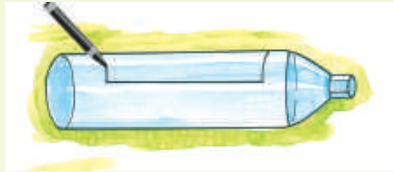
Be careful when using scissors



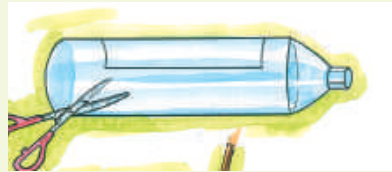
3) ACTIVITY ON REUSE: HANGING FLOWER POT

Tools/materials:

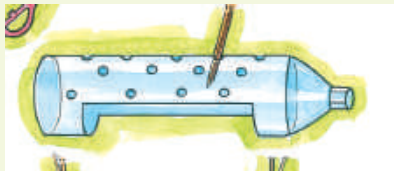
- a) Plastic bottle
- b) Marker pen
- c) Cord
- d) Scissors
- e) Cloth
- f) Soil and seedlings/saplings



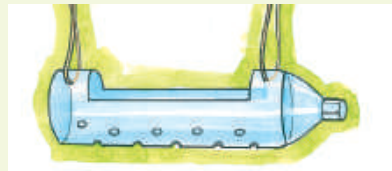
1) Draw a line



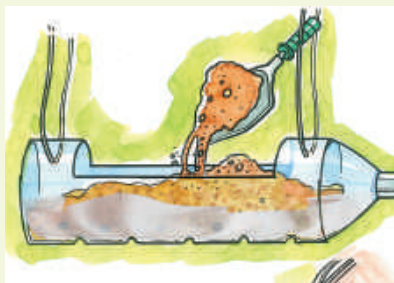
2) Cut along the line



3) Make a few holes



4) Tie the cord from end to end



5) Layer with fabric and put the soil in



6) Plant the seeds



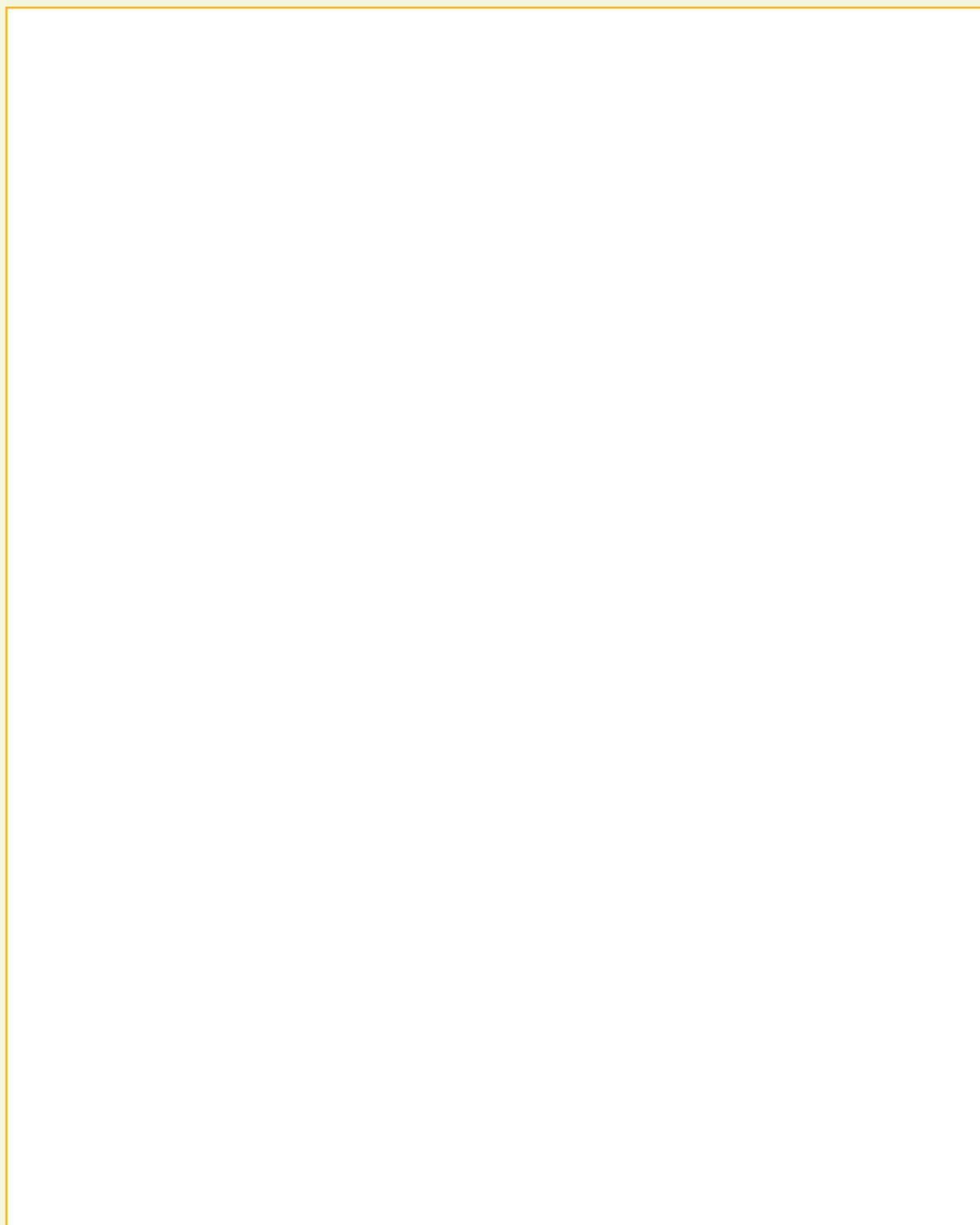
Hanging Flower Pot

4) POSTER

Pupils create a poster based on any of the following themes:

- i) Environment
- ii) Pollution
- iii) 3Rs

Pupils should portray the differences between a polluted world and a protected environment.



5) RECYCLE BOXES

Steps:

- a) Prepare three boxes of the same size.
- b) Label each box with the following:
 1. Paper
 2. Plastic
 3. Aluminium
- c) Bring recyclable waste and separate accordingly.
- d) Send the filled boxes to the nearest recycling centre and sell the recyclables.



QUESTIONS



Figure 1

- 1 Figure 1 represents
- A reduce.
 - B reuse.
 - C recycle.
 - D separation at source.



Figure 2

- 2 Figure 2 represents
- A reduce.
 - B reuse.
 - C recycle.
 - D separation at source.



Figure 3

- 3 Figure 3 represents
- A reduce.
 - B reuse.
 - C recycle.
 - D separation at source.



Figure 4

4 Figure 4 shows a recycle bin for

- A wood.
- B glass.
- C paper.
- D aluminium, steel and plastic.



Figure 5

5 Figure 5 shows a recycle bin for

- A wood.
- B glass.
- C paper.
- D aluminium, steel and plastic.

6 Which of the following are the advantages of 3Rs?

- P Reduce solid waste in landfills
- Q Changing into a luxurious lifestyle
- R Increase dependency on natural resources
- S Reduce pollution and protect the environment

- A P and S
- B Q and R
- C P, Q and R
- D All of the above

Questions 7 to 10 refer to Figure 6.

- A Buy
- B Use
- C Separate
- D New Product



Figure 6

7

8

9

10

ANSWER SCHEME

1 C

2 B

3 A

4 C

5 D

6 A

The advantages of 3Rs are as follows:

- reduce pollution and protect the environment.
- reduce solid waste in landfills.
- reduce dependency on natural resources.
- change of lifestyle.
- saves money.

7 A

8 B

9 C

10 D

CONCLUSION

We are living in a fast-paced world where life is getting more convenient due to technological advancement and easy access to a wide range of products. Our lifestyle has improved and awareness on environmental-related issues is heightened.

However, these technological advancements and sophisticated lifestyle have slowly deteriorated the world due to overconsumption leading to high waste generation. Thus, we must enhance our efforts to ensure the sustainability of the environment.

The innovation and production of materials with unique properties such as plastic is essential to fulfil our daily needs, hence a proper waste management system is required. We now realise that these materials must be managed properly at the end of their lifespan.

We have the responsibility to perform waste separation at source along with the 3Rs as our daily habits and inculcate these practices as a part of our culture. This will reduce the amount of waste going to landfills and increase the recycling rate.

The **Plastic, Environment & You** module serves as a guide for us to fulfil our responsibilities as Nature Heroes. Together, let's preserve and conserve the environment!

GLOSSARY

Bakelite

A synthetic thermoset plastic used to make telephones, toys, radios and jewellery. It is also a good electrical insulator.

Contamination

The action or state of making or being made impure by polluting or poisoning.

Ecosystem

A community of organisms that interact with each other and the environment consisting of biotic elements (plants, humans and animals) and abiotic elements (sunlight, water, air, and soil).

Epoxy

A type of reactive prepolymer or polymer which contains epoxide groups.

Insulation

To cover something with a material or substance in order to stop heat or electricity from escaping or entering.

Leptospirosis

An infectious bacterial disease occurring in rodents, dogs, and other mammals, which can be transmitted to humans.

Life cycle

The process of production through the usage and final disposal of a product.

Malaria

An intermittent and remittent fever caused by a protozoan parasite which invades the red blood cells and is transmitted by mosquitoes in many tropical and subtropical regions.

Marine litter

Marine litter consists of items that have been made or used by people and deliberately discarded into the sea or rivers or on beaches; brought indirectly to the sea by rivers, sewage, storm water or winds; or accidentally lost, including material lost at sea in bad weather.

Materials Recovery Facility

A plant to receive, separate and prepare recyclable materials.

Melamine Resin

Thermosetting plastic material which is made from melamine and formaldehyde.

Monomer

A molecule that can be bonded to other identical molecules to form a polymer.

Nylon

A tough, lightweight, elastic synthetic polymer with a protein-like chemical structure, able to be produced as filaments, sheets, or moulded objects.

Open burning

Any type of uncontrolled burning that occurs in open air.

Pellet

A small, rounded compound.

Polyethylene

A type of plastic that is tough, light, and flexible, generally used for plastic bags, food containers, and other packaging.

Polyethylene terephthalate

A type of plastic widely used to make polyester fibres.

Polymer

A substance which has a molecular structure built up chiefly or completely from a large number of similar units bonded together.

Polytetrafluoroethylene

A type of tough plastic that is widely used to coat the inner surface of non-stick cooking utensils and to make seals and bearings.

Polyvinyl chloride

A tough chemically resistant plastic and widely used for a variety of products including pipes, flooring, and sheeting.

Recycle

Way or technique to process recyclable items or materials (used aluminium, glass, paper and plastic) to allow for new usage.

Reduce

Reducing the generation of waste before and during the usage of a product.

Reuse

Reusing products or materials that can be used again.

Separation at source

The process of separating solid waste at source (home, office, school) into recyclables and non-recyclables.

Solid waste

Anything in solid form that has to be disposed because it is broken, contaminated, old, unwanted, broken etc. Types of solid waste are plastic, garden waste, rubber, paper, metal, textile and glass.

Sustainability

Sustainability is about efforts to preserve the social, economic and environmental well-being of the current generation without compromising the ability of future generations to meet their own needs.

Synthetic

Made by chemical synthesis, especially to imitate a natural product.

Thermoplastic

Plastic that melts on heating and hardens on cooling, and are able to repeat these processes.

Thermoset

Plastic which sets permanently when heated.

Vector

An organism, typically a biting insect or tick, that transmits a disease or parasite from one animal or plant to another.

ACKNOWLEDGEMENT



MINISTRY
OF EDUCATION
MALAYSIA



PETRONAS

PETRONAS Chemicals Group Berhad
would like to accord our appreciation and
utmost gratitude to the
National STEM Centre, Ministry of Education,
Malaysian Plastics Manufacturers Association (MPMA),
Solid Waste and Public Cleansing Management Corporation (SWCorp)
and all other parties directly or indirectly involved in curating and
making this effort possible.

It is our sincere hope that our collective efforts will ensure a sustainable
world for future generations.

In collaboration:



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