

THEME

1

Maintenance and Continuity of Life



- What is the importance of biodiversity to humans?
- How can we maintain the balance of nature?
- Why is it important to have a healthy lifestyle?
- What are the practices that strengthen our immune system?



Biodiversity

What is biodiversity?

Why is it important to classify organisms systematically?

How is biodiversity conserved?

Let's understand:

- Diversity of organisms
- Classification of organisms

SCIENCE BLOG

The Rafflesia in Malaysia

Malaysia is the habitat of the world's largest flower, the rafflesia (*Rafflesia* sp.). The rafflesia is a parasitic plant that feeds on its host.

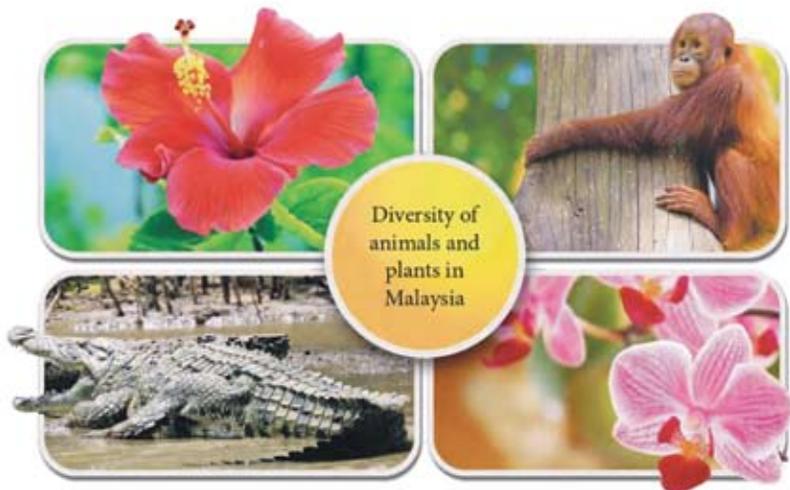
The rafflesia gives off a rotting smell when in full bloom. This flower is also very unique because it does not have any leaves to carry out photosynthesis, nor does it have roots to absorb water and nutrients from the soil.



Keywords

- ▶ Biodiversity
- ▶ Vertebrate
- ▶ Invertebrate
- ▶ Mammal
- ▶ Bird
- ▶ Reptile
- ▶ Fish
- ▶ Amphibian
- ▶ Monocotyledon
- ▶ Dicotyledon

Did you know that our country, Malaysia, is one of the 12 **megabiodiversity** countries in the world? The **equatorial** climate of Malaysia makes it a very ideal habitat for a variety of organisms. Can you name the animals and plants shown in Photograph 1.1?



Photograph 1.1 Diversity of animals and plants in Malaysia

What is Biodiversity?

The diversity of organisms, whether microorganisms, animals or plants, is known as **biodiversity**. Biodiversity exists as a result of the diversity of **habitat** and **climate**. Different organisms have different characteristics which enable them to adapt and thrive independently in their respective habitats (Photograph 1.2).

Science Info

Biodiversity also covers diversity at the genetic level. Genetic diversity is the diversity within a species, based on variations in the genes of each microorganism, animal or plant.



Desert



Polar regions



Soil



Sea

Photograph 1.2 Diverse organisms in different habitats

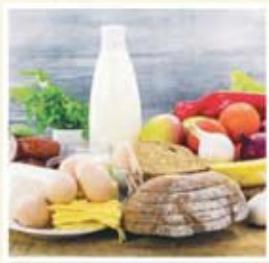
The Importance of Biodiversity

Biodiversity is a priceless treasure and a legacy of nature which should be preserved. Can you list down some of the importance of biodiversity based on Photograph 1.3?

Today in History

The International Day for Biological Diversity is celebrated on the 22nd of May every year.

Sources of food



Animals and plants supply food to humans.

Balance in nature



Cycle of nutrients, pollination and interaction between organisms create balance in nature.

Recreational places



Areas that are rich in biodiversity can be developed as recreational places.

Medical



Herbs are widely used in the manufacture of medicines and cosmetics.

Raw materials for industries



Timber, bamboo and rattan are examples of forest products which are used to make musical instruments, furniture and to build buildings.

Education



Humans increase knowledge and create new technology through scientific research on microorganisms, animals and plants.

Photograph 1.3 Importance of biodiversity

Effective Biodiversity Management

It cannot be denied that we need raw materials such as timber for development. Nevertheless, deforestation activities need to be controlled to preserve our biodiversity from extinction (Photograph 1.4).

What methods can we use to maintain and conserve biodiversity? Biodiversity can be maintained and conserved by:

- banning the killing or trade of **endemic** and **endangered** animals and plants through the Wildlife Protection Act 1972,
- protecting the habitat through creating national parks, marine parks, forest reserves and wildlife sanctuaries,
- undertaking reproductive programmes such as seedling nurseries to help with reforestation and turtle hatcheries.



Photograph 1.4 Deforestation activities cause animals to lose their habitat and food sources



An endemic species is a species that lives in clusters within a restricted habitat in a specific location. Examples of endemic plants and animals in Malaysia include the rafflesia, pitcher plant (*Nepenthes rajah*), leatherback turtle, Malayan tiger and the Borneo Pygmy elephant.

Activity 1.1

Aim: To conduct a discussion on effective biodiversity management.

Instruction

1. Work in groups.
2. Find information on:
 - (a) factors that cause the extinction of animals and plants
 - (b) ways to preserve and conserve animals and plants including endemic and endangered species
3. Present your group findings in class.



The methods of biodiversity conservation can be classified as **in situ conservation** and **ex situ conservation**. In situ conservation, preserves the species within their natural habitat such as in national parks, permanent forest reserves and marine parks. Ex situ conservation, on the other hand, preserves the species outside of their natural habitat such as in zoos and botanical parks.

Formative Practice 1.1

1. What is biodiversity?
2. How does biodiversity contribute to the economy?
3. What is an endemic species? Give two ways to preserve and conserve endemic species.
4. Give examples of endangered species in Malaysia.

1.2 Classification of Organisms

The two main groups of organisms are animals and plants. Animals and plants can be classified further into smaller groups based on their common and different characteristics. Study Photograph 1.5. What are the similarities and differences between the two animals?



Photograph 1.5

Classification of Animals

Animals can be classified as **invertebrates** and **vertebrates**. Can you state the differences between these two groups of animals?

Invertebrates

Invertebrates are animals without a backbone. Figure 1.1 shows the classification of invertebrates.

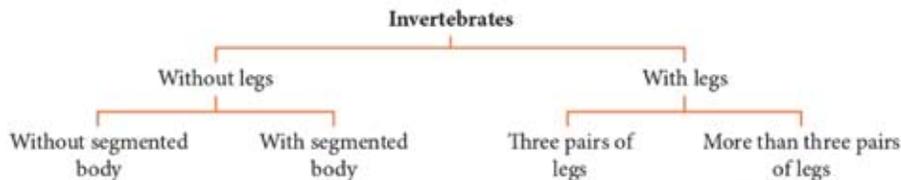


Figure 1.1 Classification of invertebrates



Segmented body is the division of an animal's body into several segments.

Invertebrates Without Legs

1 Without segmented body

- There are invertebrates without legs and without segmented bodies.



Sponge



Sea anemone



Corals



Planaria

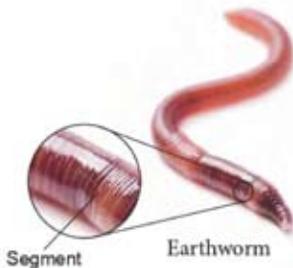


Snail

Photograph 1.6 Invertebrates without legs and without segmented bodies

2 With segmented body

- Some invertebrates without legs have segmented bodies.



Photograph 1.7 Invertebrates without legs with segmented bodies

Invertebrates With Legs

Characteristics of invertebrates with legs:

- have segmented bodies
- have hard outer shells (exoskeleton)



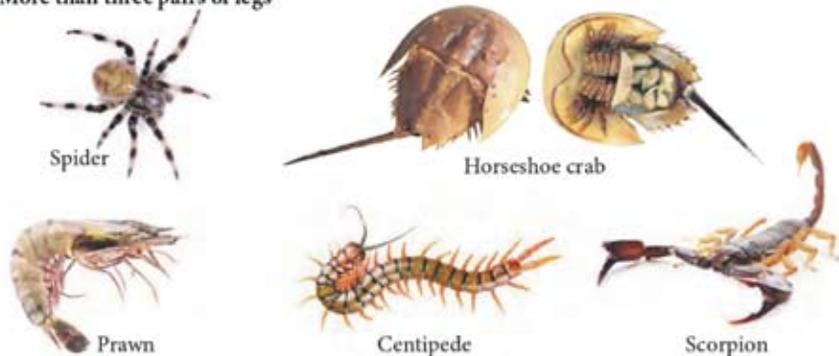
Insects are the largest group of animals. There are 950 000 species of insects.

1 Three pairs of legs



Photograph 1.8 Invertebrates with three pairs of legs

2 More than three pairs of legs



Photograph 1.9 Invertebrates with more than three pairs of legs

Vertebrates

Vertebrates are animals with a backbone (Figure 1.2).

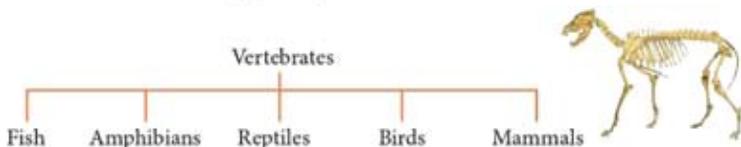


Figure 1.2 Classification of vertebrates

Fish

Fish are animals with the following common characteristics:

- poikilothermic
- covered in hard and slimy scales
- have fins and a tail
- breathe through gills
- lay eggs
- undergo external fertilisation



**Science
Info**

A **poikilotherm** is an organism that has a body temperature that changes according to its surrounding temperature. A **homeotherm**, on the other hand, is an animal with a body temperature that is constant and free from the influence of its surrounding temperature.



Clown fish



Grouper



Eel

Photograph 1.10 Examples of fish

Amphibians

Amphibians are animals with the following common characteristics:

- poikilothermic
- live on land and in water
- covered with moist skin
- young amphibians breathe through gills
- adult amphibians breathe using their lungs and moist skin
- produce jelly-like eggs (spawn) without a shell
- undergo external fertilisation



Salamander



Toad



Frog spawn



Tadpole



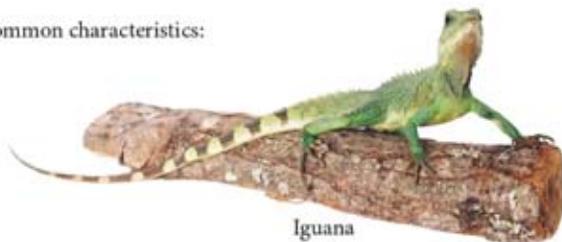
Frog

Photograph 1.11 Examples of amphibians

Reptiles

Reptiles are animals with the following common characteristics:

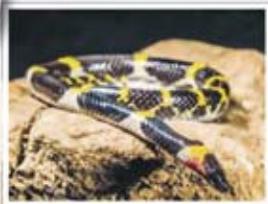
- poikilothermic
- produce eggs with a shell
- breathe through lungs
- have scales and hard skin
- undergo internal fertilisation



Iguana



Turtle



Snake



Crocodile

Photograph 1.12 Examples of reptiles

Birds

Birds are animals with the following common characteristics:

- homeothermic
- covered with feathers to maintain body temperature
- breathe through lungs
- have wings that help some birds to fly
- have a pair of scaly feet
- undergo internal fertilisation
- produce eggs with hard shell



Kingfisher



Owl



Duck

Photograph 1.13 Examples of birds

Science Info

The rhinoceros hornbill is a protected animal in Malaysia. It is the state bird of Sarawak.



Let's play

My Malaysia!

Malaysia is a habitat for nearly 742 species of birds. At least 522 species are local species, 192 are migratory species and 52 are local species with migratory characteristics.

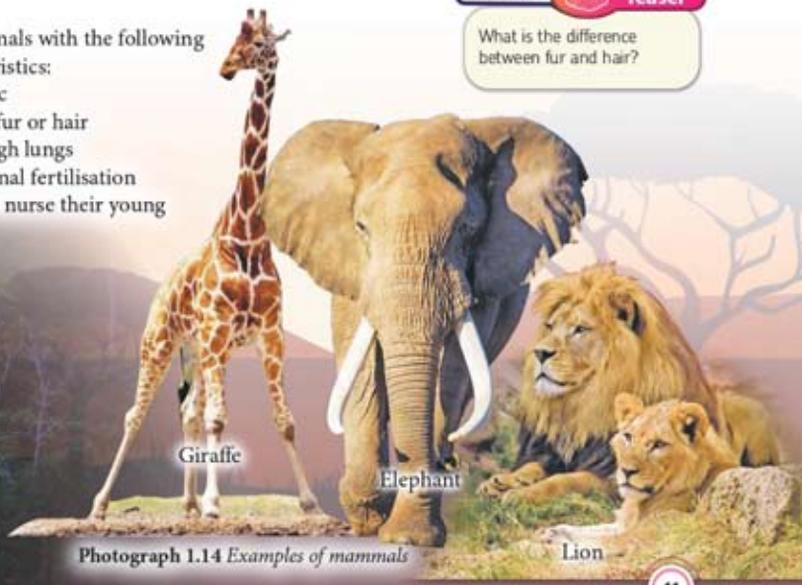
Mammals

Mammals are animals with the following common characteristics:

- homeothermic
- covered with fur or hair
- breathe through lungs
- undergo internal fertilisation
- give birth and nurse their young



Bat



Giraffe

Elephant

Lion

Photograph 1.14 Examples of mammals

Brain Teaser

What is the difference between fur and hair?

Classification of Plants

Plants are classified as **non-flowering** and **flowering** plants.



Figure 1.3 Classification of plants



Non-vascular plants are simple and small plants without a vascular system.

Vascular plants have a vascular system within them that transport water and food throughout the plant. These plants also have true roots, stems and leaves.

Non-flowering Plants

Non-flowering plants consist of **moss**, **fern** and **conifer**. What are the common characteristics of each of these groups of plants?

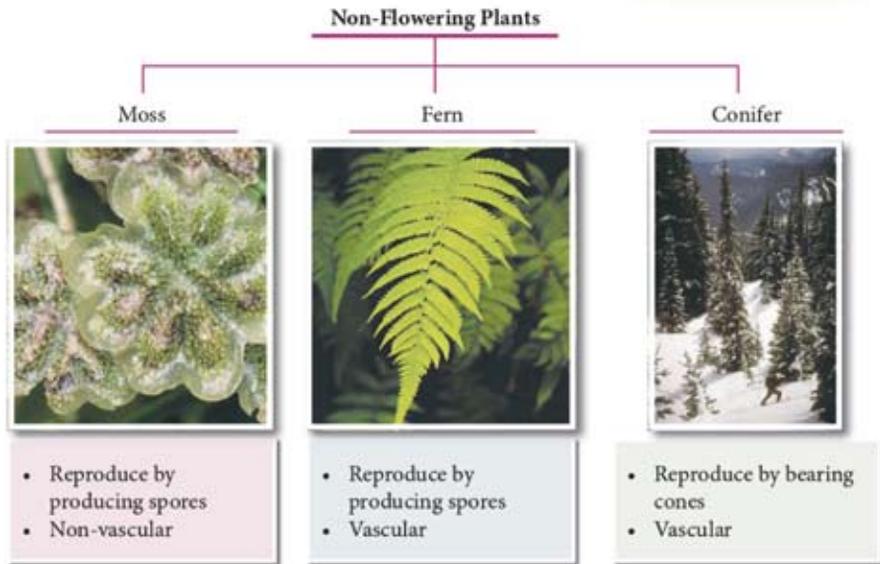


Figure 1.4 Classification of non-flowering plants

Flowering Plants

Flowering plants produce flowers which become fruits that contain seeds. Each seed has a **cotyledon**, which is stored food that is used by the seed to germinate. A seed which has one cotyledon is called a **monocotyledon**. A seed with a pair of **cotyledons** is called a **dicotyledon** (Figure 1.5).



Photograph 1.15 Examples of flowering plants

		Differences	
Monocotyledons		Dicotyledons	
One		Number of cotyledons	Two 
Fibrous root		Root	Tap root
Leaves with parallel veins		Leaf	Leaves with network-like veins
Most have non-woody stem		Stem	Woody stem
Paddy and maize plants		Example	Tomato plant and durian tree

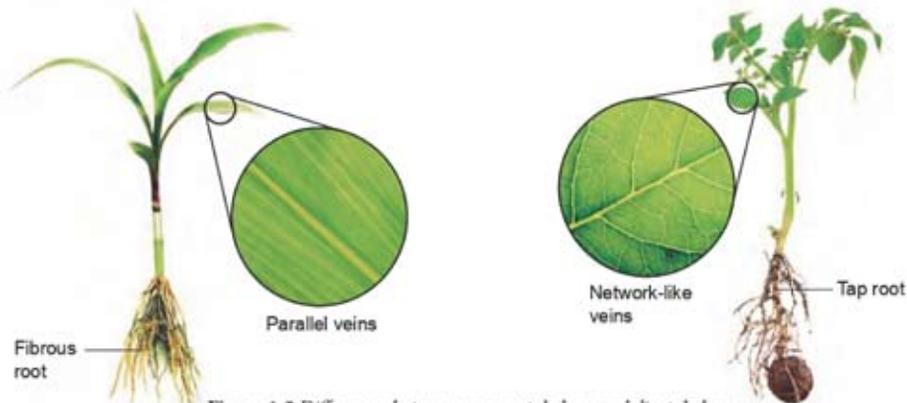


Figure 1.5 Differences between monocotyledons and dicotyledons

Activity 1.2

Aim: To identify the characteristics which differentiate major taxonomy groups.

Instruction

1. Work in groups.
2. Identify the differences between
 - (a) plants, animals and fungi
 - (b) fish, amphibians, reptiles, birds and mammals
3. Present the results using a multimedia presentation.

Constructing a Dichotomous Key

A **dichotomous key** is a method used by biologists to identify and classify organisms systematically based on similarities and differences. It is constructed of a series of couplets. Each couplet consist of two statements describing characteristics of a particular organism or group of organisms. Let's look at the example of a dichotomous key for animals (Figure 1.6) and plants (Figure 1.7).



	<u>Dichotomous key</u>
1. (a) Poikilothermic	go to 2
(b) Homeothermic	go to 3
2. (a) Scaly skin	go to 4
(b) Non-scaly skin	Frog
3. (a) Non-feathered	Lion
(b) Feathered	Chicken
4. (a) Does not have fins	Snake
(b) Has fins	Pomfret

Figure 1.6 Example of a dichotomous key for animals



Maize plant

*Marchantia* sp.

Fern

*Gnetum* sp.

Sunflower plant

Dichotomous key

1. (a) Non-flowering go to 2
- (b) Flowering go to 3
2. (a) Non-vascular *Marchantia* sp.
- (b) Vascular go to 4
3. (a) Monocotyledon Maize plant
- (b) Dicotyledon Sunflower plant
4. (a) Does not produce seeds Fern
- (b) Produce seeds *Gnetum* sp.

Figure 1.7 Example of a dichotomous key for plants

**Activity 1.3**

Aim: To construct a dichotomous key.

Instruction

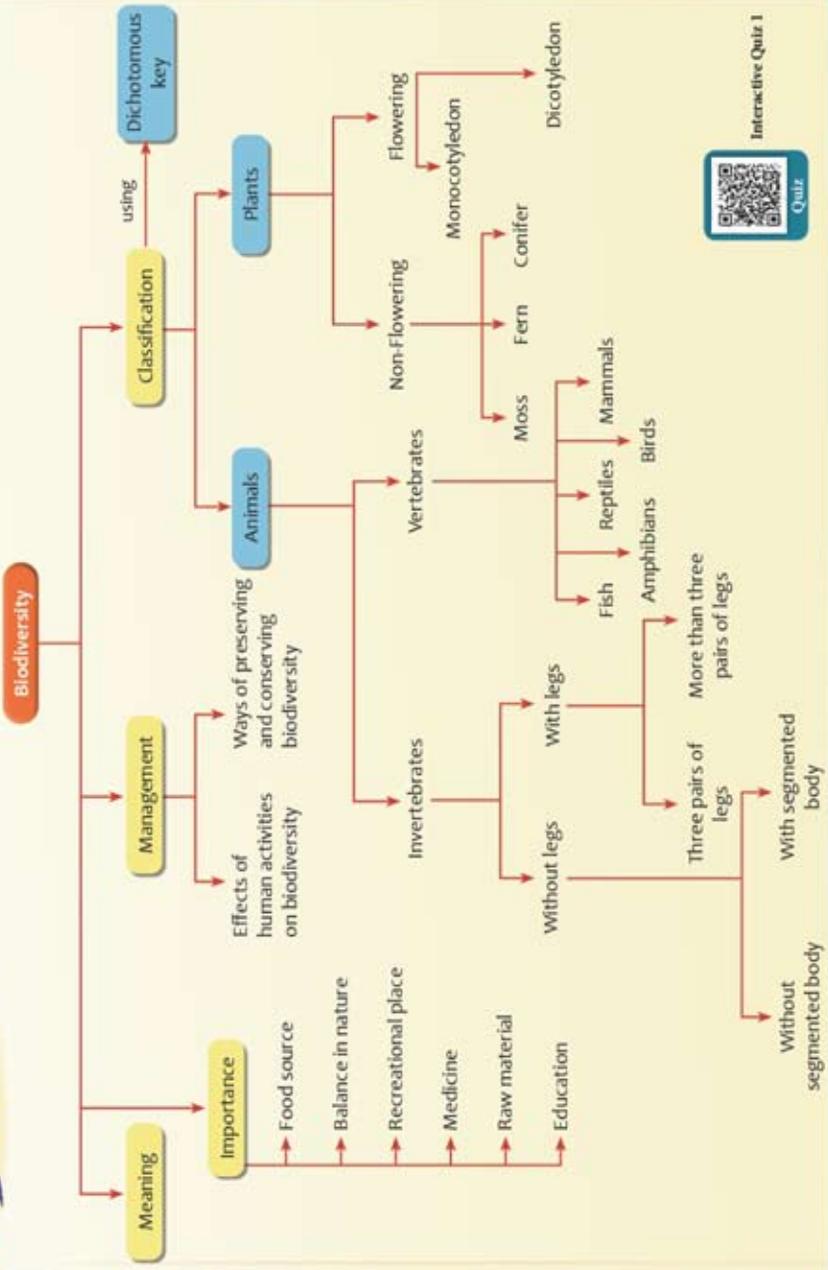
1. Work in groups.
2. List down as many invertebrates found in your school compound.
3. Construct a dichotomous key for the invertebrates.
4. Present your group findings in class.

Formative Practice 1.2

1. Classify the following animals according to their common characteristics.

tortoise, crocodile, eel, orang utan, dolphin, platypus, penguin, frog, duck, toad

2. The sunflower plant and paddy plant are flowering plants. State one similarity and three differences between the two plants.
3. Give two differences between monocotyledon and dicotyledon plants.



Interactive Quiz 1



SELF-REFLECTION

After learning this chapter, you are able to:

1.1 Diversity of Organisms

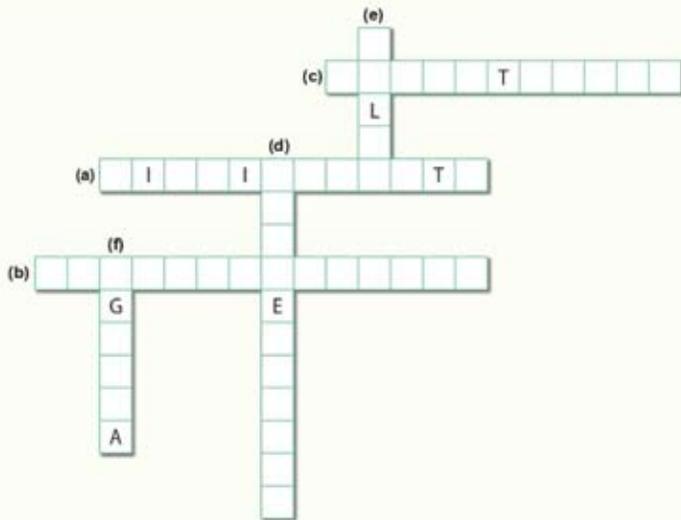
- Elaborate and communicate on biodiversity.
- Justify the needs of effective biodiversity management.

1.2 Classification of Organisms

- Differentiate organisms using a dichotomous key based on common characteristics.
- Characterise the major taxonomy groups.

Summative Practice 1

1. Complete the crossword puzzle below with the correct answers.



Across

- (a) The diversity of organisms whether animals, plants or microorganisms is known as _____.
- (b) Amphibians are _____ or cold-blooded.
- (c) A _____ key is used by biologists to identify and classify organisms systematically.

Down

- (d) _____ are animals which have backbones.
- (e) Fish breathe through _____.
- (f) An _____ is an example of a reptile.

2. Tick (✓) the true statement and cross (X) the false statement.

- (a) Biodiversity is the diversity of living and non-living organisms.
- (b) Biodiversity is very important for the continuity of human's existence.
- (c) Apart from classifying living things, a dichotomous key can also be used to classify non-living things.

3. Liana and some of her friends collected the following five types of animals when they conducted a sampling activity in a forest.



Three pairs of legs

P



Three pairs of legs

Q



Three pairs of legs

R



Four pairs of legs

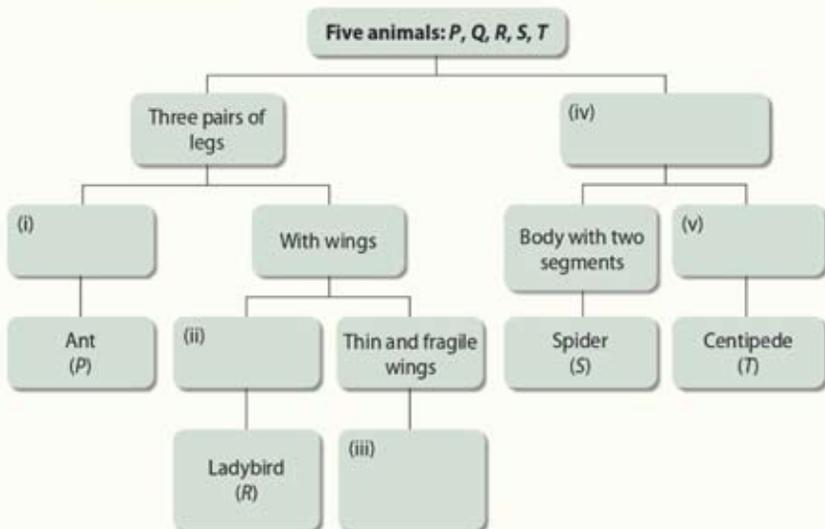
S



More than four pairs of legs

T

(a) Complete the following dichotomous key based on the physical characteristics of the animals collected by them.



(b) What are the similarities between animals P, Q, R, S and T?

(c) What are the differences between animals P, S and T?

4. Observe Figure 1.

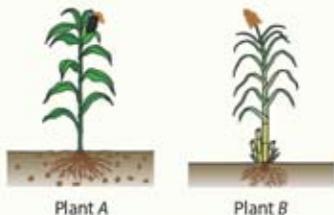


Figure 1

- (a) Suggest two characteristics that can be used to classify plants.
- (b) Give three similarities between plant A and plant B.

5. Sik Mei observed similarities between the three animals in Photograph 1. Sik Mei thinks that the three animals are in the same group. Is Sik Mei correct? Give your reasons.



Scorpion



Jellyfish



Crab

Photograph 1

6. List the differences between the animals in Photograph 2. Construct a dichotomous key to identify the animals.



Planaria



Butterfly



Earthworm

Photograph 2

HOTS Mastery 1

7. Deforestation is a huge threat on a global level. Nevertheless, it contributes to the development of a nation. Justify the needs for deforestation.
8. Photograph 3 shows a leatherback turtle, an endemic animal. Hunting this animal has serious consequences. Justify.



Photograph 3