ACTIVITY 2.1 Living and non-living

SKILLS
- Literacy
- Thinking and analysing

In biology, we start to classify the things in the world according to whether they are living or non-living. Living things have special features that make them distinctly different from non-living things.

1 All living things share eight key features. Complete the mnemonic below to outline the meaning of each feature.

a MR N GREWW

Movement: living things can move by themselves

R _____

N _____

G _____

R _____

E _____

W _____

W _____

b Construct your own mnemonic using the letters above.

_____

_____

2 Classify the following as living or non-living.

a cat _____ salt _____

a drop of water _____ bacteria _____

an ant _____ grass _____

mould _____ computer _____

3 Choose ONE of the items from question 2 that you classified as living and outline why it is living.

_____

_____

4 Choose ONE of the items from question 2 that you classified as non-living and outline why it is non-living.

_____

_____

5 A cloud can grow, it can reproduce, it can move. Explain whether or not it is a living thing.

_____

_____

6 The most advanced robots being developed today can do many things. Search the Internet for an article on the most advanced robot. Which of the features of living things does the robot show and which is it missing? Justify your answer.

_____

_____

_____

7 Light a candle and observe the candle flame. Describe how it can carry out each of the features.

Movement: the flame moves by wafting and flickering

R _____

N _____

G _____

R _____

E _____

W _____

W _____

Fig 2.1

8 Discuss whether the flame is living or non-living.

_____

_____

ACTIVITY 2.2 Sorting into kingdoms

SKILLS
- Researching and analysing data
- Group work

1 Break up into six groups. Each group must use the Internet to research one of the living or non-living things below, and answer the following questions:

   a How does it move?
   b How does it reproduce?
   c How does it obtain nutrients?
   d How does it grow?
   e How does it respond?
   f How does it exchange gases?
   g How does it excrete wastes?
   h How does it obtain water?

2 Construct a one page information sheet to present to the class.

   a Each group should present their findings to the class.

   b Each group should also be assessed by their peers and could also perform a self-assessment which analyses team work and their personal contribution to the group.

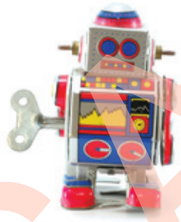
Seaweed (kelp)

Is this a living thing?

Shark

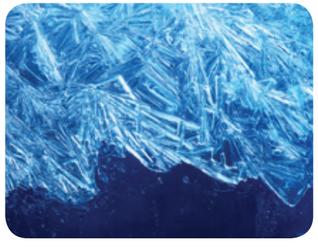
Is this a living thing?

Toy robot



Is this a living thing?

Ice crystals

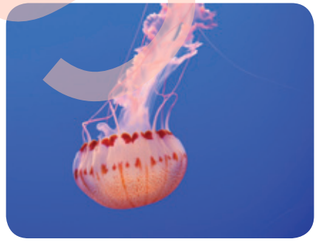


Is this a living thing?

Sea monkey

Is this a living thing?

Sea jelly



Is this a living thing?

ACTIVITY 2.3 Using keys

SKILLS
- Systems
- Processing and analysing data

A simple key can easily be designed to identify a range of living things. For instance, we can classify organisms as being autotrophic (able to make their own food) or heterotrophic (needing to get food from other organisms).

1 What is a dichotomous key?

2 Identify the two types of dichotomous key.

3 Which key is easier to use and why?

4 How many classes of vertebrates are there? What are they?

5 In a dichotomous key, classify the classes of vertebrates using significant features.

Classes of vertebrates:

Key:

6 Class Mammalia consists of three groups according to their reproductive strategies. What are these three groups?

7 Classify the three Class Mammalia groups in a dichotomous key, using the alternative format to the one you chose for question 5.

Class Mammalia includes:

Key:

8 Use your key for vertebrates and other information from an Internet search to answer the following questions.

a How is an amphibian similar to a reptile?

b How is an amphibian different to a fish?

9 Classify the objects in Figure 2.2 by constructing a branched key.

Fig 2.2

10 Which characteristics were most useful when classifying the objects from question 9?

11 Use the following key for the questions below.

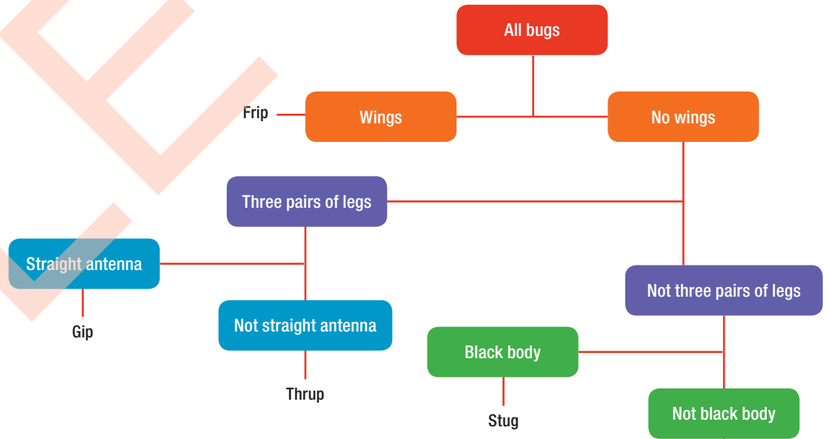


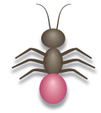
Fig 2.3

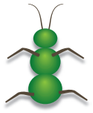
a Identify the type of key used in Figure 2.3.

b Describe the differences between a Brip and a Gip.

c Classify bugs i, ii and iii below using the key above.

i. 

ii. 

iii. 

d Draw a Stug.

12 Explain why scientists need to observe an animal through its entire life cycle to be able to classify it accurately.

13 Classify the subjects offered at your school using either a branched or tabular dichotomous key.

Subjects:

Key:

14 Compare your key to those of your classmates—how are they different? How are they similar? Why might you have chosen different features to classify?

ACTIVITY 2.4

SKILLS
- Classifying and grouping
- Processing and analysing data

Classification using seven levels

Each living thing can be classified according to the seven level classification system: kingdom, phylum, class, order, family, genus and species. The largest grouping is the kingdom and the smallest is the species.

The genus and species are used as a binomial or scientific name to refer to an organism. For example, a human is referred to as *Homo sapiens*.

Kingdom	Animalia	Animalia	Animalia	Animalia	Animalia	Animalia
Phylum	Chordata	Chordata	Arthropoda	Chordata	Chordata	Chordata
Class	Mammalia	Mammalia	Insecta	Reptilia	Aves	Actinopterygii
Order	Primate	Carnivora	Hymenoptera	Squamata	Galliformes	Scorpaeniformes
Family	Hominidae	Felidae	Apidae	Scleroglossa	Phasianidae	Scorpaenidae
Genus	*Homo*	*Uncia*	*Apis*	*Varanus*	*Pavo*	*Pterois*
Species	*sapiens*	*uncia*	*mellifera*	*varius*	*cristatus*	*antennata*
Common Name	Human	Snow leopard	Honey bee	Lace monitor	Peacock	Lion fish

1 Which level of classification contains the most number of organisms?

2 Which level contains the least?

3 Which two species in the table above would be most similar? Why?

4 Which is the most different organism listed in the table above?

5 Which two organisms in the table from Phylum Chordata would be most different? Why?

6 What is special about the way an organism's genus and species is written?

7 What two terms can be used to describe the double name made up of the genus and species?

8 Part of the Lion fish classification is named after the scorpion.

a What features do you think the Lion fish has in common with a scorpion?

b Why do you think it's called a Lion fish rather than a Scorpion fish?

9 The classification of an Australian red kangaroo is written jumbled up below. Write out the correct seven level classification of the kangaroo.

Chordata Animalia Macropodidae *Macropus rufus* Mammalia Diprotodontia

10 Write out some physical characteristics of a kangaroo.

11 Choose an animal and construct a poster of the animal showing the following features:

- A heading
- An image of the animal
- A table listing the seven-level classification of the animal
- Some interesting facts about the animal.

ACTIVITY 2.5 Kingdoms of life

SKILLS
- Patterns, order and organisation
- Literacy

Amongst the largest groupings in the classification system are the Kingdoms. Features such as body form, type of cells and methods of obtaining nutrients are used to classify living things into groups.

Kingdom	Body form and movement	Getting food	Examples	Number of known species
Animalia	Multicellular, with specialised eukaryotic cells.	Heterotrophic	Mammals, birds, reptiles, fish, amphibians, insects, worms, sponges	9 812 298
Plantae	Multicellular, with specialised eukaryotic cells. Cells have a cell wall made of cellulose.	Autotrophic	Trees, flowering plants, conifers, mosses, ferns	320 000
Fungi	Multicellular usually, with specialised eukaryotic cells. Cells have a cell wall made of chitin.	Heterotrophic	Fungi, moulds, mushrooms, yeasts, mildews	1 500 000
Monera	Tiny single-celled organisms, with prokaryotic cells. Some form chains or mats or colonies.	Heterotrophic; few are autotrophic	Bacteria, blue-green algae	1 000 000
Protista	Small single-celled organisms, with a eukaryotic cell. Some form chains or colonies. Usually found in floating water.	Heterotrophic or autotrophic	Algae, amoeba, plankton, protozoans	600 000

1 List the five main kingdoms.

2 Which of the kingdoms has the smallest number of known species?

3 Which of the kingdoms consists of unicellular organisms?

4 Explain how the members of the plant kingdom differ from all other life forms.

5 Which of the kingdoms would be the most successful type of life form on earth? Give reasons.

_____

_____

6 Choose one of the examples listed in the table on page 27 and outline how it addresses the eight characteristics of living things.

Example: _____

M _____

R _____

N _____

G _____

R _____

E _____

W _____

7 Compare Kingdom Fungi with Kingdom Plantae by completing the table of similarities and differences.

Feature (MRNGREWW)	Kingdom Fungi	Kingdom Plantae
Movement	Does not move freely but some movement through growth and reproduction.	Does not move freely but some movement through growth and reproduction.

ACTIVITY 2.6 Vertebrate classes

SKILLS
- Classifying and grouping
- Literacy

There are many different types of animal in the world. The classification system is a way of ordering all the life forms so that we may better understand them. The kingdom is a large grouping; it can be broken down into a smaller grouping called a phylum. All the animals with a backbone or spinal column are in the phylum Chordata.

1 List the five classes of vertebrates.

_____

_____

2 Determine if each of the following statements is true or false.

a Kingdom is a bigger group than phylum. _____

b Plants are in the Kingdom Animalia. _____

c A cat is not a chordate. _____

d An insect is in the Kingdom Animalia. _____

e A frog is an example of a reptile. _____

3 What determines whether an animal is a vertebrate or an invertebrate?

_____

4 How does the term ‘chordate’ differ in meaning from the term ‘vertebrate’?

_____

5 External fertilisation involves the female laying eggs and the male covering the eggs in sperm outside the female body.

a Which two classes of vertebrate use external fertilisation?

_____

b Why would animals that use external fertilisation be more likely to produce large numbers of eggs?

_____

_____

6 Complete the table.

	Fish	Amphibians	Reptiles	Birds	Mammals
Ectothermic or endothermic?					
Body covering?					
Birth from egg or womb?					

7 Complete the list of features for the vertebrate classes.

a Internal skeleton, endothermic, hair/fur _____

b _____ Birds

c Internal skeleton, ectothermic, internal fertilisation _____

d _____ Fish

e Internal skeleton, ectothermic, external fertilisation, moist skin _____

8 Construct a dichotomous key to classify the following:

Labrador dog, cat, parrot, pit-bull dog, penguin, shark, kangaroo

ACTIVITY 2.7 Strange animals

SKILLS
- Group work
- Researching and analysing data

1 Divide into six groups. Each group must use the Internet to research one of the strange creatures from the list below.

2 Produce a newspaper article on the creature. The article must contain:

a a catchy headline

b an introductory sentence

c information columns with a description of the creature—where it is found and an explanation of how it is to be classified

d a picture

e five interesting features of the creature.

Fig 2.4 A bizarre creature, dubbed the 'oriental yeti', has baffled scientists after emerging from ancient woodlands in remote central China. The hairless beast was trapped by hunters, thinking it was a bear. One hunter stated that it doesn't have any fur and it has a tail like a kangaroo.

Fig 2.5 The Ghost Slug (*Selenochlamys ysbryda*). This member of the family *Trigonochlamydidae* (a family of air-breathing land slugs, terrestrial gastropod molluscs) was found in a domestic garden in Wales. It's nocturnal and creepy looking.

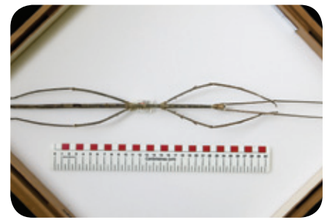


Fig 2.6 *Phobaeticus chani*. This strange creature is the world's longest insect, measuring in at about 567 millimetres in total, with a body length of 357 millimetres. It is found in Borneo.

Fig 2.7 The Barbados threadsnake is found only in Barbados. It is the world's tiniest snake and can wrap up on a small coin. It is species of blind snake measuring at approximately 100 millimetres in length.

Fig 2.8 The frogfish. This strange looking fish resembles a frog. The frogfish have developed leg-like fins that allow them to scurry across the ocean floor. They can also change colours if needed to blend into a coral reef.

Fig 2.9 The blobfish. This bizarre-looking fish is rarely seen by people since it lives at a depth where the pressure is enormous; its body is jelly-like with a density that is only slightly less than water. It floats around just above the sea floor.

ACTIVITY 2.8 Invertebrates

SKILLS
- Understanding biology
- Processing information

1	Body spongy, with many holes Body not spongy	Poriferan Go to 2
2	Soft body, no shell Outside shell or hard cover	Go to 3 Go to 6
3	Many tentacles or arms Long body without tentacles	Go to 4 Go to 5
4	Tentacles around the mouth of a sac-like body Arms with suction discs	Cnidarian Mollusc
5	Soft body, large foot Worm-like or leaf-like	Mollusc Worm
6	Proper shell or smooth, hard covering Spiny skin with rough covering	Go to 7 Echinoderm
7	Limbs in pairs Shell, no segments, large foot	Arthropod Mollusc

Fig 2.10 Tabular key for identifying invertebrates. Note: a 'foot' in this table is a muscular body, such as the body of a snail.

1 Determine if each of the following statements is true or false.

a A fish is classed as an invertebrate. _____

b A sea jelly is classed as a cnidarian. _____

c An octopus has an internal skeleton. _____

d All arthropods are insects. _____

e A fly is classed as an insect. _____

2 Convert the tabular key above to a branched dichotomous key.

3 Use the key you have constructed to write out the properties of each type of invertebrate.

4 How is an exoskeleton different to an endoskeleton?

5 Do all invertebrates have an exoskeleton?

6 How are the worms similar to the cnidarians?

7 How are the worms different to the cnidarians?

8 Arthropods account for the largest number of organisms in Kingdom Animalia. Which of their features might explain this level of success?

ACTIVITY 2.9 Review: Sorting out biodiversity

SKILLS
- Understanding biology
- Processing and analysing data

1 What is the largest grouping in the classification of living things?
- **A** Phylum
- **B** Species
- **C** Kingdom
- **D** Class

2 Which characteristic of living things is shown by a mouse eating and digesting cheese?
- **A** Reproduction
- **B** Nutrition
- **C** Excretion
- **D** Respiration

3 What is the scientific name for the animal kingdom?
- **A** Plantae
- **B** Animalia
- **C** Arthropod
- **D** Monera

4 Into which group does a cockroach belong?
- **A** Animal
- **B** Plant
- **C** Fungi
- **D** Monera

5 Into which group does an emu belong?
- **A** Mammal
- **B** Bird
- **C** Reptile
- **D** Amphibian

6 Which group is a butterfly classified in?
- **A** Insect
- **B** Arachnid
- **C** Crustacean
- **D** Worm

7 Which of these animals has under-developed young which are reared in a pouch?
- **A** Placental
- **B** Marsupial
- **C** Monotreme
- **D** Amphibian

8 Which of these animals lays eggs and gives milk to its young?
- **A** Placental
- **B** Reptile
- **C** Monotreme
- **D** Marsupial

9 How many alternatives or branches does a dichotomous key use at each classification level?
- **A** One
- **B** Two
- **C** Three
- **D** Four

10 What do the young of reptiles develop in?
- **A** Soft leathery eggs
- **B** Brittle shell eggs
- **C** A pouch
- **D** A womb

11 Match each word to its description in the table.

endothermic ectothermic exoskeleton
vertebrate invertebrate autotroph

	An organism with a spine and backbone
	An organism with a constant body temperature
	An organism without a spine and backbone.
	An organism with a changing body temperature
	An organism's hard outer shell made of chitin.
	An organism which can make its own food rather than eat others

12 Write in the correct property of living things being referred to in each case.

a An organism uses oxygen to make energy.

_____

b An organism makes more of itself.

_____

c An organism brings nutrients into its body.

_____

d An organism jumps when a bright light is shone at it.

_____

13 Describe three features that can be used to distinguish a fish from a mammal.

_____

_____

_____

14 List two substances which all living things need in order to survive.

_____

_____

15 List two things which all animals need to remove from their body.

_____

_____

16 Complete a dichotomous key to classify the following objects.