UNDERSTANDING SCIENCE

Pupil's Books 6

2ND EDITION

Contents

Theme: The world of living things

Topic 1: Classification of animals

Section 1.1: Living things

Living things are things that have life.

Charcteristics of living things

- **They feed.** Plants make their own food by the process called photosynthesis whereas animals cannot make their own food but they feed on already made food by plants.
- **They respire.** The cells in living things break down food to release energy.
- **They grow.** Living things undergo irreversible increase in size as a result of increase in the number of cells.
- **They excrete.** Living things remove waste products from their bodies.
- **They reproduce.** Living things give rise to new organisms.
- **They move.** Animals can move from one place to another, that is, they carry out locomotion but plants cannot move from one place to another. Plants can only move mainly by growth movement such as bending of a plant towards light.
- They are **sensitive** and **respond** to the changes in their environment.

Kingdoms of living things

- Kingdom animalia
- Kingdom plantae
- Kingdom fungi
- Kingdom monera
- Kingdom protoctista

Classification of animals

Classification is the process of grouping living things according to their common characteristics. Classification helps the scientists to easily identify organisms belonging to the same group.

Characteristics used in classifying animals (factors considered when classifying animals)

- Way of movement.
- Way of reproduction.
- Way of breathing.
- Way of feeding.
- Way of protection.
- Body structure

Groups of animals

There are two main groups of animals.

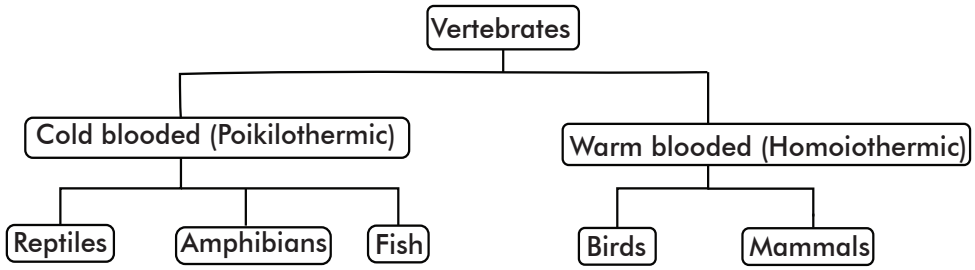
- Vertebrates.
- Invertebrates.

Activity 1.1

1. Why are animals grouped under living things?
2. Mention the kingdom of living things to which bacteria belong.
3. Why is a car not a living thing yet it can move?
4. How do plants move?

Section 1.2: Vertebrates

Vertebrates are animals with back bones/vertebral column.



Characteristics of vertebrates

- They have back bones and therefore, they have an endoskeleton. **Endoskeleton** is the type of skeleton found as a main supporting frame inside the body of an organism.
- They have a nervous system with a brain.
- They have a protective skin covering the body.
- They have blood that circulates through blood vessels.

Examples of vertebrates

• Rat	• Whale	• Snake	• Platypus	• Frog
• Rabbit	• Rabbit	• Rabbit	• Tilapia	• Sheep
• Squirrel	• Hedgehog	• Elephant	• Dog	• Man

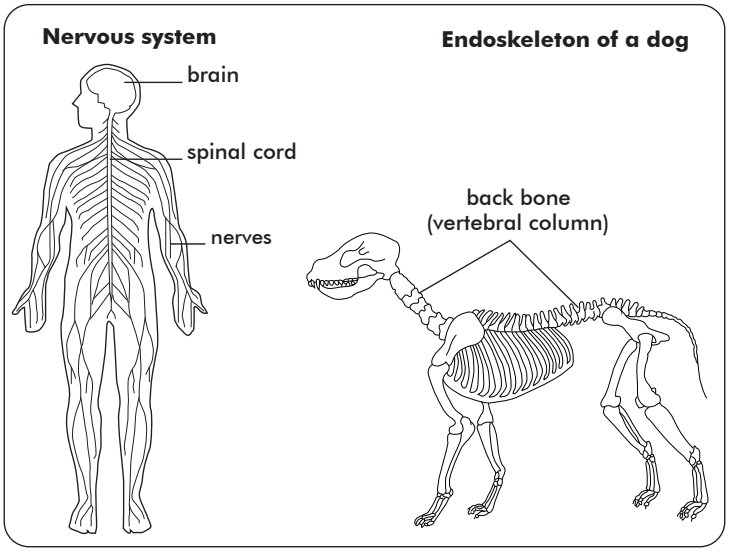


Figure 1.1: Characteristics of vertebrates.

Warm blooded vertebrates

Warm blooded vertebrates are vertebrates which maintain a constant body temperature. These animals are also called **homoiothermic** animals/**endothermic** animals. Examples are mammals and birds.

Mammals

Mammals are vertebrates with mammary glands

Characteristics of mammals

- They have mammary glands.
- They undergo internal fertilisation.
- Their skins are covered by hair or fur.
- Most mammals give birth to live young ones except the platypus and spiny anteaters.
- They are warm blooded animals (homoiothermic/endothermic).

Groups of mammals

- Primates (fingered mammals)
- Rodents (Gnawing mammals)
- Lagomorphs
- Ungulates (Hoofed mammals)
- Marsupials (pouched mammals)
- Monotremes (Egg laying mammals)
- Chiroptera (Flying mammals)
- Cetaceans (Sea mammals)

- Carnivorous (Flesh eaters)
- Insectivorous (insect eaters)

Activity 1.2

1. Why are birds and mammals grouped together?
2. Mention one class of cold blooded vertebrates.
3. Why is a dog called a warm blooded vertebrate?
4. Give two characteristics that make mammals different from other vertebrates.

Primates

Primates are the most advanced mammals with a well developed brain. They are called fingered mammals because they have five fingers on their hands. Examples of primates are human beings, gorillas, chimpanzees, baboons, bush babies and monkeys. **Apes** are primates with no tails. Examples of apes include gorillas, chimpanzees and gibbons.

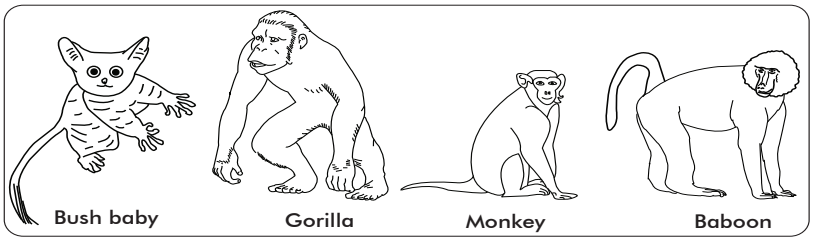


Figure 1.2: Examples of primates.

Characteristics of primates

- They have a well-developed brain.
- They produce live young ones.
- They have five fingers on each hand and five toes on each foot.

Rodents (gnawing mammals)

Rodents are mammals that bite rapidly. Examples of rodents are rats, squirrels, mice, porcupines and moles.

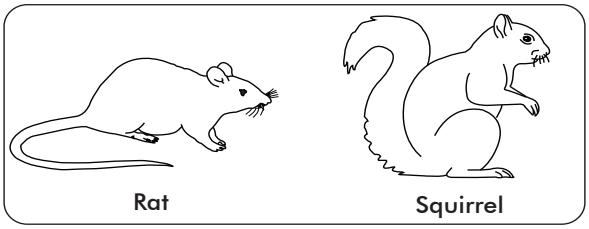


Figure 1.3: Examples of rodents.

Characteristics of rodents

- They have well developed incisor teeth that help them to bite rapidly.
- They are mostly herbivores (vegetarians).

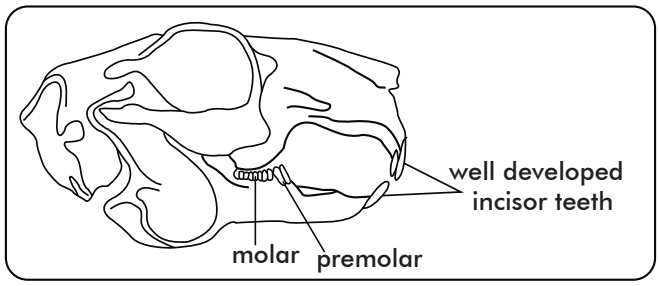


Figure 1.4: Characteristics of rodents

Dangers of rodents

Rodents destroy farmers' crops.

Lagomorphs

Lagomorphs are herbivorous mammals that have two pairs of incisors in the upper jaw. They resemble rodents but are not rodents. Examples of lagomorphs include;

- Rabbits
- Hares
- Pikas

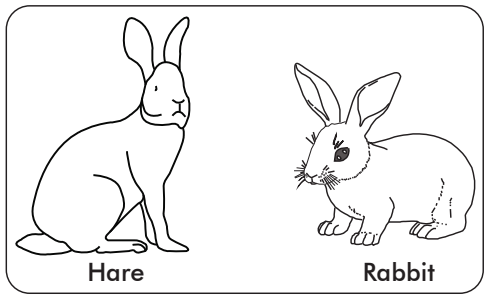


Figure 1.5: Examples of lagomorphs.

Activity 1.3

1. Why are primates referred to as the most advanced group of mammals?
2. How are apes different from other primates?
3. State one difference between rodents and lagomorphs.
4. Give one danger of rodents in the environment.
5. Give the difference between apes and monkeys.
6. How are rodents different from lagomorphs?

Ungulates (Hoofed mammals)

Ungulates are vertebrates with hooves on their feet. Hooves protect the underneath tissues from physical injuries. They are herbivorous, that is, they feed on vegetation.

Groups of ungulates

- **Even toed ungulates:** These are mammals with even toed hooves. Cattle, sheep, antelopes, camels, deer and hippopotamuses are examples of even toed ungulates.
- **Odd toed ungulates**: These are mammals with odd toed hooves. Elephants, horses, zebras, rhinoceros and donkeys are examples of odd toed ungulates.

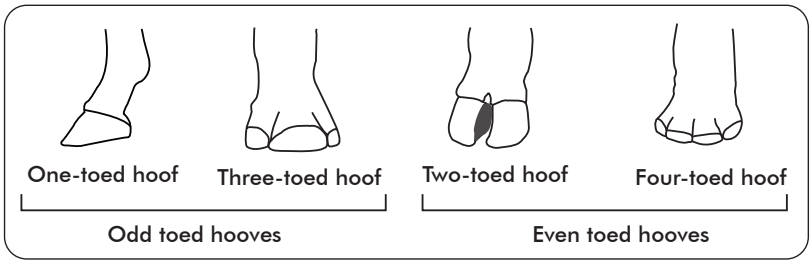


Figure 1.6: Hooves of ungulates.

Even toed ungulates

Even toed ungulates are also sub-divided into two groups.

- Ruminants
- Non-ruminants

Ruminants

Ruminants are animals that chew cud. **Cud** is a portion of food that returns from a ruminant's stomach to the mouth to be chewed for the second time. Examples of ruminants are cattle, goats, sheep and camels.

Characteristics of ruminants

- They chew cud.
- They have four stomach chambers.
- Most of them use horns for protection.

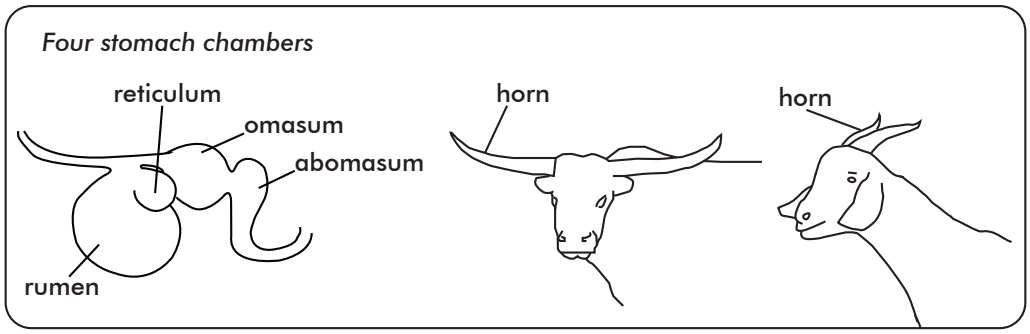


Figure 1.7: Characteristics of ruminants

Non-ruminants

Non-ruminants are animals that do not chew cud. Examples of non-ruminants are pigs, hippopotamuses and warthogs (wild pigs).

Characteristics of non-ruminants

- They have a single chambered stomach.
- They have complete dentition. **Dentition** is the arrangement of teeth in the jaws.
- They use their well developed canine teeth for protection.

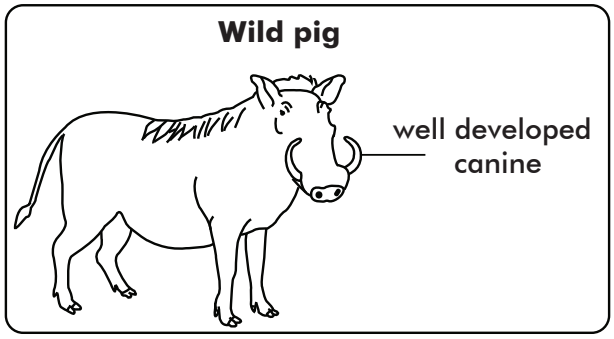


Figure 1.8: A wild pig

Marsupials (pouched mammals)

Marsupials are characterised by premature birth and continued development of the newborn while attached to the nipples of the mother in a pouch (bag-like structure). The function of the pouch is for carrying the baby (joey). Examples of marsupials are kangaroos, koala bears and wallabies.

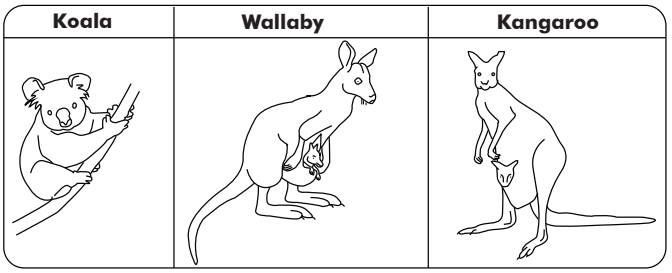


Figure 1.9: Examples of pouched mammals.

Activity 1.4

1. Why is a cow called a ruminant?
2. How do most ruminants protect themselves?
3. State the importance of a pouch to a kangaroo.
4. How are hooves important to ungulates?

Chiroptera (flying mammals)

An example of flying mammals is a bat. Bats use echoes to locate places and food.

Characteristics of chiroptera

- They are active during night (nocturnals).
- They have a fold skin attached to the fore limbs which act as wings.

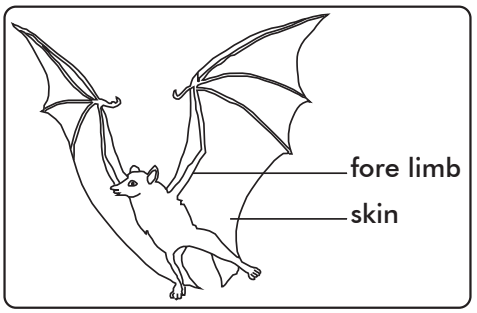


Figure 1.10: A bat

Groups of bats

Bats are grouped into three types.

- Insect eating bats
- Fruit eating bats
- Blood suckers (vampire bats). A vampire is an example of blood suckers.

Importance of bats in the environment

- Fruit eating bats help in seed dispersal. **Seed dispersal** is the scattering of seeds away from their parent plants.
- Fruit eating bats help in pollination of flowers.
- Insect eating bats eat vectors that would spread diseases.
- Bat droppings (guano) are used as fertlisers.

Disadvantages of bats

- Bat droppings lead to bad smell in the house.
- Some bats suck blood from animals causing anaemia.
- Some bats eat and destroy man's crops.

Monotremes (egg laying mammals)

Monotremes are the most primitive of all the classes of mammals. Examples of egg laying mammals are duck billed platypus and spiny ant eater (echidna). They are the most primitive mammals because they have characteristics of birds, reptiles and mammals.

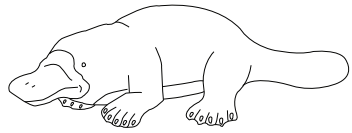


Figure 1.11: Duck billed platypus.

Characteristics of monotremes

- They reproduce by laying eggs.
- They have beaks similar to those of birds.
- They feed their young ones on milk from mammary glands after hatching.
- They have fur on the bodies.
- They breathe through lungs.

Activity 1.5

1. Why is a bat called a nocturnal?
2. How are vampire bats dangerous in the environment?
3. Give one way in which a spiny anteater is different from a whale in terms of reproduction.
4. Which part of the body is present in both birds and monotremes?
5. Why are monotremes said to be very primitive mammals?
6. Why is a duck-billed platypus classified as a mammal although it lays eggs?

Sea mammals (cetaceans)

Sea mammals are mammals that live in water as their habitats. Examples of sea mammals include whales, dolphins, porpoise, seals and dugongs. Some sea mammals entirely live in water. For example, whale and dugong. Others can also live on land. For example, seal and sea lion.

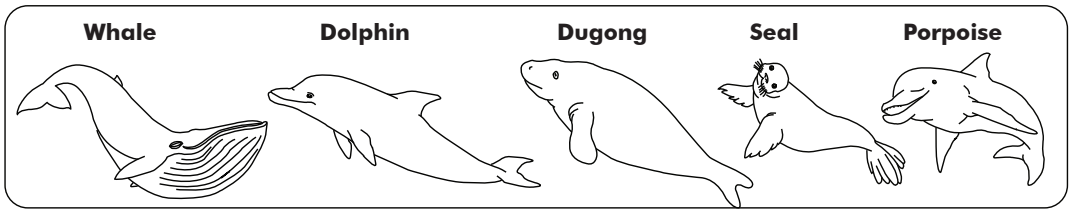


Figure 1.12: Examples of sea mammals.

Characteristics of sea mammals

- They live in the sea.
- They breathe by means of lungs.
- They feed their young ones on milk from mammary glands.
- They have a layer of fats under the skin called **blubber**. The function of blubber is to keep the animal warm when in water.

Insectivores (Insect eating mammals)

Insectivores are animals that feed on insects. Examples of insectivores are hedgehog, elephant shrew, aardvark (antbear), pangolin and anteaters. A hedgehog has spines for protection. When threatened, it rolls up into a ball. Ant eaters have long sticky tongues for trapping insects.

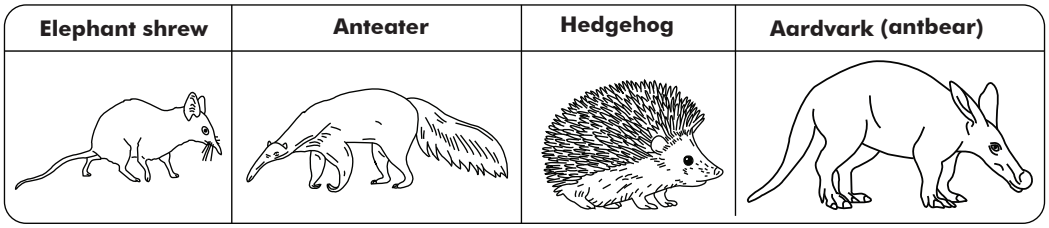


Figure 1.13: Examples of insectivores.

Characteristics of insectivores

- They are nocturnals (move and hunt at night).
- They have a sensitive snout for smelling.
- They have strong claws for digging the soil.
- They feed on insects.

Activity 1.6

1. Why is a whale called a sea mammal?
2. State one adaptation of sea mammals to living in cold conditions of the sea.
3. Apart from chiroptera, mention another group of nocturnal mammals.
4. Give any one example of a sea mammal which can also live on land.
5. How does an enteater benefit from its sticky tongue?
6. How are insect eaters adapted to digging out insects from the ground?

Carnivorous animals (flesh eaters)

Carnivorous animals are animals that feed on flesh. Some carnivorous animals are scavengers (feed on dead animals). Examples are hyena and jackal. Other carnivorous animals are predators. Examples are lions, leopards, tigers and cheetah. A **predator** is an animal that hunts and kills another animal (prey) for food.

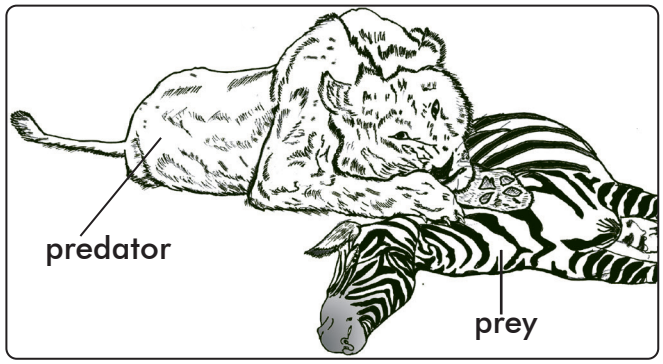


Figure 1.14: Predator and prey.

Note:

- Animals that feed only on plants are called **herbivores**.
- Animals that feed on both plants and flesh are called **omnivores**.

Characteristics of carnivorous animals

- They have well developed canine teeth for tearing the flesh of the prey. A **prey** is an animal that is hunted and killed for food.
- They have sharp claws for holding, killing and tearing the prey.
- They have a good speed, sense of smell, sight and sense of hearing.
- They have soft pads under their feet to run after prey without making noise.

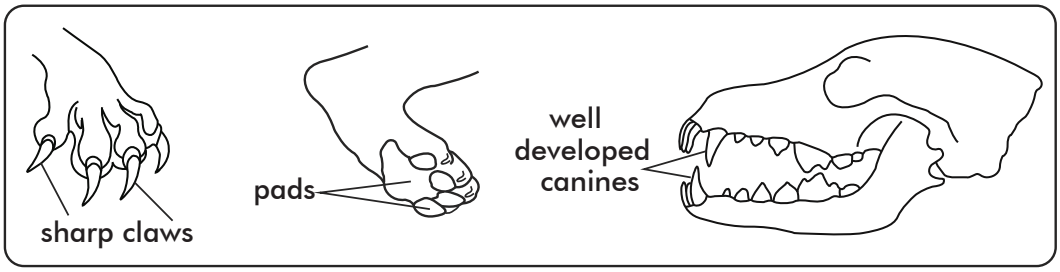


Figure 1.15: Characteristics of carnivores.

Groups of flesh eaters/carnivores

- **Cat family:** They resemble cats. Examples are lions, domestic cats, cheetahs, leopards and tigers.
- **Dog family:** Examples are domestic dogs, foxes, hyenas and jackals.

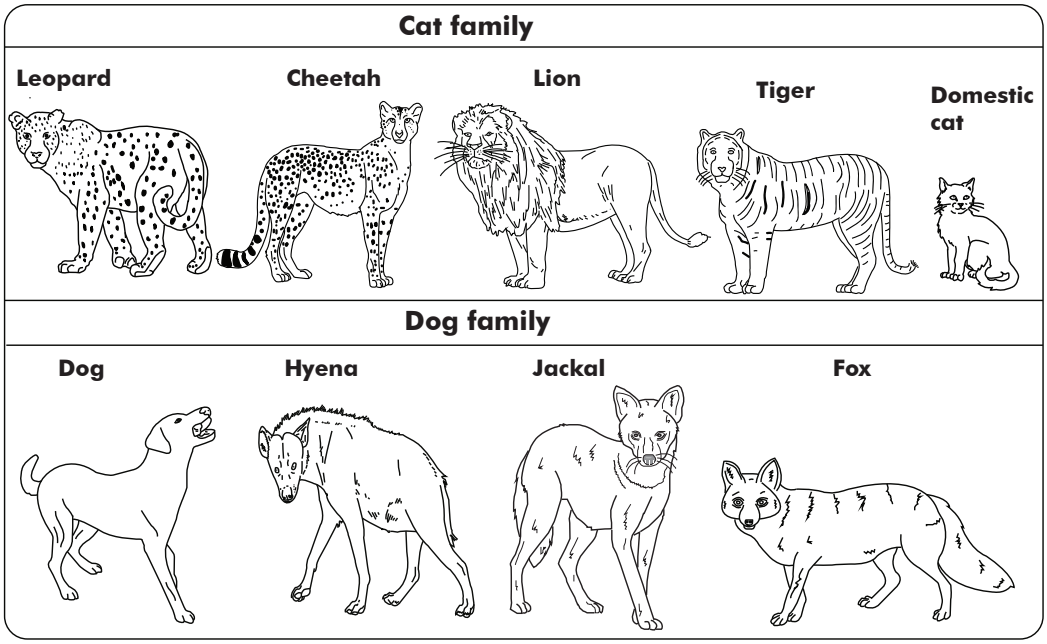


Figure 1.16: Groups of flesh eaters.

Adaptations of carnivorous mammals to obtaining food

- They have well developed canine teeth for tearing prey.
- They have sharp claws for tearing and holding prey.
- They have a good eye sight that helps them to hunt at night.
- They have soft pads under their feet to avoid making noise when hunting.

Activity 1.7

1. Mention one example of a scavenger mammal.
2. Why are hyenas ever following leopards?
3. Which group of mammals has a very high sense of smell?
4. How are predator mammals able to run after their prey without making noise?
5. Give the difference between predators and scavengers.
6. How are carnivorous mammals adapted to their mode of feeding?

Birds

Characteristics of birds

- Their legs are covered with scales.
- They reproduce by laying eggs.
- They undergo internal fertilisation.
- They breathe by means of lungs.
- They have a streamlined body shape.
- Their bodies are covered by feathers.
- They are warm blooded (homoiothermic).

External parts of a bird

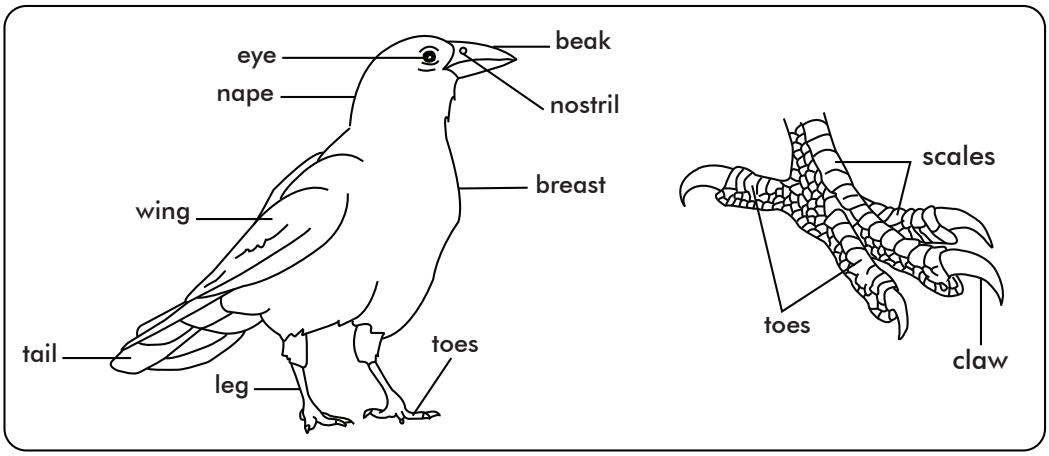


Figure 1.17: External parts of a bird.

Uses of birds to people

- Birds are sources of food.
- Birds provide us with eggs.
- Some birds help in pollination.
- Birds help in seed dispersal.

- Some birds keep the environment clean by eating carrion. **Carrion** is flesh left by other animals.

Disadvantages of birds in the environment
- Birds spoil farmers' crops.
- Some birds keep parasites like fleas and mites.
- Some birds make a lot of noise in the environment.

Adaptation of birds to their way of life
- They have beaks for feeding.
- They have wings for flying.
- They have nictitating membranes for protecting their eyes when flying.

Classification of birds

Classification of birds is the grouping of birds according to their common characteristics.

Factors considered when classifying birds
- Shape of the beak.
- Food eaten.
- Type of feet.
- Ability to fly.

Classes of birds/groups of birds
- Birds of prey
- Wading birds
- Perching birds
- Scavenger birds
- Scratching birds
- Flightless birds
- Climbing birds
- Swimming birds

Birds of prey

Birds of prey are birds that hunt and kill others for food. Examples of birds of prey include; eagles, owl, hawk, secretary bird, falcon and kite.

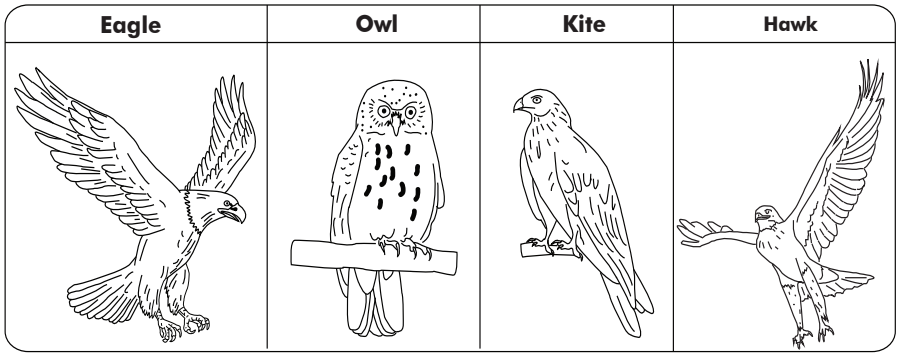


Figure 1.18: Examples of birds of prey.

Characteristics of birds of prey

- Their beaks are strong, sharp and hooked to enable them tear flesh.
- They have long strong curved claws (talons) for gripping and killing the prey.
- They have a good eye sight that helps them see their prey from a distance.

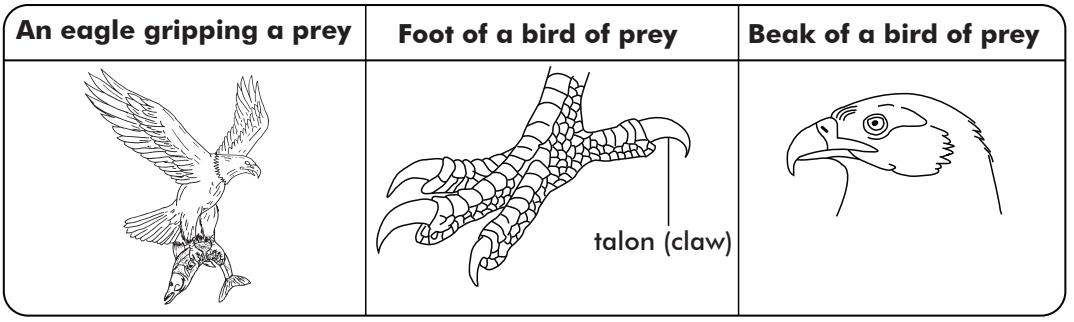


Figure 1.19: Characteristics of birds of prey

Scavenger birds

Scavenger birds are birds that feed on flesh of dead animals (carrion). They clean the environment by eating flesh of dead animals that would rot. Examples of scavenger birds include vultures, marabou stork and crows. The beak and feet of scavenger birds is similar to that of birds of prey.

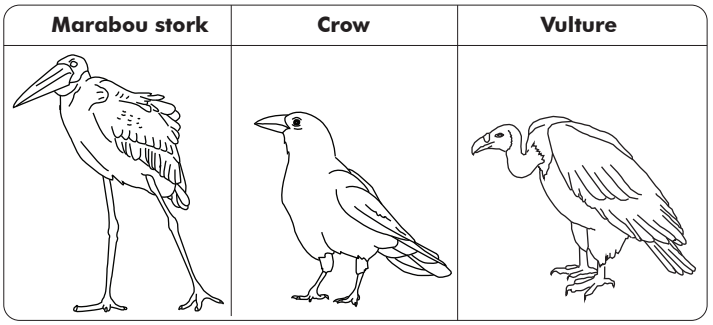


Figure 1.20: Examples of scavenger birds.

Activity 1.8

1. State the adaptation of the beaks of birds of prey to the food they eat.
2. Why do birds of prey hunt other animals?
3. How is the feeding of an eagle different from that of a vulture?
4. Give any two factors considered when classifying (grouping) birds.
5. How are scavenger birds important in the environment?

Climbing birds

Climbing birds have two toes pointed forward and two pointed backwards. They have claws that allow them to grip onto the bark of a tree. Examples of climbing birds are parrot and wood pecker.

- **Wood peckers:** They feed on insects. They have long strong pointed beaks for digging holes in trees to get insects.
- **Parrots:** They feed on seeds. They have short, strong and curved beaks for holding and cracking seeds.

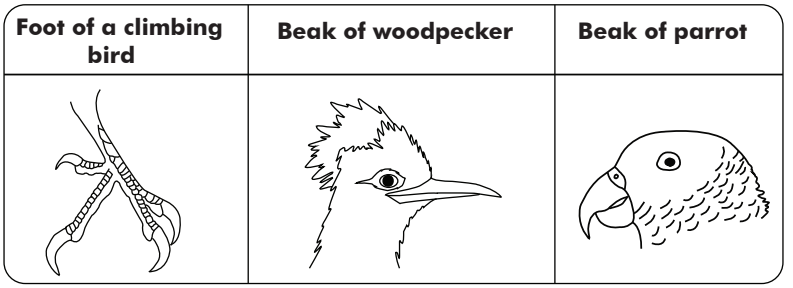


Figure 1.21: Features of climbing birds.

Wading birds

Wading birds are birds that walk through water and mud to find food. Examples of wading birds are crested cranes, ibis, heron, flamingoes, egret and king fishers.

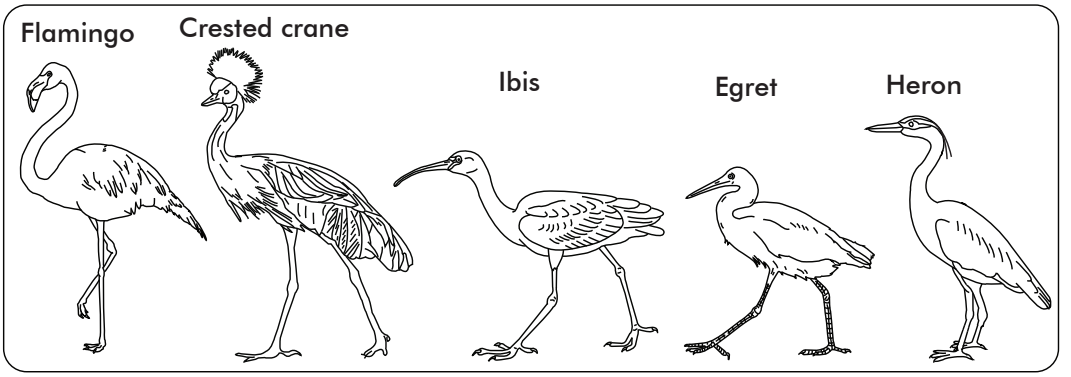


Figure 1.22: Examples of wading birds.

Characteristics of wading birds

- They have long thin legs.
- They have half webbed feet for walking in shallow water.
- They have long beaks for catching fish and frogs from the water.
- They have long spear-like beaks for spearing fish in water.
- They have long thin necks for swinging the head when spearing fish.

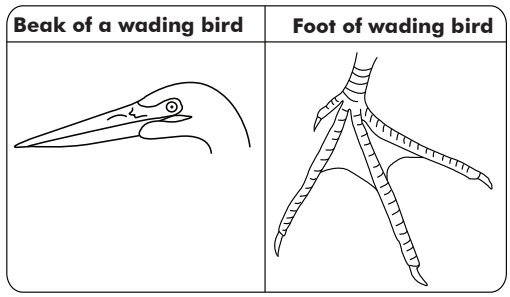


Figure 1.23: Characteristics of wading birds.

Scratching birds

Scratching birds feed on worms, seeds and insects. They scratch the soil to get insects and worms. Examples of scratching birds are chicken, turkeys and guinea fowls.

Characteristics of scratching birds

- They have short, strong and pointed beaks for picking up food.
- They have strong and blunt claws for digging the soil.

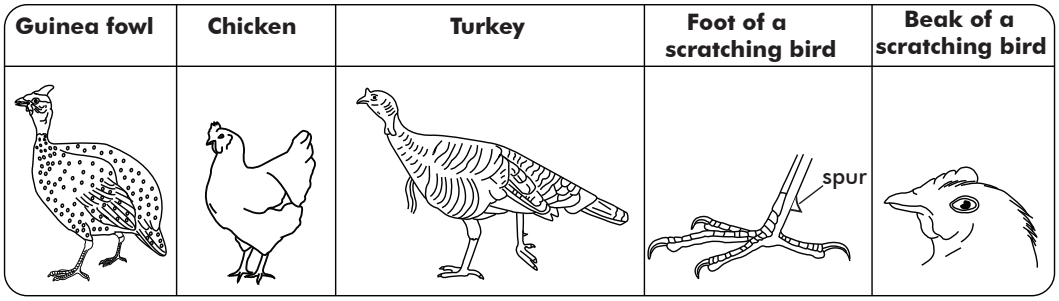


Figure 1.24: Examples of scratching birds.

Swimming birds

Examples of swimming birds include; duck, swan, penguin, pelican, goose and sea gull.

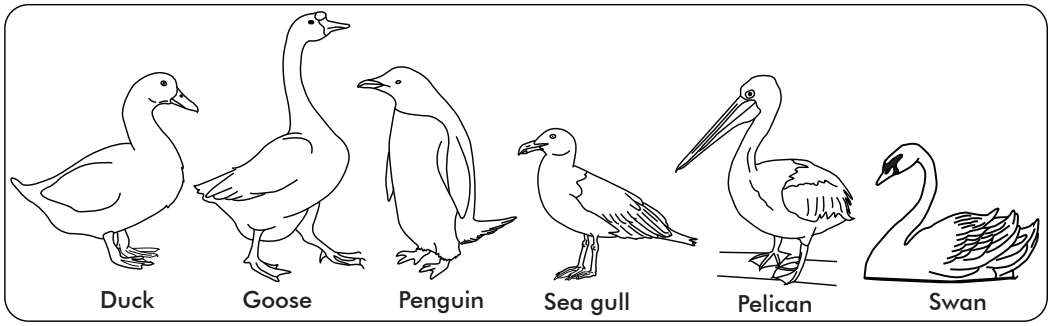


Figure 1.25: Examples of swimming birds.

Characteristics of swimming birds

- They have fully webbed toes for swimming easily in water.
- They have broad breast bones to reduce body weight.
- They have beaks with serrated edges for sieving (filtering) out small food particles from water.
- They have many oil glands that produce oil to protect them against cold water.
- They have flat, grooved and rigded beaks for gripping slippery food.

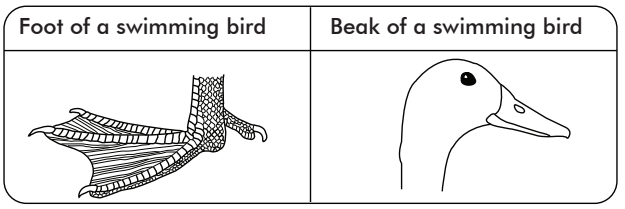


Figure 1.26: Foot and beak of a swimming bird.

Activity 1.9

1. Why do scratching birds have strong and blunt claws?
2. How are the feet of swimming birds and wading birds;
   (a) similar? (b) different?
3. State one adaptation of swimming birds to living in water.
4. Give the importance of long thin legs to wading birds.
5. Why are wading birds able to walk on mud?
6. Give the importance of long spear-like beaks to wading birds.

Perching birds

Perching birds are birds that rest or stay in trees. A perch is a place where birds rest or stay.

General characteristic of perching birds

- They have three toes pointed forward and one toe pointed backwards
- These help birds to firmly hold on branches of trees.

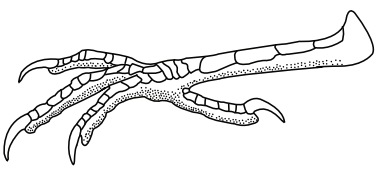


Figure 1.27: Foot of a perching bird.

Groups of perching birds

Perching birds are grouped into four groups depending on the type of food they eat.

- **Seeds eaters:** They have short, strong cornical beaks for splitting seeds. Examples of seed eaters are doves, pigeons, finches and weaver birds.

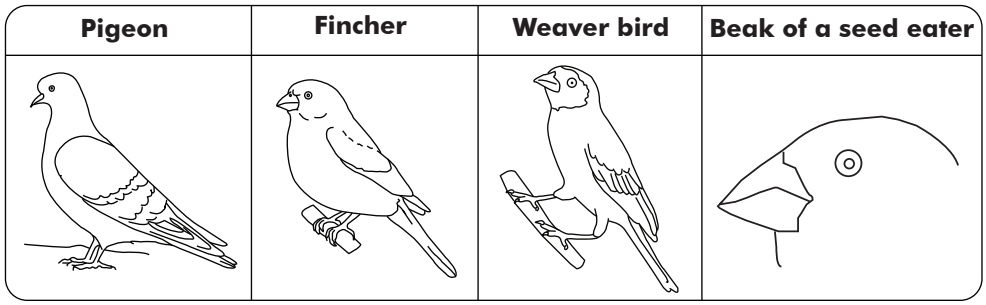


Figure 1.28: Examples of seed eaters.

- **Insect eaters:** They have short narrow beaks for picking insects from tree barks. Examples of insect eaters include; sparrows, robins, swallows, bee eaters and swifts.

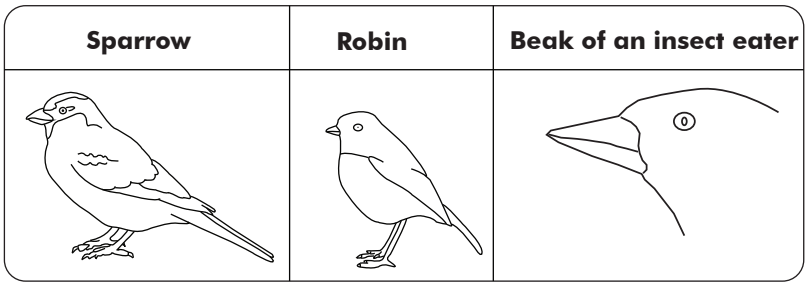


Figure 1.29: Examples of insect eaters.

- **Nectar suckers:** They have long slender beaks which are slightly curved for easy sucking of nectar. An example of nectar suckers is the sunbird.

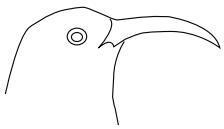


Figure 1.30: Beak of a sunbird.

- **Fruit eaters**: Fruit eaters have long stout beaks for collecting fruits. They help in fruit dispersal. An example of fruit eaters is the hornbill.

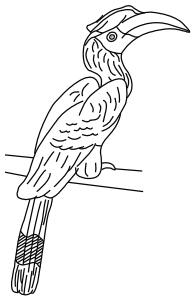


Figure 1.31: A hornbill

Activity 1.10

1. How are seed eaters adapted to their mode of feeding?
2. How is a sunbird able to suck nectar from the bottom of flowers?
3. Give one way in which crop farmers benefit from perching birds.
4. Apart from a sunbird, mention another example of a nectar sucking bird.
5. Give the factor considered when grouping perching birds.
6. Name the group of perching birds which is;
   (a) useful to crop farmers.
   (b) dangerous to crop farmers.

Flightless birds

Flightless birds are birds that cannot fly. Examples of flightless birds include; emu, penguins, rhea, cassowary, ostriches and kiwi. An ostrich is the fastest and largest flightless bird.

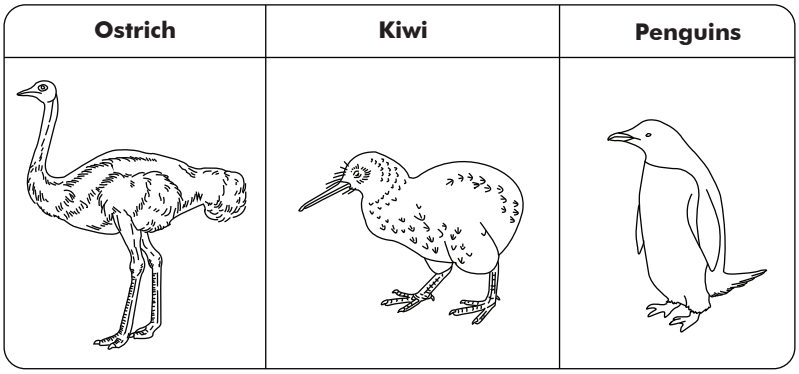


Figure 1.32: Examples of flightless birds.

Characteristics of flightless birds

- They have weak and small wings that cannot support their body weight.
- They have bone marrows that increase their body weight.

Adaptations of birds to flying

- Their bodies are streamlined to reduce air resistance when flying.
- They have hollow bones which reduce their body weight.
- They have no pinna to obstruct the flow of air.
- They have wings that help them to fly.
- They have powerful and strong front muscles that help them in movement of wings.
- They have a good sight for seeing in long distances.
- They have nictitating membranes that protect their eyes against moving air during flight.

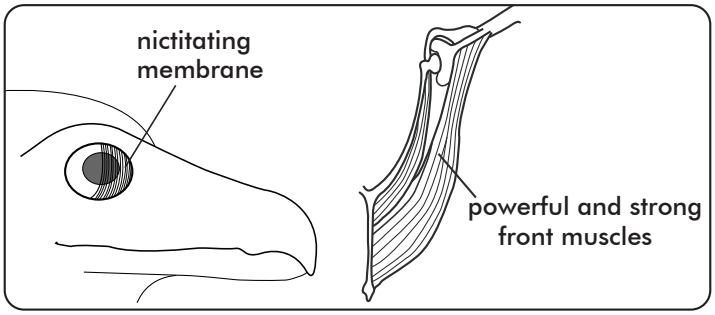


Figure 1.33: Adaptations of birds to flying.

Activity 1.11

1. State the importance of a streamlined body shape to birds.
2. How do feathers keep birds warm?
3. Why are birds able to continue seeing during flight yet they cover their eyes with a nictitating membrane?

Section 1.3: Cold blooded vertebrates

Cold blooded vertebrates are animals whose body temperature changes according to that of the environment. They are also called **poikilothermic** animals/**ectothermic** animals.

Groups of cold blooded vertebrates

- Reptiles
- Fish
- Amphibians

Reptiles
Reptiles are animals that move by crawling or slithering.

Characteristics of reptiles
- They are cold blood animals.
- They breathe by means of lungs.
- They undergo internal fertilisation.
- They have scales on their bodies.
- They have three chambered hearts, that is, two auricles and one ventricle.
- They reproduce by laying eggs.

Groups of reptiles
- Lizards
- Tortoises
- Alligators
- Crocodiles
- Snakes
- Turtles
- Terrapins

Lizards
Examples of lizards include monitor lizard, geckoes, chameleons and common lizard. A chameleon protects itself by changing colour (camouflaging). It has a sticky tongue that helps it to trap insects.

Characteristics of lizards
- They have two pairs of limbs for moving.
- They have long tongues for trapping their prey.
- They have suction pads on their feet that prevent them from falling off slippery walls and ceiling.

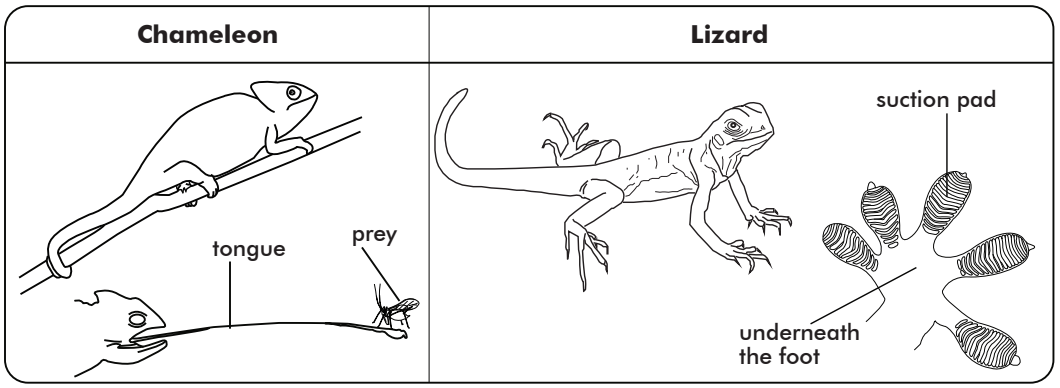


Figure 1.34: Characteristics of lizards.

Tortoises, turtles and terrapins
Tortoises move by walking using their strong legs. Turtles and terrapins use flippers for swimming in water.

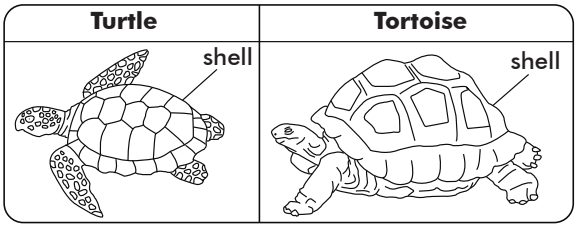


Figure 1.35: A turtle and a tortoise.

Characteristics of tortoises, turtles and terrapins

- Their bodies are covered by hard bony shells.
- They reproduce by laying eggs in sand.
- They breathe through the lungs.
- They protect themselves by hiding under hard shells.

Activity 1.12

1. Why are reptiles grouped under cold blooded animals?
2. How do cold blooded vertebrates reproduce?
3. How does a tortoise move?
4. Apart from protection, how else is camouflage important to a chameleon?
5. How are lizards able to move on slippery walls without falling?
6. How is the movement of tortoises different from that of turtles?
7. How does a chameleon help to control the spread of some diseases?

Crocodiles and alligators

They have a powerful tail that helps them swim. The tail is also used in capturing the prey by knocking to disable it. The female lay eggs in sand. Crocodiles are the largest reptiles.

Figure 1.36: A crocodile

Snakes

Characteristics of snakes

- They have no limbs.
- They use their skins for hearing.
- They have forked tongue for smelling and tasting.

- They moult. **Moulting** is the shedding off of animal skin to allow the animal to grow and increase in size.

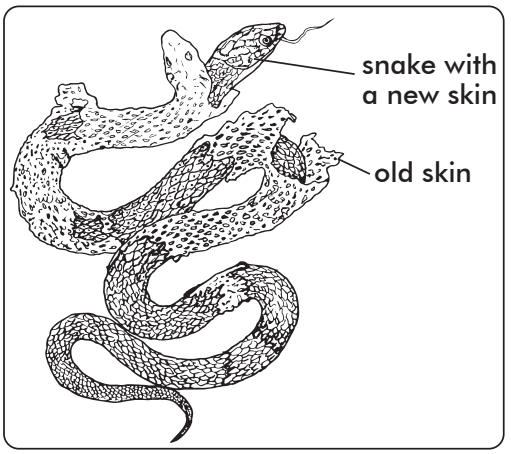


Figure 1.37: A snake moulting.

Types (groups) of snakes

- Poisonous snakes.
- Non-poisonous snakes.
- Constrictors.

Poisonous snakes (venomous snakes)

Cobra (bites to inject poison or spit poison), black mamba, puffadder and gabon viper.

Characteristics of poisonous snakes

- They have fangs which they use to bite and inject venom into enemies. Venom clots blood.
- They have triangular-shaped heads.
- They have a double row of scales underneath the tail.

Non-poisonous snakes (non-venomous snakes)

Examples of non-poisonous snakes are green snakes and brown house snakes.

Characteristics of non-poisonous snakes

- They do not have venom.
- They have oval shaped heads.
- They have a single row of scales underneath the tail.
- They have a slit-like pupil, ⦶.

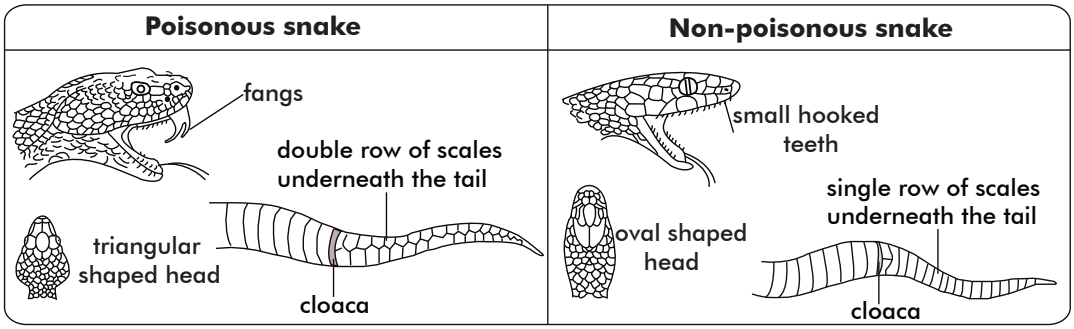


Figure 1.38: Characteristics of poisonous and non-poisonous snakes

Constrictors

Constrictors are types of snakes that have strong elastic muscles used for killing and crushing their prey. They kill and crush their prey by coiling around them. Examples of constrictors are boa, anaconda and pythons.

Note:

- Some snakes lay eggs. For example, cobras, mamba and adders.
- Some snakes give birth to live young ones. For example, boas, anaconda and viper.

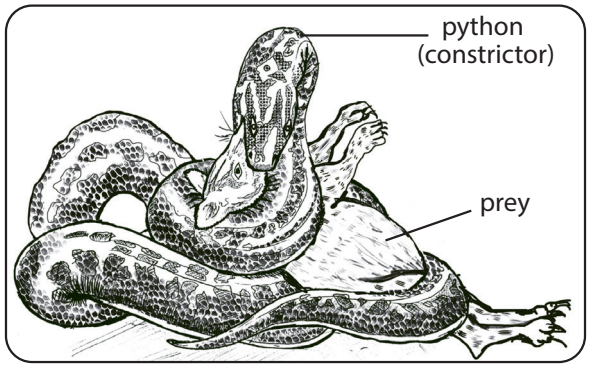


Figure 1.39: A python coiling around the prey.

Importance of reptiles

- Some reptiles are sources of food to some people .
- They provide skins for making drums, shoes and bags.
- They help to reduce the numbers of pests by eating them. For example, snakes can be useful in controlling rat populations.
- Venom is used in pharmaceutical industries to make antidotes.

Activity 1.13

1. Apart from helping crocodiles to swim, how else are tails important to them?
2. Give one use of crocodiles to people.
3. In which way do snakes move?
4. Apart from biting, how else does a cobra protect itself?
5. How do non-poisonous snakes kill their prey?
6. Give two ways in which snake venom leads to death of a person who has been bitten by a snake?
7. Why do snakes carry out moulting?
8. Name one limbless reptile.
9. Give any one difference between a venomous and a non-venomous snake.

Fish

Examples of fish include; nile perch, minnow, lung fish and tilapia.

Characteristics of fish

- They undergo external fertilisation.
- They are cold blooded animals.
- They breathe by means of gills.
- They reproduce by laying eggs.
- They use fins for swimming in water.
- Their bodies are covered with scales.
- They have a streamlined body shape to reduce water resistance during swimming.

Parts of a fish

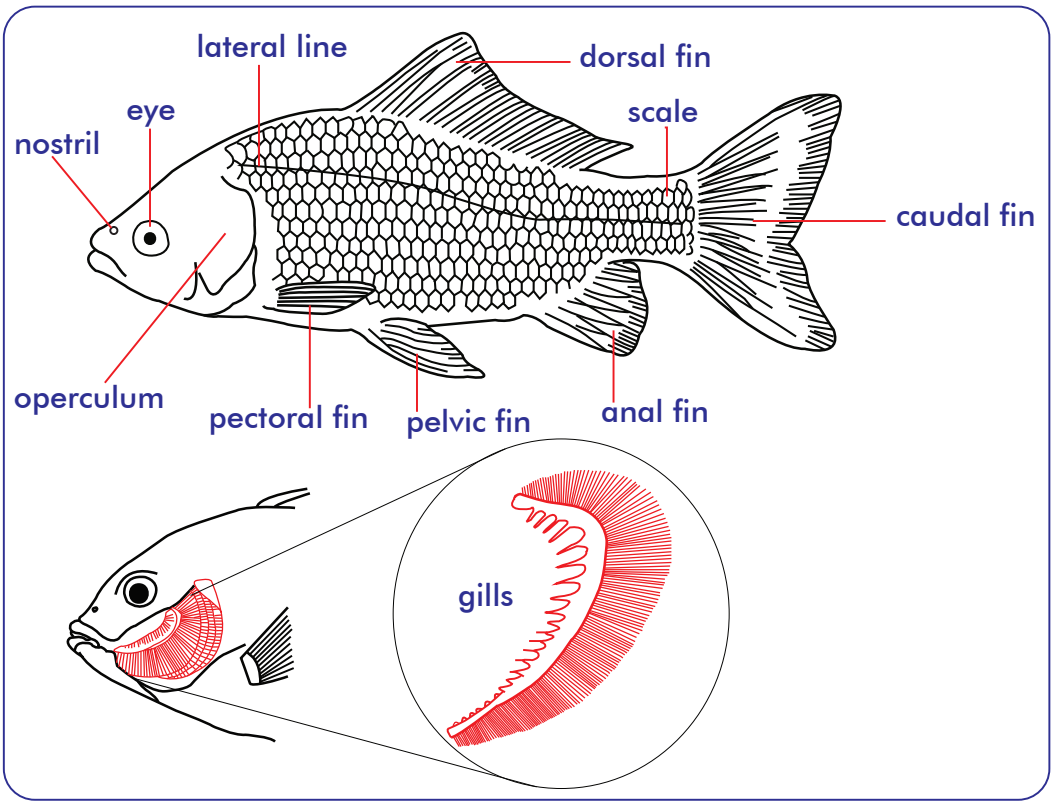


Figure 1.40: Parts of a fish.

Functions of each part of a fish

Part	Function
Scales	Proctect the internal parts of a fish.
Gill cover (operculum)	Protects gills from external damage.
Nostril	For smelling.
Tail fin/caudal fin	For changing direction when swimming.
Dorsal fin	Protects fish against predators. Prevents the fish from rolling in water.
Lateral line	Detect movement and vibrations in water.
Gills	For breathing.
Pectoral and pelvic fins	For slowing down and acting as brakes during swimming.

Table 1.1: Functions of each part of a fish.

Note:

- A fish breathes in dissolved oxygen, that is why, it dies as soon as it is removed from water. It has many gill filaments to increase the surface area for oxygen intake.
- Pectoral fin and pelvic fin are paired fins of a fish.
- A **predator** is an animal that hunts and kills another animal (prey) for food.

Adaptations of fish to living in water

- They have gills used for breathing.
- They are streamlined to reduce water resistance when swimming.
- Some fish are slippery to easily escape from their enemies.
- They have lateral lines used for detecting sound vibrations in water.
- They have swim bladders that prevent them from sinking in water.

Reproduction in fish

A female fish lays eggs and they are externally fertilised.

Note: A young fish is called a **fry.**

Uses of fish to man

- They are kept as pet in an aquarium for decoration.
- Their bones are used to make glue.
- Some fish are sources of medicine. For example, minnow.
- They are sources of food.

1. How is a fish able to move in water with less resistance?
2. Why can't a fish survive when its lungs have been removed?
3. Why are most fish dark coloured?
4. Which part of a fish has the same function with that of the human ear?
5. How are the eggs of fish fertlised?
6. Apart from swimming, how else are fins important to a fish?

Amphibians

Examples of amphibians are newt, salamander, frog, toad and caecilian.

Note:

- Caecilian is the limbless amphibian.
- Frogs and toads have no tail.
- Newt and salamander.

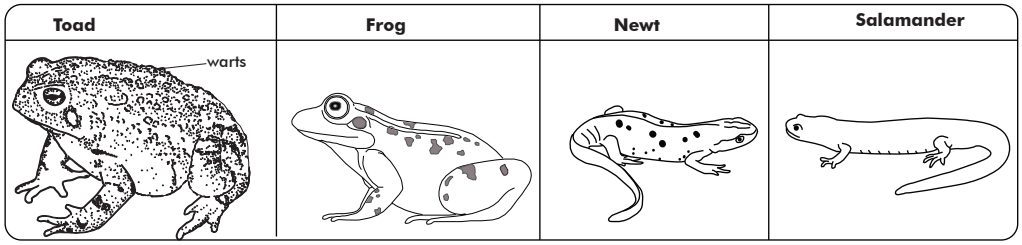


Figure 1.41: Examples of amphibians.

Amphibians such as toads and frogs hibernate during dry weather. **Hibernation** is a condition in which an animal becomes inactive. Tadpoles feed on plants (herbivores) while adult amphibians feed on flesh (carnivores). Amphibians have sticky tongues for trapping the prey.

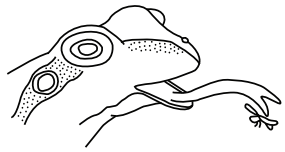


Figure 1.42: Tongue of an amphibian.

Characteristics of amphibians

- They are cold blooded animals.
- They reproduce by laying eggs.
- They under go external fertilisation.
- They have two pairs of limbs.

Differences between frogs and toads

Frogs	Toads
• Mostly live in water. • Lay eggs in big mass cluster. • Breathe through moist skin and lungs. • Have no poison glands. • Have long hind limbs. • Have no warts.	• Mostly live on land. • Lay eggs in double ribbon called spawn. • Breathe through lungs and lining of mouth cavity. • Have poison glands. • Have short hind limbs. • Have warts.

Table 1.2: Differences between frogs and toads.

Structure of eggs of a toad and a frog

The eggs are protected by a jelly-like substance which makes them difficult to be picked by predator. The jelly also provides unpleasant taste to birds and fish preventing them from eating the eggs.

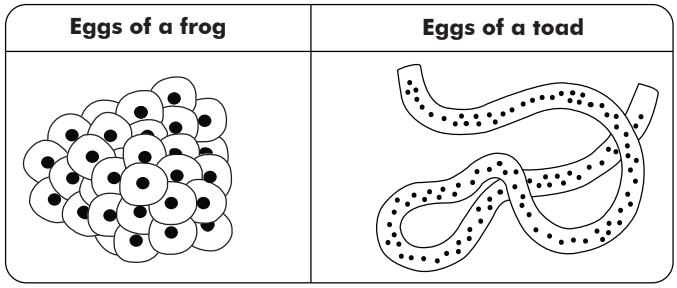


Figure 1.43: Eggs of toads and frogs.

Breathing organs of amphibians

Amphibian	In water	On land
Frog	Lining of mouth cavity/moist skin	Lungs
Toad	Lining of mouth cavity	Lungs
Tadpole	External gills	

Table 1.3: Breathing organs of amphibians

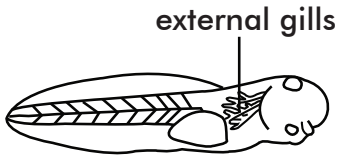


Figure 1.44: A tadpole

How a frog is adapted to living in water

- It has a streamlined body that reduces water resistance when swimming.
- It has webbed toes of hind limbs for swimming easily in water.
- It has a moist skin for breathing.

Figure 1.45: Webbed toes of a frog.

Activity 1.15

1. State the difference in feeding between tadpoles and adult amphibians.
2. How is the breathing of a tadpole different from that of an adult amphibian?

3. How does the jelly on the eggs of amphibians help to protect them from predators?
4. Why do frogs have strong hind legs?
5. What does a toad use for breathing when in water?

Section 1.4: Invertebrates

Invertebrates are animals without back bones. They have an exoskeleton or hydrostatic skeleton.

Groups of invertebrates

- Arthropods
- Molluscs
- Worms
- Echinoderms
- Sponges (porifera)
- Coelenterates

Arthropods

Arthropods are animals with jointed legs and segmented bodies.

Characteristics of arthropods

- They have segmented bodies.
- They have jointed legs.
- They have an exoskeleton. An **exoskeleton** is the type of skeleton found as a hard covering on the outside of body of an organism.

Groups of arthropods

- Myriapods
- Crustaceans
- Arachnids
- Insects

Myriapods

Myriapods have jointed legs. They are divided into two groups.

- Chilopoda (centipedes)
- Diplopoda (millipedes)

Chilopoda (centipedes)

Charateristics of centipedes

- They are carnivores, that is, they feed on flesh of insects.
- They have poisonous claws. They protect themselves by stinging or poisoning.
- They have a pair of jointed legs on each body segment.
- They live on land.