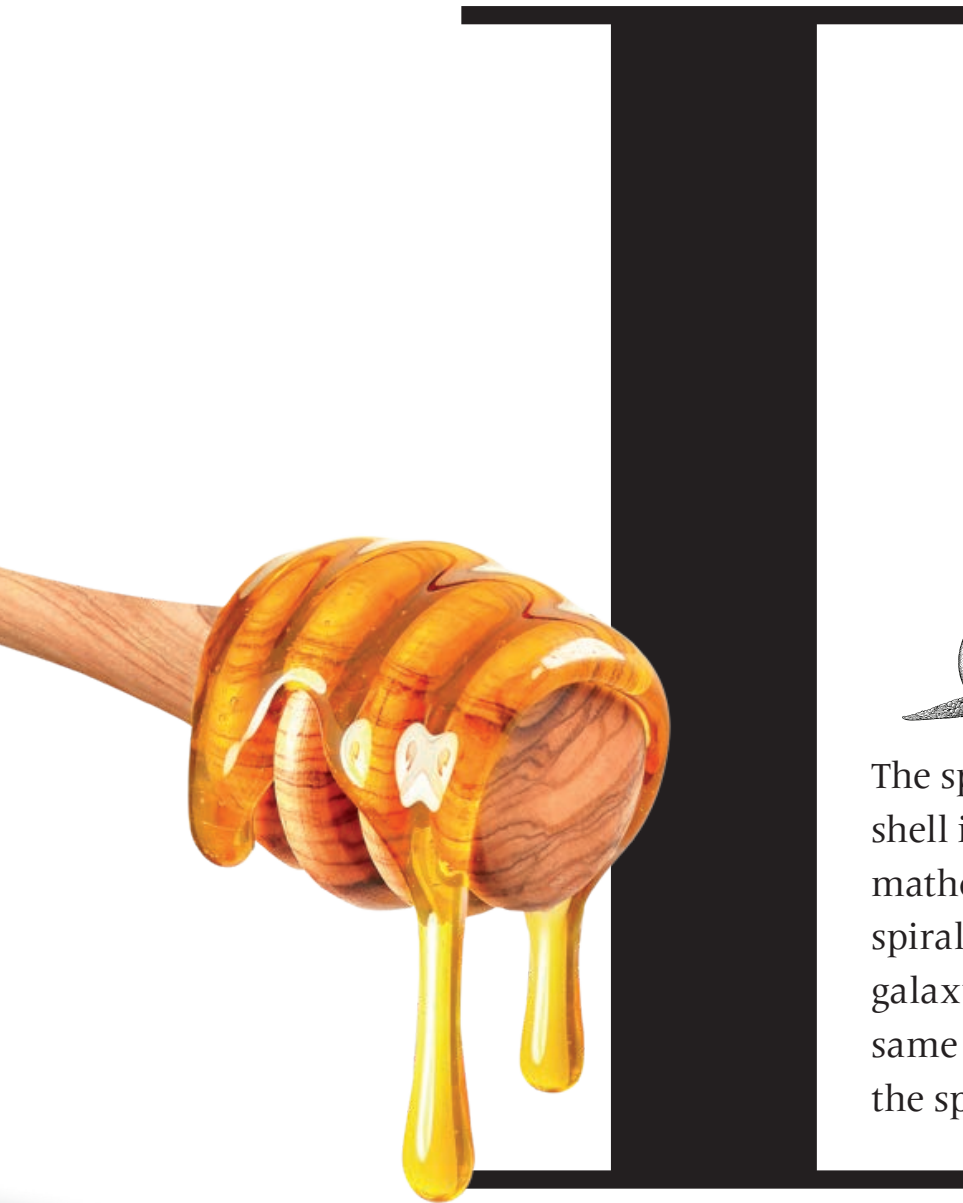


UNIT 05

INVERTEBRATE ANIMALS



The spiral in a snail's shell is the same mathematically as the spiral in the Milky Way galaxy, and it is also the same mathematically as the spirals in our DNA.

M

MAKE IT! Many invertebrate species hibernate during winter. You can help wildlife survive the cold by making a bug hotel. Before making your bug hotel, find out: What materials would you need for the bug hotel? Do all invertebrates hibernate? Where do invertebrates hibernate? Do they eat while they are hibernating?

P

POST IT! Look up the words arthropod and oligochaete. Identify the origin of these words and their meanings. Do you think these words are a good choice for the group of invertebrates they describe? Give your reasons why.

S | SAY IT!

‘OUCH!’ HAVE YOU EVER BEEN STUNG BY A BEE?

If so, you might think of bees as merely annoying visitors at your picnic. However, did you know that bees play a necessary role in the food we eat every day?

Find out why bees are important to agriculture and how human activity can negatively affect bees. In groups of four, you will create a short sketch and each play a different role. The four roles are: a farmer, someone who hates bees, an educator from a bee conservation group, and a person who does not understand why everybody seems worried about bees. Work together to write the script for your sketch and include all the information you have found. Then perform the sketch for your classmates.



01

INVERTEBRATES

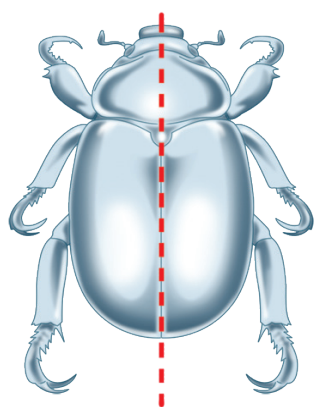
Invertebrates **do not have a backbone**. They are the largest animal group and account for approximately 95% of all animal species on Earth. Jellyfish, sponges, worms, spiders, starfish and butterflies are invertebrates.

1 AN INVERTEBRATE'S BODY STRUCTURE

Many invertebrates have an **exoskeleton** (external skeleton). This protects them, gives them shape and keeps them from drying out. Others either have an internal skeleton (starfish) or a soft body with no skeleton (earthworms).

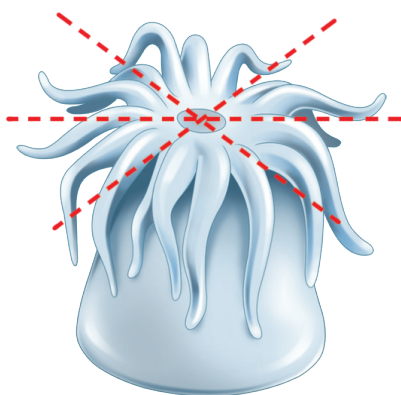
Invertebrates have three basic types of **body symmetry**.

BILATERAL SYMMETRY



Animals with **bilateral symmetry** can be divided equally along one plane. This plane splits an animal into two mirror-image sides.

RADIAL SYMMETRY



Animals with **radial symmetry** have body parts arranged in a circle around a central axis (usually the mouth). Their bodies can be divided in symmetrical parts along more than one plane.

ASYMMETRY



Some invertebrates have an **asymmetrical** body. They are irregular in shape with no symmetry or central axis.

2 LIFE PROCESSES OF INVERTEBRATES

Nutrition: Invertebrates can be carnivorous, herbivorous, omnivorous, filter feeders, parasites, active predators, scavengers or even saprotrophs. Their **respiration** can be through the skin (cutaneous), gills (branchial), tracheae (tracheal) or lungs.

Reproduction: Most invertebrates reproduce **sexually**. They normally have **separate sexes**, but some of them are **hermaphrodites** (they possess both male and female reproductive organs). They are mostly **oviparous**.

Interaction: An invertebrate's nervous system and sense organs are usually much simpler than the ones found in vertebrates. Despite this, invertebrates vary greatly in their complexity.

IT'S A FACT!

THE LARGEST INVERTEBRATE IN THE WORLD IS THE COLOSSAL SQUID (12–14 METRES LONG).

It also has the largest eyes in the animal kingdom (27 centimetres in diameter). These animals can be found in cold waters off the coasts of Antarctica, New Zealand and even some parts of Africa.

Do you know how the colossal squid feeds?

MICROPHAGOUS AND MACROPHAGOUS

Microphagous animals feed off very small particles and include filter feeders, such as clams, and detritivores, such as earthworms. Macrophagous animals feed off large portions of solid food and have beaks or jaws to help them break down and swallow food.

3 CLASSIFYING INVERTEBRATES



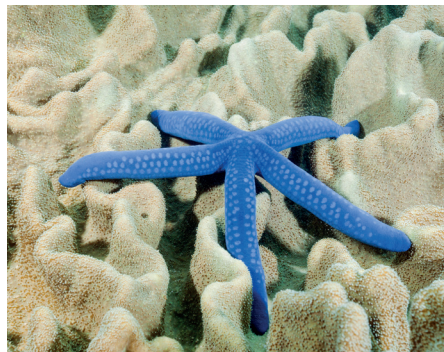
Poriferans are aquatic invertebrates with sac-shaped bodies that are full of pores.



Cnidarians are aquatic invertebrates that have tentacles with stinging cells.



Annelids are invertebrates with long, cylindrical, segmented bodies.



Echinoderms are marine invertebrates with an internal skeleton and, in most cases, spikes.



Molluscs are invertebrates with a soft body. They have a muscular foot and a shell that is sometimes inside the body.



Arthropods are invertebrates that have an external skeleton, a segmented body and jointed limbs.

* FILTER-FEEDER ORGANISMS

These organisms feed themselves by filtering water through their body and trapping food particles in it. Water also carries the oxygen that these organisms need for respiration, and eliminates their waste products.

S SPEAK

Look at the images of different invertebrates above. With a partner, hypothesise about the life processes of each of the species shown. What and how do they eat? How do they carry out respiration? Can they move? If so, how? Do they reproduce sexually, asexually or in both ways? What makes you think this?

KEY STRUCTURES: They ... by -ing ...
/ They ... through ...

02

PORIFERANS

Poriferans, also known as sponges, are aquatic – usually marine – animals which may form colonies or live as solitary organisms. Poriferans are sessile: they attach themselves to the ocean floor and cannot move around.

1 PORIFERAN BODIES

Poriferans **lack symmetry** and have an irregular shape. Their body walls are full of pores. Water enters through the pores, flows into the central body cavity (the atrium) and exits through an upper opening (the osculum).

Some poriferans join together to create shapeless colonies with many openings (oscula).

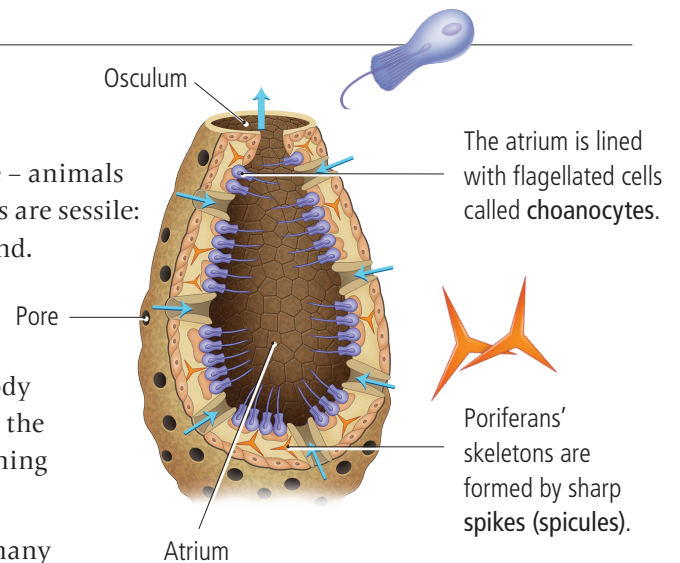
2 LIFE PROCESSES OF PORIFERANS

Nutrition: Poriferans are filter feeders. The movement of the flagella on the choanocytes creates a flow of water that circulates through the body. Poriferans capture food particles in the water, and eliminate waste products through their osculum.

Reproduction: Poriferans reproduce both asexually and sexually. Asexual reproduction occurs through gemmulation, for example, when a small piece breaks off but is still able to survive. In sexual reproduction, poriferans release sperm into the water to fertilise the ova, producing larvae which have the ability to swim. After some time, they attach themselves to a surface and become individual sessile adults. Most poriferans are hermaphrodites.

Interaction: Poriferans have no nervous system or sense organs.

3 CLASSIFYING PORIFERANS



S SPEAK

In what way do you think the spicules that help poriferans to maintain their shape could help in defence from predation? What other adaptations do you think poriferans might employ to avoid being eaten by other sea creatures? Think about the answers, then compare your ideas with a partner. Finally, join up with another pair to share your conclusions.

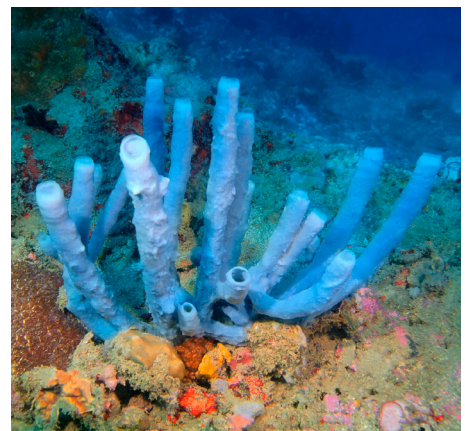
KEY STRUCTURES: ... are made of ...



Calcareous sponges have calcium carbonate spicules.



Hexactinellids, known as 'glass sponges', have silica spicules.



Demosponges have spicules of spongine (an elastic protein) and may have silica spicules.

03 CNIDARIANS

Cnidarians are a group of aquatic invertebrates which includes jellyfish, sea anemones, hydras and corals. Most cnidarians are marine organisms.

1 CNIDARIAN BODIES

Cnidarians have two basic body forms: polyp or medusa. **Polyps** are sessile and may form colonies. **Medusae** float freely and are solitary.

A cnidarian's body has **radial symmetry**. They have a round mouth surrounded by **tentacles** and a digestive cavity (the **gastrovascular cavity**) that acts as a skeleton when it is filled with water. Cnidarians' tentacles have stinging cells, called **nematocysts**. These secrete toxic substances used in self-defence or to immobilise prey.

Coral are polyps which form colonies and create reefs. Coral reefs are ecosystems with a biodiversity and abundance of life comparable to that of tropical rainforests.

2 LIFE PROCESSES OF CNIDARIANS

Nutrition: Most cnidarians are **carnivores** that capture their prey and digest it in their gastrovascular cavity. Waste is expelled through the mouth. Cnidarians breathe through gas exchange which takes place over their entire body surface.

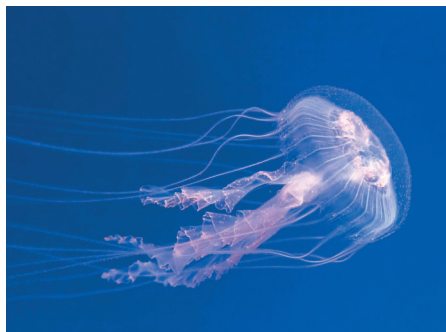
Reproduction: Polyps can reproduce asexually through gemmulation, or they can reproduce sexually. Most medusae reproduce sexually.

Interaction: Cnidarians have simple sense organs which allow them to perceive sources of light, detect vibrations and maintain balance.

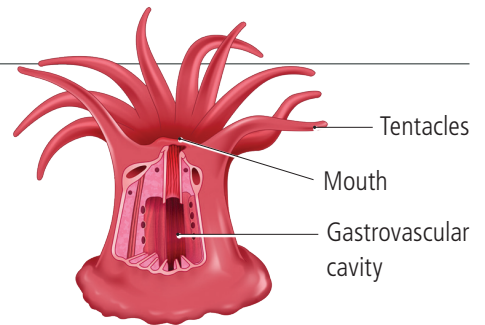
3 CLASSIFYING CNIDARIANS



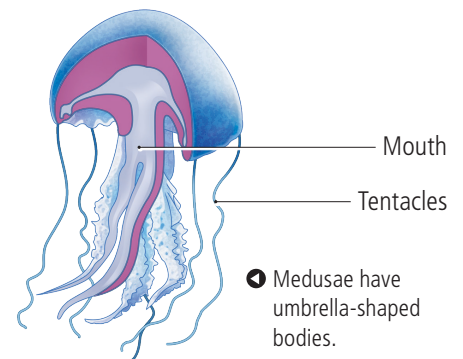
Hydrozoans include marine and freshwater species of cnidarians.



Scyphozoans include most of the common large medusae.



● Polyps have sac-like bodies.



● Medusae have umbrella-shaped bodies.

S SPEAK

Imagine you and a partner are guides in an aquarium. You have to explain the symbiotic relationship between clownfish and sea anemones. Find out about this symbiosis. What are the benefits for the two species?

KEY STRUCTURES: In return, ...



Anthozoans are always polyps. Sea anemones and corals belong to this group.

04

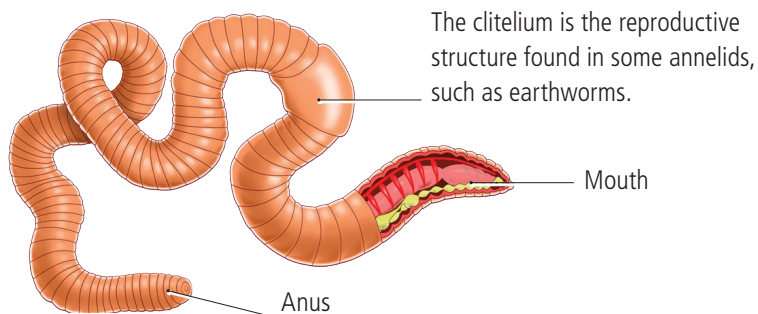
ANNELIDS

Most annelids are marine organisms, but there are also terrestrial and freshwater species. Annelids are worms whose bodies are divided internally into rings or segments called **metameres**. Earthworms and leeches are annelids.

Some annelids are sessile and live inside underwater tubes, but most move around using tiny bristles called **chaetae** or **setae**.

1 ANNELID BODIES

Annelids have **bilateral symmetry** and well-developed organs which form specialised organ systems. Some of these organs are repeated in each segment. Annelids do not have a skeleton.



2 LIFE PROCESSES OF ANNELIDS

Nutrition: Annelids can be predators, filter feeders, saprotrophs or parasites. Aquatic annelids breathe through gills, whereas terrestrial annelids breathe through their skin.

Reproduction: Annelids reproduce sexually. Some have separate sexes, while others are hermaphrodites. Annelids are oviparous.

Interaction: Annelids have a specialised nervous system. Their sense organs detect light, vibration and taste.

3 CLASSIFYING ANNELIDS



Polychaetes are marine annelids with many setae.



Oligochaetes, such as earthworms, have few setae.



Hirudineans, such as leeches, have no setae. Some hirudineans are parasites.

S SPEAK

Earthworms are considered essential to land ecosystems and also to gardening and crop production. Why do you think that is? Work with a partner. Pupil A should research this information, while Pupil B writes down possible reasons. Then A and B work together to discuss this hypothesis and compare it with the correct information.

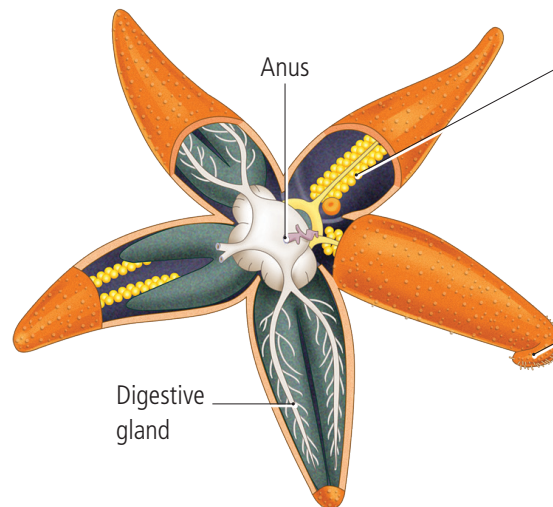
KEY STRUCTURES: I think that ... / You are totally right! / I disagree with that.

05 ECHINODERMS

Echinoderms are marine animals whose name means 'spiny skin'. Sea stars and sea urchins are echinoderms.

1 ECHINODERM BODIES

Adult echinoderms have **radial symmetry**. Their body can usually be divided into **five parts**. They do not have a head. Echinoderms have an **endoskeleton** (internal skeleton) made up of **calcium carbonate plates** and, in most cases, spikes. Their anus is on the upper part of the body, and their mouth is on the underside of the body.



The ambulacral system is a unique system of tubes through which water circulates. It is used in respiration, feeding and sensory reception.

The ambulacral system has external extensions (tube feet) with suckers for locomotion.

S SPEAK

Many people consider sea urchins and sea cucumbers a delicacy. Work in pairs. Pupil A should research sea urchins and Pupil B sea cucumbers. Then imagine one of you is a vendor while the other is a chef. The vendor has a minute to try and convince the chef to buy their species. Then swap roles.

KEY STRUCTURES: ... are low in ... / ... are high in ... (protein, fat, calories)

2 LIFE PROCESSES OF ECHINODERMS

Nutrition: Echinoderms have a complete digestive system. They can be carnivores (sea stars), herbivores (sea urchins), filter feeders (feather stars) or scavengers (sea cucumbers). Respiration occurs through small gills and the ambulacral system.

Reproduction: They reproduce sexually and have separate sexes. Some, like sea stars, can reproduce asexually by regenerating body parts that have been lost.

Interaction: Most echinoderms are sessile or move slowly. They use their tube feet to stick to the ground or for movement.

3 CLASSIFYING ECHINODERMS



Asteroids, or sea stars, typically have five arms. However, some species can have up to 50 arms.



Echinoids (sea urchins) have globe-shaped bodies covered with spikes.



Holothurians have a cylindrical body. They are also known as sea cucumbers.



Crinoids, like sea lilies and feather stars, have featherlike arms. Most crinoids are attached to the sea floor.

06 MOLLUSCS

Molluscs are a group of aquatic – generally marine – animals, although there are also freshwater and terrestrial species. Most molluscs are mobile, but some are sessile and can stay latched onto rocks or other surfaces their whole lives.

Snails, octopuses, squids, clams, slugs, cuttlefish and oysters are all molluscs.

1 MOLLUSC BODIES

Molluscs have **bilateral symmetry**. Their soft body is generally divided into three parts: a **head**, a **foot** and a **visceral mass**. The visceral mass contains the digestive, respiratory, circulatory and reproductive organs. It is surrounded by a membrane called the **mantle**. In many mollusc species, the mantle secretes materials that then form a protective **shell**.

The body is sometimes protected by an **external shell**.

The **head** contains the mouth and sense organs.

The strong **muscular foot** secretes mucus which helps the organism slide along the ground. The foot is also used to adhere to the substrate.



2 LIFE PROCESSES OF MOLLUSCS

Nutrition: Molluscs have a complete digestive system. Most molluscs have a rasping tongue with very small teeth. This structure is called the radula. Molluscs can be herbivores (most terrestrial snails), carnivores (squid), filter feeders (oysters) and even parasites (some sea snails). Aquatic molluscs breathe through gills, whereas terrestrial molluscs have lungs.

Reproduction: Molluscs reproduce sexually. Most species have separate sexes, but there are also hermaphrodite species, such as the land snail. Most molluscs are oviparous.

Interaction: Their sense organs include olfactory, sight, taste and touch organs.

IT'S A FACT!

PEARL-PRODUCING MOLLUSCS

The mantle tissue can secrete layers of nacre around a parasite or foreign body which has become trapped between the shell and the mantle. This is how the pearls found in some tropical oysters are formed. This nacre is often called 'mother of pearl'.



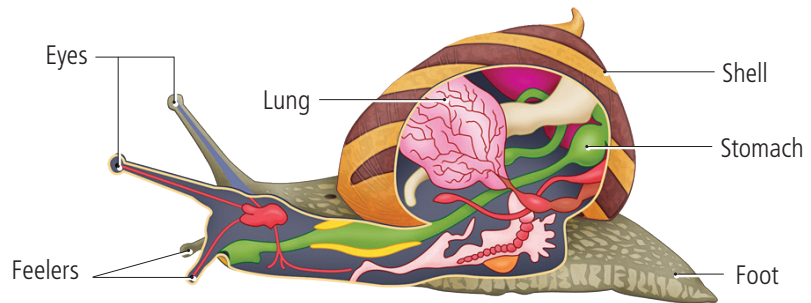
3 CLASSIFYING MOLLUSCS

GASTROPODS

This group includes slugs, land and sea snails, and limpets. Most are herbivores, but some are carnivores or parasites.

The **eyes** are located in the longer tentacles, and the **feelers** are located in the shorter tentacles.

Most have a single shell, usually with a spiral pattern. Slugs have no shell.

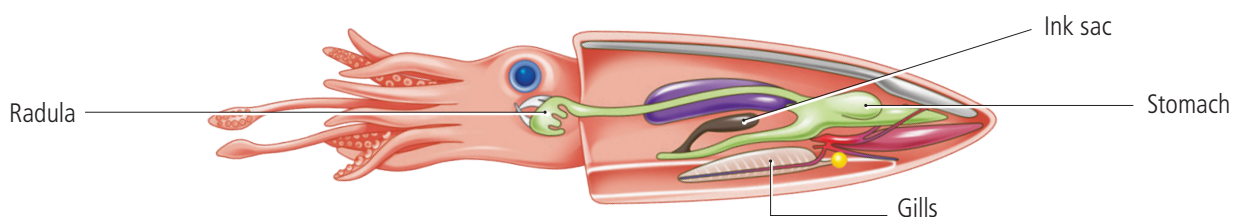
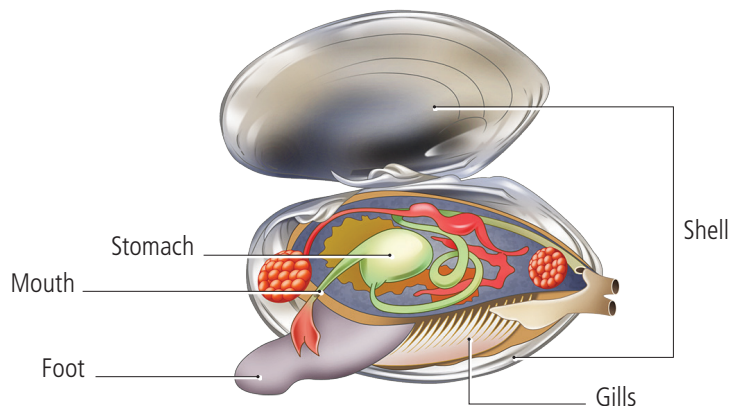


BIVALVES

Bivalves are filter feeders and include clams, oysters and mussels. They do not have a head or radula. Their sense organs are located on the mantle edge.

Their foot is used for movement, although they are mostly sessile.

Their shell is made up of two parts called valves.



CEPHALOPODS

These include squids, octopuses and cuttlefish. They are **carnivorous predators** which trap their prey using their tentacles.

Cephalopods move by jet propulsion. They fill the mantle cavity with water and then quickly expel the water via a tubular organ called the **siphon**. **Ink** is also released through the siphon.

The **foot** surrounds the mouth and is modified into a crown of **tentacles**.

The **shell** is internal in cuttlefish (called a **cuttlebone**) and squid (called a **pen**). Octopuses have no shell.

They have a highly developed brain and complex eyes.

S

SPEAK Mussels and snails are both commercially grown for food, but how? Work in pairs following the teacher's directions. Pupil A is a TV presenter, and Pupil B is an agricultural specialist of a company that produces your animal. The TV presenter should ask the specialist questions about how the animal is farmed. Then change roles.

KEY STRUCTURES: The best way to farm ... is by -ing ...

07

ARTHROPODS

Arthropods are the largest and most diverse group of animals on Earth. There are both aquatic and terrestrial arthropods. Prawns, spiders, millipedes, butterflies, grasshoppers, ants and flies belong to this group'.

1 ARTHROPOD BODIES

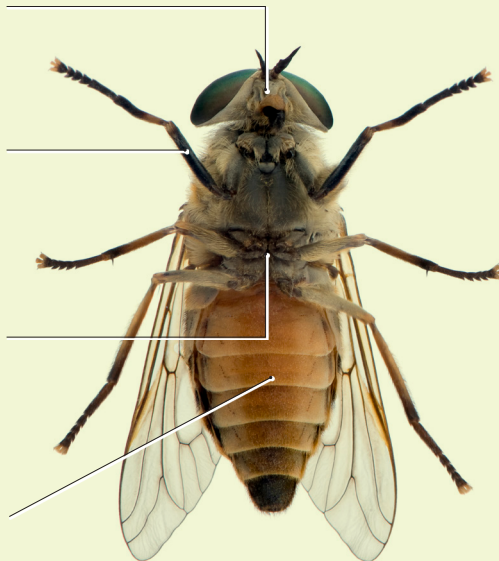
Arthropods have **bilateral symmetry**. Their body is divided into segments. Most arthropods have three body segments: the **head**, the **thorax** and the **abdomen**. In some cases, the head and the thorax are fused together and form a **cephalothorax**. The arthropod's body is covered by a **hard, jointed exoskeleton** composed of different pieces that fit together.

The **head** contains the brain, antennae, eyes and mouth.

The **jointed or articulated appendages** (legs, antennae and mouthparts) are made up of separate parts which are joined together. This makes them flexible.

The **thorax** contains the heart, the jointed legs and the wings on flying arthropods.

The **abdomen** has no appendages and contains the excretory and reproductive systems.



2 LIFE PROCESSES OF ARTHROPODS

Nutrition: Arthropods can be herbivores, carnivores or omnivores. Fleas, ticks and lice, for example, are parasites. Houseflies are scavengers, feeding on dead or decaying matter. Aquatic arthropods breathe through gills. Terrestrial arthropods breathe using a system of tiny tubes called tracheae. The tubes carry oxygen to the entire body.

Reproduction: Arthropods reproduce sexually. They have separate sexes and fertilisation takes place internally, inside the female's body. They are oviparous. Some species of arthropods develop through a process called metamorphosis, which means 'transformation' or 'change of shape'.

Interaction: Arthropods have a highly developed nervous system. They also have well-developed sense organs including simple eyes (ocelli), compound eyes and antennae. Sensitive hairs detect vibration, taste and touch.

* Compound eyes of insects are made up of multiple units (ommatidia), each of which functions as a separate visual receptor.



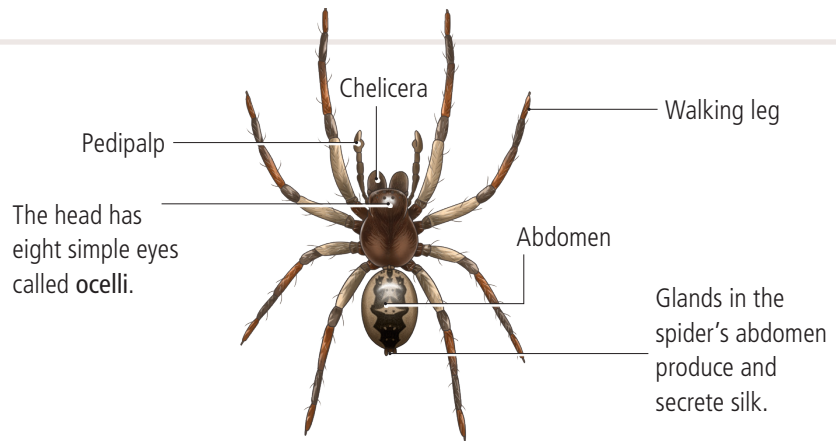
MOULTING IN ARTHROPODS

Arthropods have a rigid exoskeleton which prevents them from growing. In order to develop, arthropods must shed (or 'moult') their old skeleton and secrete a new one. This happens several times during their life.

3 CLASSIFYING ARTHROPODS

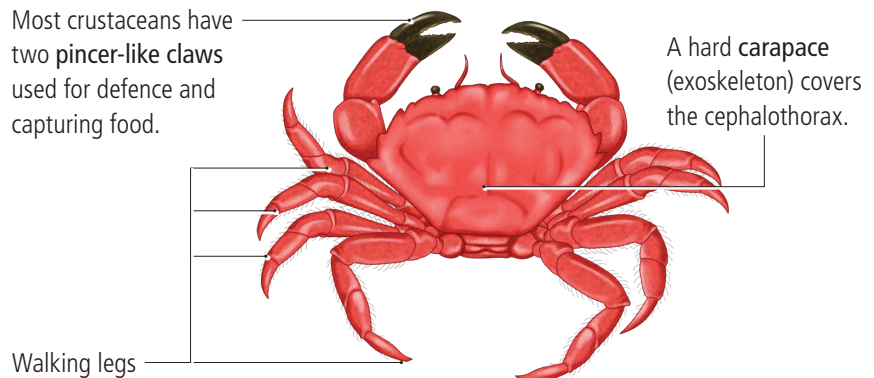
ARACHNIDS

This group includes spiders, scorpions and ticks. Their body is made up of a cephalothorax and an abdomen. The cephalothorax has: four pairs of walking legs, two sensory organs (**pedipalps**), and two appendages (**chelicerae**) which may contain poison to capture and paralyse prey. Arachnids breathe through tracheae and lungs. They are predators.



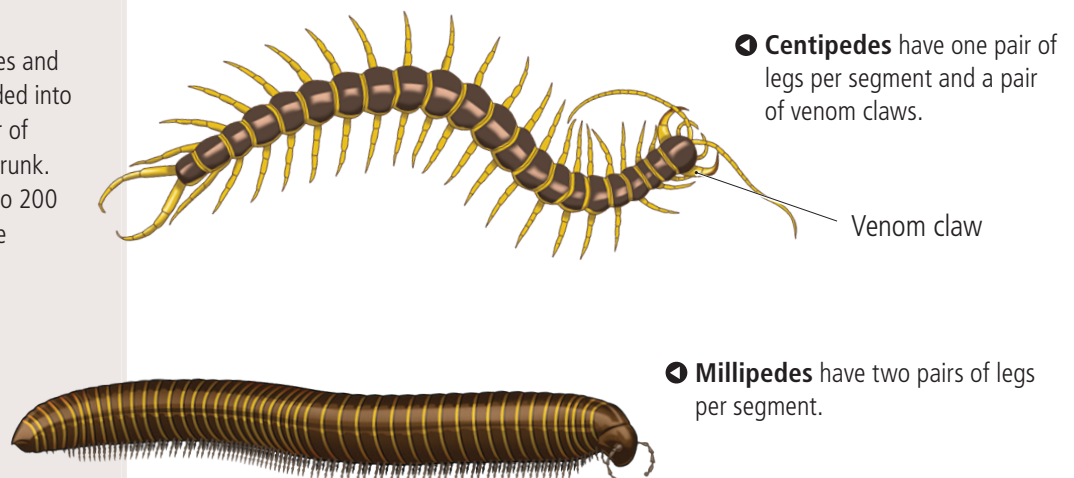
CRUSTACEANS

Crabs, lobsters, prawns and barnacles are crustaceans. Their body has two parts: a cephalothorax and an abdomen. The cephalothorax has two pairs of antennae and ten or more legs. Crustaceans breathe either through their skin or by using gills.



MYRIAPODS

This group includes centipedes and millipedes. Their body is divided into two parts: a head with a pair of antennae and an elongated trunk. The trunk can have from 15 to 200 segments. Myriapods breathe through tracheae.



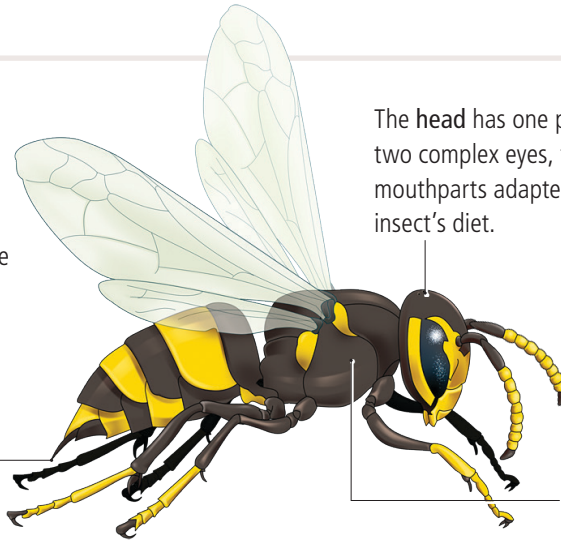
INSECTS

These are the largest group of invertebrates and the only ones that can fly. Their bodies are divided into three parts: the head, the thorax and the abdomen. Most insects are terrestrial and breathe through tracheae. In aquatic insects, however, the larvae breathe through gills.

The anus and the genital opening are found at the very end of the abdomen.

The head has one pair of antennae, two complex eyes, three ocelli and mouthparts adapted to suit the insect's diet.

The thorax has three pairs of legs and often two pairs of wings.



4 METAMORPHOSIS OF INSECTS

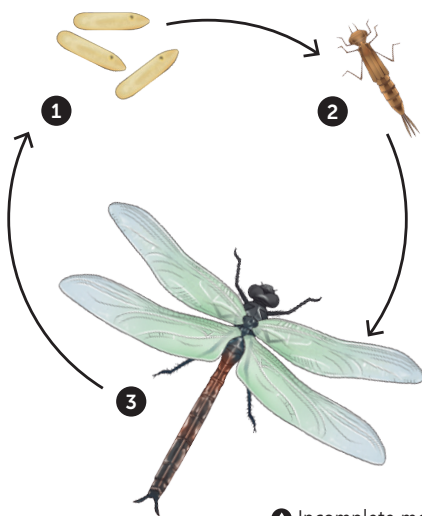
Insects grow and develop throughout a process called metamorphosis, which can be incomplete or complete.

INCOMPLETE METAMORFOSIS

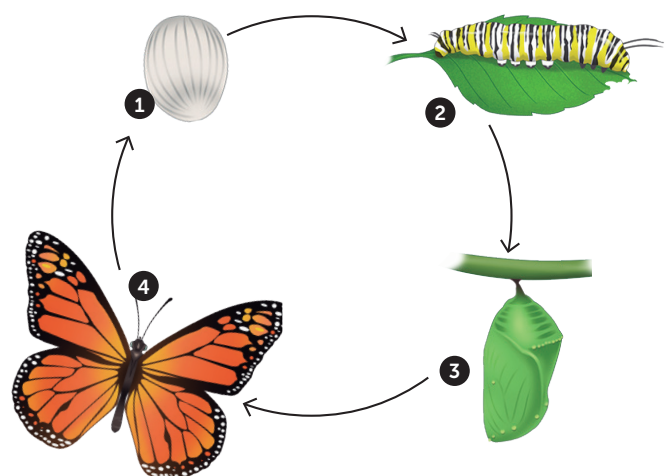
When a nymph hatches from the egg, it looks exactly like an adult insect but without wings. The wings develop inside the exoskeleton during the many moultings, and unfold once they are fully formed.

COMPLETE METAMORFOSIS

When a larva hatches from the egg, it feeds and grows until it secretes a covering around itself. While it is immobilised inside this covering, it passes to the pupa or chrysalis stage. After a period without feeding, the pupa opens and the adult specimen emerges.



1 Incomplete metamorphosis occurs in grasshoppers, dragonflies and cockroaches.



1 Complete metamorphosis occurs in butterflies, beetles, ants, flies and wasps.

5 GROUPS OF INSECTS



Coleopterans (beetles)



Lepidopterans (butterflies and moths)



Orthopterans (crickets and grasshoppers)



Dictyopterans (mantis and cockroaches)



Hymenopterans (wasps, bees and ants)



Hemipterans (cicadas and aphids)



Dipterans (flies and mosquitoes)



Odonates (dragonflies and damselflies)



Dermapterans (earwigs)

S **SPEAK** Insects can cause a lot of damage to crops, and so many farmers use insecticides. Some environmental activists and organic farmers consider that using insecticides is bad for the environment and for human health. Imagine one of you is a traditional farmer who uses insecticides, and the other is an organic

farmer who thinks there are other ways to control insect damage. You have a few minutes to prepare your arguments. Then discuss your points of view.

KEY STRUCTURES: ... are necessary because ... / ... are bad for the environment because ... / I understand what you're saying, but ... / The problem is that ...

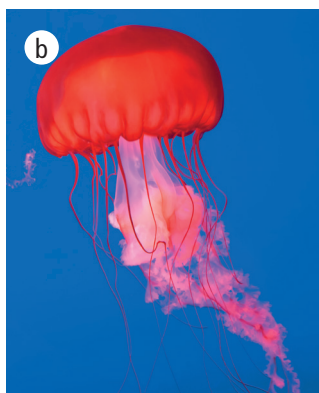
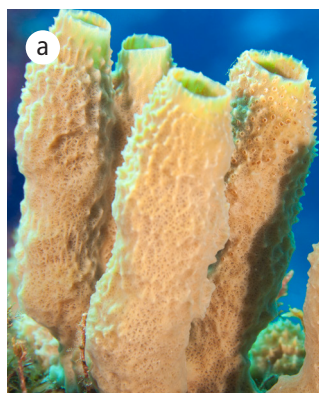


ACTIVITIES

INVERTEBRATE ANIMALS

1 INVERTEBRATES

- 1 Are invertebrates a homogeneous or heterogeneous group? Give reasons for your answer.
- 2 What six groups are invertebrates classified into? Name one invertebrate from each group.
- 3 Describe the body symmetry of the following invertebrates. What is the third type of body symmetry?



- 4 Identify which of the following animals are not invertebrates: earthworm, fly, snake, jellyfish, lion, squid, eel, snail, mussel, bird.
- 5 Are these statements true or false? Correct the false ones in your notebook.
 - a All invertebrates have an external skeleton.
 - b The majority of animal species are invertebrates.
 - c All invertebrates are filter feeders.
 - d Invertebrates only reproduce sexually.
- 6 Some invertebrates are sessile, while others are mobile. Define these two terms and give examples of each.
- 7 Describe how a filter feeder feeds itself.
- 8 What is the difference between microphagous organisms and macrophagous organisms?

9 Copy and match in your notebook.

- | | |
|--------------|--|
| 1 poriferan | a internal skeleton, spikes |
| 2 echinoderm | b sac-shaped bodies full of pores |
| 3 mollusc | c segmented bodies, cylindrical |
| 4 cnidarian | d segmented bodies, exoskeleton, some have wings |
| 5 arthropod | e tentacles, stinging cells |
| 6 annelid | f external, internal or no shell |

10 ◀ A student is giving a presentation about beetles to her classmates. Listen and answer the questions.

- a What percentage of species in the world are beetles?
- b Which two places are beetles NOT found?
- c How big are the smallest and largest beetles?
- d What is shocking about the decorated beetle brooches made in some parts of Mexico?

02 PORIFERANS

- 11 What is the function of a poriferan's pores? How do the choanocytes help?
- 12 Explain sexual and asexual reproduction in sponges.
- 13 What are the three types of poriferans? What differentiates them from one another?
- 14 Describe poriferans' nervous system and sense organs.
- 15 ◀ You are going to hear two business people debating the pros and cons of artificial and natural sea sponges: Dave Hyde, the owner of Natural Sponges Limited, and Sonia Blake, the CEO of Beautiful Bathware, an artificial sponge manufacturer. Who says each sentence? Sonia (S), Dave (D) or both (B)?
 - a The whole sponge is not harvested from the sea.
 - b Sponge production can alter the ocean ecosystem.
 - c Some sponges are made from wood.
 - d Disinfectant is added to artificial sponges.
 - e Their company's sponge production is eco-friendly.

03 CNIDARIANS

- 16** Do cnidarians have sense organs? If so, what role do they play in interaction?
- 17** Explain the difference in body forms between polyps and medusae.
- 18** What do cnidarians use their tentacles for?
- 19** ◀ You are going to hear a radio interview where Nathan, the presenter, talks to Jane, an astronaut who is working at a space station.
- Are these sentences true (T) or false (F)? Correct the false ones.
- a** Jane has been to space before.
 - b** All the jellyfish were born on Earth.
 - c** The jellyfish had problems reproducing in space.
 - d** Jellyfish and humans sense gravity in the same way.
 - e** This research helps us know how children born in space will adapt to living on Earth.

04 ANNELIDS

- 20** How do annelids move around?
- 21** Why do you think annelids are also called 'ringed worms'?
- 22** Explain the main differences between a polychaete, an oligochaete and a hirudinean.
- 23** ◀ You are going to hear the presenter of a radio phone-in introducing the topic of the day.
- Listen and answer these questions.
- a** Why were there no earthworms in the north of the American continent 600 years ago?
 - b** How were worms reintroduced to the area?
 - c** Why were they reintroduced?
 - d** What is one effect that the reintroduction of earthworms had on the ecosystem in those areas?

05 ECHINODERMS

- 24** What does the ambulacral system help echinoderms to do?
- 25** Describe an echinoderm's feet and how they are used.
- 26** Identify the key characteristics of echinoderms. Say how they breathe, reproduce and interact.

- 27** Which two characteristics of echinoderms do you think are unique to this phylum?

- 28** ◀ You are going to hear two friends talking about a famous Australian natural phenomenon.

Listen to the audio and choose the correct answer.

- 1** Ella's parents are:

- a** on holiday
- b** working as volunteers
- c** at home

- 2** Crown-of-thorns sea stars eat:

- a** coral
- b** jellyfish
- c** sea urchins

- 3** Adult crown-of-thorns sea stars can be:

- a** 0.25 metres
- b** 0.50 metres
- c** 1.50 metres

- 4** Crown-of-thorns outbreaks occur about every:

- a** 6 years
- b** 16 years
- c** 60 years

06 MOLLUSCS

- 29** Describe some of the characteristics which make molluscs different to other invertebrates.
- 30** Identify which of the following are not molluscs: grasshopper, butterfly, cuttlefish, sea snail, clam, oyster, octopus, spider, crab. Justify your answer.
- 31** In your notebook, draw a table showing the differences and similarities between the three groups of molluscs: gastropods, bivalves and cephalopods.
- 32** ◀ Listen to a representative of a skin cream company explaining how the health benefits of snail mucus were discovered.
- Are these sentences true (T) or false (F)? Correct the false ones.
- a** The first person to consider that snail mucus was good for human skin was a Spanish doctor.
 - b** The radiation treatment helped to repair the cuts on the snails' skin.

- c** The government helped Dr Iglesias to extend his research.
- d** Dr Iglesias' treatment helped people who suffered radiation burns.
- e** 'Funding' means money given by the government or an organisation.

07 ARTHROPODS

- 33** Choose any arthropod, and identify at least five features which classify it as an arthropod.
- 34** What happens when arthropods become too big for their exoskeletons? Describe this process in your notebook.
- 35** Arthropod bodies have two or three main parts. Write the names of these parts in your notebook. Identify which arthropod groups have two body parts and which have three.
- 36** You will hear a zoo guide talking about silkworms. Listen and choose the correct option.
- 1** Silkworms are:
- a** annelids
 - b** the larva of a butterfly
 - c** the larva of a moth
- 2** How many days do silkworms spend eating?
- a** 15
 - b** 50
 - c** 100
- 3** The silkworm cocoon is made by:
- a** one silk thread
 - b** one hundred silk threads
 - c** one thousand silk threads
- 4** In silk farms:
- a** The caterpillar pupates to become a moth.
 - b** The cocoons are boiled before the moths leave.
 - c** The cocoons are boiled after the moths leave.

UNIT REVISION

- 1** Explain the difference between poriferans, cnidarians and annelids in relation to:
- a** body symmetry
 - b** feeding habits
 - c** reproduction
- 2** Say if the following sentences apply to crustaceans, arachnids, myriapods or insects.
- a** Their head has eight simple eyes.
 - b** A protective carapace covers their cephalothorax.
 - c** Their bodies can have up to 200 segments.
 - d** Members of this family include scorpions and ticks.
 - e** This group of arthropods has a three-part body.
 - f** These are the only arthropods that may have two pairs of wings.
 - g** They have two sensory organs called pedipalps.
- 3** What is the main difference between complete metamorphosis and incomplete metamorphosis?
- 4** Identify what group of molluscs (gastropods, bivalves, cephalopods, or a combination of the three) the following sentences refer to. Justify your answer.
- a** This group is most likely to be found in the woods.
 - b** This group has tentacles.
 - c** Members of this group lack a head.
 - d** These groups are most likely to be found on a dinner plate.
 - e** This group produces pearls.
- 5** Match the following terms to their etymological origins: *molluscs*, *annelids*, *arthropods*, *poriferans*, *cnidarians*
- a** Latin for 'stinging nettle'
 - b** Latin for 'soft body'
 - c** Latin for 'joint' and 'foot'
 - d** Latin for 'little rings'
 - e** Latin for 'bearing pores'

R

READ AND REFLECT

INVERTEBRATE
REGENERATION

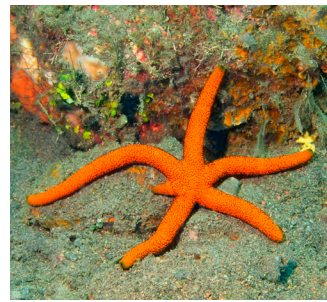
All invertebrates can repair damage to their body parts, after accidents or fights. Some species can also regenerate entire limbs that they lose.



Arthropods, such as insects and crustaceans, regenerate lost limbs when they moult and grow a new exoskeleton. The regeneration of an entire leg may require more than one moult. Some arthropods, such as crabs, pull off their own damaged legs or claws so that new ones can form.



Some worms also regenerate lost parts. For example, if we cut a flatworm in half, the head grows a new tail and the tail grows a new head. We can also split a flatworm from head to tail, into two long pieces. Each piece repairs itself and becomes a new flatworm.



Echinoderms, such as sea stars, can also regrow body parts. When a sea star loses an arm, a small bud forms and then it slowly grows to become a new arm. This growing process is called epimorphosis. It takes about one year for a sea star to grow a completely new arm.



Some cnidarians, such as hydra, can regenerate if we cut them into small pieces. The cells in each piece change to form new structures. This transformation process is called morphallaxis. Each part of the original hydra becomes a new, smaller hydra, which later grows to normal size.

A

ANSWER IT!

1 Match the sentences to the invertebrates in the text.

- a They can regenerate from small pieces.
- b They grow new limbs when they moult.
- c They can grow new heads or new tails.
- d They develop buds that form new arms.

2 When a sea star loses an arm, how long does it take for a new one to replace it?

3 Why do some crustaceans pull off their own limbs? How does this help the crustacean?

4 What is the difference between epimorphosis and morphallaxis? In your opinion, which process is more effective? Explain your reasons.

5 Do you think a sea star can survive with only one or two arms? What problems will it have?

6 Find information about amphibians that can regenerate lost limbs. Share your information with the class.