4.1 Life as a fluke

Science understanding

Verbal/Linguistic

Parasites are organisms that live in or on another organism and are dependent upon it for food or nutrients. The organism they live in or on is known as the host. Many parasites have very complicated life cycles. Some species may have several different hosts and go through different distinct stages in their life cycle (much like butterflies do).

The liver fluke shown in Figure 4.1.1 is a type of flatworm that is a parasite of humans. The adult fluke is about 3 cm long and lives in tubes in the liver known as bile ducts. Humans become infected with liver flukes by eating raw water plants such as watercress. The main symptom of liver fluke infection is general tiredness, and it rarely causes death. Infection may weaken people enough to lead to death from other illnesses. The liver fluke is only found in a few places in Australia and is not very common. However, it is widespread in Asian countries.

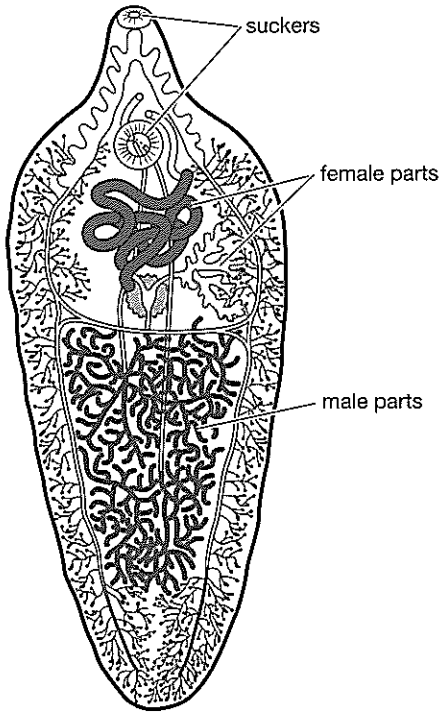
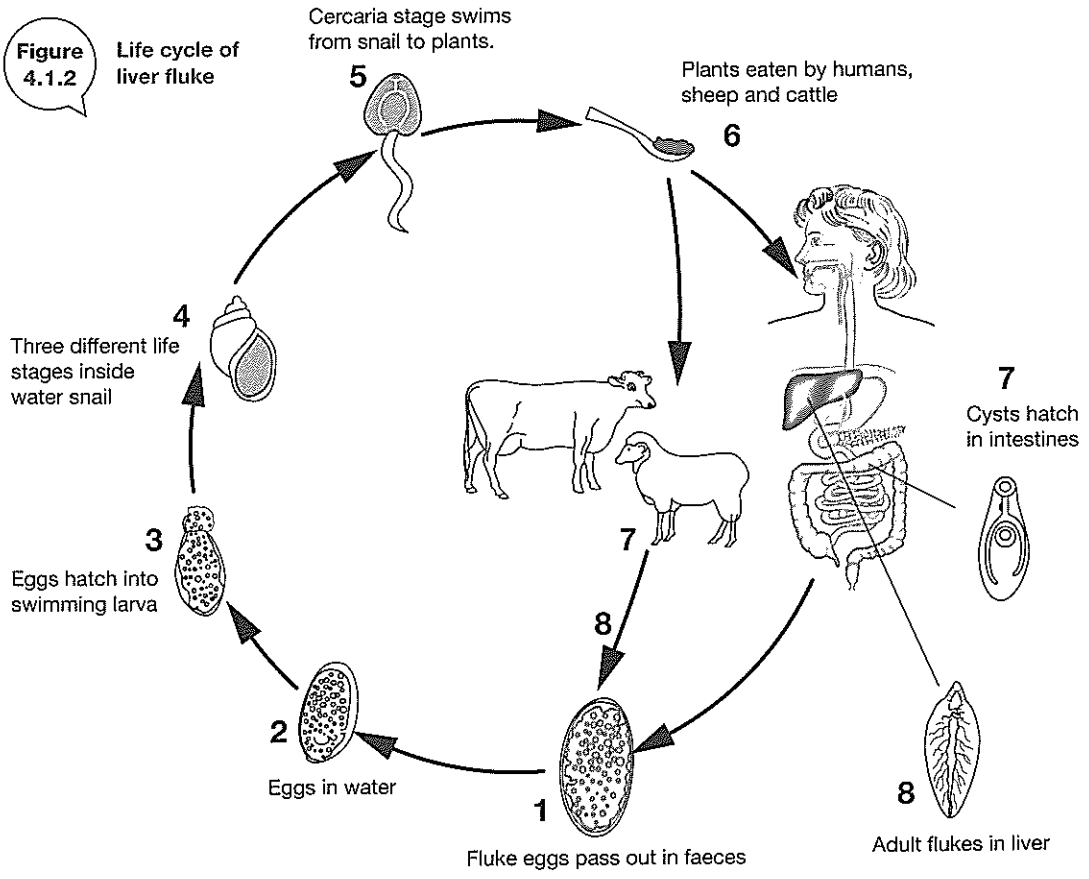


Figure 4.1.1 **The adult liver fluke has both male and female reproductive systems on one animal, so it can fertilise its own eggs. It also has two suckers it can use to hold on to the wall of the bile ducts.**

Figure 4.1.2 **Life cycle of liver fluke**



4.1

The liver fluke has a life cycle in which it lives in several different hosts. The adult fluke lives in humans, sheep and cattle. Its eggs pass out with faeces. If the eggs enter bodies of water, they hatch into microscopic free-swimming larvae. A swimming larva burrows into a water snail and there it develops through several different life stages. The last stage in the snail is called a cercaria. The cercaria escapes from the snail's body and swims to plants, where it turns into a fluid-filled ball called a cyst. This has a protective wall around it. If a cyst is eaten by humans, it hatches in the intestines and burrows through to the bile ducts, where it develops into an adult fluke. Now the life cycle is completed. The stages are shown in Figure 4.1.2 on page 47.

1 The adult liver fluke can live in many different hosts such as humans, cattle and sheep. **Describe** how the life cycle is connected between a human and the snail.

2 **Explain** the kind of environment in which infection by a liver fluke would be common.

3 **Propose** how a farmer could minimise infection of livestock by liver flukes.

4 Many species of parasitic worms are hermaphrodites, meaning they can fertilise their own eggs. **Propose** how being a hermaphrodite would be an advantage in a life cycle like that of a liver fluke.

5 **Explain** how the liver fluke is dependent on snails for survival of its species.

6 **Propose** why the survival of the liver fluke as a species depends on its ability to produce enormous numbers of eggs.

4.2 Malaria and mosquitoes

Science as a human endeavour

Logical/Mathematical **Verbal/Linguistic**

Malaria is an infectious disease caused by a single-celled parasite called *Plasmodium.* Between 1.5 million and 3 million people die of malaria every year. This is about 4–5% of all deaths in the world; 85% of these deaths from malaria are in Africa.

The *Plasmodium* parasite is transmitted from human to human by female mosquitoes (a particular type of mosquito called *Anopheles*). The female mosquito must drink blood to be able to reproduce. The life cycle of the parasite involves living in both mosquitoes and humans. You can see this in Figure 4.2.1, starting at stage 1. The first life stage of the parasite is a type of infective cell known as a spore. The spores develop in the female mosquito and are injected into a human who has been bitten by the mosquito. In stage 2 inside the person, each spore changes into life stages that develop in the liver and red blood cells. In stage 3 the parasite then forms special reproductive cells (sex cells) that remain in human blood. In stage 4 these sex cells can infect any mosquito that bites the person from then on. Once they are in the next mosquito, the sex cells join together. In stage 5 the parasite goes through several life stages one after another before again forming new infective spores. This completes the life cycle of the malaria parasite.

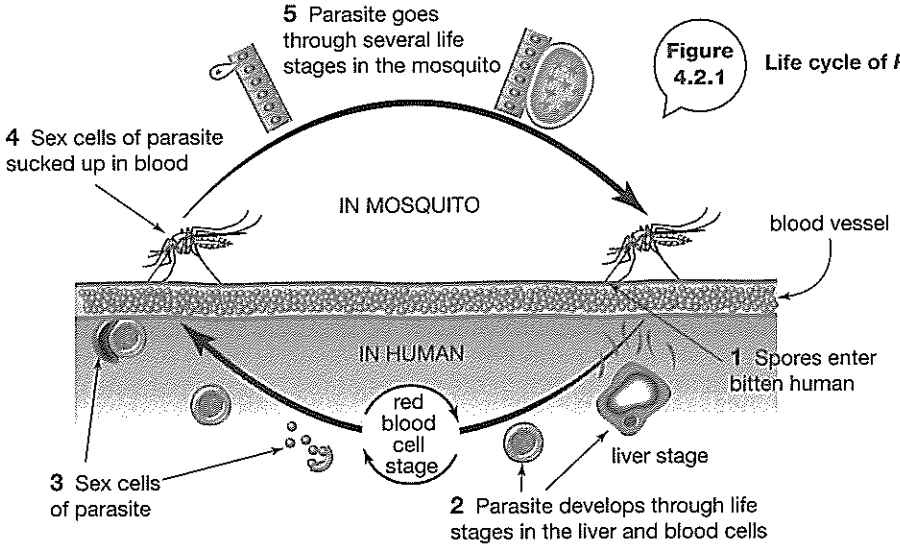


Figure 4.2.1 **Life cycle of *Plasmodium***

One strategy to control malaria is to use certain drugs to kill the parasite while it is in the human body. If the parasite is eradicated from humans, it cannot be transmitted from human to mosquito and the life cycle will stop. However, it is impossible to eradicate the parasite from every human at the same time. This approach can only slow down the spread.

Another effective strategy in malaria control is to prevent the mosquito breeding. Mosquitoes have a life cycle in which it lives in water in three of the stages: the eggs, larva and pupa. These stages are shown in Figure 4.2.2 on page 50.

There are two main approaches to preventing mosquitoes breeding:

- Removing breeding sites: The easiest, cheapest and most direct method to control malaria is to prevent the mosquito from laying eggs. This is done by eliminating places where water can collect, such as old tyres, buckets and bottles. All water tanks should be kept tightly closed. Waterlogged areas can also be drained.

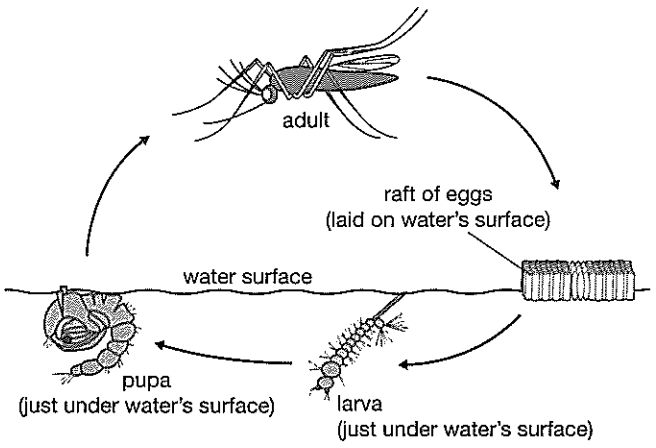


Figure 4.2.2 Life cycle of mosquito

- Killing them in the water: The larvae developing in the breeding sites can be destroyed by using chemicals or biological control. Different chemicals can be used on drinking water and non-drinking water. Oils may be spread on the water surface, suffocating the mosquito larvae and pupae. Biological control agents are organisms such as *Gambusia* fish, nematode worms and water beetles that eat the larvae. Several types of bacteria can also be spread to kill mosquitoes.

1 **State** why malaria is a problem for world health.

_____

2 **Name** the organism that causes malaria.

_____

3 **Name** the organism that transmits malaria from human to human.

_____

4 **Name** two different animals in which life stages of the malaria parasite can be found.

_____

5 **Explain** how knowledge of the life cycle of the malaria parasite can be used to develop a plan to control malaria.

_____

_____

6 **Explain** how knowledge of the life cycle of mosquitoes is used to help control malaria.

_____

_____

4.3 Flowers and pollination

Science understanding, Science inquiry

Logical/Mathematical **Verbal/Linguistic**

Flowers can have many different shapes, sizes and colours. Careful study of different flowers has led biologists to conclude that these differences are related to how the plants reproduce. This table is a summary of how the main features of cross-pollinating flowers depend on the way in which they are pollinated.

Method of pollination	Flower structure/ colour/size	Anther/stamens	Stigma/style
Wind	Often small but with many flowers in one head, often no petals, not brightly coloured, no nectar, no scent	Long stamens with large anthers exposed	Long style with exposed stigma; stigma has large surface area—often look like brushes
Insect	Usually small, some with many flowers in one head, brightly coloured petals especially blues and yellows, small amounts of nectar, strong scent, often strongly marked with 'landing guides'	Often short stamens and small anthers, close to nectar source in most flowers, sticky pollen	Short style, small stigma close to nectar source
Bird	Large strong flowers, some have petals but many don't, lots of nectar, often red	Often long, strong stamens and large anthers, sited a long way from the nectar source	Long style, smallish stigma, sited a long way from the nectar source
Mammal	Large strong flower heads, often not brightly coloured in many and often hidden in plant, much nectar produced at night	Strong and rigid	Strong and rigid

Some characteristics of Australian animals that pollinate flowers have also been studied, and are shown in the following table.

Animal	Characteristics
Insects	Poor eyesight, low intelligence, good sense of smell, small bodies
Birds	Good eyesight, intelligent, most active in daylight (diurnal), poor sense of smell, large bodies
Mammals	Good eyesight, intelligent, most are nocturnal, good sense of smell, large bodies

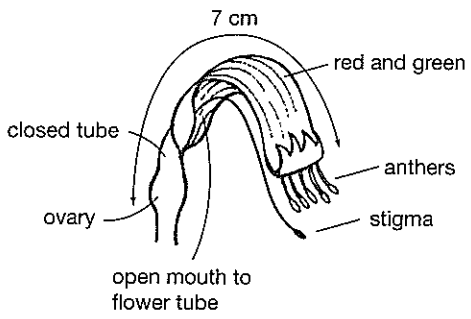
1 The flower features are related to the way the pollen is carried. **Propose** why bird-pollinated flowers would be larger and stronger and have more nectar than insect-pollinated flowers.

2 **Propose** why wind-pollinated flowers would have large brush-like stigmas and large anthers with a lot of pollen.

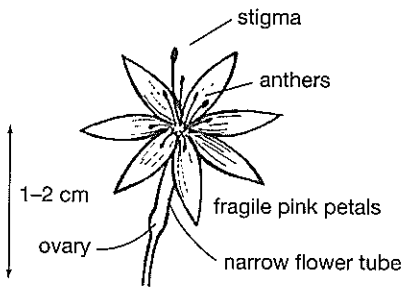
3 **Propose** why mammal-pollinated flowers in Australia lack colour, have a strong scent, and are hidden away.

4 For each flower below, **propose** which method of pollination occurs and **justify** your choice.

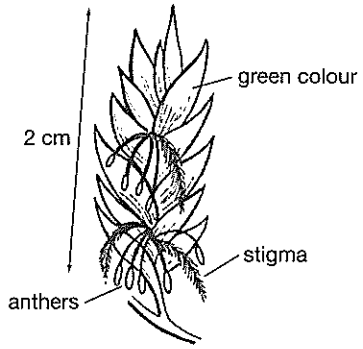
(a) Kangaroo paw



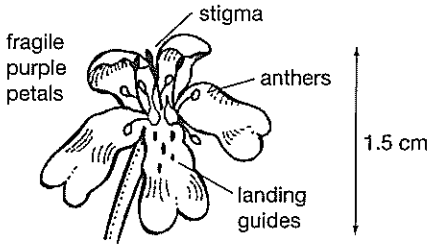
(b) Starflower



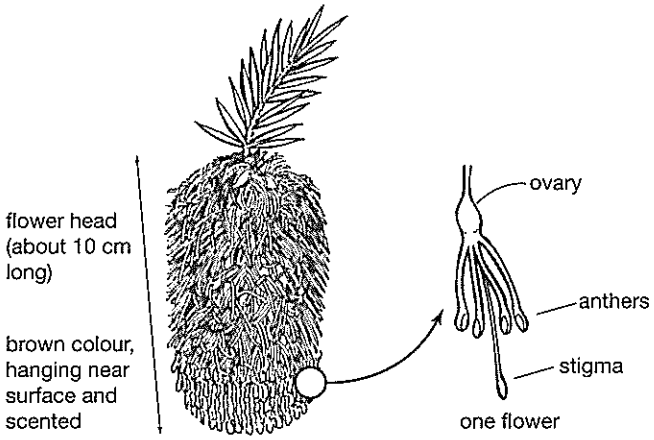
(c) Veldt grass



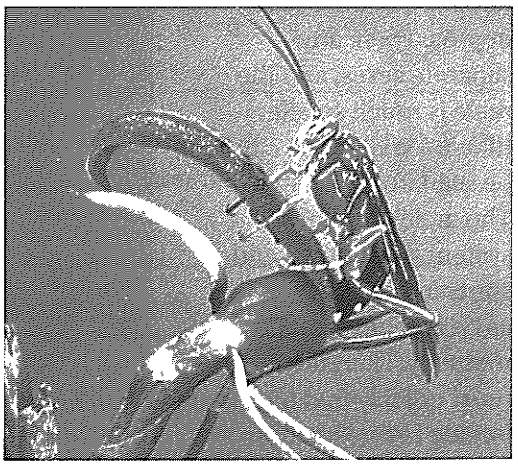
(d) Westringia



(e) Nodding banksia



5 Some amazing orchids have a flower that resembles a female wasp. The male wasp is tricked into trying to mate with the flower, as shown. When the male attempts to mate, a packet of pollen sticks to the wasp's abdomen. Then the wasp flies to another flower and attempts to mate with that one too. This pushes the pollen into the flower and pollinates it. Wasps have fairly poor vision and cannot see more than a few metres. **Propose** how the wasp finds the flower.



4.4 Sex stories

Science understanding, Science inquiry

Logical/Mathematical Verbal/Linguistic

An organism's method of reproduction can be related to its environment. Asexual reproduction may be suitable for some environments, but not others. Separate sexes and cross-fertilisation may be a disadvantage in some places. Some examples of how the method of reproduction relates to environment can be seen in the life cycles of the following organisms.

Tripod fish

The tripod fish is a strange animal. It spends most of its time resting on the bottom of the ocean in complete darkness, supported by the three large stiffened fins that give it its name. These can be seen in Figure 4.4.1. There is not much food on the bottom of the ocean and it is extremely cold. The chance of a tripod fish seeing another of its species in such an environment is low because only small numbers of fish can live in a place where food is in short supply. The tripod fish is a hermaphrodite, having male and female sex organs on the one individual. It can fertilise its own eggs.

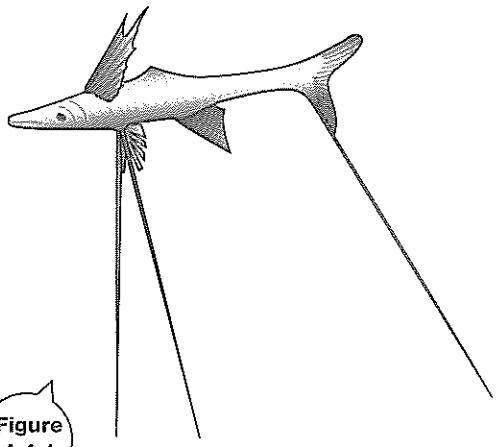


Figure 4.4.1

Tripod fish

Angler fish

Angler fish also live in darkness in the ocean depths. There are separate sexes, and the male is much smaller than a female. This can be seen in Figure 4.4.2. The male's digestive system shuts down and starts to break down as he reaches sexual maturity. Then the male must quickly find a female before he dies. When he finds a female, he bites into her skin, and the blood vessels of his mouth and her body join together. The male body then slowly shrivels up and he loses his brain, heart and eyes. The photograph shows this happening. The male then becomes nothing more than a pair of sex organs or gonads that release sperm into the female's bloodstream when hormones signal that an egg has been released.

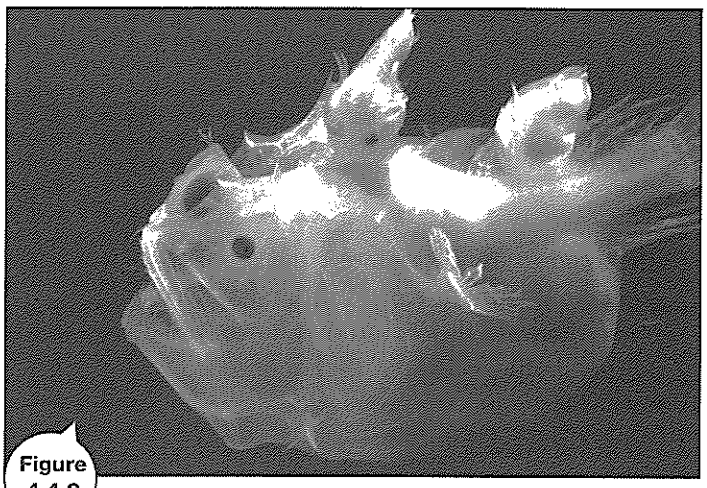


Figure 4.4.2 A female anglerfish with the tiny male attached

Seahorses

Seahorses are bony fish. In seahorses, the males become pregnant. Their mating involves the female inserting her oviduct into the male's brooding pouch and passing her eggs into it. The male passes his sperm into the brooding pouch where the eggs are fertilised. The eggs hatch in the male's pouch and are expelled by contractions of his body (Figure 4.4.3).

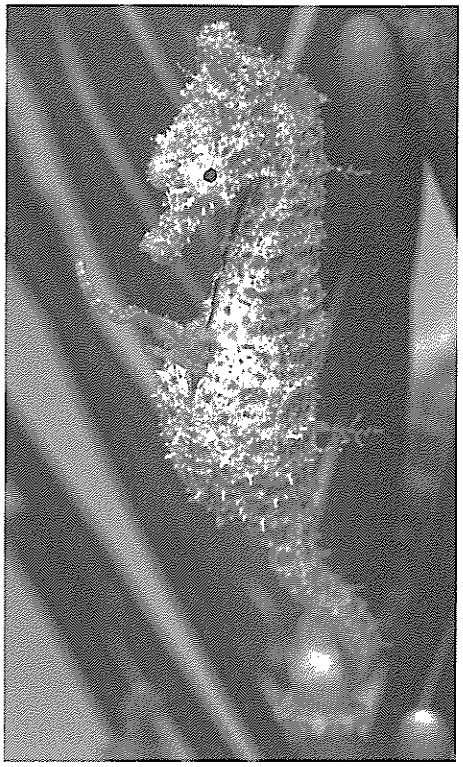


Figure 4.4.3

Male seahorse giving birth

1 Considering the place where the tripod fish lives, **propose** why the survival of the species depends on individuals being able to fertilise their own eggs.

2 Considering the place where it lives, **propose** an advantage of an angler fish male becoming attached to the female's body.

3 **Propose** an advantage of the male seahorse keeping developing babies in its pouch rather than allowing fertilised eggs to develop in the water like those of other fish.

4 **Propose** whether angler fish or tripod fish would have more variation in their offspring. **Justify** your answer.

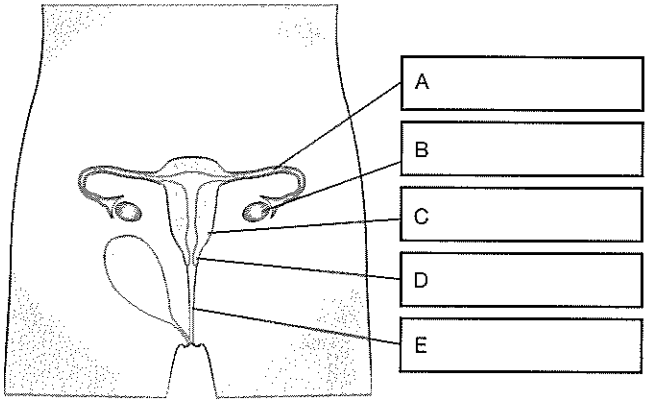
4.5 Human reproductive system

Science understanding

Verbal/Linguistic

1 Select words from the list below to **name** the parts of the female reproductive system indicated.

oviduct
vagina
ovary
cervix
uterus



2 **Recall** the function of each of the following parts of the female reproductive system.

(a) ovary _____

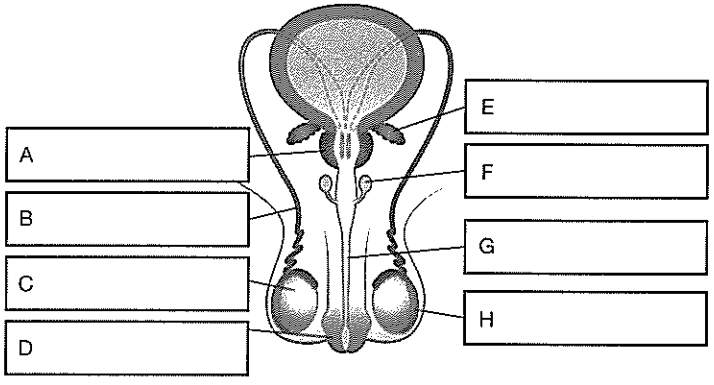
(b) uterus _____

(c) oviduct _____

(d) vagina _____

3 Select words from the list below to **name** the parts of the male reproductive system indicated.

epididymis
urethra
testicle (testis)
sperm duct (vas deferens)
prostate gland
seminal vesicle
Cowper's glands
penis



4 **Recall** the function of each of the following parts of the male reproductive system.

(a) testes _____

(b) epididymis _____

(c) sperm duct _____

(d) penis _____

4.6 Puberty and growth

Science inquiry

Logical/Mathematical

The table shows the average heights of boys and girls at different ages.

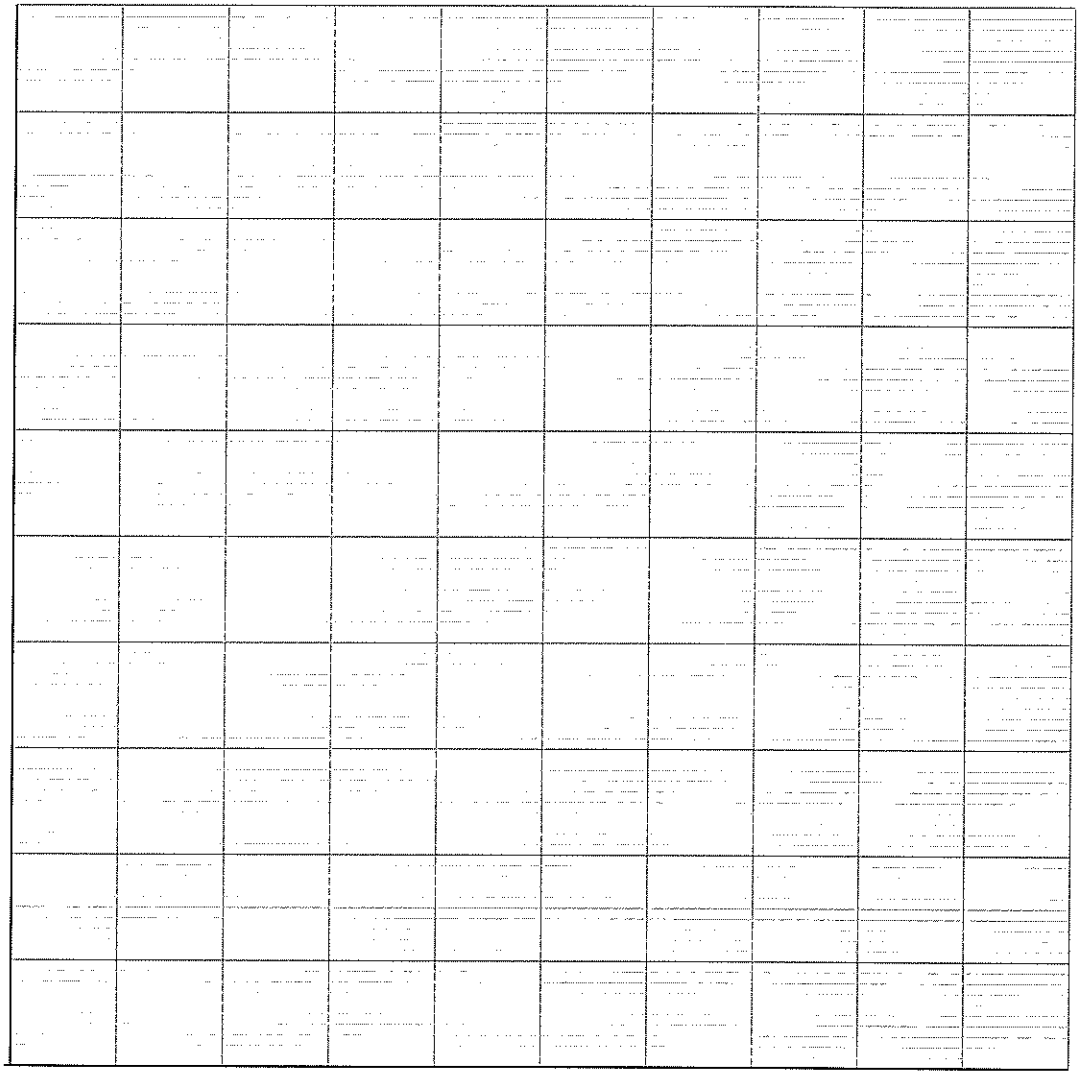
Age (years)	Male height (cm)	Female height (cm)
Birth	50.5	50.2
2	87.5	86.6
4	103.4	103.2
6	117.5	115.9
8	130.0	128.0
10	140.3	138.6
12	149.6	151.9
13	155.0	157.1
14	162.7	159.6
16	171.6	162.2
18	174.5	162.5

1 Use the axes provided on the next page to **construct** line graphs showing males and females on the same axes. Put age on the horizontal axis and height on the vertical axis.

2 **Compare** the growth patterns of boys and girls up to age 10.

3 **Compare** the growth patterns of boys and girls between ages 10 and 16.

4 **Identify** the ages when girls grow faster than boys.



5 Many people say 'Girls mature faster than boys.' Use your graph as evidence to **justify** this claim.

6 **Propose** why growth spurts occur.

4.7 Drugs and pregnancy

Science understanding, Science as a human endeavour

Verbal/Linguistic

Refer to the Science as a Human Endeavour on page 162 of your student book to answer the following questions.

1 **Explain** why thalidomide taken by a pregnant woman could damage her developing fetus.

2 **Explain** why the fetus could be affected each time a pregnant woman drinks alcohol.

3 **Identify** four signs of fetal alcohol syndrome in newborn babies.

4 **List** four permanent long-term effects of fetal alcohol syndrome on the lives of affected children.

5 **State** three ways smoking can affect the chances of a normal birth.

6 **Identify** two long-term effects that smoking during pregnancy could have on the health of children.

7 **Summarise** the advice that should be given to a pregnant woman regarding smoking, alcohol and other drugs during pregnancy.

4.8 Literacy review

Science understanding

Verbal/Linguistic

1 **Use** the clues to **identify** the jumbled words.

Jumbled word	Clue	Answer
mendlovepete	Changes in body form and shape in an organism's life	
unopredictor	The process of parents producing new individuals, or offspring	
hogwrt	An increase in body size	
harten	Part of the flower that produces the pollen	
ymebro	A developing offspring at a very early stage of development	
thedimraphero	Individual with both male and female sex organs	
lootinplain	Transfer of pollen from the anther to the stigma	
ronshome	Chemicals made in the body to control reproduction and physical characteristics	
testagoni	The time period from fertilisation to birth	
boralu	Process leading to birth, from first uterine contractions to afterbirth expulsion	

2 **Use** the clues to **identify** the words.

Clue	Word
Stage in an insect life cycle during which the larva changes into an imago	p__p__
Changes that happen to an individual from its formation to when it has produced offspring	l___e c___l__
The structure that the ovary of a flowering plant turns into as the seeds ripen	f__u___
Part of the uterus that keeps it closed while the baby is developing	c e___i__
Regular monthly changes in the hormones and reproductive organs of females	m___s__r u___c__c l__
Organ in which the fetus grows and develops	u__e___s
The process of two individuals joining to allow gametes to become fertilised	c__p___a t___n
The process of the blastocyst burrowing into the lining of the uterus	i__p___n___t___n
The time in life when physical changes bring sexual maturity	p____rt__
The first cell of the new individual after fertilisation	___g o t__

3 **Recall** key terms and their meanings by drawing a line to match each statement in column 1 with the correct term in column 2.

Column 1	Draw your lines across here	Column 2
When an organism looks quite different at different stages in its life		fetus
The joining of gametes		ovulation
Tubes down which the egg passes and where fertilisation occurs		placenta
Stage of development when most of the major organs and systems are present		germination
Preventing pest and disease organisms from entering our country		metamorphosis
When the young growing plant sprouts out of the seed		amniotic fluid
The egg bursting out of the follicle		stigma
Membranes of the fetus and mother allowing exchange of nutrients and oxygen for wastes		oviducts (fallopian tubes)
New individual grows from one parent's body and does not involve joining of gametes		fertilisation
Flower part that receives the pollen		asexual reproduction
Fluid around the embryo acting as a shock absorber and keeping the embryo at a constant temperature		biosecurity