REPRODUCING

8

What if?

Dogs and roses

What you need:

A3 paper, pens

What to do:

1 Divide into small groups.
2 Divide the piece of paper in two equal sections.
3 On one half, write down everything you know about how show dogs are bred.
4 On the other half, write down everything you know about how prize roses are grown.

What if?

» What if a show dog were unable to breed? What would happen to it?
» What if all rose bushes could grow identical flowers? What other factors could influence how the rose flower appeared?

8.1 There are different ways of reproducing

All living things reproduce, leaving new organisms to carry on when others die. **Asexual reproduction** involves a single organism making an exact genetic copy of itself. **Sexual reproduction** involves a combining of the genetic material from two organisms to produce a new organism.

Figure 8.1 The queen bee likes parthenogenesis because her unfertilised eggs always become male bees, which means no competition for her crown!

Figure 8.2 The mouth-brooding frog doesn't eat at all while protecting the eggs it holds in its mouth.

Asexual reproduction

For some organisms, finding a partner to reproduce with is not an easy option. Some have found a way, but for those that live alone or are stuck to the one spot, asexual reproduction may be their only chance of continuing the species.

In asexual reproduction, the offspring have exactly the same genetic material (known as DNA) as the parent. If an organism is really suited to an environment, the lack of variation can contribute to further success. However, if the environment changes in any way that becomes unsuitable for the organism, the entire species risks extinction. The simplest version of asexual reproduction is an organism splitting in half to form two new organisms. This is known as **binary fission**.

An amazing asexual reproductive strategy known as **parthenogenesis** involves unfertilised eggs hatching into new organisms. A reticulated python in a zoo, which had been kept isolated from other snakes, managed to lay eggs that produced six daughters. The zoo keepers tested the genetic material (DNA) of the baby snakes and found that it was identical to the mother's genetic material. Other animals, such as the crown of thorns starfish, are able to form new individuals when they are split in two. This is called **fragmentation**.

Fragmentation in plants is generally referred to as **vegetative reproduction**. Related to the term 'vegetable', this refers to all non-flower parts of a plant. Vegetative reproduction generally involves a part of the plant breaking off and surviving as a new organism with no need for spores or seeds – a bit like fragmentation, but with structures that have been grown specifically to be broken off.

Vegetative structures include plantlets, stolons and rhizomes.

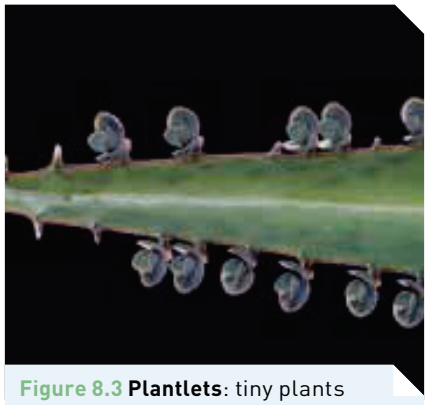

Figure 8.3 Plantlets: tiny plants that grow on either the parent stem, leaf or root.

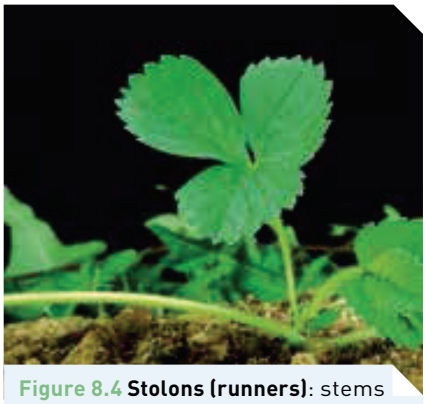

Figure 8.4 Stolons (runners): stems running along the ground.

Figure 8.5 Rhizomes: underground stems.

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Sexual reproduction

The two cells that joined to make you were called sex cells or **gametes** – an egg from your mum and sperm from your dad. Many organisms rely on gametes fusing to make new organisms, and this process is referred to as sexual reproduction.

Sexual reproduction produces variations in a population. The **offspring** (babies) are all different from their parents, having new combinations of features. This variation is really important for the survival of an entire species. Imagine what life would be like if all humans were the same – we can't all be rocket scientists!

Figure 8.8 Even though nudibranchs are hermaphrodites, they tend to find a partner to mate with. Whichever is fastest at injecting a chemical into the other will get to be the boy!

Figure 8.6 When garden snails mate, both snails give and receive sperm, so both get pregnant.

Figure 8.7 When the dominant male in a population of wrasse dies, a female can become a male to replace him.

Figure 8.9 Identical twins are only identical according to their DNA.

Hermaphrodites

Hermaphrodites are organisms that have both male and female reproductive systems. This means they can reproduce sexually by themselves but, in most cases, it results in organisms that can change sex by 'turning off' one system and 'turning on' the other. This helps to maintain genetic diversity within the species.

Nature or nurture?

Your DNA doesn't control how you cut your hair or what you eat and the same goes for other organisms. Scientists have often had lengthy discussions about 'nature versus nurture' – whether DNA is responsible for certain features or whether the features are the result of lifestyle or even upbringing. Your DNA controls your genetic features, whereas the environment (lifestyle, education etc.) controls everything else and can change regularly.

Check your learning 8.1

Remember and understand

1 What does 'reproduction' mean?
2 How does sexual reproduction differ from asexual reproduction?
3 What substance is responsible for family resemblances?

Apply and analyse

4 Is variation within a species essential? Explain.
5 What circumstances might make it difficult for an organism to reproduce sexually?
6 When would parthenogenesis be useful for organisms that usually reproduce sexually?

Evaluate and create

7 As a class, brainstorm the features of an organism that are genetically controlled compared with those that are influenced by the environment. It may be easiest to begin with a human as the subject and then try other animals and even plants.

8.2 The female reproductive system produces eggs in the ovaries

The female reproductive system varies between vertebrates depending on the reproductive habits of the species. For example, humans have a uterus that is large enough and stretchy enough to hold one or two developing foetuses until they are fully formed. Rats and rabbits have uteri large enough for multiple foetuses. Amphibians have almost no uterus at all.

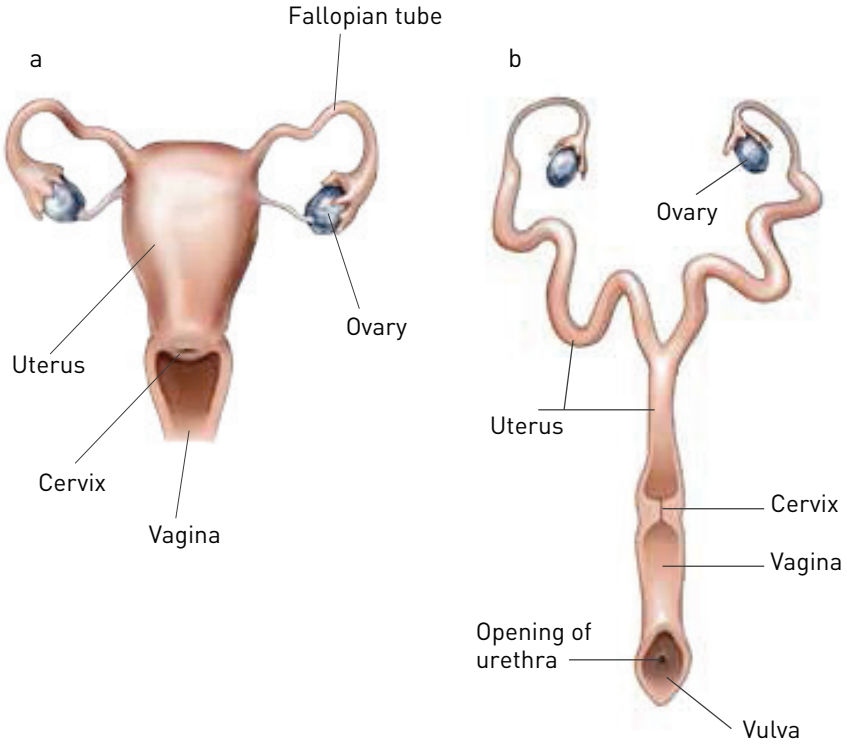

Figure 8.10 The female reproductive system varies between vertebrates. (a) Human and (b) rabbit reproductive systems.

Human reproduction

In humans, girls are born with hundreds of thousands of eggs or **ova** (singular 'ovum') partially formed in their **ovaries**. Every month a chemical messenger from the brain (**oestrogen**) causes one egg to mature and be released. This process is called **ovulation**. The egg travels down the **fallopian tubes** to the **uterus**. If sperm are present in the fallopian tubes, then the egg may become fertilised. In the 3–5 days it takes for the egg to travel the fallopian tubes, the lining of the uterus (the **endometrium**) becomes thicker. This is to provide a safe place for the fertilised egg, or **zygote**, to grow into a **foetus**.

If the egg is not fertilised, then the endometrial lining will break down and, 2 weeks after ovulation, will pass through the **cervix** and **vagina** as a period. This monthly cycle is called **menstruation**.

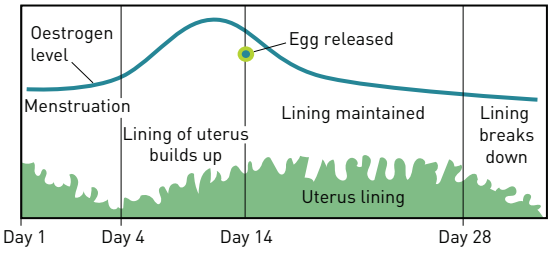

Figure 8.11 During the average 28 day menstrual cycle, ovulation occurs at day 14.

Menstruation usually first occurs in females between 11 and 15 years of age, but it can start before 10 years for some girls, and as late as 16 for others. It can take up to 2 years for menstruation to become a regular cycle. The average length of the cycle is 28 days, but it can vary from 23 to 35 days.

If the egg is fertilised and develops into a zygote, then it attaches to the thick endometrial layer. A special organ called the **placenta** forms between the foetus and the uterus. The placenta allows oxygen and nutrients to pass from the mother to the developing foetus. The length of time between fertilisation and birth is called **gestation** (or pregnancy). In humans this takes 9 months.

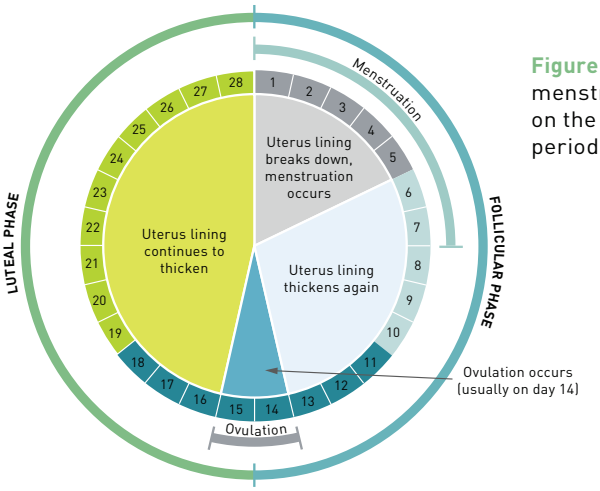

Figure 8.12 The menstrual cycle begins on the first day of a period.

Giving birth

Human mothers go through three stages when giving birth. The first stage involves the muscular walls of the uterus contracting, gently squeezing the baby down against the cervix. This causes the cervix to flatten and start dilating (opening). The cervix must open 10 centimeters before the baby's head can move through the vagina. This is the second stage of birth. When born, the baby is still attached to the placenta, which is inside the mother, via the umbilical cord. When the umbilical cord is cut, it will form the belly button on the baby. The third and final stage of birth is the delivery of the placenta. This is important to prevent infections from developing in the uterus.

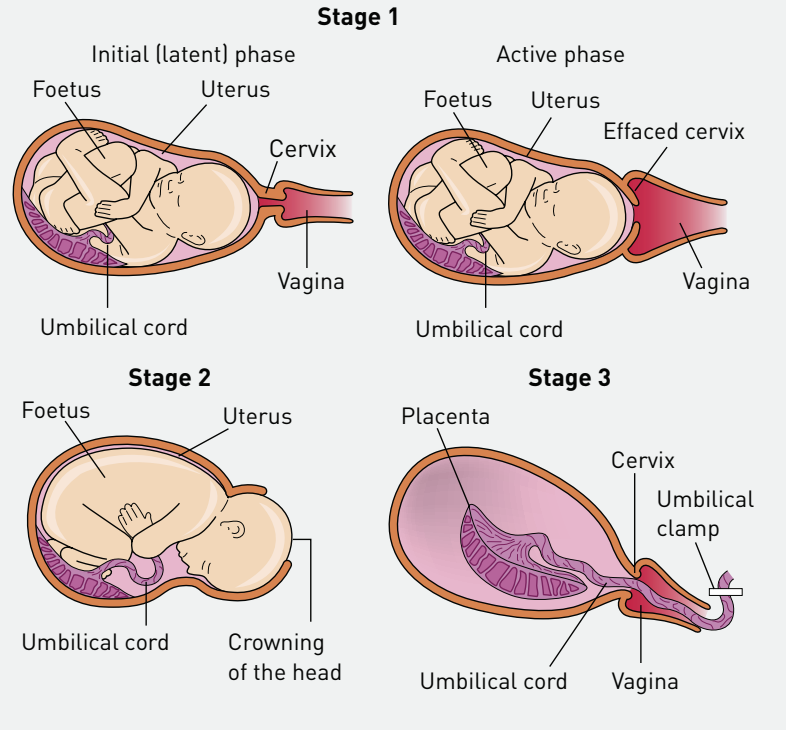

Figure 8.13 The three stages of childbirth.

Check your learning 8.2

Remember and understand

1 List a chemical messenger in human females.
2 Where does the ovum become fertilised in humans?
3 What is menstruation?
4 How often does menstruation occur?
5 What are the three stages of giving birth?
6 On what day in the average cycle does ovulation occur?

Apply and analyse

7 A student said that a baby girl already had all her eggs intact when she was born. Are they correct? Explain your reasoning.

8.3 The male reproductive system produces sperm in the testes

The vast majority of animals reproduce sexually. They are also **sexually dimorphic**, which means that the males look physically different from the females. For baby animals to be born, there needs to be **fertilisation** of an egg by a sperm. This could happen inside the female or male (**internal fertilisation**) or out in the open (**external fertilisation**).

Male reproductive organs

In fertilisation, a gamete from the father (sperm) must meet the gamete from the mother (egg or ovum). The sperm is produced in special organs called the **testes**. The testes are also responsible for producing a male chemical messenger called **testosterone**. In most animals, the two testes are kept outside the body in a sack called the **scrotum**. This is to keep the sperm cooler than the 37°C of the rest of the body. If sperm get too hot, then they will not be able to fertilise an egg properly.

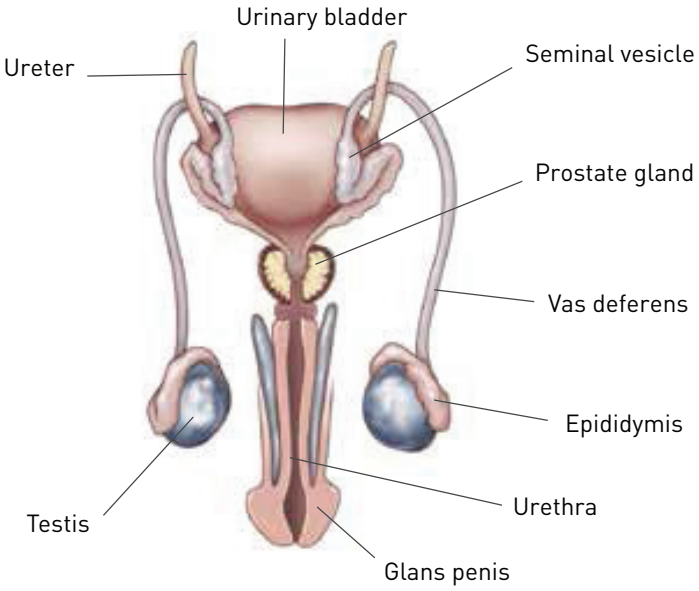

Figure 8.14 Human male reproductive system.

Once sperm are produced in the testes, they move to the **epididymis** to mature. When necessary, the epididymis contracts (squeezes tight), and the sperm is moved into the **vas deferens**. The sperm need energy to be activated. **Seminal vesicles** are small pouch-like structures that provide a sugary fluid that is needed for the sperms' journey along the vas deferens to the **prostate gland**. The prostate gland is a walnut-sized structure that blocks the flow of urine so that the sperm can move along the urethra and be ejaculated out through the penis. The function of the penis is to help the sperm reach the eggs.

Fertilisation

Mammals, such as humans, use internal fertilisation and the mother is responsible for nurturing the growing foetus until it is ready to face the world. Placental mammals, like humans, keep the foetus in the uterus for this period, whereas marsupial foetuses, such as those of the koala, crawl into the pouch for the final stages of development.

Monotremes, a very rare group of mammals that consists of the platypus and the echidna, lay leathery eggs.

All mammals suckle their young with highly nutritious milk from the mother to give them the best start in life.

Like monotremes, reptiles and birds lay internally fertilised eggs. Reptile eggs are leathery, whereas bird eggs have a hard shell. The eggs contain all the nutrients the foetus needs

Figure 8.15 Marsupial foetuses finish developing in the pouch.

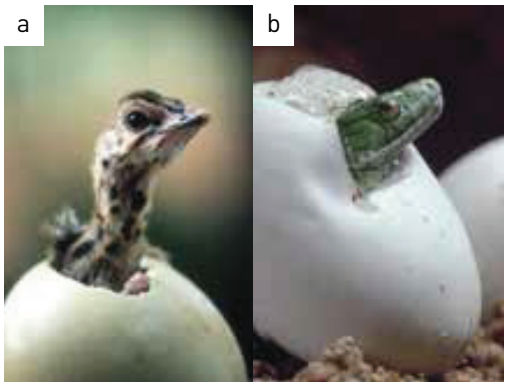

Figure 8.16 (a) Birds' eggs are hard, while (b) reptile eggs are leathery.

Figure 8.17 Some fish protect their eggs from predators.

to develop fully, which is really important for reptiles because most reptiles leave their babies to fend for themselves.

Amphibians and fish generally practise external fertilisation. This usually involves the female laying the eggs in the water and the male coating them with sperm. Often hundreds of eggs are laid at once so that there's a greater chance some will survive – they make a tasty snack for passing predators! Some parents will keep watch to ward off predators.

Invertebrates making babies

Invertebrates account for approximately 95% of all animals, so it's not surprising that their reproductive strategies vary quite a lot.

Arthropoda, the group that includes insects, spiders and crustaceans, is the largest group of invertebrates.

Terrestrial (land) arthropods generally favour internal fertilisation because of the harsh conditions they often live in. Sometimes the sperm is transferred directly into the female's **oviduct** (similar to the vagina), and sometimes the sperm is packaged for delivery to the female in more complex ways. Most arthropods will then lay their eggs. Insects and crustaceans tend to hatch as larvae, spiders as miniature adults.

Figure 8.18 A female fly lays eggs through her oviduct.

Check your learning 8.3

Remember and understand

1 Explain 'sexual dimorphism' in your own words.
2 Name a chemical messenger in males.

Apply and analyse

3 Why do animals that practise external fertilisation usually lay large numbers of eggs?
4 Which group of mammals has the longest gestation? Explain.
5 Which two vertebrate classes lay leathery eggs?
6 Why would terrestrial invertebrates fertilise their eggs internally?

Evaluate and create

7 Make up a story that describes the journey of Mr Sperm from his home in the testes to meet the love of his life, Ms Ovum.

//SCIENCE AS A HUMAN ENDEAVOUR//

8.4 Things sometimes go wrong in reproduction

There are many situations in which we wish to encourage reproduction. For example, when a human couple wants to have a baby and encounters troubles, technology can intervene. When a species is threatened with extinction, technology can reduce the threat; when certain features or characteristics are favoured, humans can step in to influence the outcome; and when reproduction is just not an option, something can be done to prevent it.

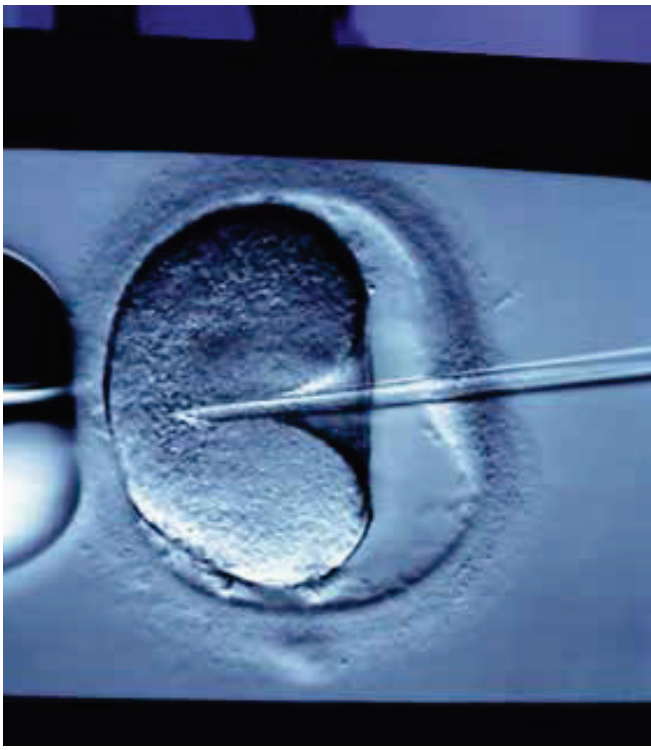

Figure 8.19 In IVF, eggs are injected with sperm for fertilisation.

Endometriosis

Sometimes the lining of the uterus, the endometrium, starts growing outside the uterus. These cells can grow on the outside of the uterus, or spread to other organs such as the ovaries. Each month the endometrial cells grow, and then break down, just as in the menstrual cycle. This can be very painful and the scarring can prevent the eggs from being able to move down the fallopian tubes. This can make it difficult for pregnancy to occur.

Human reproduction

Assisted reproductive technology (ART) is the name given to any procedure that is used to help a couple have a healthy baby. Through in-vitro fertilisation (IVF) an egg is fertilised by sperm *in vitro* or 'in glass', meaning in a test tube. This is done so that a doctor can carefully watch every step to make sure that the egg gets fertilised and begins dividing as it is supposed to. The tiny embryo can then be transferred back into the mother's uterus to go through a normal pregnancy.

Unborn babies can be screened for problems. The amniotic fluid that protects the growing foetus can be tested (amniocentesis), as can the cells of the placenta (chorionic villus sampling). The problem with these tests is that they involve inserting a needle into the belly, which may result in an infection or may interfere with the pregnancy, risking more problems than can be diagnosed. Thankfully, many issues can be spotted in an ultrasound – a picture of what's going on inside, complete with heartbeats.

Preserving biodiversity

Humans rely on the diverse range of living things (biodiversity) for food, transport, tourism and even inspiration, so it's really important that we try to stop species becoming extinct.

Many scientists work out in the wild to try to help different organisms, but the most intensive programs are often happening in our zoos and sanctuaries. These are called captive breeding programs.

When an animal is in a zoo, specialists of all types can observe and help the animal to breed. They might try to make the environment ideal or bring animals together at just the right time, or even try animal IVF.

CHALLENGE 8.4: WORKING WITH THE RSPCA
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Figure 8.21 Captive breeding programs are helping to save the bilby.

Figure 8.22 It's not a very happy life for domestic animals without food or shelter.

Contraception and desexing

It may sound silly, but many animals in captivity are on some form of **contraception** to stop them getting pregnant. This may be to control **inbreeding** or simply because there's not enough room or resources for more animals in the facility.

Desexing is a permanent contraceptive strategy that involves either the male or the female having their vas deferens or fallopian tubes 'tied', or blocked, or removed altogether.

Local councils very commonly require animals that are pets to be desexed. Cats, for example, often wander freely during the day and have many opportunities to breed – but who will look after all the kittens? If everyone's cats were free to breed, the neighbourhood would soon be swarming with kittens.

Figure 8.20 Ultrasounds allow the developing foetus to be seen.

Extend your understanding 8.4

1 What does IVF stand for?
2 Why are babies less likely to be born with problems now compared with 50 years ago?
3 What is biodiversity? Why is it so important to preserve biodiversity?
4 Explain, in your own words, why it is necessary for zookeepers to control the reproduction of animals in zoos.

8.5 Plant sexual reproduction produces seeds

Flowers come in all shapes and sizes. Not all of them are attractive and many smell terrible instead of lovely. However, the purpose of a flower is not necessarily to be sweet-smelling and beautiful, but to contain the sexual reproductive organs of the plant and to help fertilisation to occur.

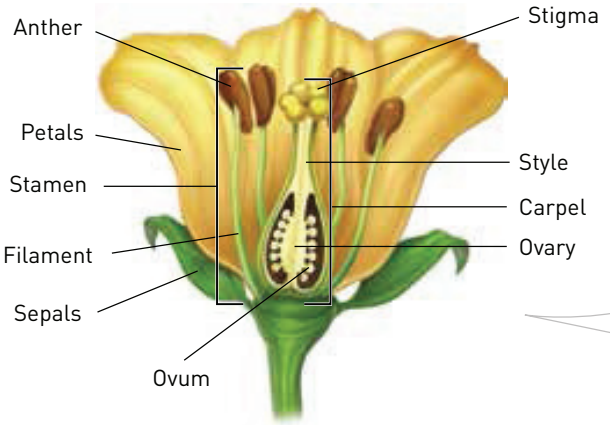

Figure 8.23 Basic structure of a flower.

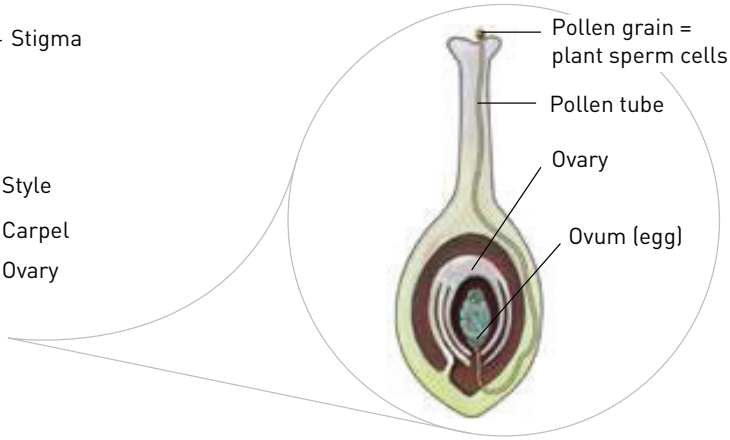

Figure 8.24 Structure of the carpel with key structures labelled.

Pollination

The female gamete, also called an ovum, is located at the base of the **stigma** inside the ovary. All these female parts together are called the **carpel**. For fertilisation to occur, the male gamete needs to find its way from the top of the male structure, the **anther**, to the ovum. This requires **pollination**, the process of pollen attaching to the stigma and 'digging' a pollen tube down to the ovary.

Flowers need assistance from other organisms (insects, birds or mammals) or the environment (wind or rain) for pollination to occur. **Self-pollination** involves pollen from a flower landing on its own stigma or that of another flower on the same plant. **Cross-pollination** occurs when pollen from a flower lands on the stigma of a flower on a different plant, combining two different sets of genetic material. Just as in animals, the pollen from one flower can only fertilise flowers from the same or or a similar species.

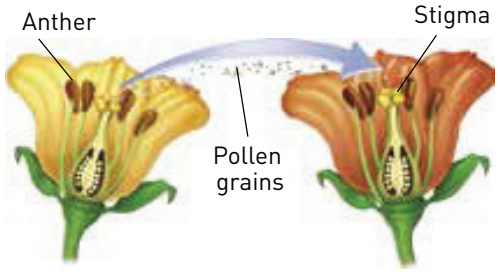

Figure 8.25 Cross-pollination.

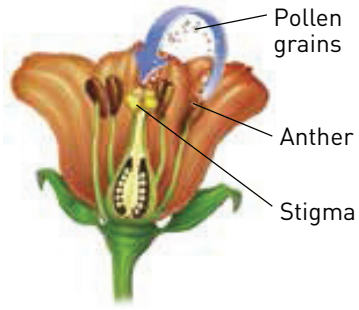

Figure 8.26 Self-pollination.

EXPERIMENT 8.5: FLOWER DISSECTION
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After fertilisation, the ovary takes on a role similar to that of a bird's egg. It swells to become a fruit, which provides nutrition and protection for the zygotes to grow into embryos inside the seeds. The ovary structure is seen in the structure of the seed-bearing area of the fruit.

Not all flowers are the same

If a flower smells, it is usually to attract a pollinator – but not all smells are sweet. Rafflesia is a flower in Borneo that smells like rotting flesh to attract flies for pollination!

The colour of a flower is also important for attracting pollinators. Birds tend to pollinate red flowers, whereas insects may be more attracted to a wide range of colours. Mammals that feed at night will rely on strong scents and not on colour at all.

Some flowers have modified structures to suit their pollinators. Birds may damage flowers with their sharp beaks when they drink the nectar, so flowers need to be strong. Insects can be small and need to be forced to brush against pollen, followed by the stigma, so the flower may be full of obstacles or simply a tight fit.

Sexual spores

If you've ever had a good look at a fern, you will have noticed that its leaves are usually quite different from the leaves of flowering plants. You will often see brown patches on the underside of fern fronds. These brown patches are specialised cells that make and release **spores** onto the ground. The spores are tiny reproductive structures that have half the genetic material of seeds. They grow into tiny heart-shaped plants called prothalli that are made up of male and female reproductive organs. Male and female gametes are produced and released when it rains – hopefully, to find a match for fertilisation. The little plant then dies, but the fertilised eggs grow into new ferns.

Figure 8.30 Fern 'sori' produce spores for reproduction.

Figure 8.27 Rafflesia.

Figure 8.28 Bottlebrush.

Figure 8.29 Daffodil.

Figure 8.31 Mosses produce spores for sexual reproduction.

Check your learning 8.5

Remember and understand

1. What is the name of the structure that holds a plant's sexual reproductive systems?
2. What is the difference between self-pollination and cross-pollination? Which produces more variety?
3. How is fertilisation different from pollination?
4. Draw a circular flow diagram using the following terms: flower, pollen, seed, fruit, pollination, fertilisation, ovum, pollen, ovary and anther.
5. Why are some flowers large and coloured, and others tiny and plain?
6. How is a spore like a seed? How is it different?

Apply and analyse

7. Plants that are successful weeds often use both sexual and asexual reproduction. Mint is common in herb gardens and reproduces with little flowers as well as using vegetative reproduction. Why would it be difficult to get rid of mint once it has spread through a garden bed?

Figure 8.32 Red Kangaroo Paw, a protected species, is the state floral emblem of Western Australia.

8.6 Reproduction techniques have an impact in agriculture

Many reproductive technologies are used in agriculture to improve desired characteristics in plants and animals. This has an impact on diversity and risks inbreeding.

Selective breeding

There are many examples of animals and plants being bred to keep, lose or enhance certain characteristics by people choosing the 'partners'. For example, a cow that is known to produce lots of milk would be chosen to breed with a bull that is known to produce healthy, strong offspring. This would mean that there's a great chance of any female offspring being good milk producers and any male offspring being good meat producers.

Occasionally animals have difficulty in breeding. This may be due to location (the animals may be on opposite sides of the country) or their owners wanting to have greater control over the animals they breed with. As a result, sperm banks for animals have been developed. Desired characteristics, such as speed or 'staying power' in racing horses, or facial shape or coat colour in dogs, are described in a catalogue for owners to examine. The desired frozen sperm can be purchased and sent to the owner of the female animal, where it will be used to create offspring with the desired characteristics.

Selective breeding also applies to plants. A type of wheat that is known to survive frost or disease can be deliberately cross-pollinated with a type of wheat that produces high-quality grains with the aim of producing a grain that combines both features.

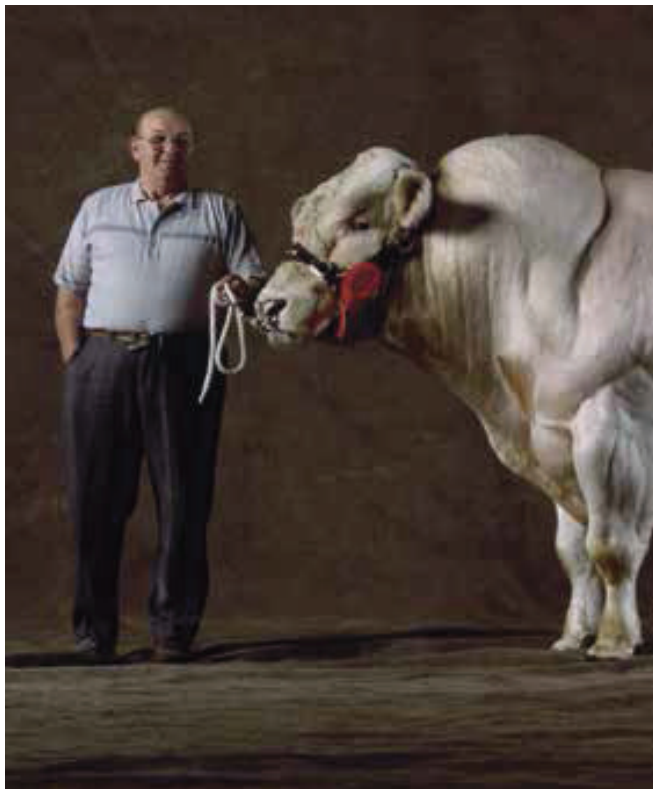

Figure 8.33 Some people get a little carried away with selective breeding.

Loss of diversity

Diversity in plants and animals refers to the variety of genetic material in a single population or species. When a characteristic, such as milk production in cows, is used for selective breeding, then any cow that does not produce 'enough' milk is not encouraged to breed. This often means the genetic material from that cow is not passed on to the next generation. Instead, the next generation of calves will only have genetic material from the few cows that meet the milk production criteria. As a result, there is less variation in the genetic material. Although this does not seem a problem initially, it puts the whole population at risk of disease. If one plant or animal is at risk of a disease, the rest of that population, with the same genetic material, is also vulnerable.

An example of this is the facial tumour in the Tasmanian devil. All Tasmanian devils have very similar genetic material. When one individual devil developed a tumour on its face, it was able to pass it on to another devil that had similar genetics.

Figure 8.34 The Tasmanian devil facial tumour is caused by the uncontrolled growth of a cancerous cell.

Inbreeding

Inbreeding results from animals reproducing with animals to which they're closely related. When this happens, rare diseases can show up. For example, some dogs that were chosen to breed because of their particular looks may also have hip problems. Inbreeding has been quite a problem with dog breeds, especially when people don't check an animal's ancestry carefully.

Figure 8.35 In the mid-1800s, the population of Ireland relied very heavily on potatoes for food. When a fungus infected the potatoes, the lack of genetic diversity meant that all potato crops were wiped out and about one million people died of starvation.

Figure 8.36 Labradors are known to have hip problems as the result of many years of inbreeding.

Extend your understanding 8.6

1. What is selective breeding? Give examples in your answer.
2. What technology can be used to assist selective breeding?
3. What is inbreeding? Give an example.
4. Why is genetic diversity in a population important?
5. Is selective breeding always a good idea?
6. Research an example of the difficulties faced by breeding flat-faced pug dogs.

REVIEW

8

Remember and understand

1 What is the scientific term for 'making new organisms'?
2 What is a gamete?
3 What are the common names for the two gametes in animals? In plants?
4 What is the difference between a foetus and a baby?
5 Which produces greater variation: sexual or asexual reproduction?
6 What is the function of a fruit?
7 Why do organisms that fertilise internally tend to produce fewer eggs than those that fertilise externally?
8 Which is better for maintaining biodiversity: self-pollination or cross-pollination? Give reasons for your answer.
9 What is the difference between a spore and a seed?

Apply and analyse

10 Use your understanding of sexual dimorphism to describe three features that differ between a male and a female in humans. Describe three that may differ in birds.
11 A farmer grows two types of corn on the farm. One type is terribly affected by the frosts in winter but produces really large, juicy corn cobs when it is protected. The other copes in winter without a problem but has only average corn cobs. What could the farmer do to improve his crops?
12 A 13-year-old girl was keeping a record of her menstrual cycle. She found her cycle lasted approximately 28 days.

If her last period started on 1 June, determine the following:

a When will she ovulate?
b When will her next period start?

13 Examine the images in Figure 8.38, and then give two features that are genetic and two that are environmental.
14 If a hermaphrodite reproduced alone, would it be considered sexual or asexual reproduction? Explain.
15 Skinks drop their tails when threatened, but their tails can grow back. Is this a type of asexual reproduction? Explain.
16 Some reptile eggs are affected by the temperatures they experience while incubating in the nest (see Figure 8.39). For example, within a single nest, the temperature may vary enough to produce a mix of both. How might warmer weather as a result of the enhanced greenhouse effect impact green sea turtle populations?

Evaluate and create

17 The life cycles and reproductive strategies of invertebrates are incredibly diverse. Choose an invertebrate to research and present your findings in the form of a poster or webpage to present to the class. Research projects could be shared in a mini-conference format.
18 Humans don't reproduce asexually – ever. What consequences might there be if a human was able to reproduce asexually? What consequences might there be if many humans were able to reproduce asexually?
19 Divide into two groups to debate one of the topics below.

a Selective breeding is essential to maintain food production for humans.
b Reproductive technologies interfere with nature.
c Selective breeding is important in preventing extinction.
d Genetic diversity can be maintained without technology.

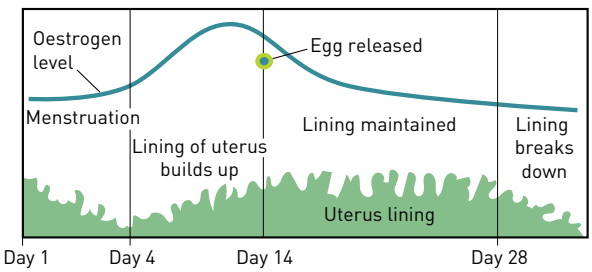

Figure 8.37 The average 28 day menstrual cycle.

Figure 8.38 These dogs are from the same litter.

Research

20 Choose one of the following topics for a research project. A few guiding questions have been provided for you, but you should add more questions that you want to investigate. Present your research in a format of your own choosing, giving careful consideration to the information you are presenting.

> **Contraception**

Contraception is the term used for the range of methods or devices that are used to prevent pregnancy. Birth control methods have been used for thousands of years. What is the difference between barrier, surgical and chemical methods of contraception? Research two methods of contraception that can be used by humans. Do males or females use them? How effective are they at preventing pregnancy?

> **Chorionic villi sampling (CVS)**

Chorionic villi sampling is a procedure that some mothers undergo to test for genetic problems in the foetus. How is this procedure performed? When can this test be taken? What types of abnormalities can be detected with this test? What is genetic counselling?

Figure 8.39 Green sea turtle eggs produce female babies when the eggs are warmer and male babies when the eggs are cooler.

> **Dog breeding in Australia**

Some breeds of dogs are vulnerable to a series of genetic problems, such as difficulty breathing or displaced hips, as a result of decades of inbreeding. Research a breed of dog that has such difficulties. What features are these pedigree dogs judged on in dog shows? What problems have arisen as a result of the inbreeding? What measures are the RSPCA and the Australian National Kennel Council taking to ensure these problems do not continue?

> **Seed banks**

A seed bank stores a large variety of seeds in case a particular species of plant is placed at risk as a result of natural disaster, outbreaks of disease or war. Research a major seed bank near your school. What types of seeds do they collect? Who collects the seeds for the bank? How are they collected? What conditions are needed for the seeds to remain viable (alive)?

KEY WORDS

8

anther
part of the stamen (male plant) that contains pollen

asexual reproduction
type of reproduction not involving the fusing of gametes; where an organism can create offspring without a partner

carpel
the female reproductive organ of a flower; includes the stigma, style and ovary

cervix
the narrow neck connecting the uterus and the vagina

endometrium
the lining of the uterus

epididymis
the coiled tube behind the testes that carries sperm to the vas deferens

fallopian tubes
the tubes that connect the ovaries to the uterus in a female

fertilisation
stage of sexual reproduction involving the joining of a sperm and an egg

foetus
stage in the development of a human baby taken from when the baby acquires human features (normally after 8 weeks of development)

gamete
sex cell; in humans, the sperm and egg cells

hermaphrodite
organism that has both male and female reproductive systems

menstruation
the process of the endometrial lining of the uterus breaking down and leaving the vagina; also know as a period

oestrogen
a reproductive hormone found in females

ovary
the female organ that produces eggs

oviduct
the tube through which eggs travel from the ovary

ovulation
the part of the menstrual cycle when an egg is released from the ovary

ovum
the reproductive egg

placenta
the organ that connects the developing foetus to its mother

prostate gland
the walnut-sized structure surrounding the neck of the male bladder that blocks the flow of urine so that the sperm can move along the urethra

scrotum
the sac-like structure that contains the testes

seminal vesicle
small pouch-like structures that provide a sugary fluid that is needed for the sperms' journey along the vas deferens tube

sexual reproduction
type of reproduction involving the fusing of gametes

sexually dimorphic
those species in which the male and female organisms look structurally different

spore
tiny reproductive structure that, unlike a gamete, does not need to fuse with another cell to form a new organism

stigma
the male part of a plant, which consists of a filament supporting an anther

testis
the male organ of the reproductive system that produces sperm; plural 'testes'

testosterone
a male hormone involved in the reproductive system

uterus
an organ in the female reproductive system; where the foetus develops

vagina
an organ that is part of the female reproductive system; a muscular tube connecting the outside of the female body to the cervix

vas deferens
the tube through which sperm travels from the epididymis to the prostate

vegetative reproduction
type of asexual reproduction where part of a plant breaks off, forming a new organism with no need for seeds or spores; similar to fragmentation

zygote
a fertilised egg