Chapter 8: Reproducing

8.1 There are different ways of reproducing

Student book answers (pages 140–141)

Check your learning 8.1

Remember and understand

1 What does ‘reproduction’ mean?

The term ‘reproduction’ refers to the process in which new individual organisms, or offspring, are produced from their parents.

2 How does sexual reproduction differ from asexual reproduction?

Sexual reproduction produces variation because the offspring are partially genetically different from their parents. Asexual reproduction results in offspring that are genetically identical to the parent.

3 What substance is responsible for family resemblances?

DNA (deoxyribonucleic acid) is responsible for family resemblances.

Apply and analyse

4 Is variation within a species essential? Explain.

Variation within a species is not essential. If it were, asexual reproduction wouldn’t exist. However, variation can be beneficial for a species, because it helps ensure the species is not decimated as a result of a random environmental change. A population’s variations provide ‘options’ in the face of threats.

5 What circumstances might make it difficult for an organism to reproduce sexually?

Difficulties for reproducing sexually include geographic isolation, immobility and having to find a mate.

6 When would parthenogenesis be useful for organisms that usually reproduce sexually?

Parthenogenesis is useful for organisms that usually reproduce sexually when males are not available to fertilise eggs or when populations are stabilised by controlling the balance between males and females.

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.

Student answers will vary. Typically, genetically controlled features include eye colour, facial features, birthmarks, genetic diseases and blood type. Characteristics such as hair colour, height and weight are all the result of environmental influences in combination with genes. Hair colour is affected by exposure to ultraviolet light and chemicals. Height is often significantly impacted by illness during childhood and/or malnutrition. Weight is related to diet and lifestyle, but maintenance of weight is generally a genetic predisposition.

Environmental influences include diet, social privilege, wealth or socioeconomic status (high, medium, low), education and lifestyle choices, such as hair dye, tattoos, food and drugs.

8.2 The female reproductive system produces eggs in the ovaries

Student book answers (pages 142–143)

Check your learning 8.2

Remember and understand

1 List a chemical messenger in human females.

Oestrogen is the chemical messenger in human females.

2 Where does the ovum become fertilised in humans?

In humans, fertilisation occurs in one of the fallopian tubes.

3 What is menstruation?

Menstruation is the periodic breakdown of the endometrial lining of the uterus that passes through the cervix and vagina as a female’s ‘period’.

4 How often does menstruation occur?

Menstruation occurs on average every 28 days, although the term ‘monthly’ is also commonly used.

5 What are the three stages of giving birth?

The first stage of giving birth is the contraction of the muscular walls of the uterus and the flattening and opening of the cervix. The second stage of birth is the movement and delivery of the baby through the cervix and vagina. The third stage of birth is the delivery of the placenta.

6 On what day in the average cycle does ovulation occur?

Ovulation occurs on Day 14 of the average menstrual cycle.

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.

Yes, in humans, girls are born with hundreds of thousands of partially formed eggs in their ovaries. No more are added over the course of a girl’s lifetime.

8.3 The male reproductive system produces sperm in the testes

Student book answers (pages 144–145)

Check your learning 8.3

Remember and understand

1 Explain ‘sexual dimorphism’ in your own words.

‘Sexual dimorphism’ is the difference in physical appearance between males and females.

2 Name a chemical messenger in males.

Testosterone is the chemical messenger in human males.

Apply and analyse

3 Why do animals that practise external fertilisation usually lay large numbers of eggs?

Animals that practise external fertilisation usually lay large numbers of eggs to ensure there is a greater chance of survival for at least some of them.

4 Which group of mammals has the longest gestation? Explain.

Placental mammals have the longest gestation period because their foetus remains in the uterus until it is usually fully formed.

5 Which two vertebrate classes lay leathery eggs?

Monotremes and reptiles lay leathery eggs.

6 Why would terrestrial invertebrates fertilise their eggs internally?

Terrestrial invertebrates fertilise their eggs internally to protect the eggs from the harsh external environment.

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.

Student answers will vary.

8.4 Science as a human endeavour: Things sometimes go wrong in reproduction

Student book answers (pages 146–147)

Extend your understanding 8.4

1 What does IVF stand for?

IVF stands for ‘in-vitro fertilisation’.

2 Why are babies less likely to be born with problems now compared with 50 years ago?

Babies are less likely to be born with problems now compared with 50 years ago because unborn babies can now be screened to determine whether there are any problems.

3 What is biodiversity? Why is it so important to preserve biodiversity?

Biodiversity is the variation in living things on Earth. It is important to conserve biodiversity because species rely on variation in order to survive. Variation helps ensure the species is not decimated because of a random environmental change. A population’s variations provide ‘options’ in the face of threats.

4 Explain, in your own words, why it is necessary for zookeepers to control the reproduction of animals in the zoo.

Zookeepers need to control the reproduction of captive animals to ensure inbreeding doesn’t occur, to conserve a species and to help the animal breed.

8.5 Plant sexual reproduction produces seeds

Student book answers (pages 148–149)

Check your learning 8.5

Remember and understand

1 What is the name of the structure that holds a plant’s sexual reproductive systems?

The ‘flower’ holds a plant’s sexual reproductive systems.

2 What is the difference between self-pollination and cross-pollination? Which produces more variety?

Self-pollination occurs when pollen from one flower falls on the stigma of the same flower or onto the stigma of a flower on the same plant. Cross-pollination occurs when the pollen of one flower falls on the stigma of another flower on a *different* plant. Cross-pollination produces more variety.

3 How is fertilisation different from pollination?

Fertilisation is the fusion of an egg and sperm (or male and female gametes). Pollination is the transfer of pollen to a stigma, which is happens before fertilisation can occur.

4 Draw a circular flow diagram using the following terms: flower, pollen, seed, fruit, pollination, fertilisation, ovum, pollen, ovary and anther.

Sequence should be: flower → anther → pollen → pollination → stigma → ovary → ovum → fertilisation → fruit → seed

5 Why are some flowers large and coloured, and others tiny and plain?

Certain flowers rely on animals for pollination. They attract these pollinators by being large and brightly coloured. Tiny, plain flowers do not rely on living pollinators and are more likely to rely on wind, rain, water or even self-pollination.

6 How is a spore like a seed? How is it different?

Student answers will vary. Typically, spores and seeds are both involved in reproduction. Spores are released by a plant and are tiny reproductive structures that grow into plants. Seeds are formed in the fruit that the plant produces as a result of fertilisation and contain zygotes.

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?

It would be difficult to remove plants that are successful weeds because they reproduce using two methods, such as mint. The tiny seeds from the tiny flowers will remain in the soil even if the rhizomes are removed. The rhizomes are very extensive and it is incredibly difficult to remove all of them.

8.6 Science as a human endeavour: Reproduction techniques have an impact in agriculture

Student book answers (pages 150–151)

Extend your understanding 8.6

1 What is selective breeding? Give examples in your answer.

Selective breeding is a reproductive technique whereby animals and plants are bred to keep, lose or enhance a certain characteristic or to be immune to disease. Examples could include any of the following:

• A cow known to produce a lot of milk would be bred with a bull that is known to produce strong offspring. This means that any female offspring are likely to be good milk producers and male offspring good meat producers.

• A type of wheat known to survive frost or disease would be cross-pollinated with a type of wheat that produces high-quality grains to produce a combination of both features.

• Selective breeding can be used to ensure animals are not closely related and avoid issues related to inbreeding. Labradors often have hip problems due to years of inbreeding.

2 What technology can be used to assist selective breeding?

Sperm banks, artificial insemination

3 What is inbreeding? Give an example.

Inbreeding occurs when animals reproduce with other animals they are closely related to. Examples include the inbreeding of pedigree dogs and thoroughbred horses.

4 Why is genetic diversity in a population important?

Genetic diversity within a population is important because it helps ensure the population is not decimated as a result of a random environmental change. A population’s variations provide ‘options’ in the face of threats.

5 Is selective breeding always a good idea?

Selective breeding is not always a good idea because it can reduce the genetic variability in a species or population, thus making it more susceptible to disease and disorders.

6 Research an example of the difficulties faced by breeding flat-faced pug dogs.

Student answers will vary.

Review 8

Student book answers (pages 152–153)

Remember and understand

1 What is the scientific term for ‘making new organisms’?

Reproduction

2 What is a gamete?

A gamete is a sex cell.

3 What are the common names for the two gametes in animals? In plants?

The common names for the two gametes in animals are egg and sperm. In plants, they are ovules and pollen.

4 What is the difference between a foetus and a baby?

A foetus is an unborn baby, whereas a baby is an animal once it has been born.

5 Which produces greater variation: sexual or asexual reproduction?

Sexual reproduction

6 What is the function of a fruit?

A fruit provides nutrition and protection for the zygote to grow into an embryo inside a seed.

7 Why do organisms that fertilise internally tend to produce fewer eggs than those that fertilise externally?

Organisms that fertilise internally produce fewer eggs than those that fertilise externally because they protect and nurture their offspring until birth, and often after, to ensure a good chance of survival.

8 Which is better for maintaining biodiversity: self-pollination or cross-pollination? Give reasons for your answer.

Cross-pollination is better for maintaining biodiversity because it combines the genetic material from two different individuals.

9 What is the difference between a spore and a seed?

Spores are released by a plant and are tiny reproductive structures that grow into plants that consist of both male and female reproductive organs. Seeds are formed in the fruit that the plant produces as a result of fertilisation and contain zygotes.

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.

Sexual dimorphism in humans would include facial hair (male), breasts (female), penis (male) and vagina (female). Sexual dimorphism in birds would include colour, size and behaviour.

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?

The farmer could selectively cross breed his corn crops in order to produce a plant that has a combination of both favourable features.

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?

14 June

b When will her next period start?

29 June

13 Examine the images in Figure 8.37, then give two features that are genetic and two that are environmental.

Student answers will vary but could include the following:

Genetic – fur colour, four legs, etc.

Environmental – haircut/hairstyle, way of sitting, etc.

14 If a hermaphrodite reproduced alone, would it be considered sexual or asexual reproduction? Explain.

If a hermaphrodite reproduced alone it would still be considered sexual reproduction because both male and female gametes are required for fertilisation to take place.

15 Skinks drop their tails when threatened, but their tails can grow back. Is this a type of asexual reproduction? Explain.

A skink’s tail growing back is not reproduction as no new organisms are produced. This is regeneration of an existing organism.

16 Some reptile eggs are affected by the temperatures they experience while incubating in the nest (see Figure 8.38). 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?

Warmer weather as a result of the enhanced greenhouse effect will mean that more females will be born, resulting in reproductive extinction and, eventually, extinction of the entire species.

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.

Student answers will vary depending on the invertebrate chosen.

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?

Student answers will vary. Typically, the consequences if humans reproducing asexually are: there would be less genetic variability; no sexual dimorphism; no need to find a mate; a higher risk of being affected by environmental changes because of a lack of variability; humans would look relatively similar.

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.

Student answers will vary.