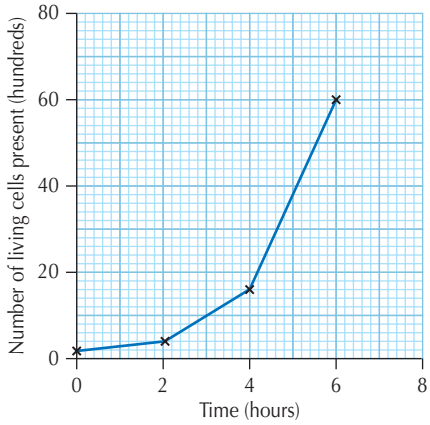
Answers

Cell biology

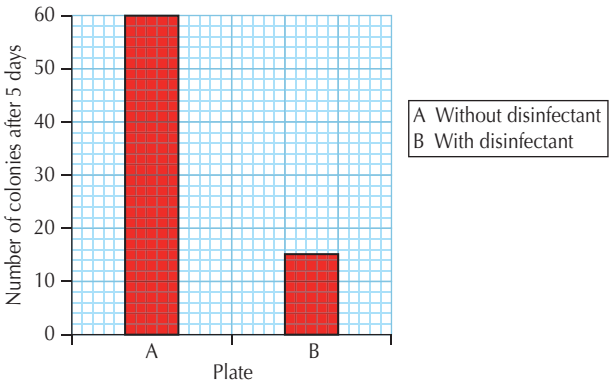
Chapter 1 Cells

1. Cell membrane; cytoplasm
2. **A** cell membrane; **B** cytoplasm; **C** nucleus
3. **A** cell membrane; **B** cell wall; **C** nucleus
4. Chloroplasts
5. Bacterial cell
6. **a** B
   b A
7. **a** C
   b B
8. Chloroplast and vacuole
9. **X** sperm cell; **Y** red blood cell; **Z** cheek cell
10. **a** Any **one** from: bread **OR** beer **OR** wine **OR** alcohol/ethanol
    b Bacteria
11. 60 units
12. **a** 12
    b 15
13. **a** 6 hours
    b 1600 million
    c 25 million

Chapter 2 Cell division

1. **a** Chromosome **OR** chromatid
   b Growth **OR** repair of damaged or diseased cells or healing of cuts **OR** replacement of dead cells
   c Reproduction
2. **a** B, D, A, C
   b Cancer **OR** formation of a tumour
3. The daughter cells produced by cell division have a chromosome number that is **identical to** their parent cell.
   The daughter cells are genetically **identical to** their parent cell.
4. 

5. **a** 64
   b 512
6. **a** Any **two** from: amount/concentration of bacteria **OR** volume/make-up of agar jelly **OR** temperature
   b Does not contain disinfectant, so shows that it is the disinfectant that causes the results in Dish B
   c Safety/to stop them being opened **OR** to prevent contact with possible harmful bacteria
   d i



   ii 75%

iii 1 The use of the disinfectant reduces/decreases the growth of the bacteria

2 Repeat the experiment and obtain an average of the results

Chapter 3 DNA function and profiling

1 **a** DNA

b Nucleus

c A section of DNA with instructions for making a particular protein

2 Any **two** from: forensics **OR** paternity testing **OR** assessing health risks **OR** food industry testing

3 Structural; hormones; antibodies; enzymes; others

4 **a** Blood sample 1 belonged to the victim **OR** blood sample 2 belonged to suspect 1 **OR** none of the blood samples belonged to suspect 2

b The DNA evidence on its own is not enough to convict a suspect. The results only show that the suspect may have been at the crime scene. They may have visited or been present at the crime scene **OR** someone could have left a sample of their DNA at the crime scene. Although the DNA evidence is useful, other evidence would also be required.

5 Male 3; more bands in the DNA profile match with the baby **OR** more bands are at the same position as the DNA of the baby

Chapter 4 DNA, genes and chromosomes

1 DNA

2 A structure containing genetic information; composed of DNA

3 Protein

4 Nucleus; A

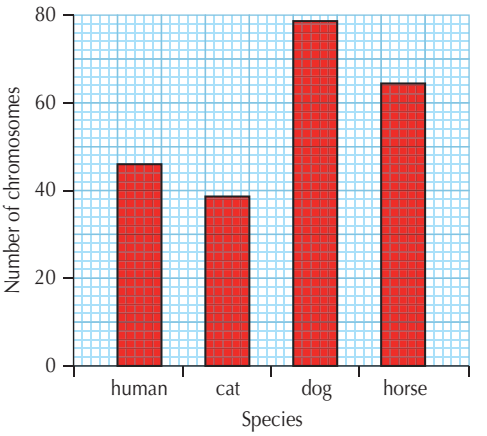
5 Gene, chromosome, nucleus, cell

6 Differences in genes/DNA make each individual unique

7 An error/mutation in the chemical code/DNA/gene/chromosome

8 An error/mutation in the chemical code/DNA/gene/chromosome

9



10 **a** 1987

b To find the positions of the human genes on the chromosomes **OR** to read the genetic code on each gene

c 4000

d Gene therapy

Chapter 5 Therapeutic use of cells

1 **a** 5, 3, 1, 2, 4

b Genetic engineering

c Human growth hormone **OR** blood clotting factor VIII

2 **a** Plasmid

b Human chromosome

3 **a** Stem cell divides to produce more stem cells

b They do not carry out a particular function

c Specialisation/differentiation

4 Divide to produce more stem cells and then differentiate into specialised cells/blood cells

5 Unspecialised cells that can divide and can become specialised

6 **a** 10%

b As age increases the percentage of the population with diabetes increases

7 **a** **i** The number of publications increased

ii New branch of medicine of growing importance **OR** others

b Continue to increase

8 **a** 6

b 55%

Chapter 6 Enzymes and their use in industry

1 **a** A substance that speeds up the rate of a chemical reaction

b Protein

2

Word	Meaning
product	the substance made after an enzyme reaction
specific	enzymes work on only one type of substance
substrate	the substance on which an enzyme works
unchanged	the effect of a reaction on an enzyme

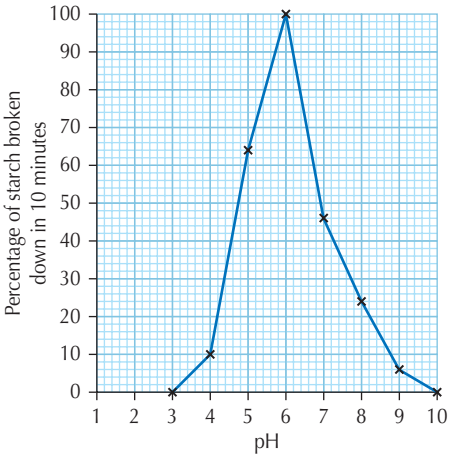
3

Statement	True	False	Correction
Enzymes are <u>unchanged</u> by the chemical reactions they catalyse.	✓		
Enzymes <u>slow down</u> chemical reactions.		✘	**speed up**
Enzyme action is <u>non-specific.</u>		✘	**specific**

4 Any **two** from: volume/mass of washing powder **OR** concentration of washing powder **OR** type of cloth/size of cloth **OR** size of grass stain **OR** temperature

5 Repeat the experiment exactly the same but at a lower temperature

6 **a**



b pH 6

7 **a** A clear area showing that protein has been broken down only formed around the hole containing trypsin

b 4·3 mm

8 **a** Non-biological; cotton; 30 °C

b 93%

c Different materials were being compared **OR** more temperatures would need to be tested

d Biological detergent works better than non-biological detergent at removing the stain on cotton T-shirts **OR** biological detergents remove the stain better from cotton T-shirts at 40 °C compared to 30 °C

Chapter 7 Microorganisms

1 **a** Nucleus

b **P** chromosome; **Q** plasmid; substance is DNA

2 **a** 45

b 215

c 30 °C

3 **a** Best = Fungigone; worst = Fungistan

b Volume/mass/amount of cream

4 **a** As the concentration of the antifungal substance increases the percentage of fungus killed increases

b 40%

c 88–96%

5 **a** Only one species of bacteria had been used/tested

b B

6 **a** **i** R

ii Q and S

iii S

b Repeat exactly but have holes with water not antibacterial cleaners

7 **a** 120 million

b 6 hours

c Yeast growth would increase

Chapter 8 Microorganisms in industry

1 Grow rapidly **OR** have diverse food sources **OR** make a wide range of products

2 **a** E

b A

c B

d C

e D

f F

3 **a** Beer; bread

b Yoghurt; cheese

4 **a** Temperature **OR** pH **OR** oxygen

b Sugar/glucose

c To mix yeast and nutrients evenly

5 **a** Acidity or alkalinity

b **i** 12 hours

ii 18 hours

c pH 4·5

d 3·5

6 **a** D

b **i** 720 cm^3/0·72 l

ii 20 minutes

7 **a** 10 000 g/10 kg

b 70 000 g/70 kg

8 **a** The species of bacteria

b Any **two** from: temperature **OR** pH **OR** oxygen concentration **OR** nutrients

c As the number of bacteria increases the amount of product increases **OR** the greater the bacterial growth the greater the product.

Chapter 9 Photosynthesis

1

Raw material	Where found
water	soil
carbon dioxide	**air**

2 Chlorophyll

3 Light energy

4 **carbon dioxide** + **water** → **glucose** + **oxygen**

5 Starch

6 **a** Oxygen

b Carbon dioxide

7 Any **three** from: providing oxygen **OR** food **OR** habitats **OR** raw materials **OR** medicines

8 **a** Area X did not receive any light (needed to carry out photosynthesis)

b Area Y had no chloroplasts/chlorophyll (needed to carry out photosynthesis)

c Area Z contained chloroplasts/chlorophyll and was exposed to light (so was able to carry out photosynthesis)

9 **a** **i** Same size/surface area/diameter

ii Light intensity/distance of lamp from test tube **OR** volume/depth of water **OR** temperature

b 15 seconds

c Place the lamp at different distances from the test tube/leaf disc; measure the time taken for the disc to reach the surface

10 **a** 105 kg

b The mass of cucumbers produced would increase

11 **a** C

b Starch

Chapter 10 Limiting factors in photosynthesis

1 Light intensity; carbon dioxide concentration; temperature

2 **a** Oxygen

b Carbon dioxide

c Moving the lamp to different distances from the beaker/pondweed

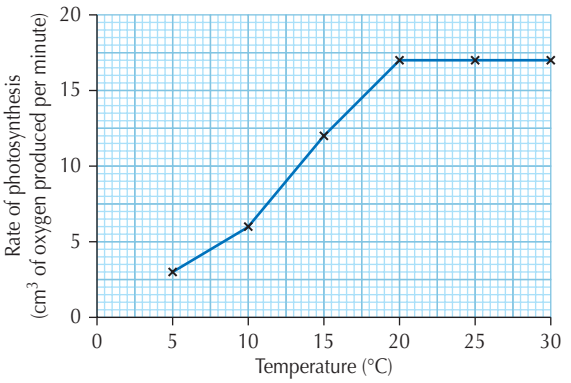
3 **a** Carbon dioxide concentration

b Temperature **OR** light intensity

4 **a** Light intensity

b The rate of photosynthesis would decrease

5 **a**



b **i** As the temperature increases between 5 °C and 20 °C the rate of photosynthesis increases and after 20 °C it remains constant

ii So that rate of photosynthesis was only affected by changes in temperature **OR** so that only one variable was altered

Chapter 11 Respiration

1 **sugar + oxygen → energy + carbon dioxide + water**

2 **a** F **b** E **c** C

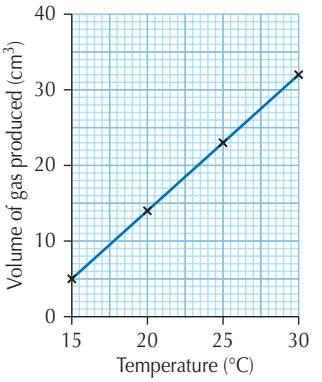
d D **e** B **f** A

3 More energy is released

4 **a** Carbon dioxide

b Alcohol/ethanol

5 **a**



b **i** As temperature increases the volume of gas produced/respiration increases

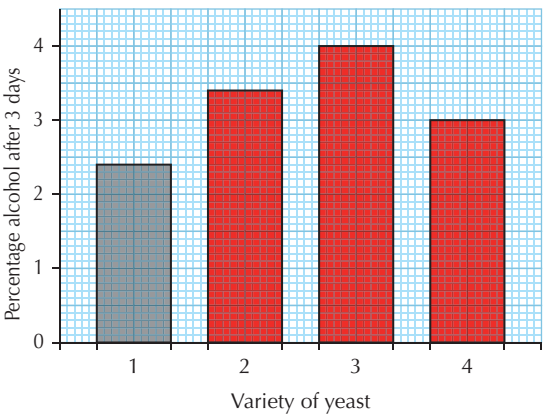
ii Respiration is controlled by enzymes

6 B

7 **a** 150 cm³

b Volume of dough **OR** temperature **OR** volume/concentration/amount of yeast

8 **a**



b Yeast variety 3 produced the highest concentration of alcohol

c Temperature

Chapter 12 Controversial biological procedures

Saviour siblings

a Provides material for treatment of an ill sibling

b Breaches the human rights of the donor sibling **OR** may cause emotional stress or pain to donor sibling

Gene therapy

a Cures the genetic condition

b May damage health of patient/risk of cancer **OR** offspring of patient may inherit the genes

Pharming

a Inexpensive **OR** large quantities of product

b Welfare issues of pharmed organisms **OR** safety of products for human use

Transgenic organisms

a Increase crop yields/quality **OR** reduced pesticide application

b Health concerns of GM products **OR** risk of accidental release of GM genes

Stem-cell technology

a Provide replacement tissues **OR** artificial organs

b Ethical issues regarding embryonic stem cells **OR** risk of tumour formation in patients

DNA profiling

a Allows identification of an individual from a small DNA sample in forensics **OR** paternity testing **OR** archaeology **OR** prediction of future health risks

b Use by insurance companies to deny cover **OR** use by employers to deny work

Multicellular organisms

Chapter 13 Body systems

1 B

2 C

3 A

4 **a** **P** windpipe; **Q** bronchus; **R** lung; **S** air sac

b Oxygen passes into the blood and carbon dioxide passes out of the blood

5 **a** mouth → gullet → stomach → small intestine → large intestine → rectum → anus

b Digestion is the breakdown of large food molecules into smaller molecules that can be absorbed by the body

c Absorbs the digested food molecules, which pass into the bloodstream

6 **a** C

b 70 beats per minute

c Same exercise **OR** same effort **OR** same length of time

d Student B; Lower resting pulse rate **OR** pulse rate did not increase as much after exercise **OR** faster recovery time/pulse returned to starting value more quickly

7 **a** **i** B

ii 20

b **i** Smoking by mothers during pregnancy decreases the average mass of babies at birth **OR** the more the mother smokes during pregnancy the lower the average mass of babies at birth

ii Non-smokers acted as a control group to allow a fair comparison to be made

Chapter 14 Role of technology in monitoring health

1 **a** Communicating well **OR** showing respect **OR** having friends **OR** taking part in enjoyable activities **OR** others

b Mental; physical

2 C

3 C

4 D

5 C

6 A

7 A

8 5:1

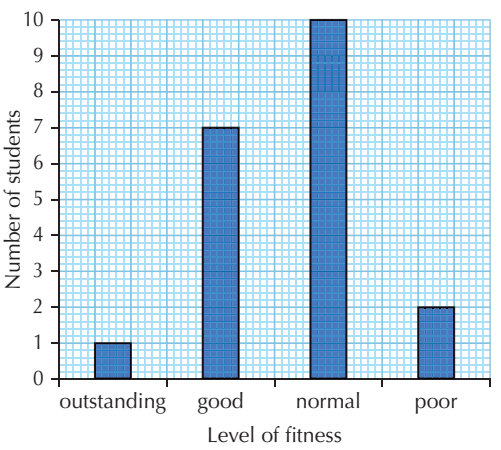
9 **a** 500

b i A and C

ii The effect of gender/sex of the individual on peak flow

10 **a** Outstanding

b



Chapter 15 Body defences against disease and the role of vaccines

1 Skin **OR** stomach acid **OR** tear fluid **OR** cilia in airways **OR** mucus

2 Immune system

3 Number of white blood cells increases

4 This white blood cell surrounds and digests the microorganism

5 The antibodies attach to microorganisms and destroy them

6 Bacteria **OR** viruses **OR** fungi

7 Infection

8 Antibodies

9 B

10 **a** Vaccination provides immunity to the disease/flu **OR** stops them catching flu

b Health service saves money by not having to treat as many people with the disease **OR** if enough people are immunised the disease does not spread so easily

11 Physical – skin **OR** mucus **OR** cilia

Chemical – stomach acid **OR** tear fluid

12 Diseases caused by microorganisms are called **infections**.

Most infections are caused by **bacteria** and **viruses**.

First-line defence barriers include **stomach acid** and **tear fluid**.

13 **a** **Two** from: Skin **OR** mucus **OR** tear fluid **OR** stomach acid

b i **Tear fluid** contains enzymes that destroy microorganisms landing on the surface of the eye

ii **Mucus** is a sticky substance that traps microorganisms and prevents them passing into the lungs

iii **Stomach acid** kills microorganisms that are swallowed.

c Antibodies

14 **a** Resistance to infection (because of specific antibodies made by white blood cells)

b Measles **OR** mumps **OR** rubella **OR** HPV **OR** flu **OR** whooping cough **OR** others

15 **a** The cowpox virus from the milkmaid caused James to become **immune** to the smallpox virus.

b James' body had produced **antibodies** which stopped the smallpox virus from causing an infection.

16 The security staff would have less or no contact with the patients

17 **a** 1951

b A report suggested a link between whooping cough immunisation and brain damage in some children **OR** parents worried that the children could suffer brain damage

c 6%

18 **a** 1 year

b 11 years

c To keep antibody levels above the minimum level needed for immunity **OR** because antibody levels decrease with age

Chapter 16 Fertilisation and embryonic development

1

Letter	Name	Function
A	**oviduct**	site of fertilisation
F	**penis**	deposits sperm
B	ovary	**produces eggs/ova**
G	testis	**produce sperm**
C	uterus	development of embryo

2 **a** Fertilisation occurs when the **nucleus** of a sperm cell fuses with the **nucleus** of an egg cell.

b A fertilised egg divides repeatedly to form a ball of cells called an **embryo**.

c The **uterus** is the part of the female reproductive system where the embryo develops.

d The **foetus** is the name given to the later stages of development when the organs of the embryo have developed.

3 **a** **i** Placenta

ii Glucose **OR** oxygen **OR** other nutrients

iii Carbon dioxide

iv Rubella **OR** HIV

v Carbon monoxide **OR** insecticides **OR** lead **OR** mercury

b **i** Amniotic fluid/amniotic sac

ii Cushions/protects the developing foetus

c Carries blood vessels and connects the foetus to the placenta **OR** carries useful substances from the placenta to the foetus and removes waste materials from the foetus to the placenta

4 **a** The average sperm production decreases

b Temperature **OR** light

c 1500 million

Chapter 17 Reproduction and survival

1 **a** **i** **A** sperm; **B** egg

ii Sperm are able to swim **OR** eggs cannot swim

iii Cell A: small, for easier/more efficient movement/swimming towards egg; cell B: larger, to supply/have food store for energy

b **i** Pollen

ii Ovule

c The nucleus of the male gamete fuses with the nucleus of the female gamete

d Variation allows species to survive and adapt to environmental change

2 **a** Sexual reproduction involves the fusion of **gametes** and usually involves **two** parents.

b In fish and amphibians, fertilisation is **external**. To help ensure fertilisation and survival of the species **many** eggs and sperm are released.

c In reptiles, birds and mammals, fertilisation is **internal**. This method makes fertilisation more likely and so **fewer** eggs and sperm are needed.

3 **a** Asexual reproduction involves only one parent and no gametes

b Bacteria **OR** yeast

c Advantage = quick **OR** maintains good characteristics; disadvantage = lack of variation could prevent populations adapting to changing conditions

d Runners **OR** bulbs **OR** tubers

e Asexual reproduction of certain plants is an **advantage** to garden centres as this enables them to sell plants with the **same** characteristics all year round.

4 **a** **A** runners; **B** tubers

b Quick **OR** maintains good characteristics

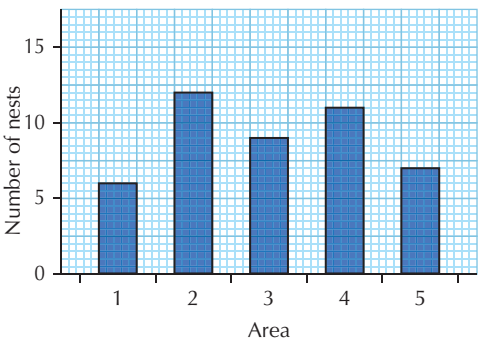
c Asexual reproduction involves only one parent and no gametes **OR** all offspring are identical

d Clones

5 **a** 9

b 90

c



Chapter 18 Propagating and growing plants

1

Part	Name	Description of function
A	**embryo**	grows into the new plant
B	seed coat	**protection**
C	**seed leaf/ food store**	provides food for growth

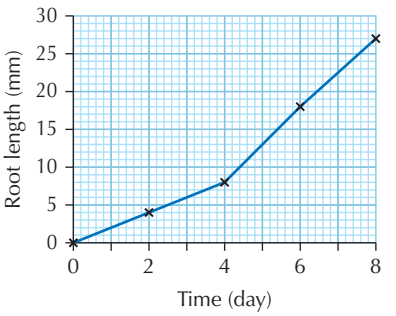
2 **a** **A** bulbs; **B** tubers

b Provides food for growth of a new plant

c Rapid method of producing more plants; new plants have the same characteristics as the parents

d Cuttings

3 **a**



b 4–6

4 **a** Moisture/water

b 80%

c No germination

5 **a** 2 and 5

b Temperature **OR** moisture **OR** compost/soil

c Repeat the experiment and obtain an average

6 9

7 **a** As the temperature increases the average time for germination decreases

b 7 days

c 4 days

Chapter 19 Commercial use of plants

1 Food **OR** fuel **OR** raw materials **OR** medicine

2 Decoration/gardens/parks **OR** ceremony/ examples such as weddings

3 Pharming

4 Genetically modifying plants to produce medicines

5 Medicines can be produced cheaply **OR** safely

6 Environmental concerns **OR** long-term health concerns

7 **a** Spruce tree and oak tree

b Poppy

c Cotton

d Soya bean, wheat and maize

8 **a** April

b Leek

c Beetroot, cauliflower and leek

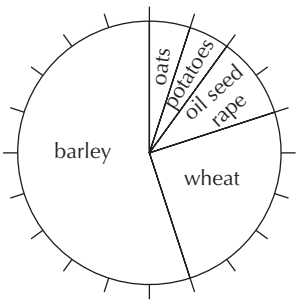
9 Plant A – aesthetic use **OR** house/garden plant **OR** decorative **OR** perfume

Plant B – Raw material **OR** example

Plant C – medicine **OR** some foods

Plant D – Food

10 **a**



b 1000 hectares

c 11:1

Chapter 20 Genetic information and inheritance

1 **a** Allele

b Dominant

c Genotype

d Heterozygous

e Homozygous

f Phenotype

g Recessive

h Monohybrid

2 **a** P

b F_1

c F_2

3 3:1 (3 showing the dominant characteristic; 1 showing the recessive characteristic)

4 A

5 C

6 C

7 B

8 Bb

9 Dimples

10 **a** F_2

b 3 tall:1 dwarf

c 1:2:1 (I × TT:2 × Tt:1 × tt)

11 B

12 **a** C

b D

13 D

14 B

15 A

16 C

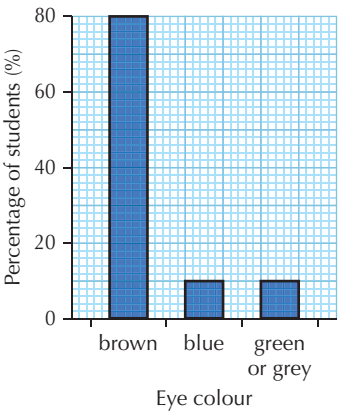
17 C

18 **a** 35%

b 7:2

19 **a** 80

b



Chapter 21 Growth and development

1 Annual plant seeds **germinate** and produce seedlings that grow and develop into mature plants. The mature plants flower. After **pollination** and **fertilisation**, the flowers develop into **fruits**. The fruits contain **seeds** which germinate the following year.

2 **a** Germination

b Photosynthesis

c Seed dispersal

3 Male gamete fertilises female gamete → baby born 9 months after fertilisation → children grow and develop → following puberty adolescents can produce gametes → adults

4 **a** C

b D

5 D

6

Food group	Use
carbohydrate	energy
protein	growth and repair of cells and tissues
fat	**energy**

7 **a** 1500 kg

b As the nitrogen fertiliser increases the yield of barley increases

c The control barley sample did not get any added nitrate fertiliser

d Temperature **OR** light intensity **OR** water **OR** soil type

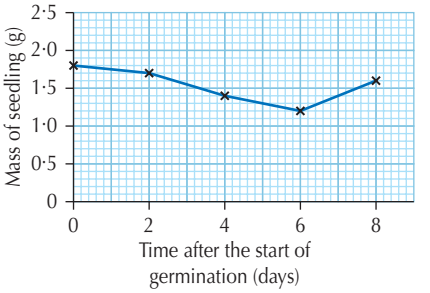
8 **a** As the gamma radiation exposure increases the percentage germination success of the barley seeds decreases

b Even with zero/no exposure to gamma radiation the percentage germination success was still only 90%

c 60%

9 **a** B

b

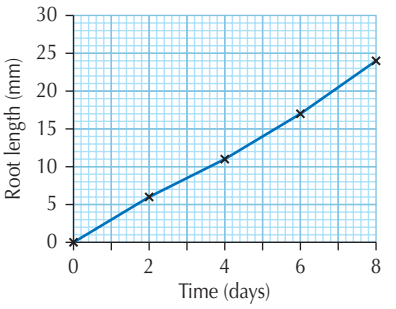


10 C and D

11 C

12 C

13 **a**



b 3 mm/day

14 **a** Temperature of water bath

b 60%

c No seeds would germinate

15 **a** Tube 1 acts as a control. It allows a comparison to be made so that the effect of the missing mineral can be determined.

b Nitrogen/N **and** phosphorus/P

c Reduced height **AND** root length

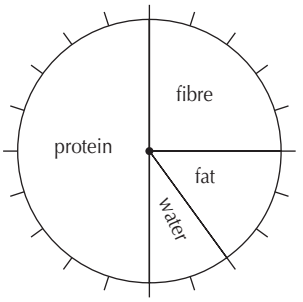
16 B

17 **a** Dairy **AND** meat

b 21

c 175 g

18 **a**



b 25 g

c 7:3

Chapter 22 Maintaining stable body conditions

1 The ability of the body to maintain a steady internal environment.

2 **a** Decrease in blood flow to the skin surface **OR** the raising of skin hairs **OR** shivering

b Increase in blood flow to the skin surface **OR** sweating

c Hypothermia

3 B

4 **a** Diabetes

b The blood glucose level rises after a meal. In response, the hormone **insulin** is released. This hormone causes the **liver** to **store** glucose.

5 A

6 **a** **i** Blood vessels narrow

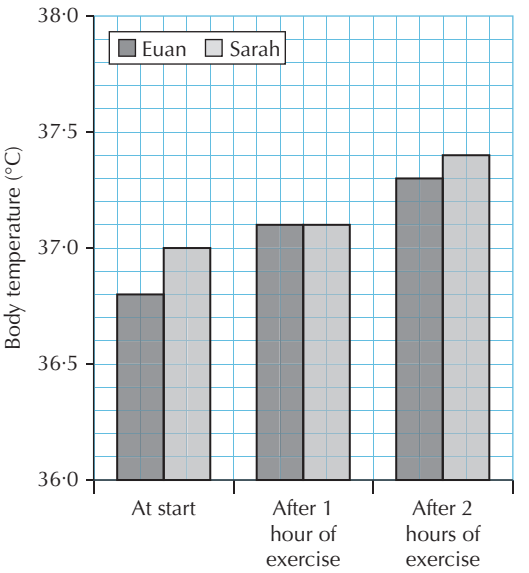
ii Decrease in blood flow to the skin surface which reduces heat loss

b Raising of skin hairs to trap warm air in response to a decrease in temperature **OR** increased sweating in response to an increase in temperature

c Human body temperature must be kept at 37 °C so that enzymes work at the **fastest** rate.

d Homeostasis

7 **a**



b The student whose body temperature increased more over 2 hours was **Euan** and this student's body temperature increased by **0·6 °C**.

8 **a** 44 mg/100 cm^3

b 90–120 minutes

c 400 mg

9 **a** 75+

b **i** 1·4%

ii 3·2%

c 25–34

10 The blood glucose concentration increased more in patient 2

The time for blood glucose concentration to decrease takes longer in patient 2

Life on Earth

Chapter 23 Biodiversity, sampling and distribution of living organisms

1 **a** Ecosystem

b Habitat

c Tree leaves/canopy **OR** trunks/bark **OR** soil/leaf litter **OR** others

d Temperature **OR** light **OR** humidity **OR** pH/acidity **OR** salinity **OR** others

e Abundance/number of species **OR** variety of different types of organisms

f Provides us with food/medicines/raw materials **OR** others

2 Quadrat – used to sample low-growing plants/slow-moving animals **OR**

Pitfall trap – used to sample soil-surface/leaf-litter invertebrates

3 The **habitat** is the place where an organism lives.

The **biodiversity** is the number and variety of different species in an ecosystem.

4 **a** A

b E

c C

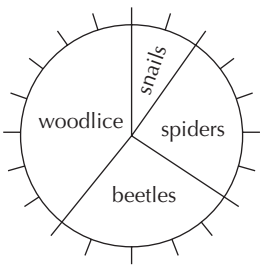
5 **a** Time/strength of shaking **OR** size/area of sheet **OR** time of day/weather during sampling **OR** others

b Some species may be attached to tree/don't shake off **OR** may fly away **OR** different species live at different heights/only lower branches were sampled

6 **a** Moisture of soil using a moisture meter **OR** light intensity using a light meter **OR** pH of soil using a pH meter

b Lip of traps not level/below soil surface **OR** left out too long and predation had occurred **OR** others

c



d Flying insects/would not be trapped by pitfall trapping

7 **a** **i** 7

ii 14

iii Set more traps **OR** repeat the procedure

b Ensure lip of trap is level/below soil surface **OR** empty traps after one night **OR** others

8 **a**

Beneficial insect	Number of pairs of wings	Spots
hoverflies	1	no
ground beetles	**none/0**	no
ladybirds	1	**yes**
wasps	2	no
lacewings	**2**	**yes**

b Ladybirds have one pair of wings but lacewings have two pairs

9 **a** Temperature/humidity

b 32

More food in the centre **OR** others

10 **a** Student B – many **OR** well-scattered/random quadrats

b Temperature **OR** humidity **OR** moisture **OR** light intensity **OR** pH

11 B

12 A

Chapter 24 Interdependence

1 Food **OR** pollination **OR** shelter **OR** seed dispersal **OR** others

2 **a** Green algae → water flea → water beetle → perch → pike **OR** Pondweed → tadpoles → water beetles → perch → pike

b The direction of flow of energy

c Green algae **AND** pondweed

d Any **two** from: trout; perch; water beetles

e Increase in pondweed population

Decrease in trout/perch/water beetles

3 **a** Butterflies would increase because fewer are being eaten

Red grouse would increase because less competition for food/beetles

b

Biotic factor	Example from the moorland ecosystem
predation	Hen harriers chase and catch skylarks and linnets.
disease	Every few years, red grouse populations are infected with worms which live in their gut.
competition	Red grouse and red deer eat some of the same moorland plants.

c Niche

4 **a** Increase in squid numbers which are food for seals

b Number of squid within the ecosystem

c They eat the krill which eat the plant plankton

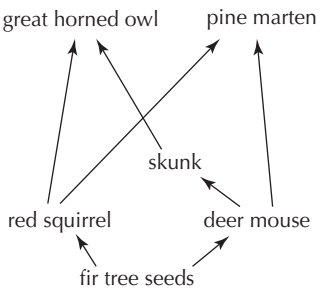
d Predation/squid are predators of fish **OR** competition/fish and squid compete for food

5 **a** 450

b Excluding oystercatchers did not affect the numbers

c 75

6



Chapter 25 Impacts on biodiversity

1 **a** Increased slowly until 1800/1900 **AND** then increased quickly to the year 2000/ the present

b Any **two** from: more/better food **OR** medicine/better health **OR** decreased predation

c Any **two** from: food **OR** water **OR** shelter **OR** space to live **OR** raw materials **OR** others

2 **a** Biodiversity has decreased

b Any **two** from: habitat destruction **OR** overfishing **OR** deforestation **OR** intensive agriculture **OR** pollution **OR** others

c Any **two** from: forest fires **OR** earthquake **OR** tsunami **OR** flood **OR** volcanic eruption **OR** others

d Nature reserves **OR** breeding programmes **OR** reintroduction schemes **OR** conservation laws **OR** others

3 **a** A measure of the impact a human population has on resources of the planet

b Escape of GM organisms into nature and potential transfer of their genes

4 **a** Description: removal of habitat e.g. forests cleared for farmland; impact: reduces biodiversity

b Description: fertilisers run off into water and cause algal blooms; impact: lower biodiversity **OR** description: pesticides enter natural food webs and affect other species; impact: lower biodiversity

5 Overfishing reduces the food available for other sea animals and could reduce the biodiversity in the oceans **OR** deforestation destroys animal habitats and reduces biodiversity

6 Burning fossil fuel/deforesting could cause global changes of temperature and affect survival of living organisms **OR** Sewage in rivers can result in decreased oxygen which reduces biodiversity **OR** Fertilisers leaching into rivers result in algal bloom and decreased oxygen, which reduces biodiversity

7 **a**

Part of the world	Hectares of rain-forest lost per year
Africa	3300
Asia	2800
South America	4000

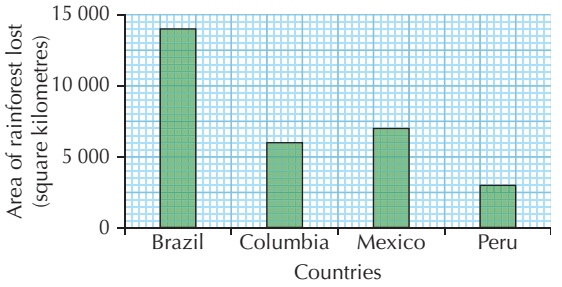
b 50 500 hectares

8 **a** Important habitat/thousands of species live there **AND** they protect coastlines from erosion

b Loss of trees causes mud to be washed into the sea, where it can bury coral reefs

c Tourism **OR** pollution

9



Chapter 26 Nitrogen cycle

1 A

2 **a** The addition of nitrogen to the soil from the atmosphere is called **nitrogen fixation**.

b The conversion of ammonium to nitrate in the soil is called **nitrification**.

c Plants absorb nitrate from the soil and use it in the synthesis of **protein**.

d In waterlogged conditions, **denitrifying** bacteria remove nitrogen from soil.

3 Bacteria **AND** fungi

4 **a**

Stage	Number
absorption	**5**
death	**1**
nitrification	**3 OR 4**
decomposition	**2**

b Nitrate

c Bacteria

5 **a** 1 → 6 → 4 → 5 → 3 → 2

b Any **two** from: 3, 4 and 5

6 **a** Convert ammonium to nitrate

b Convert nitrates to nitrogen gas

c Convert nitrogen gas to nitrates

7 **a** **i** 3

ii 8

b Soil **OR** plant roots

c Nitrate; needed to make protein

8 **a** 100 kg per hectare

b 4600 kg per hectare

c 4 times

Chapter 27 Adaptations for survival

1 **a** B

b A

c C

d B

2 **a** Reduces their surface area and cuts down water loss **OR** spines discourage animals from eating them **OR** provide shade

b Less water lost because pores closed at the hottest times

3 **a** Cuts down surface area for evaporation

b Allows fast absorption of rain water before it can evaporate

c Protects the cactus flesh from being eaten by animals **OR** provide shade

4 **a** Behavioural

b **i** C

ii A

iii E

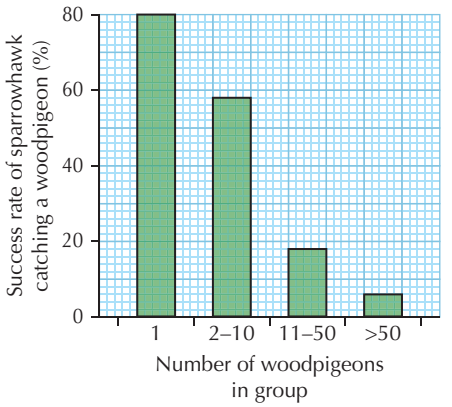
iv D

v F

5 **a** Insulate them from the cold

b Reduces the surface area from which heat can be lost **OR** allows them to share heat with each other

6 **a**



b **i** The larger the group, the lower the success rate of sparrowhawks

ii The larger the group, the further the distance at which the sparrowhawk is seen and the more time there is to escape

7 **a** A

b C

8 **a** 3

b Between 80 cm/s and 90 cm/s

c Species A prefers slower water flow **OR** Species B prefers faster water flow

Chapter 28 Chemicals and food production

1 Fertilisers

2 Some pests/insects may eat the crop **OR** some pests/weeds compete with the crops

3 The human population is increasing/there is an increasing demand for food **OR** to replace chemicals that have been lost from the soil **OR** to kill/reduce pests.

4 Organic farming

5 Any **one** from: manure **OR** compost **OR** peat

6 Biological control

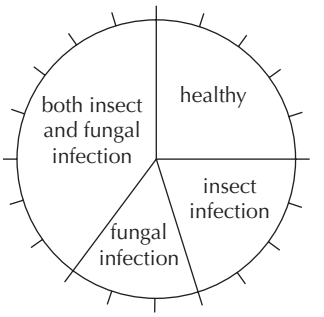
7 Enclosed space makes it more likely that the predator will find and eat the pest **AND** the introduced predator is less likely to escape into the wild

8 **a** **i** Fewer insects to eat the plants

ii Reduces competition between rice plants and weeds

b Droppings contain nitrogen which can act as fertiliser **OR** acts as a natural fertiliser

9 **a**



b 150 plants

10 **a** Ladybirds and lacewings

b Hoverflies and wasps

c Might kill beneficial insects as well as the pests

11 **a** Same area (m^2) **OR** watering **OR** fertiliser **OR** others

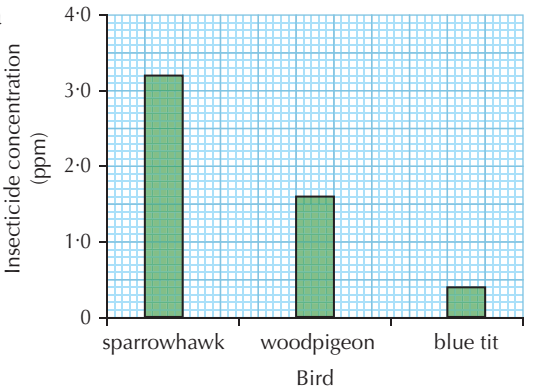
b The beetle-resistant/GM variety had the bigger yield

12 **a** Between 1950 and 1960

b 2 tonnes per hectare

c 5 tonnes per hectare

13 **a**



b Might have taken it in with its food

c 8 times

d i It built up in the sparrowhawk because it was present in all of their prey items

ii The levels/concentrations are much higher in the sparrowhawk

14 **a** Tomato plants with predatory mites had less red spider mites

b 200 per cm^2

Chapter 29 Fertilisers

1 **a** When crops grow and are harvested, **nitrate** is removed from the soil. In agriculture this is replaced by adding **fertiliser** to improve crop yield.

b Natural fertilisers include **manure**, **compost** and **peat**.

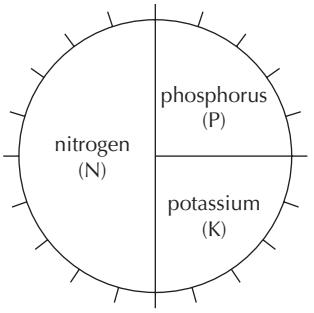
c **Artificial** fertilisers are made in factories from inorganic substances.

2 **a** Manure **OR** compost **OR** peat

b Inorganic and made in factories

3 F → D → E → B → A → C

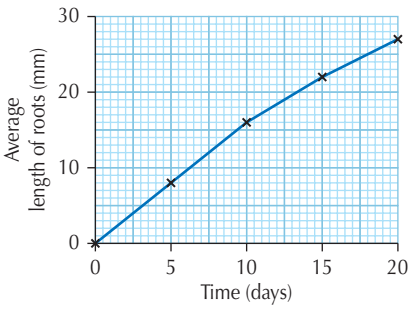
4 **a**



b 2:3:2

5 **a** Improved reliability from a high number of seeds

b



c To act as a control **OR** to show that it was the minerals which caused the results

6 **a** 10·1 cm

b All three fertilisers increased the growth/height of the tomato plants **OR** fertiliser A caused the greatest increase in growth

7 **a** Nitrate

b Potato

8 **a** Increasing nitrate concentration increases the rate of reproduction in duckweed

b Temperature **OR** volume of solution **OR** pH **OR** others

c Another identical container but with no nitrate

9 **a** A

b Field B – not enough potassium **OR** Field C – not enough phosphate

c 10 kg/hectare

Chapter 30 Learned behaviour

1 Behaviour which is inborn/present from birth

2 Woodlice response to light **OR** moisture **OR** others

3 Behaviour which is acquired by experience

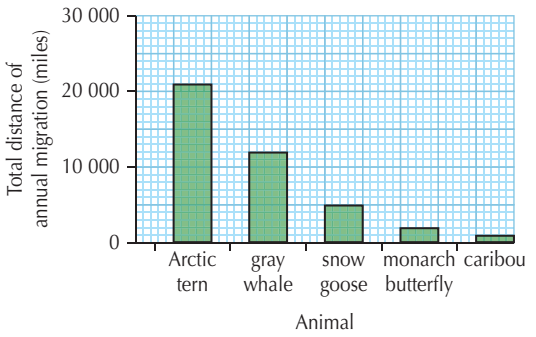
4 Imprinting **OR** habituation **OR** trial and error/associative learning

5 The temporary disappearance of an innate response to a repeated harmless stimulus **OR** learning not to respond to a harmless stimulus

6 Disappearance of the withdraw response in snails when harmless shell tapping is repeated

7 A

8 **a**



b 100 hours

9 **a** C

b It shows that the beetles are responding to humidity (and not innately turning either left or right)

c Allowed time for the humidity to affect the insides of the tube

d To avoid humidity from previous experiment affecting the results **OR** to prevent any chemical trail/contamination from the previous beetles affecting the results

e 18%

10 **a** Temperature **OR** humidity

b Allow them to settle into the environment of the tube

c Woodlice move to dark areas **OR** woodlice move away from the light

d Use more woodlice in the tube

11 **a** 60%

b Make them less easy for predators to see

12 **a** Temperature **AND** humidity

b 3

c Woodlice move to the dark **OR** woodlice move away from the light

13 **a** Carry out the experiment in the dark so slugs can't see

b It increases reliability **OR** one slug might be atypical