

Chapter 1 Cells

In-text questions

1.

Part	Animal cells	Plant cells
cell membrane	Y	Y
cytoplasm	Y	Y
nucleus and nuclear membrane	Y	Y
chromosomes in nucleus	Y	Y
cell wall	N	Y
vacuole	N	Y
chloroplasts	N	Y

2. **Similarities**

- plant and bacterial cells both have cell walls
- both have cytoplasm

Differences (any two)

- in plants the cell wall is made of cellulose – in bacteria it is made of a different material
- bacteria do not have a nucleus
- bacteria have plasmids

3. a) Stem cells are of interest to medical researchers because they can differentiate into many cell types therefore can be used to grow tissues or even organs to treat patients or for medical research into medical conditions – stem cells could help treat diabetes, spinal cord injury, stroke damage and many other conditions.
- b) Scientific advisers have the knowledge to understand the potential of stem cell research. They also have the knowledge to understand the limitations of stem cell research and the type of ethical scenarios that could arise.
4. The upper apices will not grow but the side apices will continue to grow making the plant bushier but not higher – ideal if used in a hedge or for cover.

Exam questions (page 6)

1. a) i) A – eyepiece; B – stage ; C – light source/lamp (3 marks)
 ii) To focus the image. (1 mark)
 iii) $10 \times 4 = 40$ (2 marks)
- b) i) So the structures are more easily seen. (1 mark)
 ii) Coverslip is being lowered over the tissue. (1 mark)
- c) i) A – nucleus; B – cytoplasm; C – vacuole (3 marks)
 ii) 45 mm (1 mark)
2. a) Cell wall drawn outside cell membrane; labelled (cell wall); vacuole drawn inside cell membrane and excluding nucleus; labelled (vacuole); chloroplast(s) drawn between vacuole and membrane; labelled (chloroplasts). (6 marks)
- b) i) 10 (mm) (1 mark)
 ii) $10/100$; Dividing by magnification; 0.1 correct computation (–1 mark for cm) (1 mark)

Chapter 2 Photosynthesis and plants

In-text questions

- Only the part of the leaf in light will turn blue-black when the iodine is added showing that starch is only produced in photosynthesis when light is available.
- The control leaf will have starch (iodine will turn blue-black when added to the leaf). This is because carbon dioxide is present and therefore photosynthesis can take place. The leaf without carbon dioxide (removed by sodium hydroxide) cannot photosynthesis and therefore will remain yellow-brown when iodine is added.
- It is more accurate to trap and measure the volume of oxygen produced rather than count the bubbles of oxygen produced as it is easy to miss some bubbles and also the bubbles will vary in size.
- Stomata will be in the upper surface of water plants such as water lilies as they float on water and therefore they cannot be on the lower surface.
- During a bright winter afternoon in a British grassland there will be enough light and carbon dioxide therefore temperature is likely to be limiting.
 - In a cornfield in mid-summer sunshine in Southern France there will be enough light and temperatures will be high. Carbon dioxide availability is likely to be the limiting factor.
- The indicator will remain red as the muslin will allow enough light through for some photosynthesis to take place. The carbon dioxide taken in during photosynthesis will be approximately equal to the volume of carbon dioxide given out in respiration.
 - The addition of more pondweed will allow more photosynthesis to take place. Therefore as the tubes are in bright light the rate of photosynthesis in the pondweed will be greater than the combined rates of respiration of the beetles and the pondweed. The indicator will turn purple.

Exam questions (pages 15–20)

- Chlorophyll/chloroplast. (1 mark)
 - water + CO₂ (either order) → glucose + oxygen (accept symbols) (1 mark)
 - Placed in a dark cupboard for 1 day or more. (1 mark)
 - Step 2 – remove chlorophyll/green colour/decolourise (**Not** kill chlorophyll)
Step 3 – remove alcohol/soften leaf (**Not** kill leaf) (2 marks)
 - Alcohol is flammable/inflammable (**Not** dangerous/explosive/using Bunsen burners) (1 mark)
 - Flask 1 – yellow/brown/yellow-orange (**not** red **or** no colour change)
Flask 2 – blue-black/black (**not** blue on its own **or** brown-black) (2 marks)
- Result: no colour change/remains yellow-brown/no starch present. Explanation: sodium hydroxide absorbs CO₂; no photosynthesis. (3 marks)
 - Place in boiling water/reference to dipping in water after step below; boil in ethanol/alcohol; add iodine; blue-black colour positive result. (4 marks)
- Axes correct way round (x = temperature, y = number of bubbles) and appropriate scaling on both axes; labels and units on axes; accurate plots; line. (4 marks)
 - So that the plant is carrying out photosynthesis at the desired temperature. (1 mark)
 - 30°C. (1 mark)

- d) 19. (1 mark)
- e) Light; move the light source further away from the apparatus and repeat the experiment. (2 marks)
- f) Set up the apparatus without the plant and record the number of bubbles given off. (1 mark)
4. a) Points plotted correctly and joined with a line graph. (1 mark)
- b) 36. (1 mark)
- c) Start at 0 and lower than for higher light intensity; levels off. (2 marks)
- d) More carbon dioxide available for more photosynthesis/more growth. (1 mark)
- e) i) The variable that restricts photosynthesis. (1 mark)
- ii) Temperature. (1 mark)
5. a) i) A – Upper epidermis; D – Spongy mesophyll. (2 marks)
- ii) Clear/thin; allows light through. Accept reference to: preventing evaporation of water from leaf; due to it being waterproof/waxy. (2 marks)
- iii) Allows gases to move/gas exchange; quickly/easily. (2 marks)
- iv) Palisade cell. (1 mark)
- v) Guard cell. (1 mark)
- b) i) Line joined to 0.04% CO₂ 15°C line; line levels off above 0.04% CO₂ 15°C line. (2 marks)
- ii) Increased CO₂ increases the rate of photosynthesis; plants show increased growth/yield or more profit. (2 marks)
- iii) Low light intensity; low rate of photosynthesis/production of O₂ same as rate of respiration/use of O₂; compensation point. (3 marks)

6.

Tube	Initial colour of indicator	Final colour of indicator	Plant cells
A	red	yellow	no photosynthesis but there is respiration
B	red	red	rate of photosynthesis = rate of respiration
C	red	purple	more photosynthesis than respiration

(5 marks)

Chapter 3 Nutrition and health

In-text questions

- Volume of water in boiling tube; mass of food; distance burning food is held away from boiling tube.
 - Energy lost in heating glass of boiling tube/to atmosphere/energy left in food residue.
- Breathing, beating of heart, metabolism of cells. (*any two*)
 - Less body mass/lower metabolic activity, e.g. less growth/division of cells.
- Equal mass of white chocolate and onion.
 - Add Benedict's solution.
 - Heat for same length of time.
 - The colour of brown chocolate will mask the colour change – less likely to happen with white chocolate.
- Bleeding gums from scurvy due to a shortage of Vitamin C on long voyages. Little citrus fruit carried.
- People in tropical regions get more strong sunshine to make Vitamin D.

Exam questions (pages 24–5)

1. a) i) **Indicative content:**

- record initial temperature of water
- burn the food
- record the final temperature of water
- calculate the temperature increase of the water
- repeat with other food
- one named controlled variable e.g. volume of water, same distance of food sample from apparatus

Response mark

Candidates must use appropriate specialist terms throughout to describe how you would collect data and explain, in a logical sequence, how they would calculate and compare the energy released from equal masses of biscuit and bacon. They use good spelling, punctuation and grammar and the form and style are of a high standard. (5–6 marks)

Candidates must use some appropriate specialist terms throughout to describe how you would collect data and partially explain, in a logical sequence, how they would calculate and compare the energy released from equal masses of biscuit and bacon. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. (3–4 marks)

Candidates describe how they would collect data or explain how they would calculate and compare the energy released from equal masses of biscuit and bacon using some or all of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms. (1–2 marks)

Response not worthy of credit. (0 marks)

- ii) Bacon will contain more energy than biscuit. (1 mark)

2. a) i) 0–17: Steep increase in daily energy requirement. 20–65: Slowly reducing daily energy requirement. (2 marks)
ii) Growth/repair/reproduction/movement/active transport/nerve impulses. (1 mark)
iii) Males have more muscle (allow converse for female). (1 mark)
iv) Activity. (1 mark)
v) Any **two** from: below required energy; starvation; cause weight loss. (2 marks)
- b) i) $25 \times 20 \times 4.2 = 2100$. Correct answer gets full marks. (2 marks)
ii) Any **one** from: heat loss from around the sides of the boiling tube/tin can; pasta not burning completely; heat used to raise the temperature of the thermometer/boiling tube; heat added to the pasta to start it burning. (1 mark)
- c) Any **two pairs** [evidence + advantage] from: (4 marks)
- high fibre; reduced risk of constipation/colon cancer
 - low salt; reduced risk of high blood pressure/stroke
 - low cholesterol/fat; reduced risk of obesity/reduced risk of cardiovascular disease
 - accept named example
 - source of calcium; healthy bones
 - source of iron; needed for formation of red blood cells/prevents anaemia
3. a) Any **two** from: growth/repair; energy/respiration; protection against disease; storage/insulation. (2 marks)
- b) i) Add Benedict's; heat water in bath. (2 marks)
ii) Orange/red. (1 mark)
iii) Biuret; blue to purple/violet. (3 marks)
4. a) DCPIP. (1 mark)
b) Blue to colourless/clear (need both). (1 mark)
c) Blackcurrant. (1 mark)
d) Any **two** from: vit C is broken down; dissolves/leaches into the water; damages/denatures cell membranes. (2 marks)
5. a) i) Hydrogen; oxygen. (2 marks)
ii) Cellulose; glucose/sugar. (2 marks)
- b) i) 1512. (1 mark)
ii) Butter. (1 mark)

Chapter 4 Digestion and enzymes

In-text questions

1. Protein is digested by proteases in the stomach and small intestine/duodenum and is broken down into amino acids. Absorption takes place in the small intestine.

2.

Enzyme	Substrate	Product	Region(s) in gut where enzyme acts
Amylase	starch	glucose/ sugar	mouth and small intestine/duodenum
Protease	protein	amino acids	stomach and small intestine/duodenum
Lipase	lipids/fats	glycerol and fatty acids	small intestine/duodenum
Carbohydrase	carbohydrates	range of sugars	small intestine/duodenum

3. At **X** as the enzyme concentration increases so does the rate of reaction – this is because there are more enzymes and active sites available to react with the substrate. At **Y** an increase in enzyme concentration has no further effect on the rate of reaction as the substrate has become limiting – there are too many enzymes for the amount of substrate available.
4. a) Proteases for blood and carbohydrases for grass.
b) It will be cheaper to wash at 40 °C and it is likely to be less damaging to clothes.

Exam questions (pages 31–2)

1. a) So that it can be absorbed/get into bloodstream. (1 mark)
b) A. (1 mark)
c) (2 marks)

Enzyme	Food broken down	Product
Protease	protein	amino acids
Amylase	starch	glucose/sugar/maltose (not carbohydrate)

2. **Indicative content:**

- length/folds/villi provide a large surface area
- thin epithelium/membrane gives a short diffusion distance
- permeable epithelium/membrane allows digested food molecules to pass through easily
- good blood supply/capillaries in villi maintain a high diffusion gradient

Response mark:

Candidates must use appropriate specialist terms throughout to explain, using all of the four points how the structures of the ileum are related to the function of absorption. They use good spelling, punctuation and grammar and the form and style are of a high standard. (5–6 marks)

Candidates use some appropriate specialist terms to partially explain, using two or three of the points above, how the structures of the ileum are related to the function of absorption. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. (3–4 marks)

Candidates make little use of specialist terms to explain how the structures of the ileum are related to the function of absorption or use some or all of the points above but fail to relate structure to function. They use limited spelling, punctuation and grammar. (1–2 marks)

Response not worthy of credit. (0 marks)

3. a) Fatty acids. (1 mark)
- b) Any **three** from: optimum temp for lipase is 35°C; at lower temperature, less collisions between enzyme and substrate; at higher temperature (50°C), lipase is denatured. (3 marks)
4. a) i) Biological catalyst. (1 mark)
- ii) Active site on enzyme labelled correctly. (1 mark)
- iii) Lock and key. (1 mark)

b) Indicative content:

- 0 min, blue/black as starch present (in all test-tubes)
- Test-tube A: after 10 mins amylase had broken down starch to glucose so iodine doesn't change colour
- Test-tube B: boiling denatures amylase enzyme; starch is not broken down to glucose; so iodine changes colour (brown to blue-black)
- Test-tube C: enzyme required for digestion of starch; so iodine changes colour (brown to blue-black)

Response mark:

Candidates must use appropriate specialist terms throughout to explain, using all of the four points how the structures of the ileum are related to the function of absorption. They use good spelling, punctuation and grammar and the form and style are of a high standard.

(5–6 marks)

Candidates use some appropriate specialist terms to partially explain, using two or three of the points above, how the structures of the ileum are related to the function of absorption.

They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. (3–4 marks)

Candidates make little use of specialist terms to explain how the structures of the ileum are related to the function of absorption or use some or all of the points above but fail to relate structure to function. They use limited spelling, punctuation and grammar. (1–2 marks)

Response not worthy of credit. (0 marks)

5. a) Any **two** from: protein; speeds up reactions; biological catalyst; not used up in the reaction. (2 marks)
- b) Accurate plots; [-1] for each inaccuracy [max -2]; line drawn; single line through all plotted points. (3 marks)
- c) i) Both remove same/similar mass of protein. (1 mark)
- ii) [Their performance] depends on temperature used. (1 mark)
- d) i) Protease x – it works best at lower temperatures; so less energy used to heat water (for washing). (2 marks)
- ii) Cleans across a range of temperatures. (1 mark)
- iii) Enzymes are specific/lipase needed to digest fat/grease; protease works only on protein/wouldn't breakdown grease or fat. (2 marks)

e) Indicative content:

- Protease X works because it exactly fits part of the protein molecule/reference to lock and key model
- Protease X works in the temperature range 0–25°C
- Its optimum temperature is 10°C when 30 arbitrary units of protein are broken down

- Higher temperatures/above 10°C changes shape of enzyme
- Denatures the enzyme
- Enzyme no longer fits/compliments the protein molecule
- Less protein digested/broken down

Response mark:

Candidates must use appropriate specialist terms throughout to explain, using all of the four points how the structures of the ileum are related to the function of absorption. They use good spelling, punctuation and grammar and the form and style are of a high standard.

(5–6 marks)

Candidates use some appropriate specialist terms to partially explain, using two or three of the points above, how the structures of the ileum are related to the function of absorption.

They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.

(3–4 marks)

Candidates make little use of specialist terms to explain how the structures of the ileum are related to the function of absorption or use some or all of the points above but fail to relate structure to function. They use limited spelling, punctuation and grammar.

(1–2 marks)

Response not worthy of credit.

(0 marks)

Chapter 5 Breathing and the respiratory system

In-text questions

- The model wouldn't work – the crack would keep air pressure in the Bell jar (thorax) and the atmosphere the same.
- The diagram should look like the right-hand side of Figure 5.1 on page 33.
- Arrow should show oxygen moving from alveolus into the blood capillary.
 - Alveolus is adapted by having a large surface area - only two cell layers (alveolar lining and capillary lining) separate the air in the alveolus from the blood.
- The breathing rate increases with exercise. It is important that this happens as during exercise we need more energy therefore we need more oxygen for the respiration that provides the energy.
 - Graph will show the breathing rate increasing as the exercise starts and will reach a peak (plateau) during the period of exercise. It will gradually fall when the exercise stops but will take several minutes to return to normal.
- Humans can only respire anaerobically for a short period of time as there is not enough energy produced in anaerobic respiration to sustain body processes.
- Anaerobic respiration does not require oxygen as a raw material. Anaerobic respiration in yeast produces less energy than aerobic respiration and produces alcohol as a waste product. Unlike aerobic respiration it does not produce water as a waste product.

Exam questions (page 38)

- A – Bronchus; B – Chest/thorax wall/ribs (2 marks)
 - trachea → **bronchus** → **bronchiole** → **alveolus** → blood capillary (3 marks)
 - Ribs move up and out to increase lung/chest/thorax volume; this decreases lung/chest/thorax/pressure; so it's lower than atmospheric pressure; air moves/drawn into lungs (down the pressure gradient) (any three). (3 marks)
- Any **three** appropriately linked points from: intercostal muscles contract moving ribs up and out; diaphragm contracts become lower/flatter; increased volume/decreased pressure; higher atmospheric pressure forces air into lung. (3 marks)
 - $10 \div 28 = 0.36$ litre per breath. (1 mark)
 - More air breathed in per min/per breath; increases concentration gradient of O_2/CO_2 . (2 marks)
- (4 marks)

	Respiration in yeast	
	Aerobic respiration	Anaerobic respiration
Uses of oxygen	Yes	No
Releases energy	Yes	Yes
Produces ethanol	No	Yes
Produces carbon dioxide	Yes	Yes

- Cells/muscles; transported in the blood to the lungs/and breathed out. (2 marks)
- Boil solution. (1 mark)
 - Thin **layer of oil** on top of solution/add oil. (1 mark)

- b)** Any **two** from: to heat up the water bath/vary the temperature; count number of bubbles; in a set time; (how quickly limewater goes cloudy → 1 mark). *(2 marks)*

Chapter 6 The nervous system and hormones

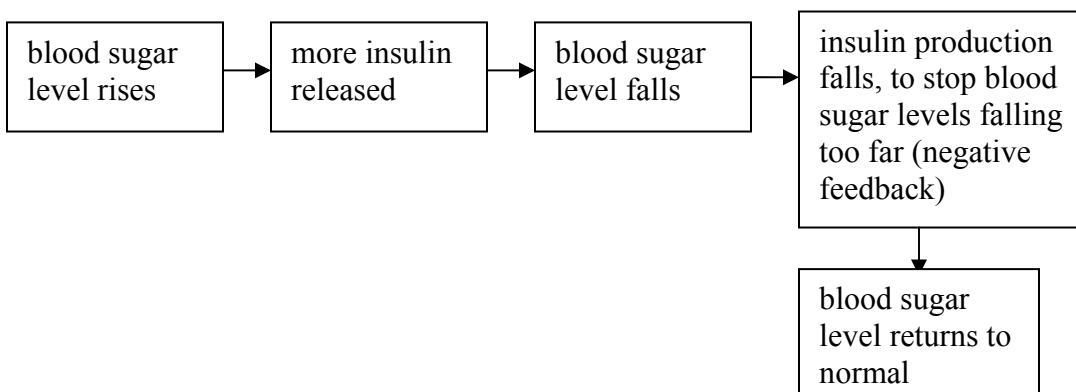
In-text questions

1. When viewing a close-up object the cornea refracts (bends) the light rays as they enter the eye. Further refraction takes place in the lens, which becomes thicker for the purpose, and the rays are focused on the retina.

2.

	Nervous system	Hormones
Speed of action	very fast	slow
Duration of effect	fast	usually over a long period of times
Mode of delivery	neurones	transported in blood

3.



4. a) Exercise will cause the blood sugar level to fall rapidly. The biscuit or glucose drink will help provide the glucose that will prevent the blood glucose level from dropping too quickly.
 b) If the blood glucose level is higher than it should be they could give themselves an extra insulin injection to bring the blood glucose level down. Exercise will also help bring it down but will be slower acting.
5. a) By rotating the plant every few days so that all sides will have even time facing the source of light.
 b) Removing the tip will remove the part that is sensitive to light and also remove the part that produces the auxin.
6. In heavy rain the weedkiller will get washed off the weeds and will have little effect. It is also likely to end up polluting waterways.

Exam questions (pages 49–50)

1. a) Controls the amount of light that enters the eye/regulate/control width of pupil/protect from too much light (**not** protection on its own). (1 mark)
 b) B – optic nerve. (1 mark)
 c) Rays are bent/refracted; by cornea/or lens. (1 mark)
2. a) Any **two** from: males faster than females/reaction times increase with age; both males and females have fastest reaction times at age 30; percentage increase is greater in males than females (with age). (2 marks)

- b) i) Sensory neurone. (1 mark)
 ii) Any **two** from: long; branched ends; insulating sheath. (2 marks)
- c) Diffusion; of a transmitter substance; accept correct named example. (2 marks)
- d) Any **two** points from: shorter distance; fewer neurones/synapses; no co-ordination by brain/only involves spinal cord. (2 marks)
3. a) **Indicative content:**
- Patrick's blood glucose level is 6 at the start whereas Glen's is 4
 - Patrick's blood glucose level rises more steeply/quicker than Glen's
 - to reach a maximum of 20.75(20–21) for Patrick
 - compared to a mark of 8.5(8–9) for Glen
 - Patrick's blood glucose level is approximately 2.5 times/over twice that for Glen
 - 2 hours after taking energy drink, Patrick's blood glucose is 11 whereas Glen's is 5
 - (then) sharper decline in Patrick's blood glucose level compared to Glen
- Response mark:**
 Candidates must use appropriate specialist terms throughout to explain, using all of the four points how the structures of the ileum are related to the function of absorption. They use good spelling, punctuation and grammar and the form and style are of a high standard. (5–6 marks)
- Candidates use some appropriate specialist terms to partially explain, using two or three of the points above, how the structures of the ileum are related to the function of absorption. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. (3–4 marks)
- Candidates make little use of specialist terms to explain how the structures of the ileum are related to the function of absorption or use some or all of the points above but fail to relate structure to function. They use limited spelling, punctuation and grammar. (1–2 marks)
- Response not worthy of credit. (0 marks)
- b) Blood glucose levels increase as glucose absorbed from digestive system; insulin then causes blood glucose levels to decrease/insulin converts glucose to glycogen/glucose is respired. (2 marks)
- c) i) Patrick. (1 mark)
 ii) Thirst/lethargy. (1 mark)
4. a) Pancreas. (1 mark)
 b) Absorption of digested food/sugar/glucose (in the intestine). (1 mark)
 c) Carried/transported in the blood. (1 mark)
 d) Any **three** from: glucose absorbed from the blood; converted to glycogen/fat; stored; respired. (3 marks)
 e) Any **two** from: blood **sensed/monitored** by organ A/pancreas; continuous/always/constantly; brings about change in opposite direction/described. (3 marks)
 f) Diabetes. (1 mark)
5. a) Auxin is present in the left hand side/shaded side; the impermeable sheet prevents its downward movement. (2 marks)
 b) i) Phototropism. (1 mark)
 ii) Plant gets **more** light; so more photosynthesis/more growth or better photosynthesis. (2 marks)
6. a) When hormone level rises the % of apple fall reduces/accept converse/inverse relationship. (1 mark)

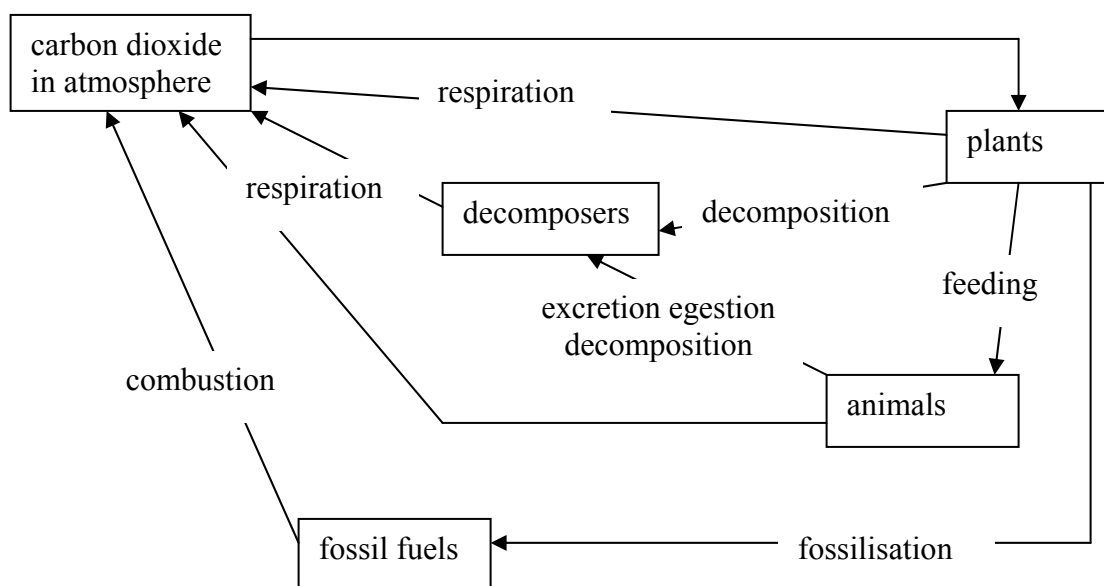
- b) One** from: to reduce/prevent apple fall; produce larger apples; seedless fruit; synchronise ripening. *(1 mark)*
- c) Any two** from: rooting powder/cloning; weed control; stimulation of flowering; fruit formation; any from (b) if not already given. *(2 marks)*

Chapter 7 Ecological relationships and energy flow

In-text questions

- Quadrats must be placed randomly to avoid bias – for example, the possibility that someone could pick a particular area (even subconsciously) because particular plants being sampled were common there or avoiding a certain part of the habitat because the ground was soggy in that area.
- With plants it is sometimes difficult to say where one plant ends – what looks like a group of plants may only be one plant as they are all joined together by underground roots.
- Butterflies could fly out of pitfall traps.
- The information is reliable as data was collected from 20 quadrats in each transect. Reliability could be further increased by using more quadrats (e.g. 30) in each transect or having more transects.
- Birth rate is increasing and with people living longer the death rate is decreasing.
 - locally by causing more pollution, habitat damage and decreasing biodiversity (more land used for housing).
 - globally increasing human population is causing shortage of some resources, decreasing biodiversity including extinction of some organisms and increased pollution including global warming.
- If the one source becomes scarce or extinct then there will be no food available.
- As there is only one stage from producer to consumer less energy will be lost in energy flow. Therefore a higher proportion of the energy available will be available to man than there would be if it was a longer food chain.
- Extracellular digestion takes place outside the body, e.g. fungi release enzymes into the soil and then absorb the breakdown products.
- Large flat tropical leaves will decompose much quicker than Norwegian pine needles as they will be in a much warmer and humid (moist) environment that favours decomposition and they have a much larger surface area for the decomposers to work on.

10.



11. Unlike fossil fuels the willow can be re-grown so it will not run out. Additionally, when it is growing the willow will take in as much carbon dioxide in photosynthesis as it produces when burnt as a fuel so it can be carbon neutral.
12. Slurry must be properly stored so is less likely to run into waterways causing eutrophication. Some types of fertiliser can only be sprayed at the times of the year, or in certain weather conditions, when it is more likely to be used by the plants for growth, less likely to accumulate in the soil, and less likely to leach into the waterways.

Exam questions (70–3)

1. a) i) Spiral wrack decreases from upper to lower; bladderwrack increases from upper to lower. (1 mark)
- ii) Waves/tides/desiccation/time covered by H₂O/time exposed/wind. (1 mark)
- iii) Light/temperature; light meter/thermometer. (2 marks)

b) Indicative content:

- set out transect line
- use quadrats
- identified seaweeds/used keys
- counted % cover in each quadrat
- repeated for several quadrats in each area
- average for each seaweed
- repeated for different areas of seashore

Response mark:

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(5–6 marks)

Candidates use some appropriate specialist terms to partially explain, using two or three of the points above, how the structures of the ileum are related to the function of absorption. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.

(3–4 marks)

Candidates make little use of specialist terms to explain how the structures of the ileum are related to the function of absorption or use some or all of the points above but fail to relate structure to function. They use limited spelling, punctuation and grammar.

(1–2 marks)

Response not worthy of credit.

(0 marks)

- c) i) Pyramid in blocks and symmetrical; large seaweeds at bottom with correct number + scale; others in order + correctly labelled + numbers correct. (3 marks)
- ii) Animals move/can be eaten. (1 mark)
- d) i) 3 (1 mark)
- ii) $3 \times 4 = 12$ (1 mark)
- e) Any **two** from: death; eaten by crabs; removed by people; disease; emigration. (2 marks)

2. Indicative content:

Pied Wagtail [PW]

- PW population decreases during winter 62–63/between summer 62 and 63
- High PW death rate
- PW resident during harsh winter/low temperatures/lack of food

- PW population increases summer 63 to summer 65
- PW birth rate + PW immigration greater than PW death rate + PW emigration

Swallow [S]

- S population remains constant/shows little change 62 and 65
- S birth rate + S immigration equals S death rate + S emigration
- Not resident during harsh winter/low temperatures/period of food shortage due to emigration/migration

Response mark:

Candidates must use appropriate specialist terms throughout to explain, using all of the four points how the structures of the ileum are related to the function of absorption. They use good spelling, punctuation and grammar and the form and style are of a high standard. (5–6 marks)

Candidates use some appropriate specialist terms to partially explain, using two or three of the points above, how the structures of the ileum are related to the function of absorption. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. (3–4 marks)

Candidates make little use of specialist terms to explain how the structures of the ileum are related to the function of absorption or use some or all of the points above but fail to relate structure to function. They use limited spelling, punctuation and grammar. (1–2 marks)

Response not worthy of credit. (0 marks)

3. a) Kingdom A – Animals/Animalia; Kingdom B – Plants/Plantae; Kingdom C – Fungi; Kingdom D – Bacteria/Monera/Prokaryote. (4 marks)
- b) Group of organisms with similar features/characteristics; capable of reproducing fertile/viable offspring. (2 marks)
- c) Lack of cellular organisation; considered by many (biologists) as non-living. (2 marks)
4. a) Sun/sunlight/light/light energy. (1 mark)
- b) Zooplankton; sand eel. (2 marks)
- c) phytoplankton → zooplankton → sand eels → fish → polar bears; phytoplankton must be at start and polar bears at end; missing arrow →; organisms in between in correct order (zooplankton – sand eels – fish). (3 marks)
- d) Produce sugars/food/photosynthesise/starch (**not** produce energy); using sunlight. (2 marks)
- e) Less phytoplankton; due to less light/lower temperature (**not** harsh conditions/more sand eels eat them). (2 marks)
- f) Numbers 1 polar bear, 4 fish, 6 sand eels, 8 zooplankton, 12 phytoplankton; symmetrical and pyramid shape; numbers correct; phytoplankton at base; polar bear top/or seals if CM from (c); all other labels correct. (5 marks)
- g) If problem with one food source – still have other; if one dies out; more to eat. (1 mark)

5. Indicative content:

Description

- first graph shows that the area of arctic ice is decreasing (1979–2010)
- second graph shows carbon dioxide concentration/levels increasing (1959–2010)

Explanation

- thicker layer of carbon dioxide allows less heat energy to escape the earth/pass back into space
- heat is trapped/global temperatures rise/global warming
- causes increased ice melting
- which is shown in first graph

Response mark:

Candidates must use appropriate specialist terms throughout to explain, using all of the four points how the structures of the ileum are related to the function of absorption. They use good spelling, punctuation and grammar and the form and style are of a high standard. (5–6 marks)

Candidates use some appropriate specialist terms to partially explain, using two or three of the points above, how the structures of the ileum are related to the function of absorption. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. (3–4 marks)

Candidates make little use of specialist terms to explain how the structures of the ileum are related to the function of absorption or use some or all of the points above but fail to relate structure to function. They use limited spelling, punctuation and grammar. (1–2 marks)

Response not worthy of credit. (0 marks)

6. a) Fungi (**not** earthworms). (1 mark)
 b) Denitrifying – A; nitrogen fixing – B; nitrifying bacteria – C. (3 marks)
 c) Denitrifying/A. (1 mark)
 d) More nitrates (**not** nitrogen/protein/fertilises). (1 mark)
7. a) i) Type 1: nitrogen fixing bacteria; type 2: nitrifying bacteria; role of type 1: to convert atmospheric nitrogen to nitrate in soil; role of type 2: to convert ammonium compounds to nitrate in the soil. (4 marks)
 ii) Less nitrate available in the soil for the plants; therefore less protein for growth. (2 marks)
 iii) Increased surface area. (1 mark)
- b) i) Graph 1 shows the oxygen concentration falls immediately after sewage is discharged into the river; the drop in the oxygen causes a fall in the number of river animals; however as oxygen levels rise further downstream the number of river animals also increases. (3 marks)
 ii) The discharge of sewage adds minerals to the river. Any **two** from: this causes the increase of water plants; these water plants block out the light at 1m; as the minerals are diluted further downstream there are fewer water plants which means that less light is blocked out. (3 marks)
8. a) More lakes affected/fish killed each year. (1 mark)
 b) Kills trees/plants. (1 mark)
 c) Any **two** from: rises into atmosphere; reacts/combines with water in clouds to form acid; blown by winds towards Norway. (2 marks)
 d) Lichens/blood worms. (1 mark)

Chapter 8 Osmosis and plant transport

In-text questions

- If a potato cylinder is placed in pure water it will gain mass due to the water outside the potato entering it. The water moves from the more dilute solution (pure water) into the more concentrated solution (the solution in the potato cells) by osmosis.
 - If placed in a strong sugar solution the potato would lose water. The water moves from the potato cells to the more concentrated external solution by osmosis.
 - The solution inside the potato cells was similar to the weak sugar solution so there was no overall movement of water by osmosis.
 - Measuring mass is more accurate - a good quality balance is more reliable than the human eye. Mass also takes account of differences in width between cylinders and when measuring lengths inaccuracies may arise due to the end of the cylinder not being perfectly smooth/straight.
- Plant cells do not burst when placed in water as the cell wall limits the extent that the cell membrane can expand and therefore the amount of water the cell can take in.
- The air bubble could be introduced by lifting the potometer out of the beaker to allow it to suck in some air as the water is drawn up the capillary tube. If then placed back in the beaker, water will continue to be taken up but an air bubble will be trapped.
 - Measure the distance the bubble moves in still conditions over a period of time. Reset the potometer by returning the bubble to the end of the capillary tube using the reservoir. Use a fan to provide windy conditions and using the same shoot measure the distance the bubble moves over the same period of time. Other conditions, e.g. light and temperature, must be kept the same. Both sets of results can be repeated for reliability.
- Measure the weight loss of the pot plant in non-humid conditions over a period of time. To ensure that the loss of mass is only due to water evaporating through the leaves (transpiration) the soil in the pot should be covered with foil/polythene to stop evaporation of soil water. Create humid conditions, by covering the plant with a clear polythene bag, measure weight loss of the pot plant over the same period of time. Other conditions, e.g. light, the effect of wind, and temperature, must be kept the same. To increase reliability the experiment could be repeated.

Exam questions (pages 78–80)

- Any **two** from: temperature; time in solution; volume of solution; size of potato; type of potato (**not** same volume of water/‘amount’). (2 marks)
 - They would have got lighter/shorter/floppier/shrink/thinner. (1 mark)
 - Beaker 3. (1 mark)
- The sugar molecules are too big to pass across the selectively permeable membrane; therefore only water molecules can pass across the selectively permeable membrane; because water moves from an area of high water concentration to an area of low water concentration/down a concentration gradient. (3 marks)
 - $-12/3 = -4$. (1 mark)
 - The decrease in length is caused by water moving out of the potato; as there is a more concentrated sugar solution outside the potato than in the potato tissue. (2 marks)
 - Thickness of potato/volume of solution. (1 mark)

- iv) Cell will have plasmolysed/same contents/smaller vacuole. (3 marks)
3. a) i) $2.5/0.8; \times 100 = 3$ (correct answer gets full marks) (2 marks)
- ii) 26 (1 mark)
- b) So results can be compared/potato chips are different sizes. (1 mark)
- c) Axes correct way round (x – solution, y – % change) and appropriate (linear) scaling on both axes; labels and units on axes; accurate plots; line. (4 marks)
- d) i) As concentration of solution increased, % change in mass decreased. (1 mark)
- ii) 0.44 or correct reading from graph. Allow $\frac{1}{2}$ square tolerance. (1 mark)
- e) Any **two** from: bigger range of solutions; more replicates; measure mass to two decimal places (accept other appropriate responses). (2 marks)
- f) **Indicative content:**
- cells plasmolysed
 - lost water
 - to hypertonic solution by osmosis
 - through selectively permeable membrane
 - so cell membrane pulls away from cell wall
 - sugar solution fills space between membrane and wall

Response mark:

Candidates must use appropriate specialist terms throughout to explain, using all of the four points how the structures of the ileum are related to the function of absorption. They use good spelling, punctuation and grammar and the form and style are of a high standard.

(5–6 marks)

Candidates use some appropriate specialist terms to partially explain, using two or three of the points above, how the structures of the ileum are related to the function of absorption. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.

(3–4 marks)

Candidates make little use of specialist terms to explain how the structures of the ileum are related to the function of absorption or use some or all of the points above but fail to relate structure to function. They use limited spelling, punctuation and grammar.

(1–2 marks)

Response not worthy of credit.

(0 marks)

4. a) A – upper epidermis; B – palisade mesophyll (layer); C – spongy mesophyll (layer). (3 marks)
- b) Water evaporates from cell surface; diffuses; through air space/stomata. (3 marks)
- c) Cuticle is waterproof/waxy; prevents evaporation; guard cells close stomata. (3 marks)
5. a) i) The rubber tubing must be well sealed. (1 mark)
- ii) **Indicative content:**
- measure the distance water moves/bubble moves at 20°C in a given time
 - repeat with same plant at 30°C
 - name at least one controlled variable that should be kept the same
 - reset the bubble (using the reservoir) to zero
 - leave for given time
 - measure the distance the water moves/bubble moves at 30°C
 - calculate rate to compare

Response mark:

Candidates must use appropriate specialist terms throughout to explain, using all of the four points how the structures of the ileum are related to the function of absorption. They use good spelling, punctuation and grammar and the form and style are of a high standard. *(5–6 marks)*

Candidates use some appropriate specialist terms to partially explain, using two or three of the points above, how the structures of the ileum are related to the function of absorption. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. *(3–4 marks)*

Candidates make little use of specialist terms to explain how the structures of the ileum are related to the function of absorption or use some or all of the points above but fail to relate structure to function. They use limited spelling, punctuation and grammar. *(1–2 marks)*

Response not worthy of credit. *(0 marks)*

b) i) $12 \div 10 = 1.2$; mm per min. *(2 marks)*

ii) Rate of water loss at 30°C is higher (1.2mm per minute) than at 20°C (0.6mm per minute); the greater loss of water causes the plant to wilt; therefore there is a greater need for frequent watering at 30°C to replace water lost. *(3 marks)*

Chapter 9 Chromosomes, genes and DNA

In-text questions

- 177 divided by 3 = 59.
- In DNA adenine always pairs with thymine therefore there will always be the same number of adenine and thymine bases. Same applies to guanine and cytosine as they always pair together.

Exam questions (pages 85–6)

- Complementary strand drawn with bases paired to each other. (1 mark)
 - Sugar; phosphate. (2 marks)
 - Double helix. (1 mark)
- Any **two** from: Chargaff/Franklin/Wilkins. (2 marks)
 - 6 (1 mark)
- GCT (1 mark)
 - 90 (1 mark)
 - Double helix structure; modelling. (3 marks)
 - Erwin Chargaff – amount of adenine and thymine always the same; likewise guanine and cytosine. (3 marks)
- Correct match. (1 mark)
 - 4 (1 mark)
 - Join in the sequence A–T, C–G. (1 mark)
 - Chargaff. (1 mark)
 - Sequence of 3; (DNA) bases; codes for 1 type of amino acid/form proteins. (3 marks)

Chapter 10 Cell division and genetics

In-text questions

- Height is less influenced by the environment – mass (weight) is affected by environmental factors such as the amount of food eaten or exercise taken.
- If not dried until constant mass there will be some water present therefore it will not be the dry weight.
 - Dry weight is an accurate indicator of cell/tissue mass. Fresh weight will vary, e.g. whether plant cells are turgid or flaccid.
-

Advantages	Disadvantages
only needs one parent	lack of variation can make the plants all equally susceptible to infection
only produce characteristics required	natural selection cannot favour the best adapted – they are all equally adapted
fast	
tissue cloning can produce disease-free varieties	
tissue cloning can help conserve rare or endangered plants	

- He can:
 - avoid going into the sun in the hottest part of the day
 - use a high factor sun screen
 - cover up – wear a t-shirt, hat etc.
- The cancer cells are smaller/have a larger nucleus.
 - There is no distinct boundary / capsule around the tumour and the cells are not contained in one area.
 - If not caught they could spread to many other areas of the body.
- cc
 - Cc and Cc
 - CC or Cc – as both parents are carriers (Cc) could have received either a C or c allele from either of them (but not a c from both as would have the condition).
 - 1 in 8 – (1 in 4 chance of the next child having cystic fibrosis x 1 in 2 of being a boy).
 - At least one grandparent on each side must carry the cystic fibrosis allele.

Exam questions (pages 102–105)

- Tissue culture. (1 mark)
 - Small sections are cut from the stem using a sterile scalpel. (1 mark)
 - To kill any microbes. (1 mark)
 - Minerals (or named) /water/hormones. (1 mark)
 - Mitosis. (1 mark)
- Thicker wall/smaller lumen. (1 mark)
 - Abnormal/uncontrolled cell division. (2 marks)

- b) Test those at risk for presence or absence of the disease; early detection improves the survival rate/no symptoms in early stages of disease. (2 marks)
3. a) X between adult and gamete. (2 marks)
- b) A – fertilisation; B – mitosis. (2 marks)
- c)

Stage	Description of stage	
A	nucleus/nuclear membrane breaks down; chromosomes shorten/become visible	(2 marks)
B	chromosomes replicate/make a copy; each chromosome has 2 strands	(2 marks)
C	any two from: chromatids separate/described; cytoplasm splits; two new cells produced	(2 marks)

4. a) One solid and one dashed chromosome in each cell; different length chromosomes in each cell. (2 marks)
- b) Diploid; to haploid (allow one mark for number of chromosomes halved). (2 marks)
- c) Nucleus. (1 mark)
- d) Testes/ovaries. (1 mark)
- e) Any **two** from: mitosis produces two daughter cells, meiosis four; mitosis produces identical daughter cells (clones), meiosis different; mitosis diploid, meiosis haploid (must give comparison). (2 marks)
5. a) 4 cells; (**not** ball of cells); each cell 1 large + 1 small chromosome; at least two different combinations; (if 2 cells – haploid with diff. combinations = 1 mark). (3 marks)
- b) Meiosis. (1 mark)
- c) Haploid (**not** n). (1 mark)
6. a) Correct gametes; offspring genotype. (2 marks)
- b) 50%. (1 mark)
- c) One dominant and one recessive allele; Bb. (2 marks)
- d) Male XY/female XX; only one chromosome/allele in each gamete; 50% gametes have X/50% Y. (3 marks)
7. a) i) Punnett; both parents Rr; correct cross RR, Rr, Rr, rr. (3 marks)
- ii) Wrinkled and smooth; 3:1 (correct phenotype needed before second mark awarded). (2 marks)
- b) i) Nucleus. (1 mark)
- ii) Genes/alleles. (1 mark)
- iii) DNA. (1 mark)
- c) Mother XX; gametes of father X and Y; XX and XY corresponding. (3 marks)
8. a) i) Long wing/L. (1 mark)
- ii) Ll. (1 mark)
- b) (2 marks)

		Long wing male gametes	
		L	l
Long wing female gametes	L	LL	Ll
	l	Ll	ll

c) Indicative content:

- carry out a test cross/back cross
- cross long winged fly with short winged fly(II)
- short winged fly has double recessive genotype
- if offspring all long, then parent is homozygous
- if half offspring long and half short, parent is heterozygous

Response mark:

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(5–6 marks)

Candidates use some appropriate specialist terms to partially explain, using two or three of the points above, how the structures of the ileum are related to the function of absorption.

They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.

(3–4 marks)

Candidates make little use of specialist terms to explain how the structures of the ileum are related to the function of absorption or use some or all of the points above but fail to relate structure to function. They use limited spelling, punctuation and grammar.

(1–2 marks)

Response not worthy of credit.

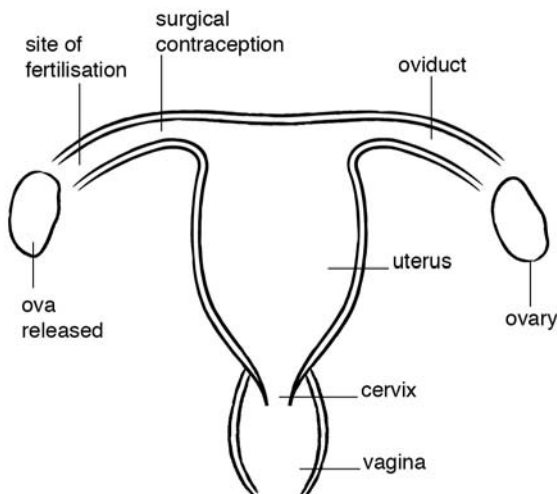
(0 marks)

9. a) $X_h Y$; $X_H X_H$. *(2 marks)*
- b) Carrier; $X_H X_h$. *(2 marks)*
- c) Receives normal X_H from mother; and Y from father. *(2 marks)*
- d) One quarter/one out of four/25%/1:3. *(1 mark)*
- e) Female haemophilic must get X_h from both parents/father must be a haemophilic and mother a carrier. *(1 mark)*

Chapter 11 Reproduction, fertility and contraception

In-text questions

1. Amino acids/vitamins/minerals.
2. Urea and carbon dioxide.
3. Strong possibility that he may change his mind.
- 4.



Exam questions (pages 111–12)

1. a)

Type of cell division	Cell
Mitosis	B
Meiosis	C

- b) i) Testes. (2 marks)
 ii) Testosterone. (1 mark)
 iii) Mitosis. (1 mark)
- c) i) On the lining of the uterus. (1 mark)
 ii) Differentiation. (1 mark)
 iii) Amnion: cushions the foetus; placenta: exchange of gases and substances. (2 marks)
 iv) Larger surface area. (1 mark)
2. a) Arrow pointing from placenta to foetus. (1 mark)
 b) Amino acids/glucose/water/hormones/drugs/other correct response. (1 mark)
 c) Villi; increases surface area; for diffusion **or** thin membranes; short distance; for diffusion **or** good blood supply; maintains gradient; for diffusion. (3 marks)
3. **Indicative content:**
- days 6–13 or 14 uterus thickens/develops
 - uterus becoming more vascular
 - day 14 ovulation occurs/egg released

- from ovary
- day 15–28 fertilisation occurs
- in oviduct
- embryo/ball of cells implants in uterus lining

Response mark:

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Candidates use some appropriate specialist terms to partially explain, using two or three of the points above, how the structures of the ileum are related to the function of absorption. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. *(3–4 marks)*

Candidates make little use of specialist terms to explain how the structures of the ileum are related to the function of absorption or use some or all of the points above but fail to relate structure to function. They use limited spelling, punctuation and grammar. *(1–2 marks)*

Response not worthy of credit. *(0 marks)*

4. **a)** (Given) hormone treatment. *(1 mark)*
- b)** Sperm sample collected; mixed with ova in glass dish. *(2 marks)*
- c)** Placed back into uterus; where implantation occurs. *(2 marks)*
- d) i)** Gives an infertile couple the chance to have a child. *(1 mark)*
- ii)** Some embryos may be destroyed/against nature/religious objections/too expensive. *(1 mark)*

(Reward other appropriate responses for both (i) and (ii))

Chapter 12 Applied genetics

In-text questions

- More people taking foreign holidays/using sun beds.
- Avoid being in sun in hottest part of day/use a high factor sun lotion/cover up/avoid using sun beds.
- Very small size of microbes/chemicals involved; difficulty in separating insulin form other products; high-tech equipment needed; skilled technicians/scientists involved.

Exam questions (pages (118–19))

- 18 to 6; 3 times. (2 marks)
 - Cells from baby/chromosomes/DNA. (1 mark)
- Amniocentesis. (1 mark)
 - D circled. (1 mark)
 - Whether or not to continue the pregnancy or other appropriate response. (1 mark)
 - $1/200 \times 1000/1$; 5 (correct answer gets full marks). (2 marks)
 - The older the mother, the greater the risk of Down Syndrome. (1 mark)
 - x-axis – age of mother; y-axis – no. of DS babies. (2 marks)

- Indicative content:**
 - human gene for insulin removed from human chromosome
 - plasmid removed from bacterium and spliced open
 - the gene for insulin is inserted to the plasmid
 - the modified plasmid is re-inserted into the bacterium
 - the bacterium is provided with the correct requirements for growth
 - the bacteria multiply
 - the bacteria produce human insulin
 - reference to purification for human use

Response mark:

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(5–6 marks)

Candidates use some appropriate specialist terms to partially explain, using two or three of the points above, how the structures of the ileum are related to the function of absorption.

They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.

(3–4 marks)

Candidates make little use of specialist terms to explain how the structures of the ileum are related to the function of absorption or use some or all of the points above but fail to relate structure to function. They use limited spelling, punctuation and grammar.

(1–2 marks)

Response not worthy of credit.

(0 marks)

- Any **two** from: can produce larger quantities; can produce human insulin; no side effects.

(2 marks)

Chapter 13 Variation and selection

In-text questions

1. Insect resistance can arise by some insects developing a mutation that makes them resistant to insecticides. The insecticide will still kill the 'normal' non-resistant type but the mutated resistant type will survive as will their offspring. In time virtually all the insects will be resistant as they are the only ones surviving and passing the resistant allele on to the next generation.

Exam questions (pages 124–5)

1.
 - a) Height/weight/mass/suitable example; discontinuous/discrete; genetic/genes. (3 marks)
 - b) Full range of results/intermediates. (1 mark)
 - c)
 - i) Height – A. (1 mark)
 - ii) Tongue rolling – C. (1 mark)
2.
 - a) More of the black moth eaten by birds. (1 mark)
 - b) % black increases; % pale decreases. (2 marks)
3.
 - a)
 - i) One mark for correct bars and one each for each correctly labelled axis. (3 marks)
 - ii) Distinct categories. (1 mark)
 - b) **Indicative content:**
 - in absence of antibiotic, normal bacteria fitter
 - some antibiotic resistant bacteria still present due to mutation
 - in presence of antibiotic, antibiotic-resistant bacteria fitter (can survive)
 - antibiotic-resistant bacteria reproduce
 - pass on the antibiotic resistant gene to the offspring
 - therefore the numbers of antibiotic resistant bacteria increase in the population
 - meanwhile, normal bacteria killed by antibiotic (differential survival)

Response mark:

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(5–6 marks)

Candidates use some appropriate specialist terms to partially explain, using two or three of the points above, how the structures of the ileum are related to the function of absorption.

They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.

(3–4 marks)

Candidates make little use of specialist terms to explain how the structures of the ileum are related to the function of absorption or use some or all of the points above but fail to relate structure to function. They use limited spelling, punctuation and grammar.

(1–2 marks)

Response not worthy of credit.

(0 marks)

4.
 - a) Natural. (1 mark)
 - b) Poisonous variety/B increases with time or A decreases with time; poisonous clover not eaten; link with increasing number of slugs. (3 marks)
 - c) The idea that living organisms/species have changed over time. (1 mark)

Chapter 14 The circulatory system

In-text questions

- Red blood cells are smaller and in higher numbers than white blood cells. They are more uniformly shaped and don't have a nucleus.
- Arteries have much thicker walls than veins because the blood is at a higher pressure.
- The hepatic portal vein transports dissolved food from the intestine to the liver.
 - The coronary arteries supplies the heart muscle with oxygen and glucose for respiration.
 - The blood in the renal artery is at a higher pressure/contains more oxygen/glucose/waste and less carbon dioxide than the renal vein.
 - The blood in the hepatic artery has more oxygen and is at higher pressure than in the hepatic vein but has less carbon dioxide and less glucose.
- Extreme tiredness is a symptom of anaemia as the cells will have less oxygen for respiration for energy.
 - A rapid pulse rate is the body's way of compensating for the reduced oxygen-carrying capacity of the blood.

Exam questions (pages 132–4)

- Any **two** from: transport/pumps blood/O₂/glucose; protection/fight disease; control of body temperature. (2 marks)
 - Pulmonary vein. (1 mark)
 - A carries oxygenated blood/vena cava carries deoxygenated blood; A has low level of CO₂/vena cava has high level of CO₂. (1 mark)
 - Coronary artery. (1 mark)
- A – Aorta; B – Vena Cava. (2 marks)
 - Any **three** from: deposit reduces size of lumen; less blood flows/less glucose or oxygen/less respiration; to heart muscle; heart muscle dies/fails to beat. (3 marks)
 - Any **two** from: increase exercise; stop smoking; eat less fatty food. (Reward other appropriate response.) (2 marks)
- Just one area/side brain affected. (1 mark)
 - Bigger size → more symptoms; or location differs → different symptoms. (1 mark)
 - Indicative content:**
 - blockage/reduced blood flow
 - in blood vessel/or part of brain
 - less O₂ or glucose to brain
 - less respiration in cells of brain
 - cells die in brain/reduced brain activity
 - results in reduced body part function

Response mark:

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Candidates use some appropriate specialist terms to partially explain, using two or three of the points above, how the structures of the ileum are related to the function of absorption. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. (3–4 marks)

Candidates make little use of specialist terms to explain how the structures of the ileum are related to the function of absorption or use some or all of the points above but fail to relate structure to function. They use limited spelling, punctuation and grammar. (1–2 marks)

Response not worthy of credit. (0 marks)

- b) i) Any **two** from: genetic factors; high blood pressure; age. (2 marks)
 ii) Any **three** from: reduce blood pressure; reduce weight; more exercise; reduce salt intake; reduce sugar intake; reduce their chances of diabetes; reduce alcohol consumption; stop smoking. (3 marks)
- c) i) Arteries. (1 mark)
 ii) Permeable/thin wall/large surface area. (1 mark)
4. a) Logical construction (reading across or down); row/column heading explanatory; time units within headings. (3 marks)
 b) Athletes have higher pulse at 0 to 30 sec (accept at start); athletes have lower pulse from 30 to 60 sec (onwards)/60 to 90 sec/90 to 120 sec. (Accept converse for non-athletes.) (2 marks)
 c) i) Athletes. (1 mark)
 ii) Athletes recover faster/fitter/hearts more efficient/heart pumps out more blood with each pulse. (1 mark)
5. a) Any **two** from: low red cell count/haemoglobin; lack of O₂ transport to the tissues; would endanger patients own health/may cause heart problems. (2 marks)
 b) Any **two** from: one of blood loss/accident/childbirth/haemorrhage; ongoing blood diseases/anaemia/cancer; major surgery/transplant; need for part of blood/platelets/red cells/white cells/plasma/factor VIII. (2 marks)
 c) Any **two** from: 9000 new donors is a difficult target to meet; some donors/3,000 (65,000–62,000) do not donate every year; some will become too old/>70 and have to stop donating; some may become ill and not be allowed/able to donate. (Accept: History of blood transfusions/tattoos/recent travel to certain parts of the world/surgery/pregnancy/childbirth/CJD in family/AIDS/hepatitis.) (2 marks)

Chapter 15 Microorganisms, defence against disease, medicines and drugs

In-text questions

- The flasks and their contents need to be sterilised otherwise any microbes present would cause contamination.
 - In flasks A and C microbes from the air could not enter the flasks.
- Boiling milk affects the quality/taste.
- To give time for enough antibodies complementary to the smallpox antigens to be produced.
- Young children are more vulnerable and it takes time for the levels of antibodies to rise to produce immunity.
- Microorganisms used in vaccinations must be dead or modified otherwise they would cause the illness they are designed to give protection against.
- In passive immunity the antibodies are given to the individual – they are not produced by the body. In active immunity the individual produces the antibodies – whether by responding to an infection or having had a vaccination. Passive immunity is much faster-acting than active immunity but it will not be as long lasting.
- Most vaccinations are free as they are part of the NHS health care – it is also more cost effective to prevent illness than treat it. Travellers opt in to foreign holidays – this is above and beyond basic health provision.
- Catherine needed an antibiotic as she had a bacterial infection which can be cured by antibiotics.
 - Siobhan had a cold which is caused by a virus – antibiotics have no effect on viral illnesses.
 - New antibiotics need to be produced to combat bacteria resistant to many of the current antibiotics.
 - The full course of antibiotics is more likely to kill all the bacteria rather than allowing some with some element of resistance to survive and reproduce.
- Antibiotic C was most effective and A least effective.
 - In the second test antibiotic C had no effect on the bacteria – the bacteria had become resistant to this antibiotic.
 - Any **two** from: Petri dishes left for the same time; kept at the same temperature; same strength of antibiotics used.
- With bronchitis less oxygen (air) can enter the alveoli, therefore less can diffuse into the blood and therefore there is less for respiration for energy.
 - The nicotine makes smoking addictive.

Exam questions (pages 148–52)

- A and D. *(1 mark)*
 - Bacteria/fungi. *(1 mark)*
 - Pasteur. *(1 mark)*
 - Rows 1, 2, 5, 6 (all correct = [2]; 2/3 correct = [1]). *(2 marks)*
 - Process used in culturing microbes; to avoid contamination. *(2 marks)*

2. Indicative content:

- microbes get trapped in swan neck/s-bend
- no microbes can enter flask
- but air can enter
- no decay means microbes not produced by broth
- therefore spontaneous generation theory disproved
- tilting allows microbes to enter broth and cause decay

Response mark:

Candidates must use appropriate specialist terms throughout to explain, using all of the four points how the structures of the ileum are related to the function of absorption. They use good spelling, punctuation and grammar and the form and style are of a high standard. (5–6 marks)

Candidates use some appropriate specialist terms to partially explain, using two or three of the points above, how the structures of the ileum are related to the function of absorption. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. (3–4 marks)

Candidates make little use of specialist terms to explain how the structures of the ileum are related to the function of absorption or use some or all of the points above but fail to relate structure to function. They use limited spelling, punctuation and grammar. (1–2 marks)

Response not worthy of credit. (0 marks)

- 3. a) i)** Gonorrhoea/TB. (1 mark)
- ii)** White. (1 mark)
- iii)** Stage 2: Surrounds the bacterium; Stage 3: Digest the bacterium. (2 marks)
- b) i)** Antigens. (1 mark)
- ii)** Antibodies would not fit/shapes are different. (1 mark)
- iii)** Antibodies remain; memory cells present/ white blood cells remember how to make antibodies. (2 marks)
- 4. a)** Traps; microbes. (2 marks)
- b) i)** More microbes in vaccination/booster/another vaccination. (1 mark)
- ii)** Any **three** from: modified microbes; causes antibody production; antibodies combine with microbes/antigens; clumping/immobilisation; phagocytosis; memory cells. (3 marks)
- c)** New microbes in Africa; produces new antibodies. (2 marks)
- 5. a)** Natural; active; acquired. (3 marks)
- b)** Any **four** from: antibody level immediately high/20 arbitrary units; injection contains antibodies, produced by another animal; continuous decline (after 2 weeks); body does not produce own antibodies; white blood cells/lymphocytes are not stimulated by appropriate antigen. (4 marks)
- c)** Antibodies attach to antigens of disease microorganism; causes clumping of microorganism; stops spreading/reproduction of microorganisms; phagocytes digest/break them down with enzymes. (4 marks)
- d) i)** Between 5 and 6 weeks. (Accept 5 weeks.) (1 mark)
- ii)** May become ill/life threatening/could infect others. (1 mark)
- 6. a)** A substance diffuses/spreads from the fungus; which kills/stops growth of bacteria. (2 marks)
- b) i)** To prevent contamination/to ensure that only bacteria grown were those transferred. (1 mark)

- ii) Temperature too low in incubator/loop not cooled after heating and hot loop kills bacteria. (1 mark)
 - iii) Lid left off for too long/microbes in air. (1 mark)
7. a) To mix the **fungus** with nutrients/air. (1 mark)
- b) Temperature monitored/measured/sensed (by sensor); water jacket cools the biodigester when required. (2 marks)
 - c) High temperatures would kill the fungus. (1 mark)
 - d) To prevent other microorganisms entering (**not** contamination *as could be chemicals*). (1 mark)
- e) Extraction/taken out of the biodigester; purification/separating out the penicillin; packaging/making into tablet/storage. (3 marks)
8. a) i) Cannabis does less harm than alcohol/ no more than smoking; any comparative value(s) from table. (2 marks)
- ii) Adults better able to make decisions concerning lifestyle/risks/duty of care/children still developing. (1 mark)
 - iii) 1. Nicotine. (1 mark)
2. tar. (1 mark)
- b) i) 12; 10; 4. (1 mark)
- ii) Tony. (1 mark)
 - iii) Greater harm to health specified; harm to society specified. (2 marks)