B2a answers

Remember: Check which grade you are working at.

Page 70 Cells

1 a A cell membrane
C vacuole
E nucleus
F cell wall *All four correct = (3) 3 correct = (2) 2 correct = (1)*

b A, D, E *(1)*

c It has chloroplasts *(1)*

d Ribosomes – where proteins are made *(1)*
Mitochondria – where (aerobic) respiration takes place *(1)*

Page 70 Specialised Cells

2 a When it fuses with a sperm cell, the new cell (the zygote) will end up with two sets *(1)*

b To provide energy for cell division *(2)*

c i Sweep mucus (containing trapped bacteria and dirt) up from the lungs *(1)*

ii They have cilia which can move in unison *(1)*; they have many mitochondria to provide energy for the movement of the cilia *(1)*

Page 71 Diffusion 1

1 a Diffusion is the spreading of the **particles** of a **gas**, or of any substance in solution. This results in a **net** movement from a region where they are in a **higher** concentration. *(4)*

b Particles are moving faster / have more kinetic energy *(1)*; so they spread out faster / bump into each other more often *(1)*

2 a Animal, because it does not have a cell wall (absence of chloroplasts does not mean it is an animal cell, because many plant cells do not have chloroplasts) *(1)*

b The cell is respiring *(1)*; which uses oxygen *(1)*

c Oxygen is able to pass through it *(1)*

d Mitochondria *(1)*

e Respiration happens faster / oxygen used up more rapidly resulting in a lower concentration of oxygen in the cell so there is a greater concentration gradient (between the cell and outside) *(2)*

Page 71 Diffusion 2

3 a Carbon dioxide *(1)*

b Carbon dioxide is used in photosynthesis so there is a lower concentration inside the leaf than in the air *(1)*; there is a concentration gradient from the air to the leaf *(1)*

B2a answers

Page 72 Osmosis 1

1 Osmosis is the **diffusion** of **water** from a **dilute** to a more concentrated solution, through a **partially** permeable membrane. *(4)*

2 a Beaker / dilute sugar solution, tubing / concentrated sugar solution *(1)*

b It rises *(1)*

c *(Any 3:)* Water molecules can go through the membrane sugar; molecules are too large to go through; water molecules diffuse / move by osmosis from the more dilute solution to the concentrated one; idea of random movement

Page 72 Osmosis 2

3 a Cell membrane *(1)*

b It will burst *(1)*

c The strong cell wall stops it bursting *(1)*

d *(Any 3:)* It will lose water; by osmosis; because the cytoplasm is a less concentrated solution than the sugar solution; contents will shrink; may pull away from the cell wall

Page 73 Photosynthesis

1 a (The remaining words should be:)
Carbon dioxide; water; glucose; oxygen *All three correct = (2) 1/2 correct = (1)*

b *(Any 2:)* Absorbs energy from light; the energy is used to make glucose; from carbon dioxide and water

Page 73 Leaves

2 a *(Any 4:)* Tiny pores (stomata) on the underside; allow carbon dioxide to diffuse into the leaf; broad flat surface large surface; area to absorb, sunlight / carbon dioxide; veins; bring water from the roots; thin, so carbon dioxide can diffuse in quickly / light can reach all cells

b i Near the upper surface so light can easily reach them *(1)*; so they get a lot of light *(1)*

ii Cell in epidermis (either upper or lower) *(1)*

B2a answers

Page 74 Limiting factors

1 a 32.0 *(1)*

b The number of bubbles given off per minute *(1)*

c The greater the light intensity, the greater the rate of photosynthesis *(1)*

d *(Any 2:)* The number of bubbles increases with each reading; suggesting the plant was still responding to the increase in light intensity; she should have waited until the plant was photosynthesising steadily

e *(Any 3:)* Yes, the more light the plant is given, the faster it photosynthesises; suggesting that lack of light was stopping it from photosynthesising faster; however, at the highest light intensities the rate of photosynthesis seems to be levelling off; suggesting some other factor is beginning to be the limiting factor.

Page 74 Healthy plants

2 a Plants need nitrate ions for producing **amino** acids, which are then used to form **proteins**. They need **magnesium** ions for making chlorophyll. *(3)*

b Through their roots *(1)*; into root hairs by active transport *(1)*

c **i** It cannot make proteins which are needed for growth *(1)*; forming new cells *(1)*

ii It cannot make chlorophyll, which is green *(1)*

Page 75 Food chains

1 a phytoplankton → krill → penguins or fish → seals → killer whales *(1)*

b The arrows show energy flowing along the food chain *(1)*

c Phytoplankton *(1)*

d All except primary consumer *(1)*

2 a As chemical potential energy (in food) *(1)*

b *(Any 2:)* Some light does not hit their leaves; some light passes straight through the leaves; some light is reflected from the leaves; chlorophyll does not absorb all wavelengths (colours) of light

Page 75 Biomass

3 a The mass of living organisms *(1)*

b *(Any 2:)* Lions do not eat all of the antelopes; they do not eat all parts of the antelopes; the lions do not digest all of the antelopes so some remains are lost in their faeces

4 *(Any 2:)* Glucose broken down by respiration; to provide heat energy (to keep warm); this is lost to the environment so there is less energy for the next organism in the chain

B2a answers

Page 76 Capital food production

1 a Apple tree → Karen *(1)*
Wheat (or other plant) → chicken → chicken → Jo *(1)*

b A shorter food chain *(1)*; so less energy lost / energy is lost at each transfer *(1)*

c *(Any 2:)* The chickens do not need to produce heat in their bodies; which involves respiration; and uses up food; so more of their food becomes chicken meat

2 Transport vehicles emit pollutants *(1)*; especially carbon dioxide, which may cause global warming *(1)*; (there are other pollutants that could be described, e.g. sulfur dioxide causing acid rain, nitrogen oxides causing acid rain, carbon monoxide reducing oxygen carriage in the blood, particulates causing damage to the lungs)

Page 76 The cost of good food

3 a *(Any 2:)* There are greater energy losses; because the chickens use energy moving around; so fewer eggs produced per, chicken / square metre / quantity of food provided

b *(Any 2:)* They may think they taste better; they may think they are better for health; they may dislike the idea of hens being reared in battery cages

Page 77 Death and decay

1 a Bacteria *(1)*; fungi *(1)*

b Many microorganisms need oxygen *(1)*; for (aerobic) respiration *(1)*

2 a Temperature in a fridge at about -4 °C *(1)*; temperature at which spores are killed at 120 °C *(1)*

b *(Any 2:)* Microorganisms are less active at lower temperatures (but they are not killed); because their metabolic reactions take place more slowly; reference to optimum temperature of enzymes

Page 77 Cycles

3 a Organisms such as earthworms, which eat dead leaves and other plant remains, are called **detritus** feeders. They help to recycle the materials in the plant remains, so that they become available to other members of the **community** of organisms in the ecosystem. For example, they release some of the carbon in the leaves back into the air, in the form of carbon dioxide, by the process of **respiration**. *(3)*

b All of them *(1)*

c They eat food that has been produced by other organisms *(1)*; they need organic nutrients / they need carbohydrates, fats and proteins; they do not photosynthesise *(1)*

B2a answers

Page 78 The carbon cycle 1

1 a Photosynthesis *(1)*

b Respiration *(1)*

c Carbohydrates; fats; proteins *All three correct = (2) 1/2 correct = (1)*

Page 78 The carbon cycle 2

2 a *(Any 2:)* Microorganisms; break down carbon compounds in dead bodies / wastes; use them in respiration (which produces carbon dioxide)

b 70 billion tons *(1)*

c Plants take in more carbon than they give out; so they help to remove carbon dioxide from the atmosphere; reducing the concentration of carbon dioxide; carbon dioxide traps heat and is contributing to a global rise in temperature

d Carbon came from animals / plants / waste materials *(1)*; decomposer break them down parts of the decomposers / dead bodies / faeces remain in the soil *(1)*

e Tiny plants / phytoplankton remove carbon dioxide for photosynthesis *(1)*; they and sea animals release carbon dioxide by respiration *(1)*

B2b answers

Remember: Check which grade you are working at.

Page 80 Enzymes – biological catalysts

1 Enzymes are **biological** catalysts. They are **protein** molecules. Each kind of **enzyme** only works on a particular kind of substrate, which fits perfectly into a fold in the enzyme called the **active** site *(4)*

2 a 40 °C *(1)*

b Particles moving faster / have more kinetic energy (as temperature increases) *(1)*; more frequent collisions *(1)*; more energetic collisions between enzyme and substrate *(1)*

c *(Any 3:)* Enzymes are not alive so cannot be killed; the enzyme is denatured (at high temperatures); the enzyme molecule loses its shape; so its substrate cannot fit into its active site

Page 80 Enzymes and digestion

3 a Mouth *(1)*; pancreas *(1)*

b It digests starch to maltose *(1)*

c Any value below 5 (it is actually 2) *(1)*

d They are neutralised / the pH is raised *(1)*

Page 81 Enzymes at home

1 a *(Any 2:)* Haemoglobin is a protein; proteases break down proteins; turns them into amino acids; that can be washed away

b This is the optimum temperature for the enzymes in them *(1)*; enzymes are denatured if they get too hot *(1)*

c Hands / cells, contain proteins *(1)*; the enzymes could start to digest these proteins *(1)*

Page 81 Enzymes and industry

2 a Proteases predigest protein in some baby foods *(1)*; carbohydrases convert starch into sugar syrup *(1)*; isomerase changes glucose to fructose *(1)*

b *(Any 2:)* Babies may not be able to make all the enzymes they need; so some of their food would be undigested / not be absorbed; would remain as, large / insoluble, molecules; pre-digested food contains small molecules that can be absorbed

c Fructose is sweeter than glucose *(1)*; so less needs to be used *(1)*

B2b answers

Page 82 Respiration and energy

1 a glucose + oxygen → carbon dioxide + water *(2)*

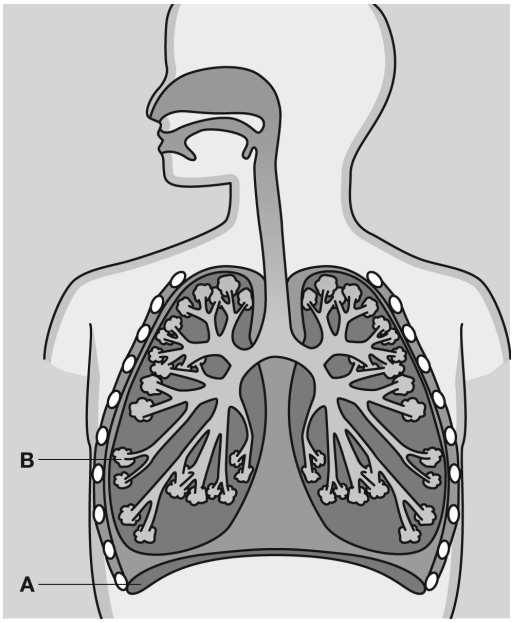
b Respiration releases energy from glucose, so that the cell can use it *(1)*

c Lungs *(1)*

d *(Any 2:)* Aerobic respiration takes place in mitochondria; so many mitochondria supply a lot of energy; sperm need a lot of energy for swimming

Page 82 Removing waste: lungs

2 a



(2)

b In the blood (mostly) *(1)*; dissolved in the blood plasma *(1)*

3 a Oxygen in exhaled air around **16 %** *(1)*; Nitrogen in inhaled air around **79 %** *(1)*

b Body cells use oxygen in respiration; so blood arriving at the lungs is low in oxygen

c *(Any 2:)* Oxygen moves between the lungs and the blood by diffusion; down a concentration gradient; diffusion only occurs until concentrations are equal (another reason is that not all of the air that is breathed into and out of the lungs ever reaches the alveoli)

Page 83 Removing waste: liver and kidneys

1 Urea is a waste product that is made in the **liver** from excess **amino** acids. The urea dissolves in the blood and is carried to the **kidneys**, where it is excreted from the body dissolved in a liquid called **urine**. *(4)*

2 There is more urea in the urine than in the blood because the kidneys remove urea from the blood *(1)*

Page 83 Homeostasis

3 a Water would enter the cells by osmosis *(1)*; could make them burst *(1)*

b *(Any 2:)* In sweat; in breath; in faeces

c *(Any 2:)* More sweat is lost on hot days; so there is less water in the body; so the kidneys conserve water.

B2b answers

Page 84 Keeping warm, staying cool

1 a Sweating; water in sweat evaporates taking heat from the skin *(1)*

b *(Any 2:)* Enzymes; are denatured by high temperatures; so cannot catalyse metabolic reactions

Page 84 Treating diabetes

2 a Just over 90 mg per 100 cm^3 *(1)*

b It fell rapidly then rose again and levelled off *(2)*

c Take care about when he eats foods containing carbohydrates, and how much carbohydrate he eats *(1)*

3 a So that the only source of 'pancreas extract' was the injections they gave *(1)*

b It was given an injection of glucose *(2)*

c *(Any 1:)* The blood glucose concentration was very high; because the dog had no pancreas / there was no insulin; that would normally lower the blood glucose concentration (in normal circumstances there is no glucose in the urine)

d *(Any 2:)* Yes, the hypothesis is supported; in a dog with no pancreas the blood glucose concentration became too high; injecting pancreas extract lowered the blood glucose level

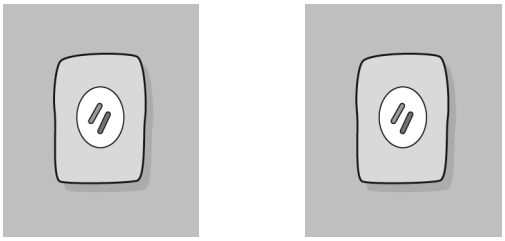
Page 85 Cell division – mitosis

1 a 23 *(1)*

b 2 *(1)*

c They must duplicate (make copies of themselves) *(1)*

2 a



Each cell should contain two chromosomes inside its nucleus = (2)

b Genetically *(1)*

Page 85 Gametes and fertilisation

3 a So that after fertilisation the new cell has the correct number of 46 *(2)*

b A variety of a gene *(1)*

c *(Any 3:)* Some characteristics are determined by genes; the parents may have different mixtures of alleles; so the gametes also have different mixtures of alleles; so the offspring have different mixtures of alleles (and therefore characteristics)

B2b answers

Page 86 Stem cells

1 a

1	2	3	4
D	B	C	A

(4)

2 a Embryo stem cells can form every different kind of cell *(1)*; bone marrow stem cells can only form blood cells *(1)*

b Embryo stem cells could be made to produce new nerve cells *(1)*; which could help to mend the spinal cord *(1)*

Page 86 Chromosomes, genes and DNA

3 a DNA *(1)*

b Amino acids *(1)*

c Ribosomes / cytoplasm *(1)*

d The sequence of bases in the DNA of the gene determines the sequence of amino acids that will be linked together to form the protein *(2)*

Page 87 Inheritance

1 Some characteristics, such as flower colour in pea plants, are controlled by a single **gene**. Genes often have different forms, called **alleles**. If an allele produces a characteristic only when a different allele is not present, it is said to a **recessive** allele. *(3)*

2 a T *(1)*; its characteristic appears even when the other allele is present *(1)*

b t and t *(1)*

Page 87 How is sex inherited?

3 a The X chromosome and the Y chromosome *(1)*

b A man has XY *(1)*; a woman has XX *(1)*

c *(Any 2:)* The father's sperm; which could carry either an X chromosome or a Y chromosome; an egg always carries an X chromosome

4 a Two *(1)*

b Female, they have two X chromosomes *(1)*

B2b answers

Page 88 Inherited disorders

1 a It is caused by genes *(1)*; DNA passed on from parent to child *(1)*

b Dominant *(1)*

2 a The cystic fibrosis allele is recessive *(1)*; Angela and Sam both have this allele but they both also have the normal allele *(1)*; they are carriers *(1)*; their child inherited a cystic fibrosis allele from each parent *(1)*

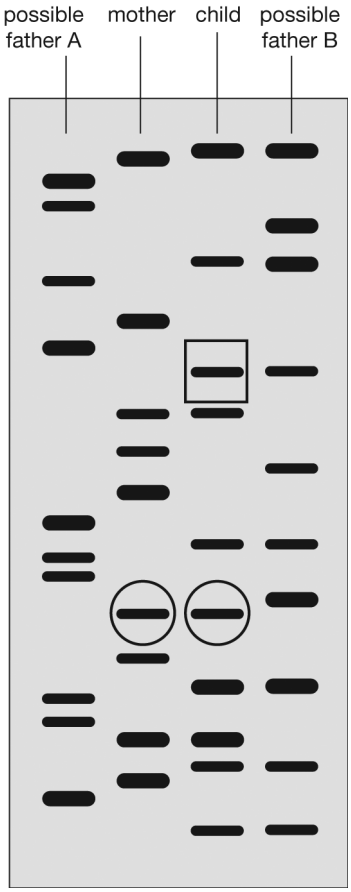
b She could have a child with cystic fibrosis if she is a carrier and her partner is also a carrier but she may not be a carrier, in which case she cannot have a child with the disorder *(3)*

Page 88 DNA fingerpriting

3 a Because everyone's DNA is unique (unless they are an identical twin) *(2)*

b i *(See diagram) (1)*

ii *(See diagram) (1)*



iii *(Any 3:)* Possible father B is the actual father; the child has some bands that have not come from its mother; these bands must have come from its father; not all of these bands are present in possible father A; they are all present in possible father B