

SOLUTIONS: Biology Sample Paper 2022/2023		
1(a)	Air / oxygen enters the mouth or nose	[1]
	Air travels down the trachea	[1]
	Trachea splits into bronchi (with one leading to each lung)	[1]
	Each bronchus divides into (smaller tubes called) bronchioles	[1]
	(eventually) ending at alveoli	[1]
	Where gas exchange takes place / oxygen enters the blood	[1]
1(b)	<p>Any two from:</p> <ul style="list-style-type: none"> • Lung has large surface area (alveoli) to allow more gas exchange • Lungs have thin walls so diffusion faster / shorter diffusion distance • Blood supply to lungs so concentration gradient maintained • Moist walls in lung so gases in solution • Trachea and bronchi walls contain cartilage to support airways / keep airways open • Thorax separated from lungs by pleural membranes (moist membranes) which form an airtight seal • Pleural cavity filled with layer of pleural fluid which acts as lubrication • Trachea and large airways cells secrete mucus which traps dirt and bacteria • Trachea and large airways have cells covered with cilia which stops dirt and bacteria from entering lungs (sweeps away mucus and trapped particles out towards mouth) 	[2] One mark per correct statement.
1(c)	<p>8 million × 60 = 480 million 10% of 480 million</p>	[1]
	48 (million)	[1]
2	<p>Any five from:</p> <ul style="list-style-type: none"> • Some giraffes would have had longer necks due to variation /mutation • Those with longer necks would have been able to reach higher for food • This gives them a survival advantage other those with smaller necks • These are more likely to survive and reproduce (survival of the fittest / less likely to starve) • Their offspring are more likely to inherit these characteristics / adaptations • Process repeated over many generations (now all giraffes have longer necks) 	[5] One mark per correct statement.

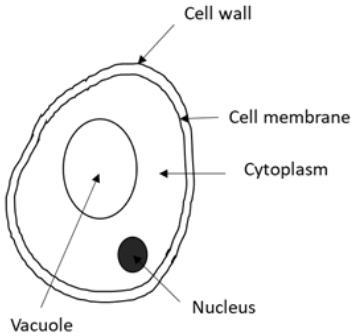
Turn over ►

3(a)	(Polysaccharide of) glucose that acts as a storage carbohydrate in plants	[1] Allow 'a chain of glucose molecules'. Allow 'an energy store in plants'. Allow 'a plant carbohydrate'.
3(b)	Shows whether the plant has been photosynthesising recently	[1]
3(c)	Dewax / place leaf in boiling water	[1]
	Remove colour / place leaf in boiling ethanol	[1]
	Wash leaf with cold water	[1]
	Add iodine solution to leaf	[1]
	Blue/black indicates starch, whereas yellow/orange indicates no starch (colour change to blue/black)	[1]
4(a)	C	[1]
4(b)	Veins	[1]
	To make sure blood only travels in one direction/ to stop backflow.	[1]
4(c)	No fatty deposit	[1]
	Healthy artery is wider / bigger / has more blood flow	[1] allow converse arguments
4(d)	Any two from: <ul style="list-style-type: none"> • Hereditary • Diet / obesity • Lack of exercise • Smoking • High blood pressure / stress 	[2] One mark per correct point. Allow suitable alternatives.
4(e)	Any two from: <ul style="list-style-type: none"> • Plasma • Platelets • White blood cells 	[2] One mark per correct point.
4(f)	Any two from: <ul style="list-style-type: none"> • Contains haemoglobin which binds oxygen • No nucleus to carry more haemoglobin • Small / flexible to pass through capillaries • Biconcave for efficient exchange of oxygen • High surface area to volume ratio giving large area for diffusion • Thin shape providing short diffusion distance to centre of cell 	[2] One mark per correct statement.
4(g)	35 (minutes)	[1]
4(h)	Heart rate increases from 50 bpm to 110 bpm from starting exercise (10 mins) to 25 mins / for 15 mins	[1] One mark for a general description without specific data.

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4(h)	Heart rate increases from 50 bpm to 110 bpm from starting exercise (10 mins) to 25 mins / for 15 mins	[1] owtte
	Where it remains constant from 25 mins to 45 mins / for 20 mins	[1] owtte
	Heart decreases from 45 mins to 55 mins / for 10 mins (after stopping exercise)	[1] owtte
	Heart rate constant before exercising and after heart rate stopped decreasing after exercising (higher after exercising)	[1] owtte One mark for a general description without specific data.
4(i)	Any four from: <ul style="list-style-type: none"> • Exercise increases heart rate • Exercising increases energy demand • Rate of respiration increases • More oxygen / glucose needed to supply respiring muscles • Blood flow to muscles increases 	[4] One mark per correct statement.
4(j)	Sweat secreted onto surface of skin (from sweat glands)	[1]
	Sweat evaporates due to high body temperature	[1]
	Removing heat energy from the surface of the skin	[1]
5(a)	number of bubbles (in one minute)	[1]
5(b)	Any two from: <ul style="list-style-type: none"> • Amount of yeast (in glucose solution) • Amount of oil • Amount of water 	[2] Allow suitable alternatives. Award max one mark if answers do not specify the amount.
5(c)	$21 + 17 + 19 = 57$ $57 / 3$	[1] Award mark if mean is correct.
	19	[1]
5(d)	As the temperature increases more bubbles are released / rate of respiration increases	[1]
5(e)	Any three of the following: <ul style="list-style-type: none"> • Increased / high temperature causes vibration / bonds to break • Causes change in shape of active site • Enzyme denatures • Substrate can no longer bind with enzyme 	[3] One mark per correct statement.
5(f)	40 (°C)	[1]

Turn over ►

5(g)	 <p>The diagram shows a plant cell with a thick outer boundary labeled 'Cell wall' and a thinner inner boundary labeled 'Cell membrane'. Inside the cell, there is a large, clear central area labeled 'Vacuole', a smaller dark circular area labeled 'Nucleus', and the remaining space is labeled 'Cytoplasm'.</p>	[2]
6(a)	Parent 1	[1]
6(b)	0.5 / half	[1] Allow alternate wording.
	2 out of 4 boxes are XX (female) / half of the sperm contain an X-chromosome	[1]
6(c)	<p>Any three from:</p> <ul style="list-style-type: none"> • Two strands of nucleotides • (Nucleotides coiled to form) a double helix • Strands (of nucleotides) are linked by a series of paired bases • Strands are connected by hydrogen bonds 	[3] One mark per correct statement.
6(d)	<p>Any two from:</p> <ul style="list-style-type: none"> • DNA double helix / RNA single strand • DNA contains deoxyribose / RNA contains ribose • DNA contains thymine (T) / RNA contains uracil (U) 	[2] One mark per correct statement.
7(a)	Plankton	[1]
7(b)	<p>Any one from:</p> <ul style="list-style-type: none"> • Lack of food • Imbalance in food chain / web • Number of tuna decreased / unpopulated tuna species • Extinction 	[1]
7(c)	<p>Any three from:</p> <ul style="list-style-type: none"> • Water quality can be monitored • Conditions can be modified • Protects fish against predators • Diet of fish controlled • Selective breeding can be used to improve quality of fish • No by-catch 	[3] One mark per correct statement.

Turn over ►

7(d)	<p>Any three from:</p> <ul style="list-style-type: none"> • Spread of disease greater than normal since animals close together • Antibiotics used to treat disease may not degrade by the time the fish are eaten by humans • Pesticides used to kill fish parasites may be toxic to other species • Organic material from animals faeces and food pellets can pollute waters and cause eutrophication • Activists may have ethical objections to the confinement of animals / poor conditions • Production of food pellets depletes natural fish stocks in other species 	[3] One mark per correct statement.
8(a)	Nitrate / NO_3^-	[1]
	Denitrifying bacteria / denitrification	[1]
	Nitrogen-fixing bacteria in soil / nitrogen fixation	[1]
	Ammonia / NH_3	[1]
8(b)	(bacteria) that convert nitrogen (gas) to 'fixed nitrogen' compounds.	[1] Allow examples of fixed nitrogen compounds, e.g. ammonia, ammonium, nitrate, nitrite and amino acids or their chemical symbols.
8(c)	Faeces / excretion / excrement	[1] Allow alternate wording.
9(a)	Protective sheath that covers the first leaves of cereal seedlings.	[1]
9(b)	A: grows and curves towards light	[1]
	B: No growth or curving	[1]
	C: Growth but no curving	[1]
9(c)	<p>Any two from:</p> <ul style="list-style-type: none"> • Stimulus of unidirectional light detected by tip (of coleoptile) / tip causes growth. • Stimulus of unidirectional light transmitted to growth zone/area behind the tip. • Direction of light causes direction of growth. 	[2] One mark per correct point.
9(d)	Phototropism	[1]
9(e)	Auxin / auxins	[1]
10(a)	A: Glomerulus	[1]
	B: Bowman's capsule	[1]
	C: Collecting duct	[1]
10(b)	A longer loop of Henle makes more concentrated urine.	[1] Allow converse.

Turn over ►

10(c)	$0.125 \times 60 \times 24 = 180 \text{ dm}^3$ per day $0.9 \div 180 = 0.005$	[1] Award mark if final answer is correct.
	$(1 - 0.005 = 0.995)$ 99.5%	[1]
10(d)	Pituitary (gland).	[1]
10(e)	Any four from: <ul style="list-style-type: none"> • ADH released by pituitary gland and travels to kidney • Increases permeability of collecting ducts to water • So more water reabsorbed back into blood / water content of blood increases • Urine becomes more concentrated / darker • So body loses less water and blood becomes more dilute 	[4] One mark per correct point.
10(f)	(Process where) change in body is detected	[1] Allow alternate wording.
	Events occur /processes work to return conditions to normal.	[1] Allow alternate wording.

END