

Question	Answers	Extra information	Mark	AO / Specification reference
01.1	0.48 (dm ³)		1	AO2 4.2.2.2 MS 4a
01.2	5.52 (dm ³)	accept 6.00 – 0.48 for 1 mark accept ecf from 01.1 for 2 marks	2	AO2 4.2.2.2 MS 4a
01.3	1 respiratory cycle = 2.8 seconds = 21.429 = 21	accept correct answer for 3 marks	1 1 1	AO2 4.2.2.2 MS 4a, 2a
01.4	intercostal muscles contract moving ribs up and out diaphragm contracts and moves down (lung volume increases so) pressure inside chest decreases		1 1 1 1	AO1 4.2.2.2
01.5	reduced lung volume / asthma / emphysema so more breaths needed to take in the same amount of oxygen	accept heart pumps less blood / less effectively / named heart condition so more breaths needed to provide same volume of oxygen to cells	1 1	AO3 4.2.2.2
02.1	avoid getting on skin / wear gloves / wear safety goggles because Biuret solution / reagent is corrosive		1 1	AO3 4.2.2.1
02.2	the food sample contains fat and protein		1	AO3 4.2.2.1

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02.3	a meat burger		1	AO3 4.2.2.1
02.4	Benedict's solution is a qualitative test which only tells you if glucose is present, but not how much		1 1	AO2 4.2.2.1
03.1	long chain of amino acids		1	AO1 4.2.2.1
03.2	$\frac{50\,000}{7200}$ = 7 (villi/ μm^2)	accept 6.9	1 1	AO2 4.2.2.1 MS 1c
03.3	any four from: <ul style="list-style-type: none"> flattened villi / lack of villi reduce the surface area for absorption fewer amino acids / glucose / fatty acids absorbed less glucose means less transfer of energy / respiration reduced fewer amino acids available to build new proteins proteins are needed for growth 		4	AO3 4.2.2.1
04.1	A – liver C – small intestine		1 1	AO2 4.2.2.1
04.2	D		1	AO2 4.2.2.1

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04.3	muscular tissue – churns the food and digestive juices of the stomach together		1	AO1 4.2.2.1
	glandular tissue – produces the digestive juices		1	4.2.1
	epithelial tissue – covers the inside and outside of the stomach		1	
04.4	any six from: <ul style="list-style-type: none"> • lipids are broken down by lipase • lipase is produced in the pancreas • bile is produced in the liver and stored in the gall bladder • bile and lipase are both secreted / released into the small intestine • bile neutralises the acidic food / hydrochloric acid from the stomach • lipase works optimally in alkaline conditions / in a high pH • bile emulsifies the fat into tiny droplets • this increases the surface area for lipase to work on (speeding up the rate of digestion) 	allow a maximum of 5 marks if students refer to bile as an enzyme	6	AO1 4.2.2.1
05.1	B		1	AO2 4.2.2.2

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05.2	any one feature and linked explanation from: <ul style="list-style-type: none"> • thick walls containing muscles • to withstand high (blood) pressure or <ul style="list-style-type: none"> • elastic fibres • to allow wall to stretch as (high-pressure) blood passes through / to recoil / return to shape after blood (pulse / flow) passes 		2	AO1 4.2.2.2
05.3	pulmonary artery		1	AO1 4.2.2.2
05.4	takes blood from the heart to the lungs / transports deoxygenated blood towards lungs / transports blood that has provided oxygen to body cells		1	AO1 4.2.2.2
05.5	any two from: <ul style="list-style-type: none"> • to provide cells with oxygen / glucose • to remove waste products / carbon dioxide / other named waste product • to enable respiration to take place 		2	AO1 4.2.2.2

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06	<p>Indicative content:</p> <p><i>Test for starch</i></p> <ul style="list-style-type: none"> • Practical procedure add a few drops of distilled water ,add a few drops of iodine to one sample • Expected result if colour changes from yellow-orange to blue-black, starch is present <p><i>Test for sugar</i></p> <ul style="list-style-type: none"> • Practical procedure add a few drops of Benedict’s solution • Expected result heat tube in water bath (at > 60 °C) <p><i>Test for protein</i></p> <ul style="list-style-type: none"> • Practical procedure add a few drops of Biuret reagent • Expected result if colour changes from blue to purple, protein is present <p><i>Test for fats</i></p> <ul style="list-style-type: none"> • Practical procedure add a few drops of ethanol (and shake) • Expected result if cloudy layer forms, fats are present 	<p>award 3 marks for practical procedure award 3 marks for expected results</p> <p>maximum 4 marks if not all food tests are described</p>	6	AO1 4.2.2.1

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07.1	C		1	AO1 4.2.2.2
07.2	A – vena cava B – aorta		1 1	AO1 4.2.2.2
07.3	valve prevents blood flowing backwards into the (right) atrium		1 1	AO1 4.2.2.2
07.4	one circulatory system carries blood from the heart to the lungs (and back) to allow gas exchange the second system transports blood around the body to enable cells to respire / to transport oxygen / glucose / other materials		1 1	AO1 4.2.2.2
08.1	biconcave disc maximises surface area for diffusion no nucleus maximises space for haemoglobin contains haemoglobin to bind to oxygen		1 1 1 1 1 1	AO1 4.2.2.3
08.2	$\frac{7.2}{6.2} = 1.161$ increase of 16.1%	accept decrease of 13.9% accept correct answer with no working shown for 2 marks	1 1	AO2 4.2.2.3 MS 1c

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08.3	the higher the altitude, the more red blood cells (per mm ³ of blood)		1	AO2
	each blood cell delivers less oxygen to cells (as there is less in the atmosphere)		1	4.2.2.3
	so more red blood cells are required to maintain delivery of adequate oxygen		1	
09.1	capillary		1	AO2 4.2.2.2
09.2	any two from: <ul style="list-style-type: none"> • large surface area • thin walls (one cell thick) • good blood supply 		2	AO2 4.2.2.1
09.3	A		1	AO2 4.2.2.2
10.1	blood vessel B		1	AO3
	veins carry blood at lower pressure than arteries		1	4.2.2.2
	blood pressure remains constant / no 'pulse'		1	
10.2	contain valves		1	AO1
	to prevent blood flowing backwards		1	4.2.2.2
	wide lumen / thin walls		1	
	to reduce resistance in blood flow		1	

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10.3	horizontal line below A and above B	line must be approximately flat	1	AO2 4.2.2.2
10.4	19 beats in 15 seconds $19 \times 4 = 76$ (beats per minute)	allow 1 mark for 19 beats identified on the graph	1 1	AO2 4.2.2.2 MS 4a
11.1	water in the plant is used for photosynthesis cell vacuoles become less full less pressure on the cell wall cell becomes flaccid / floppy (therefore the plant wilts)		1 1 1 1	AO2 4.1.3.2
11.2	mass uptake with access to oxygen is always higher than mass uptake without access to oxygen rate of mass uptake high (both with and without access to oxygen) initially / for first 30 s rate of mass uptake decreases after 30 s for (both) with / without access to oxygen rate of mass uptake constant after 90 s (with oxygen)	accept converse accept correct calculation of initial rate accept correct calculation of final rate	1 1 1 1	AO2 x 1 AO3 x 3 4.1.3.2
11.3	mass nitrate uptake with oxygen = 450 mass nitrate uptake without oxygen = 250 $\frac{450}{250}$ = 80(%) greater with oxygen than without	accept nitrate uptake without oxygen is $\frac{250}{450} = 65\%$ that of with oxygen	1 1	AO2 4.1.3.2 MS 1c, 4a

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11.4	lower graph (without oxygen) shows rate of diffusion of nitrate ions		1	AO3
	upper graph (with oxygen) shows rate of diffusion + rate of active transport		1	4.1.3.2
	as root cells / plant requires oxygen for respiration		1	
	to provide energy for active transport		1	
12.1	any three from: <ul style="list-style-type: none"> • place slide on stage • select lowest magnification • use focusing knob / move stage to bring cells on slide into focus • increase magnification to view structures in more detail 		3	AO1 4.1.1.5
12.2	roughly circular / elliptical		1	AO2
	labelled cell membrane		1	4.1.1.2
	labelled nucleus		1	4.1.1.5
	labelled cytoplasm	ribosomes labelled negates this mark	1	
12.3	ribosomes	accept other correct named structure and function	1	AO1
	protein synthesis		1	4.1.1.1 4.1.1.5
12.4	risk of disease transmission	accept other sensible answer	1	AO2 4.1.1.5 4.2.2.3

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13.1	the smallest structure that can be seen through the microscope		1	AO1 4.1.1.5
13.2	TEM magnification 1000× greater / resolution 1000× finer $\frac{200}{1000}$ = 0.2 (nm)		1 1 1	AO2 4.1.1.5 MS 2h

Question	Answers	Extra information	Mark	AO / Specification reference
13.3	<p>any five from:</p> <p>light microscopes – advantages:</p> <ul style="list-style-type: none"> • cheap • easily transported / small • do not require high level of training to use effectively • able to view movement in the sperm cells <p>light microscopes – disadvantages:</p> <ul style="list-style-type: none"> • limited resolution <p>electron microscopes – advantages:</p> <ul style="list-style-type: none"> • very high magnification • able to view any (sub-cellular) structures / cell abnormalities <p>electron microscopes – disadvantages:</p> <ul style="list-style-type: none"> • will kill sperm cells when used / unable to view movement • expensive • large / fixed location • require significant training / expertise to operate • scanning electron microscopes able to produce 3-dimensional images 	To gain 5 marks, at least one advantage and one disadvantage should be given for both light and electron microscopes	5	AO3 4.1.1.5

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	Evaluation – any one from: <ul style="list-style-type: none"> • light microscope – could identify healthy sperm / movement, but (small-scale) abnormalities may be missed • electron microscope – will not be able to see movement, but could identify (small-scale) abnormalities in cell 		1	
14.1	3	accept human is $10^3\times$ bigger	1	AO2 4.1.1.1 MS 1b, 2h
14.2	human has a low surface area to volume ratio so gases cannot diffuse directly in and out of the body for respiration / specialised respiration system needed to transport gases	accept the converse	1 1	AO2 4.1.3.1
14.3	800 nm = 0.8 μm prokaryotic cell	accept just prokaryotic cell for 2 marks	1 1	AO2 4.1.1.5

Question	Answers	Extra information	Mark	AO / Specification reference
14.4	hydrogen atom = $1 \text{ \AA} = 1 \times 10^{-10} \text{ m} = 0.1 \text{ nm}$	accept 100 (nm) / 0.1 (nm) for 1 mark	1	AO2
	virus = 100 nm	accept 1000 for 3 marks	1	4.1.1.1
	$\frac{100}{0.1} = 1000$ (hydrogen atoms)		1	MS 1b