



MARKING GUIDANCE
SECTION A

Question	Answer	Marks
01	C	1
02	D	1
03	D	1
04	B	1
05	B	1
06	A	1
07	C	1
08	B	1
09	C	1
10	D	1
11	C	1
12	A	1
13	B	1
14	A	1
15	C	1
TOTAL		15



SECTION B

Question	Answer	Additional Guidance	Marks
16ai	Islets of Langerhans	Accept alpha and beta cells in islets of Langerhans but not alone	1
16aii	1. They monitor blood glucose concentration 2. They release hormones (insulin and glucagon) directly into the blood (not into a duct)		2
16b	<ul style="list-style-type: none">• Decrease in blood glucose levels detected by alpha (α)cells in the islets of Langerhans/pancreas• Alpha cells release glucagon into bloodstream• glucagon reduces/inhibits insulin secretion• Causes conversion of glycogen to glucose / glycogenolysis in liver/muscle/effector cells• Causes gluconeogenesis in the liver• Causes conversion of triglycerides to fatty acids/ triglyceride breakdown/ increased use of fatty acids in respiration• negative feedback, reduces / inhibits the secretion of glucagon	Must not indicate glucagon is carrying out the conversion of molecules directly. Accept promotes, stimulates, triggers, or AW for causes.	5

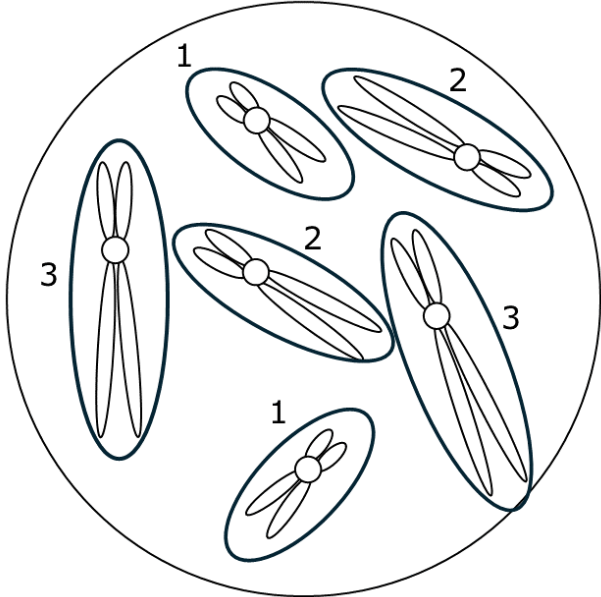


	QWC Mark for technical terms used appropriately and spelled correctly	Use of three terms from: alpha, pancreas, glycogenolysis, gluconeogenesis, islet, glycogen, effector, negative feedback	1
16c	Any three from: <ul style="list-style-type: none">• Pancreas is unable to produce (enough/effective) insulin/does not produce insulin• Insulin producing cells/beta cells/islet of Langerhans are damaged/destroyed/attacked• By the body's own immune system/antibodies OR caused by auto-immune disease• Can be caused by genetic/hereditary condition• Or environmental cause e.g. virus, shock, infection, cancer,		3
TOTAL			12

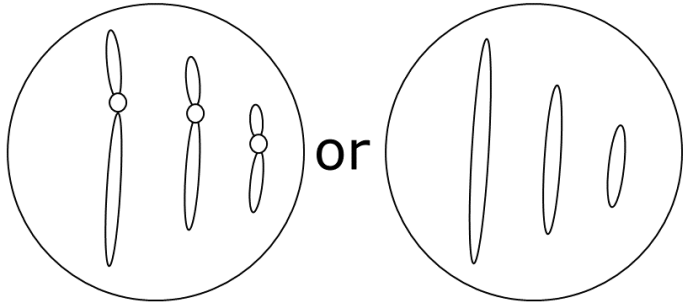


Question	Answer	Additional Guidance	Marks
17a	<ol style="list-style-type: none">1. <u>Countercurrent</u> flow/system2. Water and blood flow in opposite directions3. Maintains concentration / diffusion gradient / equilibrium not reached / water always next to blood with a lower concentration of oxygen4. Along whole / length of gill / lamellae/gill filament	Must have the idea of 'maintaining' or 'always' in reference to concentration / diffusion gradient	4
17b	<ol style="list-style-type: none">1. RER makes/synthesises proteins2. Amino acid chain/protein leaves ribosome/RER in vesicle to be modified3. Travels to Golgi where carbohydrate chain added to protein4. Glycoprotein leaves Golgi in vesicle and fuses to the cell membrane/exocytosis (described)		4
17c	<ol style="list-style-type: none">1. Reduced surface area OR thicker so longer diffusion distance2. Reduced oxygen diffusion/absorption	Ignore SA:V ratio	2
TOTAL			10



Question	Answer	Additional Guidance	Marks
18a		Must be two chromosomes of the same length circled for one mark e.g. pair 1, 2 or 3 from diagram	1
18b	Any three from: <ul style="list-style-type: none">• One maternal and one paternal/one from sperm one from egg• Carry same genes in the same order/same loci of genes• Can carry the same or different alleles• Similar length/shape/size• Centromere in same position• Pair up in meiosis/can form a bivalent• Same banding pattern	Do not accept references to being identical/genetically identical	3



18c	6		1
18d		3 chromosomes made of one chromatid = 1 mark each must be a different length = 1 mark	2
TOTAL			7



Question	Answer	Additional Guidance	Marks
19	<p>Structure:</p> <ul style="list-style-type: none">• Triglyceride = three fatty acid chains bound to glycerol• Ester bonds between glycerol and fatty acid chains• Fatty acid chains can be saturated or unsaturated <p>Functions:</p> <ul style="list-style-type: none">• Energy source – hydrolysis of ester bonds to break molecule down for respiration/glycerol and fatty acids can act as respiratory substrate• Energy source – high/more energy released (than carbohydrates) as more H atoms and no O atoms.• Energy store – insoluble so do not affect water potential. (Stored in adipose tissue).• Insulation – electrical insulation of neurones/in myelin/around neurones/axons/dendrons or heat insulator as layer of adipose tissue	<p>Max 3 for structure: Accept labelled diagram if clearly shows correct points not contradicted in any text</p> <p>Max 3 for Functions: must be explained/link to structure as shown</p> <p>do not allow “for respiration” unqualified</p> <p>allow saltatory conduction</p>	6

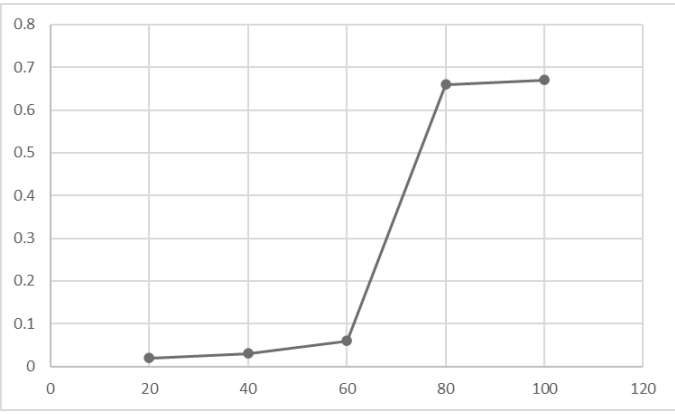


	<ul style="list-style-type: none">• Buoyancy – less dense than water so allows aquatic organisms to float• Protection – fat layer around organs acts as shock absorber/lipid-rich outer coat of some bacterial cells <p>Aid absorption/storage/production of vitamins (A,D,E,K) – because they are fat/lipid soluble</p>		
TOTAL			6



Question	Answer	Additional Guidance	Marks
20a	1. Mosaic because: <u>phospholipid bilayer</u> with proteins, scattered / randomly arranged / spread throughout / here and there (between the phospholipids) 2. Fluid because proteins / phospholipids are free to move (in membrane)		2
20b	Because it is charged / polar / hydrophilic OR Because it is (too) large	ALLOW repelled by phospholipid bilayer/tails	1
20c	1. Volume of distilled water needed = 78.95mL 2. Volume of stock solution needed = 21.05ml		2



20di	<ol style="list-style-type: none">1. Ethanol (%) on x-axis and absorbance (au) on y-axis2. Linear scale on both axes and both axes labelled3. All points plotted correctly (to \pm half a 2 mm grid square)4. Line of best fit drawn  <table border="1"><caption>Data points from the graph</caption><thead><tr><th>Ethanol (%)</th><th>Absorbance (au)</th></tr></thead><tbody><tr><td>20</td><td>0.02</td></tr><tr><td>40</td><td>0.04</td></tr><tr><td>60</td><td>0.06</td></tr><tr><td>80</td><td>0.66</td></tr><tr><td>100</td><td>0.67</td></tr></tbody></table>	Ethanol (%)	Absorbance (au)	20	0.02	40	0.04	60	0.06	80	0.66	100	0.67		4
Ethanol (%)	Absorbance (au)														
20	0.02														
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20dii	<ol style="list-style-type: none">1. Increase in ethanol concentration causes more pigment to leach out of the cells (which increases the absorbance)2. Because ethanol dissolves/disrupts /denatures proteins in the phospholipid bilayer making it more permeable		2												



20dii	<ol style="list-style-type: none">1. Below 60% the ethanol has very little effect on the membranes as there is little pigment released/absorbance is low2. At concentrations below 60% the ethanol in hand sanitizer may not dissolve/disrupt /denature proteins in the phospholipid bilayer/cell membrane of bacteria enough to kill them	Accept converse for greater than 60% or 80%	2
TOTAL			13



Question	Answer	Additional Guidance	Marks														
21a	<table border="1"><thead><tr><th data-bbox="394 316 689 355">Photosynthesis</th><th data-bbox="689 316 958 355">Respiration</th></tr></thead><tbody><tr><td data-bbox="394 355 689 403">✓</td><td data-bbox="689 355 958 403">✓</td></tr><tr><td data-bbox="394 403 689 451">✓</td><td data-bbox="689 403 958 451"></td></tr><tr><td data-bbox="394 451 689 499">✓</td><td data-bbox="689 451 958 499">✓</td></tr><tr><td data-bbox="394 499 689 547">✓</td><td data-bbox="689 499 958 547"></td></tr><tr><td data-bbox="394 547 689 595"></td><td data-bbox="689 547 958 595">✓</td></tr><tr><td data-bbox="394 595 689 643"></td><td data-bbox="689 595 958 643">✓</td></tr></tbody></table>	Photosynthesis	Respiration	✓	✓	✓		✓	✓	✓			✓		✓	1 mark for each correct column	2
Photosynthesis	Respiration																
✓	✓																
✓																	
✓	✓																
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	✓																
	✓																
21bi	In the matrix (of mitochondria)	do not accept just mitochondria	1														
21bii	A = acetyl Coenzyme A (CoA) B = CO ₂ C = CO ₂ D = ADP + Pi (inorganic phosphate)		4														



21c	<ol style="list-style-type: none">1. ATP binds away from the active site/to the allosteric site of IDH32. Causes the active site of IDH3 to change shape3. IDH3 can no longer bind to substrate so 5 carbon molecule not produced/cycle cannot continue as no substrate for further reactions made4. Less/no more ATP produced/ATP production slows so concentration of ATP decreases until it is no longer inhibiting5. Prevents too much ATP being produced	ax 4	4
TOTAL			11



Question	Answer	Additional Guidance	Marks
22a	A = vein <ul style="list-style-type: none"> • Wider lumen • Thinner muscle walls B = artery <ul style="list-style-type: none"> • Narrower lumen • Thicker muscular walls • Folded endothelium 	1 mark for each correctly matched explanation	2
22b	1. Allows visibility/detail can be seen/increase contrast 2. Named example of what could be visible/ recognised e.g. nucleus/organelles/named organelles/contrast between nucleus and cytoplasm	One mark for seeing One mark for recognising	2
22c	Any two from: <ul style="list-style-type: none"> • Wash hands thoroughly after handling • Dispose of material responsibly and safely • Wear goggles/apron/gloves • Cut away from the body/down onto a tile or wax tray 		2
22d	$\text{Artery} = \frac{(5.2-4.0)}{4.0} \times 100 = 30.0\%$ $\text{Vein} = \frac{(5.1-4.7)}{4.7} \times 100 = 8.51\%$ Difference = 21.5% / 21.49%	1 mark for correct % difference formula 1 mark for difference	2



22e	<ol style="list-style-type: none">1. Arteries stretch more/ get longer than vein/recoil back into shape2. (Because) arteries contain more/thicker layer of elastic tissue/fibers/elastin (than veins)3. To stretch and recoil to maintain/even out blood pressure		3
22f	<ul style="list-style-type: none">• Arteries contain more/thicker layer of collagen (than veins)• to withstand high blood pressure• Collagen is very strong/high mechanical strength		3
TOTAL			14



Question	Answer	Additional Guidance	Marks
23a	Auxins/Indoacetic acid/IAA		1
23b	Any two from: 1. Temperature 2. Water availability/volume 3. Mineral ion concentration 4. Soil pH 5. Age of seedlings/starting height 6. Soil/substrate type	IGNORE carbon dioxide concentration / wind movement / humidity ALLOW pre-treatment of seeds	2
23c	1. T-test 2. Testing for difference between two means	Do not accept paired t test	2
23d	1. Most stems showed positive phototropism/grew towards the light 2. Description of phototropism: IAA produced in shoot tip moves to side away from light and cause more cell elongation on side away from light 3. (almost) half the roots grow away from light/show negative phototropism/positive geotropism 4. Description of negative phototropism: IAA moves to the more shaded side of roots. Increased concentration of IAA on the shaded side inhibits growth so the unshaded side elongates more, so the root bends away from the light. 5. reason for varied data/ some growth unaffected by light, e.g.		5



	conditions not natural / measurement error / shading of stems / stems heavier than roots so tips grow slower		
23e	<ol style="list-style-type: none">1. Would accumulate in cells (as they cannot diffuse out)2. Cause rapid cell elongation so stem grows too quickly collapsing/buckling stem		2
TOTAL			12