



Mark Scheme (Results)

Summer 2022

Pearson Edexcel GCE

In AS Biology (8BI0\_01)

Paper 1: Core Cellular Biology and  
Microbiology

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Question Number	Answer	Additional Guidance	Mark
1(a)	<ul style="list-style-type: none"> <li>diameter measured and mean value calculated (1)</li> <li>2 000 / 2 300 / 2 320 / 2 316 (1)</li> </ul>	<p>Example of calculation:</p> <p>44 (mm) / 4.4 (cm) and 0.019 (mm)</p> <p>ecf if either 44 (mm) or 0.019 used and answer rounded up to whole number correctly e.g. (45 and 0.019 =) 2 368</p> <p>Correct answer with no working gets 2 marks</p>	(2)

Question Number	Answer	Additional Guidance	Mark
1(b)	<p>A description that makes reference to three of the following:</p> <ul style="list-style-type: none"> <li>use an (eye piece) graticule to measure the diameter (1)</li> <li>take several measurements and calculate the mean (for each cell) (1)</li> <li>calibrate the (eye piece) graticule (1)</li> <li>using a stage micrometer (1)</li> </ul>	<p><b>ACCEPT</b> length / size</p> <p><b>ACCEPT</b> a description of how this is done</p>	(3)

Question Number	Answer	Additional Guidance	Mark
2(a)(i)	<p>The only correct answer is D</p> <p><i>A is incorrect because all 3 statements are correct</i>  <i>B is incorrect because all 3 statements are correct</i>  <i>C is incorrect because all 3 statements are correct</i></p>		(1)

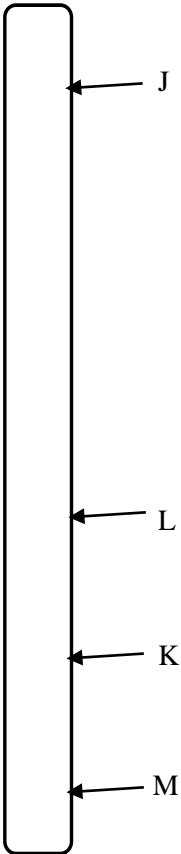
Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	<p>The only correct answer is C</p> <p><i>A is incorrect because three molecules of water are lost which is 54, 18 is one molecule</i>  <i>B is incorrect because three molecules of water are lost which is 54, 33 is one molecule with reverse number of H and O atoms</i>  <i>D is incorrect because three molecules of water are lost which is 54, 99 is three molecules with reverse number of H and O atoms</i></p>		(1)

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	<ul style="list-style-type: none"> <li>10.14</li> </ul>		(1)

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	<p>An answer that makes reference to the following:</p> <ul style="list-style-type: none"> <li>heat (solid) samples (of the fatty acids) and measure the temperature at which they melt (1)</li> <li>use fatty acids of the same chain length but with different {numbers of C C double bonds / degrees of saturation} (1)</li> <li>use fatty acids of different chain length but the same {number of C C double bonds / saturation} (1)</li> <li>repeat (for each fatty acid) and calculate the mean (1)</li> </ul>	<p><b>ACCEPT</b> cool (liquid) samples (of the fatty acids) and measure the temperature at which they solidify</p> <p><b>ACCEPT</b> average / identify anomalies / do a stats test</p>	(3)

Question Number	Answer	Additional Guidance	Mark
3(a)	<p>The only correct answer is C</p> <p><i>A is incorrect because crossing over has taken place by metaphase I</i>  <i>B is incorrect because crossing over takes place in meiosis I</i>  <i>D is incorrect because crossing over takes place in meiosis I</i></p>		(1)

Question Number	Answer	Additional Guidance	Mark
3(b)	<ul style="list-style-type: none"> <li>10.2</li> </ul>		(1)

Question Number	Answer	Additional Guidance	Mark
3(c)	<p>A diagram that shows the following:</p> <ul style="list-style-type: none"><li>• L drawn below J (1)</li><li>• K and M indicated correctly (1)</li><li>• diagram drawn to (approximate) scale (9, 3, 3) (1)</li></ul>	 <p data-bbox="1352 1257 1951 1321"><b>NB</b> Everything must be correct to award all 3 marks</p>	(3)

Question Number	Answer	Additional Guidance	Mark
3(d)	<p>An explanation that makes reference to two of the following:</p> <ul style="list-style-type: none"> <li>crossing over occurs between chromatids (between the same homologous chromosomes) (1)</li> <li>therefore (only) half the chromosomes (produced by anaphase II) will be recombinant chromosomes (so maximum of 50%) (1)</li> <li>crossing over does not always take place (so can be less than 50%) (1)</li> </ul>	ACCEPT will have recombinant {genes / alleles}	(3)

Question Number	Answer	Additional Guidance	Mark
4(a)	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>arranged in a bilayer (1)</li> <li>{phosphate / polar / hydrophilic} heads orientated outside as they can interact with aqueous environment (on both sides of membrane) (1)</li> <li>{fatty acid / non polar / hydrophobic} tails within membrane because they turn away from the water (1)</li> </ul>	<p>ACCEPT phosphate heads on outside and fatty acid tails inside from labelled diagram</p> <p>ACCEPT description of aqueous environment</p> <p>ACCEPT water repels phospholipids / phospholipids repel water</p>	(2)

Question Number	Answer	Additional Guidance	Mark
4(b)(i)	<ul style="list-style-type: none"> <li>the resolution of the (electron) microscope was good (to see the two membranes as separate structures)</li> </ul>		(1)

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	<ul style="list-style-type: none"><li>• magnification of photograph calculated / ratio of membrane to space given (1)</li> <li>• value 12 (nm) (1)</li></ul>	100 000 OR in the range of space : membrane = 1 : 1.5 to 1 : 2.5 or 0.4 : 1 to 0.67 : 1  ACCEPT any value between 9 and 15 to one decimal place max ECF for 1 mark if numerical value falls in our range and answer is given to one decimal place max but order of magnitude is wrong  Correct answer only = 2 marks	(2)



Question Number	Answer	Additional Guidance	Mark
4(c)	<p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none"> <li>• liver has smaller percentage of cell membrane as there are more organelles inside it (1)</li> <li>• liver has less RER (membrane) because it is {making / transporting} less protein OR liver has more SER (membrane) as it is {making / transporting} more lipid (1) OR liver has more RER (membrane) as it makes steroids and pancreas has more SER (membrane) as it makes insulin</li> <li>• liver has more mitochondria (membrane) as it is more metabolically active (1)</li> <li>• liver has less Golgi as it is {modifying / secreting} fewer proteins OR pancreas {may have more / has} secretory granules for exocytosis of proteins (1)</li> </ul>	<p><b>ACCEPT</b> converse throughout for pancreas correctly named proteins throughout e.g. pancreas - insulin</p> <p><b>ACCEPT</b> because of liver's role in producing lipids and pancreas' role in producing proteins</p> <p><b>ACCEPT</b> stores lipid steroids / cholesterol metabolism of toxins</p> <p><b>ACCEPT</b> requires more energy / more (aerobic) respiration</p>	(3)

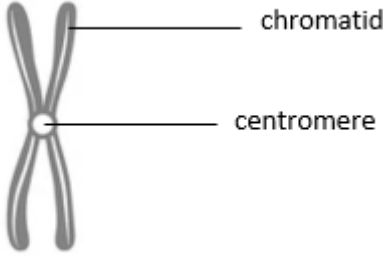
Question Number	Answer	Additional Guidance	Mark
5(a)	<p>The only correct answer is C</p> <p><i>A is incorrect because water is H<sub>2</sub>O</i>  <i>B is incorrect because water is H<sub>2</sub>O</i>  <i>D is incorrect because the H has the slightly positive charge and O has the slightly negative charge</i></p>		(1)

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	<p>An explanation that makes reference to two of the following:</p> <ul style="list-style-type: none"> <li>• because water forms (many) hydrogen bonds (1)</li> <li>• (which gives it a) high specific heat capacity (1)</li> <li>• so the temperature of the water rises less than the temperature of the land for the same input of energy (1)</li> </ul>	<p><b>ACCEPT</b> H bonds / strong cohesive forces / very cohesive</p> <p><b>ACCEPT</b> a lot of energy needed to raise temperature of water</p> <p><b>NB</b> a lot of energy needed to break the H bonds to raise temperature of water = 2 marks</p>	(2)

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>because the (body) temperature of a fish {fluctuates with {external / water / ocean} temperature / cannot be regulated} (1)</li> <li>need appropriate (body) temperature for {enzyme activity / metabolism} (1)</li> <li>if temperature increased there would be less oxygen (dissolved) in the water for the fish (1)</li> </ul>	<p><b>ACCEPT</b> organisms for fish throughout</p> <p><b>ACCEPT</b> cold-blooded / poikilothermic helps keep fish' temperature constant</p> <p><b>ACCEPT</b> temperature change could denature enzymes</p> <p><b>ACCEPT</b> constant temperature maintains levels of prey for the fish</p>	(2)

Question Number	Answer	Additional Guidance	Mark
5(c)	<p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none"> <li>because water molecules are tightly bonded together (1)</li> <li>by hydrogen bonds (1)</li> <li>so water is incompressible (1)</li> <li>shape of body changes because {pressure increases / volume does not increase} (1)</li> </ul>	<p><b>ACCEPT</b> water molecules are close together / strong cohesive forces <b>DO NOT ACCEPT</b> adhesive forces</p> <p><b>ACCEPT</b> so the water molecules cannot be pushed closer together</p>	(3)

Question Number	Answer	Additional Guidance	Mark
6(a)	<p>A description that makes reference to the following:</p> <ul style="list-style-type: none"><li>• a tissue is (a group of) similar cells (1)</li><li>• an organ is tissues working together to perform {one / several} functions (1)</li></ul>		(2)

Question Number	Answer	Additional Guidance	Mark
6(b)(i)	<p>A drawing that shows the following:</p> <ul style="list-style-type: none"> <li>• {one / two} chromatids drawn and labelled (1)</li> <li>• joined at the centromere, which is labelled (1)</li> </ul>		(2)

Question Number	Answer	Additional Guidance	Mark
6(b)(ii)	<p>A description that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• chromosomes line up along the equator (of the cell) (1)</li> <li>• spindle fibres (from the centrioles) attach to the {centromere / chromosome} (1)</li> </ul>	<p>ACCEPT middle / metaphase plate pairs of chromatids DO NOT ACCEPT chromatids</p> <p>DO NOT ACCEPT chromatids</p>	(2)

Question Number	Answer	Additional Guidance	Mark
6(c)(i)	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>the number of cells in metaphase increases because colchicine stops the cells from moving out of this phase (1)</li> <li>the number of cells in anaphase {decreases / goes to zero} as the cells are not moving out of metaphase (1)</li> <li>because colchicine {interferes with spindle fibres / stops centromeres being split / stops chromatids being pulled apart} (1)</li> <li>number of cells in prophase decreases as there are fewer cells to pass through the cell cycle (1)</li> </ul>	<p>ACCEPT stuck in metaphase</p> <p>ACCEPT stuck in metaphase</p> <p>ACCEPT going into mitosis</p>	(3)

Question Number	Answer	Additional Guidance	Mark
6(c)(ii)	<p>A description that makes reference to three of the following:</p> <ul style="list-style-type: none"> <li>cells grown with colchicine for a period of time (1)</li> <li>minimum of three plastic dishes sampled at each of the time intervals (shown in the table) (1)</li> <li>cells stained with (acetic / propionic / ethano) orcein (1)</li> <li>cells observed under a microscope and the number of cells in each stage of the cell cycle counted (1)</li> </ul>	<p>ACCEPT treated</p> <p>DO NOT ACCEPT plant cells</p> <p>ACCEPT acetocarmine, Giemsa, methylene blue, toluidine blue</p> <p>ACCEPT observe how many</p>	(3)

Question Number	Answer	Additional Guidance	Mark
7(a)	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• (primary structure is) sequence of amino acids that determines the tertiary structure (1)</li> <li>• because the {amino acids / R groups} determine the {type / position} of the bonds (1)</li> <li>• credit named bond (that forms between the R groups) (1)</li> <li>• polar {amino acids / R groups} need to be on the outside of the hormone so that it can dissolve in the (blood) plasma (1)</li> <li>• (part of) the (final structure of) molecule has to be of a specific shape to {be complementary / bind} to the receptor molecules (on the target cells) (1)</li> </ul>	<p><b>ACCEPT</b> shape / folding / 3D structure</p> <p>e.g. hydrogen, ionic, disulfide, van der waals</p> <p><b>ACCEPT</b> hydrophilic</p> <p><b>ACCEPT</b> active site in either context of hormone or receptor, unless clearly talking about enzymes</p>	(4)

Question Number	Answer	Additional Guidance	Mark
7(b)(i)	<p>An answer that makes reference to the following:</p> <p>Similarities:</p> <ul style="list-style-type: none"> <li>all three types have the same amino acids in positions 1, 2, 4, 5, 6, 7 and 9 (1)</li> </ul> <p>Differences:</p> <ul style="list-style-type: none"> <li>type A has ile in position 3 whereas types B and C have phe (1)</li> <li>type C has lys in position 8 whereas types A and B have arg (1)</li> </ul>	<p><b>ACCEPT</b> they all have cys, tyr, gln, asn, (cys), pro, gly they all have one amino acid different</p> <p><b>ACCEPT</b> instead of phe</p> <p><b>ACCEPT</b> instead of arg</p>	(3)

Question Number	Answer	Additional Guidance	Mark
7(b)(ii)	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>there are more (triplet) codes than there are amino acids (1)</li> <li>so the <u>code</u> is degenerate (1)</li> <li>therefore the same amino acids may have a different code (1)</li> <li>this helps to maintain the same {structure / function} of the {nonapeptide / protein} (1)</li> </ul>	<p><b>ACCEPT</b> this helps to prevent a mutation from changing the {structure / function}</p>	(3)



Question Number	Answer	Additional Guidance	Mark
8(a)(i)	<p>The only correct answer is B</p> <p><i>A is incorrect because galactose is a monosaccharide</i> <i>C is incorrect because maltose is a disaccharide</i> <i>D is incorrect because the pairs of sugars are the wrong way round</i></p>		(1)

Question Number	Answer	Additional Guidance	Mark
8(a)(ii)	<p>The only correct answer is C</p> <p><i>A is incorrect because glycosidic bonds join sugars not ester bonds</i> <i>B is incorrect because glycosidic bonds join sugars not ester bonds</i> <i>D is incorrect because bonds are formed by condensation reactions</i></p>		(1)

Question Number	Answer	Additional Guidance	Mark
8(b)	<p>An answer that makes reference to three of the following:</p> <ul style="list-style-type: none"> <li>• same concentration of sugar used (1)</li> <li>• (solution of) each sugar should be tasted by same person (1)</li> <li>• sweetness compared with sucrose solution (1)</li> <li>• {water / dried biscuit} should be used between each tasting (1)</li> </ul>	<p>ACCEPT several people doing the test provided it is clear that they are each tasting all the sugars</p> <p>ACCEPT rank sugars in the order of sweetness if no other marks awarded</p>	(3)

Question Number	Answer	Additional Guidance	Mark
8(c)(i)	<ul style="list-style-type: none"> <li>• {3 to 4} : 1 : {10 to 13} (1)</li> </ul>		(1)

Question Number	Indicative content	
*8(c)(ii)	<p><b>Points made from table:</b></p> <ul style="list-style-type: none"> <li>• statement about fruit and sugar concentration (S) e.g. grapes have the highest concentration lemons have the lowest concentration</li> <li>• comment about grapes being the only fruit to contain maltose and galactose (P)</li> <li>• comment about high sugar concentration and high proportion of fructose or glucose or sucrose (P)</li> </ul> <p><b>Points made from graph:</b></p> <ul style="list-style-type: none"> <li>• statement about fruit and energy content (S) e.g. bananas have the highest energy content</li> <li>• statement about fruit and relative sweetness (S) e.g. grapes have highest relative sweetness</li> <li>• comment linking energy content to relative sweetness (P) e.g. lemons have the lowest energy content and relative sweetness bananas have the highest energy content but not the highest relative sweetness</li> <li>• comment on the positive correlation between relative sweetness and energy content (P*)</li> </ul> <p><b>Links made between different sources of information given:</b></p> <ul style="list-style-type: none"> <li>• link between relative sweetness and total sugar concentration (L) e.g. grapes have the highest relative sweetness and total sugar concentration lemons have the lowest relative sweetness and total sugar concentration</li> <li>• positive correlation between relative sweetness and total sugar concentration (L)</li> <li>• positive correlation between energy content and total sugar concentration (L)</li> <li>• with bananas not fitting this pattern (L)</li> <li>• link between relative sweetness and sugar content (L) e.g. grapes have the highest relative sweetness and a high proportion of fructose and glucose mangoes have lower fructose and glucose but have a high relative sweetness because they contain a large proportion of sucrose</li> <li>• bananas must contain other high-energy substances as they have the highest energy content but not the highest sugar content (L)</li> </ul>	<p><b>Level 1:</b></p> <p>1 mark = 1 point made</p> <p>2 marks = 2 points made</p> <p><b>Level 2:</b></p> <p>3 marks = 3 points made about table and graph that includes either one P or L</p> <p>4 marks = 3 points made about table and graph that contains at least two P or L</p> <p><b>Level 3:</b></p> <p>5 marks = 4 points made about table and graph that contains two Ls</p> <p>6 marks = 4 points made about table and graph that contains at least three Ls and P*</p>

Question Number	Answer	Mark
9(a)(i)	<p>The only correct answer is D</p> <p><i>A is incorrect because spermatogonia divide by mitosis and primary spermatocytes divide in meiosis I to form secondary spermatocytes</i></p> <p><i>B is incorrect because spermatogonia divide by mitosis and primary spermatocytes divide in meiosis I to form secondary spermatocytes</i></p> <p><i>C is incorrect because spermatogonia divide by mitosis and primary spermatocytes divide in meiosis I to form secondary spermatocytes</i></p>	(1)
Question Number	Answer	Mark
9(a)(ii)	<p>The only correct answer is C</p> <p><i>A is incorrect because primary spermatocytes are diploid</i></p> <p><i>B is incorrect because primary spermatocytes are diploid</i></p> <p><i>D is incorrect because primary spermatocytes are diploid</i></p>	(1)

Question Number	Answer	Additional Guidance	Mark
9(b)	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"><li>• to be the source of centrioles in the zygote (1)</li><li>• so that the spindle (fibres) can be synthesised (in the zygote / embryo) (1)</li><li>• so that the (fertilised egg cell /zygote) can divide by mitosis (to form the embryo) (1)</li></ul>	<p><b>ACCEPT</b> fertilised egg cell / cell resulting from fertilisation</p> <p><b>DO NOT ACCEPT</b> meiosis</p>	(3)

Question Number	Indicative content	
*9(c)	<p>Low sperm counts:</p> <ul style="list-style-type: none"> <li>• fewer sperm arriving at the egg cell, reducing the likelihood of fertilisation</li> <li>• not enough enzymes released for fertilisation</li> </ul> <p>Absence of an acrosome:</p> <ul style="list-style-type: none"> <li>• sperm will not be able to digest through (the outer membrane of egg cell)</li> <li>• therefore {nucleus / genetic material} will not be released inside the egg cell</li> </ul> <p>Mutations in the mitochondrial DNA:</p> <ul style="list-style-type: none"> <li>• less energy available for flagellum</li> <li>• without energy sperm will not be able to swim (through female)</li> </ul> <p>Chromosomal mutations:</p> <ul style="list-style-type: none"> <li>• could result in {lack of / too much} genetic material</li> <li>• cell division maybe affected</li> <li>• embryo maybe defective and not develop</li> </ul> <p>Structural defects:</p> <ul style="list-style-type: none"> <li>• defect in head may prevent penetration of sperm into egg cell</li> <li>• defects in flagellum could prevent motility</li> <li>• two heads might prevent entry into egg cell*</li> <li>• small head may not contain {an acrosome / a nucleus}*</li> <li>• misshapen head may {not be able to penetrate egg cell / impair motility}*</li> <li>• two flagella may {get tangled up together / not receive sufficient energy for swimming}*</li> <li>• short flagella may not provide enough motility*</li> <li>• no mid piece would mean no energy for swimming*</li> </ul>	<p><b>Level 1:</b></p> <p>1 mark = effect of one factor commented on</p> <p>2 marks = effects of two factors commented on</p> <p><b>Level 2:</b></p> <p>3 marks = effects of three factors commented on</p> <p>4 marks = effects of four factors commented on</p> <p><b>Level 3:</b></p> <p>5 marks = effects of all five factors commented on</p> <p>6 marks = effects of all five factors commented on but includes <b>one</b> specific types of structural defects*</p>

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