



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"> • diameter measured and mean value calculated (1) • 2 000 / 2 300 / 2 320 / 2 316 (1) 	<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"> • use an (eye piece) graticule to measure the diameter (1) • take several measurements and calculate the mean (for each cell) (1) • calibrate the (eye piece) graticule (1) • using a stage micrometer (1) 	<p>ACCEPT length / size</p> <p>ACCEPT 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)

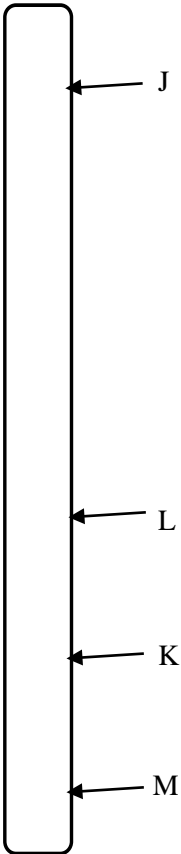
Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	<p>The only correct answer is C</p> <p><i>A is incorrect because three molecules of water are lost which is 54, 18 is one molecule</i> <i>B is incorrect because three molecules of water are lost which is 54, 33 is one molecule with reverse number 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"> • 10.14 		(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"> • heat (solid) samples (of the fatty acids) and measure the temperature at which they melt (1) • use fatty acids of the same chain length but with different {numbers of C C double bonds / degrees of saturation} (1) • use fatty acids of different chain length but the same {number of C C double bonds / saturation} (1) • repeat (for each fatty acid) and calculate the mean (1) 	<p>ACCEPT cool (liquid) samples (of the fatty acids) and measure the temperature at which they solidify</p> <p>ACCEPT 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"> • 10.2 		(1)

Question Number	Answer	Additional Guidance	Mark
3(c)	<p>A diagram that shows the following:</p> <ul style="list-style-type: none">• L drawn below J (1)• K and M indicated correctly (1)• diagram drawn to (approximate) scale (9, 3, 3) (1)	 <p>NB 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"> crossing over occurs between chromatids (between the same homologous chromosomes) (1) therefore (only) half the chromosomes (produced by anaphase II) will be recombinant chromosomes (so maximum of 50%) (1) crossing over does not always take place (so can be less than 50%) (1) 	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"> arranged in a bilayer (1) {phosphate / polar / hydrophilic} heads orientated outside as they can interact with aqueous environment (on both sides of membrane) (1) {fatty acid / non polar / hydrophobic} tails within membrane because they turn away from the water (1) 	<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"> the resolution of the (electron) microscope was good (to see the two membranes as separate structures) 		(1)

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	<ul style="list-style-type: none"> • magnification of photograph calculated / ratio of membrane to space given (1) • value 12 (nm) (1) 	<p>100 000 OR in the range of space : membrane = 1 : 1.5 to 1 : 2.5 or 0.4 : 1 to 0.67 : 1</p> <p>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</p> <p>Correct answer only = 2 marks</p>	(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"> • liver has smaller percentage of cell membrane as there are more organelles inside it (1) • 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 • liver has more mitochondria (membrane) as it is more metabolically active (1) • liver has less Golgi as it is {modifying / secreting} fewer proteins OR pancreas {may have more / has} secretory granules for exocytosis of proteins (1) 	<p>ACCEPT converse throughout for pancreas correctly named proteins throughout e.g. pancreas - insulin</p> <p>ACCEPT because of liver's role in producing lipids and pancreas' role in producing proteins</p> <p>ACCEPT stores lipid steroids / cholesterol metabolism of toxins</p> <p>ACCEPT requires more energy / more (aerobic) respiration</p>	(3)

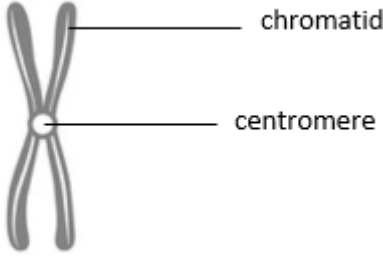
Question Number	Answer	Additional Guidance	Mark
5(a)	<p>The only correct answer is C</p> <p><i>A is incorrect because water is H₂O</i> <i>B is incorrect because water is H₂O</i> <i>D is incorrect because the H has the slightly positive charge and O has the slightly negative charge</i></p>		(1)

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"> • because water forms (many) hydrogen bonds (1) • (which gives it a) high specific heat capacity (1) • so the temperature of the water rises less than the temperature of the land for the same input of energy (1) 	<p>ACCEPT H bonds / strong cohesive forces / very cohesive</p> <p>ACCEPT a lot of energy needed to raise temperature of water</p> <p>NB 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"> • because the (body) temperature of a fish {fluctuates with {external / water / ocean} temperature / cannot be regulated} (1) • need appropriate (body) temperature for {enzyme activity / metabolism} (1) • if temperature increased there would be less oxygen (dissolved) in the water for the fish (1) 	<p>ACCEPT organisms for fish throughout</p> <p>ACCEPT cold-blooded / poikilothermic helps keep fish' temperature constant</p> <p>ACCEPT temperature change could denature enzymes</p> <p>ACCEPT 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"> • because water molecules are tightly bonded together (1) • by hydrogen bonds (1) • so water is incompressible (1) • shape of body changes because {pressure increases / volume does not increase} (1) 	<p>ACCEPT water molecules are close together / strong cohesive forces DO NOT ACCEPT adhesive forces</p> <p>ACCEPT 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">• a tissue is (a group of) similar cells (1)• an organ is tissues working together to perform {one / several} functions (1)		(2)

Question Number	Answer	Additional Guidance	Mark
6(b)(i)	<p>A drawing that shows the following:</p> <ul style="list-style-type: none"> • {one / two} chromatids drawn and labelled (1) • joined at the centromere, which is labelled (1) 		(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"> • chromosomes line up along the equator (of the cell) (1) • spindle fibres (from the centrioles) attach to the {centromere / chromosome} (1) 	<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"> the number of cells in metaphase increases because colchicine stops the cells from moving out of this phase (1) the number of cells in anaphase {decreases / goes to zero} as the cells are not moving out of metaphase (1) because colchicine {interferes with spindle fibres / stops centromeres being split / stops chromatids being pulled apart} (1) number of cells in prophase decreases as there are fewer cells to pass through the cell cycle (1) 	<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"> cells grown with colchicine for a period of time (1) minimum of three plastic dishes sampled at each of the time intervals (shown in the table) (1) cells stained with (acetic / propionic / ethano) orcein (1) cells observed under a microscope and the number of cells in each stage of the cell cycle counted (1) 	<p>ACCEPT treated 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"> • (primary structure is) sequence of amino acids that determines the tertiary structure (1) • because the {amino acids / R groups} determine the {type / position} of the bonds (1) • credit named bond (that forms between the R groups) (1) • polar {amino acids / R groups} need to be on the outside of the hormone so that it can dissolve in the (blood) plasma (1) • (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) 	<p>ACCEPT shape / folding / 3D structure</p> <p>e.g. hydrogen, ionic, disulfide, van der waals</p> <p>ACCEPT hydrophilic</p> <p>ACCEPT 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"> all three types have the same amino acids in positions 1, 2, 4, 5, 6, 7 and 9 (1) <p>Differences:</p> <ul style="list-style-type: none"> type A has ile in position 3 whereas types B and C have phe (1) type C has lys in position 8 whereas types A and B have arg (1) 	<p>ACCEPT they all have cys, tyr, gln, asn, (cys), pro, gly they all have one amino acid different</p> <p>ACCEPT instead of phe</p> <p>ACCEPT 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"> there are more (triplet) codes than there are amino acids (1) so the <u>code</u> is degenerate (1) therefore the same amino acids may have a different code (1) this helps to maintain the same {structure / function} of the {nonapeptide / protein} (1) 	<p>ACCEPT 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"> • same concentration of sugar used (1) • (solution of) each sugar should be tasted by same person (1) • sweetness compared with sucrose solution (1) • {water / dried biscuit} should be used between each tasting (1) 	<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"> • {3 to 4} : 1 : {10 to 13} (1) 		(1)

Question Number	Indicative content	
8(c)(ii)	<p>Points made from table:</p> <ul style="list-style-type: none"> • statement about fruit and sugar concentration (S) e.g. grapes have the highest concentration lemons have the lowest concentration • comment about grapes being the only fruit to contain maltose and galactose (P) • comment about high sugar concentration and high proportion of fructose or glucose or sucrose (P) <p>Points made from graph:</p> <ul style="list-style-type: none"> • statement about fruit and energy content (S) e.g. bananas have the highest energy content • statement about fruit and relative sweetness (S) e.g. grapes have highest relative sweetness • 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 • comment on the positive correlation between relative sweetness and energy content (P) <p>Links made between different sources of information given:</p> <ul style="list-style-type: none"> • 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 • positive correlation between relative sweetness and total sugar concentration (L) • positive correlation between energy content and total sugar concentration (L) • with bananas not fitting this pattern (L) • 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 • bananas must contain other high-energy substances as they have the highest energy content but not the highest sugar content (L) 	<p>Level 1:</p> <p>1 mark = 1 point made</p> <p>2 marks = 2 points made</p> <p>Level 2:</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>Level 3:</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"> • to be the source of centrioles in the zygote (1) • so that the spindle (fibres) can be synthesised (in the zygote / embryo) (1) • so that the (fertilised egg cell /zygote) can divide by mitosis (to form the embryo) (1) 	<p>ACCEPT fertilised egg cell / cell resulting from fertilisation</p> <p>DO NOT ACCEPT meiosis</p>	(3)

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

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