

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)	• diameter measured and mean value calculated (1) • 2 000 / 2 300 / 2 320 / 2 316 (1)	Example of calculation: 44 (mm) / 4.4 (cm) and 0.019 (mm) 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 Correct answer with no working gets 2 marks	(2)

Question Number	Answer	Additional Guidance	Mark
1(b)	A description that makes reference to three of the following: • 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)	**ACCEPT** length / size **ACCEPT** a description of how this is done	(3)

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

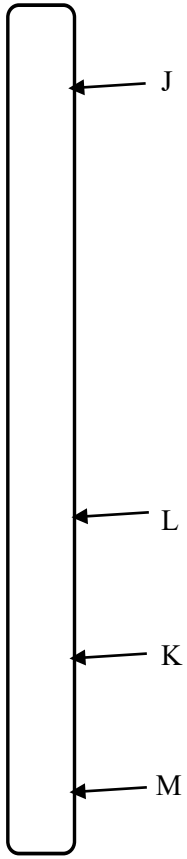
Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	**The only correct answer is C** ***A** is incorrect because three molecules of water are lost which is 54, 18 is one molecule* ***B** is incorrect because three molecules of water are lost which is 54, 33 is one molecule with reverse number of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

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	• 10.14		(1)

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	An answer that makes reference to the following: • 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)	**ACCEPT** cool (liquid) samples (of the fatty acids) and measure the temperature at which they solidify **ACCEPT** average / identify anomalies / do a stats test	(3)

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

Question Number	Answer	Additional Guidance	Mark
3(b)	• 10.2		(1)

Question Number	Answer	Additional Guidance	Mark
3(c)	A diagram that shows the following: • L drawn below J (1) • K and M indicated correctly (1) • diagram drawn to (approximate) scale (9, 3, 3) (1)	 **NB** Everything must be correct to award all 3 marks	(3)

Question Number	Answer	Additional Guidance	Mark
3(d)	An explanation that makes reference to two of the following: • 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)	An explanation that makes reference to the following: • 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)	**ACCEPT** phosphate heads on outside and fatty acid tails inside from labelled diagram **ACCEPT** description of aqueous environment **ACCEPT** water repels phospholipids / phospholipids repel water	(2)

Question Number	Answer	Additional Guidance	Mark
4(b)(i)	• 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)	• magnification of photograph calculated / ratio of membrane to space given (1) • value 12 (nm) (1)	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)	An explanation that makes reference to three of the following: • 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)	**ACCEPT** converse throughout for pancreas correctly named proteins throughout e.g. pancreas - insulin **ACCEPT** because of liver's role in producing lipids and pancreas' role in producing proteins **ACCEPT** stores lipid steroids / cholesterol metabolism of toxins **ACCEPT** requires more energy / more (aerobic) respiration	(3)

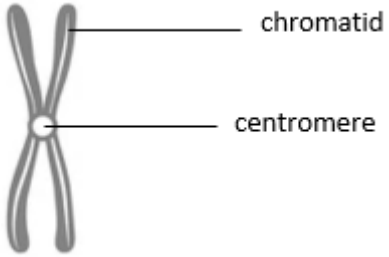
Question Number	Answer	Additional Guidance	Mark
5(a)	**The only correct answer is C** ***A** is incorrect because water is H_2O* ***B** is incorrect because water is H_2O* ***D** is incorrect because the H has the slightly positive charge and O has the slightly negative charge*		(1)

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	An explanation that makes reference to two of the following: • 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)	**ACCEPT** H bonds / strong cohesive forces / very cohesive **ACCEPT** a lot of energy needed to raise temperature of water **NB** a lot of energy needed to break the H bonds to raise temperature of water = 2 marks	(2)

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	An explanation that makes reference to the following: • 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)	**ACCEPT** organisms for fish throughout **ACCEPT** cold-blooded / poikilothermic helps keep fish' temperature constant **ACCEPT** temperature change could denature enzymes **ACCEPT** constant temperature maintains levels of prey for the fish	(2)

Question Number	Answer	Additional Guidance	Mark
5(c)	An explanation that makes reference to three of the following: • 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)	**ACCEPT** water molecules are close together / strong cohesive forces **DO NOT ACCEPT** adhesive forces **ACCEPT** so the water molecules cannot be pushed closer together	(3)

Question Number	Answer	Additional Guidance	Mark
6(a)	A description that makes reference to the following: • 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)	A drawing that shows the following: • {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)	A description that makes reference to the following: • chromosomes line up along the equator (of the cell) (1) • spindle fibres (from the centrioles) attach to the {centromere / chromosome} (1)	**ACCEPT** middle / metaphase plate pairs of chromatids **DO NOT ACCEPT** chromatids **DO NOT ACCEPT** chromatids	(2)

Question Number	Answer	Additional Guidance	Mark
6(c)(i)	An explanation that makes reference to the following: • 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)	**ACCEPT** stuck in metaphase **ACCEPT** stuck in metaphase **ACCEPT** going into mitosis	(3)

Question Number	Answer	Additional Guidance	Mark
6(c)(ii)	A description that makes reference to three of the following: • 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)	**ACCEPT** treated **DO NOT ACCEPT** plant cells **ACCEPT** acetocarmine, Giemsa, methylene blue, toluidine blue **ACCEPT** observe how many	(3)

Question Number	Answer	Additional Guidance	Mark
7(a)	An explanation that makes reference to the following: • (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)	**ACCEPT** shape / folding / 3D structure e.g. hydrogen, ionic, disulfide, van der waals **ACCEPT** hydrophillic **ACCEPT** active site in either context of hormone or receptor, unless clearly talking about enzymes	(4)

Question Number	Answer	Additional Guidance	Mark
7(b)(i)	An answer that makes reference to the following: Similarities: • all three types have the same amino acids in positions 1, 2, 4, 5, 6, 7 and 9 (1) Differences: • 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)	**ACCEPT** they all have cys, tyr, gln, asn, (cys), pro, gly they all have one amino acid different **ACCEPT** instead of phe **ACCEPT** instead of arg	(3)

Question Number	Answer	Additional Guidance	Mark
7(b)(ii)	An explanation that makes reference to the following: • 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)	**ACCEPT** this helps to prevent a mutation from changing the {structure / function}	(3)

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

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

Question Number	Answer	Additional Guidance	Mark
8(b)	An answer that makes reference to three of the following: • 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)	**ACCEPT** several people doing the test provided it is clear that they are each tasting all the sugars **ACCEPT** rank sugars in the order of sweetness if no other marks awarded	(3)

Question Number	Answer	Additional Guidance	Mark
8(c)(i)	• {3 to 4} : 1 : {10 to 13} (1)		(1)

Question Number	Indicative content	
***8(c)(ii)**	**Points made from table:** • 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) **Points made from graph:** • 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*) **Links made between different sources of information given:** • 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)	**Level 1:** 1 mark = 1 point made 2 marks = 2 points made **Level 2:** 3 marks = 3 points made about table and graph that includes either one P or L 4 marks = 3 points made about table and graph that contains at least two P or L **Level 3:** 5 marks = 4 points made about table and graph that contains two Ls 6 marks = 4 points made about table and graph that contains at least three Ls and P*

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

Question Number	Answer	Mark
9(a)(ii)	**The only correct answer is C** ***A*** *is incorrect because primary spermatocytes are diploid* ***B*** *is incorrect because primary spermatocytes are diploid* ***D*** *is incorrect because primary spermatocytes are diploid*	(1)

Question Number	Answer	Additional Guidance	Mark
9(b)	An explanation that makes reference to the following: • 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)	**ACCEPT** fertilised egg cell / cell resulting from fertilisation **DO NOT ACCEPT** meiosis	(3)

Question Number	Indicative content	
***9(c)**	Low sperm counts: • fewer sperm arriving at the egg cell, reducing the likelihood of fertilisation • not enough enzymes released for fertilisation Absence of an acrosome: • 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 Mutations in the mitochondrial DNA: • less energy available for flagellum • without energy sperm will not be able to swim (through female) Chromosomal mutations: • could result in {lack of / too much} genetic material • cell division maybe affected • embryo maybe defective and not develop Structural defects: • 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*	**Level 1:** 1 mark = effect of one factor commented on 2 marks = effects of two factors commented on **Level 2:** 3 marks = effects of three factors commented on 4 marks = effects of four factors commented on **Level 3:** 5 marks = effects of all five factors commented on 6 marks = effects of all five factors commented on but includes **one** specific types of structural defects*

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