



Mark Scheme (Results)

Summer 2022

Pearson Edexcel GCE  
In AS Biology (8BI0\_01)  
Paper 1: Core Cellular Biology and  
Microbiology

## **Edexcel and BTEC Qualifications**

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at [www.edexcel.com](http://www.edexcel.com) or [www.btec.co.uk](http://www.btec.co.uk). Alternatively, you can get in touch with us using the details on our contact us page at [www.edexcel.com/contactus](http://www.edexcel.com/contactus).

## **Pearson: helping people progress, everywhere**

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: [www.pearson.com/uk](http://www.pearson.com/uk)

Summer 2022

Question Paper Log Number P70809

Publications Code 8B10\_01\_2206\_MS

All the material in this publication is copyright

© Pearson Education Ltd 2022

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)

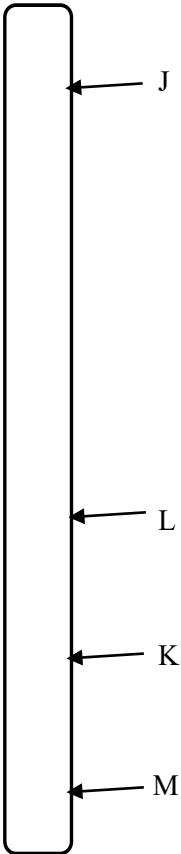
Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	<p>The only correct answer is C</p> <p><i>A is incorrect because three molecules of water are lost which is 54, 18 is one molecule</i>  <i>B is incorrect because three molecules of water are lost which is 54, 33 is one molecule with reverse number 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><b>The only correct answer is C</b></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><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>	<p><b>ACCEPT</b> will have recombinant {genes / alleles}</p>	(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><b>ACCEPT</b> phosphate heads on outside and fatty acid tails inside from labelled diagram</p> <p><b>ACCEPT</b> description of aqueous environment</p> <p><b>ACCEPT</b> 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>	<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><b>ACCEPT</b> any value between 9 and 15 to one decimal place max <b>ECF</b> 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"> <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)

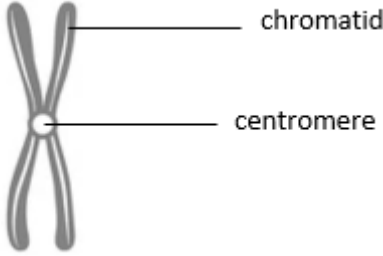
Question Number	Answer	Additional Guidance	Mark
5(a)	<p>The only correct answer is C</p> <p><i>A is incorrect because water is H<sub>2</sub>O</i>  <i>B is incorrect because water is H<sub>2</sub>O</i>  <i>D is incorrect because the H has the slightly positive charge and O has the slightly negative charge</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</p> <p><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><b>ACCEPT</b> middle / metaphase plate pairs of chromatids <b>DO NOT ACCEPT</b> chromatids</p> <p><b>DO NOT ACCEPT</b> 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><b>ACCEPT</b> stuck in metaphase</p> <p><b>ACCEPT</b> stuck in metaphase</p> <p><b>ACCEPT</b> 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><b>ACCEPT</b> treated <b>DO NOT ACCEPT</b> plant cells</p> <p><b>ACCEPT</b> acetocarmine, Giemsa, methylene blue, toluidine blue</p> <p><b>ACCEPT</b> 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><b>ACCEPT</b> several people doing the test provided it is clear that they are each tasting all the sugars</p> <p><b>ACCEPT</b> 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	
<b>*9(c)</b>	<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>

Pearson Education Limited. Registered company number 872828  
with its registered office at 80 Strand, London, WC2R 0RL, United Kingdom