

Mark Scheme (Results)

Summer 2023

Pearson Edexcel GCE
In Biology B (8BI0)
Paper 01: Core Cellular Biology and Microbiology

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Answer	Additional Guidance	Mark
1(a)	**The only correct answer is B** *A is incorrect because Down's syndrome is an example of polysomy not monosomy* **C** *is incorrect because Down's syndrome is caused by a chromosome mutation not a gene mutation* **D** *is incorrect because Down's syndrome is caused by a chromosome mutation not a gene mutation*		(1)

Question Number	Answer	Additional Guidance	Mark
1(b)	An answer that makes reference to the following: • birth order has no effect on the incidence (1) • the incidence increases with the age (of the mother) (1) • credit use of manipulated figures to support answer (1)	**ACCEPT** no pattern **e.g.** approx. 80 times greater chance if over 40 than under 20 approx. 4 times greater chance if over 40 than between 35 and 39 approx. 500 per 100 000 more if over 40 than between 35 and 39	(3)

Question Number	Answer	Additional Guidance	Mark
2(a)	A description that makes reference to the following: • to {digest / breakdown} the {egg cell / ovum / secondary oocyte} membrane (1) • so that the sperm {nucleus / genetic material} can enter the {egg cell / ovum / secondary oocyte} (1)	**ACCEPT** zona pellucida	(2)

Question Number	Answer	Additional Guidance	Mark
2(b)	A description that makes reference to three of the following: • transcription of the genes coding for the (acrosome) enzymes (1) • translation (of the mRNA) (to synthesise the enzymes) (1) • transported in the RER (to the Golgi) (1) • {modification / processing / packaging} (of the enzymes) in the Golgi (1) • packaging (by the Golgi of the enzymes) into {the membrane / vesicles} (of the acrosome) (1)	**ACCEPT** description of transcription e.g. mRNA copy of gene coding for enzyme made **ACCEPT** description of translation e.g. amino acids joined by peptide bonds **DO NOT ACCEPT** for exocytosis	(3)

Question Number	Answer	Additional Guidance	Mark
3(a)	A description that makes reference to the following: • glucose and galactose (1) • joined by a (1-4) glycosidic bond (1)		(2)

Question Number	Answer	Additional Guidance	Mark
3(b)	• tangent drawn as a straight line touching at 2 hours, on the outside of the curve (1) • rate calculated (1)	**ACCEPT** value between 0.034 and 0.052 to 2 or 3 dps Correct answer gains 2 marks 0.08 / 0.075 gains 1 mark	(2)

Question Number	Answer	Additional Guidance	Mark
3(c)	A description that makes reference to the following: • (2.5 % and 7.5 %) lactose stimulates growth of pollen tubes (1) • the effect is dose-dependent / growth depends on the concentration (1) • high concentrations inhibit pollen tube growth (1)	**ACCEPT** pollen tubes can grow in lactose increases pollen tube growth **ACCEPT** pollen tube did not grow in high concentrations 10% was too concentrated for growth	(3)

Question Number	Answer	Additional Guidance	Mark
3(d)	An answer that makes reference to the following: • because sucrose is {produced / secreted / used} by the {stigma / carpel / plant} (1) • because lactose is {found in milk / not {produced by / found in} plants} (1)		(2)

Question Number	Answer	Additional Guidance	Mark
4(a)	**The only correct answer is A** ***B*** *is incorrect because human immunodeficiency virus is polyhedral* **C** *is incorrect because λ (lambda) phage is non-enveloped, complex in structure and has DNA* **D** *is incorrect because tobacco mosaic virus does not have an envelope*		(1)

Question Number	Answer	Additional Guidance	Mark
4(b)	**The only correct answer is A** ***B*** *is incorrect because hydrolysis uses water not produces it* **C** *is incorrect because hydrolysis splits bonds not forms them* **D** *is incorrect because hydrolysis splits bonds not forms them*		(1)

Question Number	Answer	Additional Guidance	Mark
4(c)(i)	An answer that makes reference to three of the following, that includes the similarity: **Similarities** • both contain carbon, hydrogen and oxygen (1) **Differences** • polysaccharides are made up of monosaccharides but the primary structures of proteins are made up of amino acids (1) • polysaccharides contain glycosidic bonds but the primary structures of proteins contain peptide bonds (1) • polysaccharides do not contain {nitrogen / sulfur} but primary structures of proteins do contain {nitrogen / sulfur} (1) • polysaccharides may be branched but primary structures of proteins are linear (1)	**DO NOT PIECE TOGETHER** **ACCEPT** glucoses	(3)

Question Number	Answer	Additional Guidance	Mark
4(c)(ii)	An explanation that makes reference to the following: • because (if lectins bind to the {spike / polysaccharide) then the virus will not be able to attach to the {ACE 2 / enzyme / (host) cell} (1) • and therefore will not be able to {infect / enter} the cell (1) • new virus particles will not be made (1)	**ACCEPT** {genetic material / RNA} cannot enter cell **ACCEPT** virus cannot replicate lytic cycle will be prevented **DO NOT ACCEPT** latency / lysogenic cycle	(3)

Question Number	Answer	Additional Guidance	Mark
5(a)(i)	**The only correct answer is C** ***A** is incorrect because the tips need heating in acid before acetic orcein* **B** *is incorrect because the tips need heating in acid before acetic acid* **D** *is incorrect because the cells need teasing apart and the cover slip placed on top before the preparation is squashed*		(1)

Question Number	Answer	Additional Guidance	Mark
5(a)(ii)	An explanation that makes reference to the following: • because this is (the only part of the root) where mitosis takes place (1) • because the tips are the only part of the root {that grows / where cell division takes place} (1) • because the tips contain {meristem / stem cells} (1)		(2)

Question Number	Answer	Additional Guidance	Mark
5(a)(iii)	**The only correct answer is B** ***A** is incorrect because L comes before J* **C** *is incorrect because M comes after J and L* **D** *is incorrect because N is the last stage*		(1)

Question Number	Answer	Additional Guidance	Mark
5(b)			(1)

	• estimate between 6 and 7.5 to one decimal place max (hours) (1)		

Question Number	Answer	Additional Guidance	Mark
5(c)(i)	**The only correct answer is D** ***A** is incorrect because meiosis is involved in the formation of stage 1* **B** *is incorrect because meiosis is involved in the formation of stage 1 and 2* **C** *is incorrect because meiosis is involved in the formation of stage 2*		(1)

Question Number	Answer	Additional Guidance	Mark
5(c)(ii)	**The only correct answer is A** ***B** is incorrect because the ovary is at the bottom of the style* **C** *is incorrect because the stigma is at the top of the style* **D** *is incorrect because the stigma is at the top of the style*		(1)

Question Number	Answer	Additional Guidance	Mark
5(c)(iii)	A description that makes reference to three of the following: • polar nuclei fuse (1) • to form a {diploid nucleus / primary endosperm nucleus} (1) • which is then fertilised by one of the male {nuclei / gametes} (1) • to form a (triploid) endosperm nucleus / which will result in the formation of {endosperm / nutrients} (1)	**ACCEPT** fuses / join together sperm **ACCEPT** (triploid) endosperm cell	(3)

Question Number	Answer	Additional Guidance	Mark
6(a)(i)	• 1000 / 1 x 10^3 (1)	**DO NOT ACCEPT** if units given	(1)

Question Number	Answer	Additional Guidance	Mark
6(a)(ii)	An explanation that makes reference to two of the following: • to keep the enzymes and their substrates close together (1) • so that the (enzyme) reactions are faster (1)	**ACCEPT** converse throughout **ACCEPT** compartmentalisation **ACCEPT** respiration reaction is faster	

	• because bacteria {have mesosomes / can use their cell membranes} (1)		(2)

Question Number	Answer	Additional Guidance	Mark
6(b)(i)	• volumes of sucrose solution and water calculated (1) • 0.3 : 1 / 0.33 : 1 (1)	e.g. 1.25 cm^3 sucrose and 3.75 cm^3 water **ACCEPT** 1 : 3 **DO NOT ACCEPT** 0.3 recurring **ACCEPT** CE for incorrect volumes Correct answer = 2 marks	(2)

Question Number	Answer	Additional Guidance	Mark
6(b)(ii)	An explanation that makes reference to two of the following: • because the pipette needs to be held {vertically /at eye level / kept steady} (1) • so that the (bottom of the) meniscus (of the suspension) is sitting on the line (of the pipette) (1) • (slightly) squeezing it will lose liquid (1) • pipette too large for this volume to be measured (1)	**ACCEPT** to avoid a parallax measurement	(2)

Question Number	Answer	Additional Guidance	Mark
6(b)(iii)	• 0.5 / ½ (%) (1)		(1)

Question Number	Answer	Additional Guidance	Mark
6(b)(iv)	**The only correct answer is D** ***A** is incorrect because the mitochondria are bigger than ribosomes* **B** *is incorrect because nuclei are the largest so will be at the bottom* **C** *is incorrect because nuclei are the largest so will be at the bottom*		(1)

Question Number	Indicative content	
***6(c)**	**Indicative content:** **Lumen of smooth endoplasmic reticulum** • no radioactivity as the SER is not involved in protein synthesis • as it transports lipids **Ribosomes** • level of radioactivity high in first 10 minutes as the amino acids are incorporated into the polypeptide chain • during translation • level then falls as polypeptide chain leaves the ribosomes • and protein synthesis ends **Lumen of rough endoplasmic reticulum** • level rises as RER is also site of protein synthesis • the polypeptide chains are transported through the cell • level falls to zero once all polypeptide chains have left the RER **Golgi apparatus** • level of radioactivity rises as the proteins are transferred into the Golgi • by vesicles from the RER • level of radioactivity drops once the proteins have been modified • and packaged into vesicles / lysosomes **Vesicles** • level rises as the vesicles are formed from the Golgi that contains radioactive proteins • level falls as proteins are released from the cell • by exocytosis **Unaccounted for radioactivity** • some radioactive amino acids were present in the cytoplasm as not all the radioactivity is in the organelles	**Level 1** 1 mark : description of changes in levels of radioactivity in two organelles 2 marks : description of changes in levels of radioactivity in four organelles **OR** explanation for one organelle **Level 2 :** 3 marks : explanation for two organelles 4 marks : explanation for three organelles **Level 3 :** 5 marks : explanation for four organelles, which includes at least one increase and one decrease explained for one of the organelles 6 marks : explanation for four organelles + an explanation for the unaccounted radioactivity

	• these amino acids were not used in protein synthesis • not all the proteins were packaged into vesicles • because the proteins were going to be used by the cell itself	

Question Number	Answer	Additional Guidance	Mark
7(a)(i)	A description that makes reference to two of the following: • unsaturated fatty acid has (at least one) carbon carbon double bonds whereas a saturated fatty acid has {no carbon carbon double bonds / has single carbon carbon bonds (only)} (1) • unsaturated fatty acids have fewer hydrogens than saturated fatty acids (for the same number of carbons) (1) • unsaturated fatty acid structure has kinks and saturated does not (1)	**ACCEPT** C C double bonds / C=C bonds **DO NOT ACCEPT** saturated fatty acid has no double bonds **ACCEPT** converse expressed as a ratio	(2)

Question Number	Answer	Additional Guidance	Mark
7(a)(ii)	An explanation that makes reference to three of the following: • lipids are used for (energy) storage because they are {insoluble / hydrophobic / non-polar / do not mix with water} (1) • lipids are used for energy storage as they have a high content of hydrogen (1) • lipids are used for insulation as they do not conduct heat (1) • because they are large molecules that are loosely packed (1)	**ACCEPT** poor conductors (of heat)	(3)

Question Number	Answer	Additional Guidance	Mark
7(b)(i)	A description that makes reference to three of the following: • stain the fat cells (1) • use an (eye piece) graticule to measure the {diameter / length} (1) • use a (stage) micrometer to {determine the actual diameter of the cell / calibrate the graticule} (1) • take several measurements and calculate a mean (1) • calculate the area using the formula $A = \pi r^2$ (1)	**ACCEPT** size **DO NOT ACCEPT** area **ACCEPT** $\pi (d \div 2)^2$	(3)

Question Number	Indicative content	
***7(b)(ii)**	**Indicative content:** **Graph 1** • juvenile whales have more fat cells at all depths from skin than adult whales (D) • because they have been fed high quality milk from their mothers (E) • they need a thick layer as they have a larger surface area : volume ratio (E) • and therefore will lose more heat (E) • adult whales have fewer fat cells than young whales (D) • because their diet is not so energy-rich (E) • because the females are feeding their young (E) • fasting whales have the least number of fat cells at all depths (D) • because their fat reserves have been used up over the winter (E) • fat cells present in all layers of skin (D) • to provide a thick insulator layer (E) • because the whales live in cold waters (E) **Graph 2** • juvenile whales have the highest area of fat cells at all depths from skin than adult whales (D) • because they have been fed high quality milk from their mothers (E) • adult whales have smaller area of fat cells than young whales (D) • because their diet is not so energy-rich (E) • because the females are feeding their young (E) • fasting whales have the lowest area of fat cells at all depths (D) • because their fat reserves have been used up over the winter (E) • highest area of fat cells is in intermediate layer for all whales (D) **Graph 3** • juvenile whales have lowest area of fibrous tissue at all depths from skin	**Level 1 : descriptions** 1 mark : results from one graph described 2 marks : results from two graphs described **Level 2 : some explanation** 3 marks : one explanation given 4 marks : two explanations given **Level 3 : detailed explanation** 5 marks : three explanations of data from at least two of the graphs 6 marks : at least one explanation of data from each graph

	than adult whales (D) • fasting whales have the highest fibrous tissue (D) • because fibrous tissue being formed to replace area filled by fat cells (E)	

Question Number	Answer	Additional Guidance	Mark
8(a)	• mass of plastic in kg calculated (1) • mass of polyester calculated (kg) (1) **OR** • 15 % of 25.8 million calculated (1) • mass of polyester calculated (kg) (1)	Example of calculation: 23 405 373 000 / 23 405.373 million 3.5×10^9 / 3.51×10^9 / 3 510 805 950 3.87 million / 3 870 000 3.5×10^9 / 3.51×10^9 / 3 510 805 950 Correct answer = 2 marks Correct answer but incorrectly expressed in standard form or too many dps = 1 mark Correct figures but wrong order of magnitude = 1 mark	(2)

Question Number	Answer	Additional Guidance	Mark
8(b)	• bacteria {produce enzymes / can digest plant material} (1)		(1)

Question Number	Answer	Additional Guidance	Mark
8(c)	An explanation that makes reference to two of the following: • because this is the {pH / temperature} of the cow's stomach (1) • therefore the optimum {pH / temperature} of the <u>enzymes</u> (1) • buffer used to keep pH constant (1)	**ACCEPT** optimum conditions **{**pH / temperature} that the enzymes work fastest at	(2)

Question Number	Answer	Additional Guidance	Mark
8(d)(i)	An answer that makes reference to three of the following: • no correlation (between mean enzyme activity and the number of carbons in the fatty acid chain) (1) • {optimum / best} number (appears to be) 4 carbons (1) • but could be {6 / between 4 and 6} as the range bars overlap (1) • small standard deviations indicating that variability within data sets is low (1)	**ACCEPT** not proportional **ACCEPT l**east activity with 2 carbons **ACCEPT** but could be 10 as error bars overlap	(3)

Question Number	Answer	Additional Guidance	Mark
8(d)(ii)	An answer that makes reference to five of the following: • use (polyesters with) fatty acid chains {of varying lengths / containing either 2, 4, 6, 8, 10 or 12 carbons} (1) • initial rate of reaction measured (1) • credit method for monitoring reaction (1) • experiment carried out at 40°C in (thermostatically-controlled) <u>waterbath</u> (1) • credit named control variable (1) • experiment repeated several times to calculate mean and {range bars / standard deviation} (1)	e.g. colorimeter / absorbance / transmission / pH change / mass change e.g. enzyme {volume / concentration}, same temperature if mp 4 not awarded, substrate {volume / concentration}, pH	(5)

Question Number	Answer	Additional Guidance	Mark
8(e)	An explanation that makes reference to two the following: • because there were two different types of polyester and enzymes are specific (1) • because the two polyesters produced different {products / concentration of products} • and therefore there must be different bonds that need breaking (1)	**ACCEPT** description / examples	(2)