

INTERNATIONAL A-LEVEL **BIOLOGY**

BL05 (9610)

Unit 5 Synoptic paper

Mark scheme

January 2024

Version: 1.0 Final



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Question	Marking guidance	Mark	Comments
01.1	Higher magnification than SEM or light microscope; Internal details visible or high resolution or high definition;	2	Allow high magnification Ignore magnification = $\times 27\,500$ Ignore only 2-D, ignore not in colour

Question	Marking guidance	Mark	Comments
01.2	Drawing large and clear; Correct shape with envelope and grana; Correct internal details – thylakoids in grana and intergranal regions, vesicles, lipid droplet;	3	Smooth lines, not sketchy

Question	Marking guidance	Mark	Comments
01.3	$\frac{160 \times 1000}{27\,500}$ 5.82 / 5.8 / 6;	2	Allow one mark if wrong order of magnitude Allow ± 1 mm for measured length Allow one mark for answer correctly derived from incorrect measurement

Question	Marking guidance	Mark	Comments
01.4	To prevent denaturation of proteins / enzymes / cytochromes;	1	ignore optimum pH

Question	Marking guidance	Mark	Comments
01.5	1. Lose (only) a little <u>water</u> by osmosis/diffusion; 2. Chloroplasts remain intact or do not burst;	2	1. Allow so there is no (net) gain of <u>water</u> by osmosis 1. Ignore reference to isotonic 2. Allow do not shrink too much 2. Ignore reference to cells

Question	Marking guidance	Mark	Comments
01.6	1. So (opposite) tubes are balanced in the centrifuge; 2. Does not damage centrifuge; OR 1. Different volumes would have different numbers of chloroplasts; 2. Which would give different rates of reaction or would prevent valid comparisons;	2	

Question	Marking guidance	Mark	Comments
01.7	Each tube differs in one way from Tube 1; To show the need for the missing factor in the reaction;	2	Allow named factors: 2 chloroplasts + 3 light + 4 DCPIP

Question	Marking guidance	Mark	Comments
01.8	1. Electrons/H ⁺ ions from water; 2. Electrons excited by light; 3. Electrons lost from chlorophyll; 4. Electrons and H ⁺ ions combine with DCPIP to decolourise DCPIP or to leave the green colour of the chloroplasts / chlorophyll;	4	1. Allow photolysis of water 2. Allow light raises electrons to higher energy level

Question	Marking guidance	Mark	Comments
02.1	1. Constant volumes of potato filtrate and buffer solution; 2. Incubate potato filtrate + buffer in water bath / at 25°C (for 5–10 min); 3. Inject H ₂ O ₂ solution and measure volume of O ₂ in given time; 4. Raise syringe so levels inside and out are same before measuring; 5. Repeat at least twice more and calculate mean (and SD) for each concentration; 6. Repeat with same vol. of different concentrations of H ₂ O ₂ solution; 7. Further detail – eg cleaning test tube between experiments or method of filling syringe with water by opening tap and submerging or method of diluting H ₂ O ₂ ;	7	

Question	Marking guidance	Mark	Comments
02.2	1. Plot line graph of volume of oxygen against concentration of H ₂ O ₂ ; 2. Add error bars to represent standard deviation; 3. Line graph plotted because the two variables are continuous;	3	1. must distinguish dependent and independent variables

Question	Marking guidance	Mark	Comments
02.3	Overlap of SDs; Use of data: (at 40%) $8.0 + 0.61 = 8.61$ and (at 60%) $9.2 - 0.62 = 8.58$;	2	

Question	Marking guidance	Mark	Comments
03.1	Reverse transcriptase;	1	

Question	Marking guidance	Mark	Comments
03.2	Restriction endonuclease OR Restriction enzyme;	1	

Question	Marking guidance	Mark	Comments
03.3	To join pieces of DNA which are complementary (by base pairing);	1	

Question	Marking guidance	Mark	Comments
03.4	4;	1	

Question	Marking guidance	Mark	Comments
03.5	2 bands merge OR only 4 bands; New band formed at heavier position OR nearer to origin;	2	Allow new band formed higher up

Question	Marking guidance				Mark	Comments
04.1	Cross 1		Cross 2		4	Cross 1 P genotypes + gametes correct = one mark F ₁ genotypes + phenotypes correct = one mark Cross 2 P genotypes + gametes correct = one mark F ₁ genotypes + phenotypes correct = one mark
	Parental genotypes	X^BY and X^bX^b	X^bY and X^BX^B			
	Gametes	X^B Y X^b	X^b Y X^B			
		-----	-----			
	F ₁ genotypes	X^BX^b X^bY	X^BX^b X^BY			
	Phenotypes:	Tortoiseshell Orange	Tortoiseshell Black			
	Sex	female male	female male			

Question	Marking guidance	Mark	Comments
04.2	Yes, because: 1. With 3 degrees of freedom; 2. Closest to $\chi^2 = 2.60$ is χ^2 between 0.352 and 6.25 or P between 0.95 and 0.10 / P > 0.05 or $\chi^2 <$ critical value of 7.81; 3. So expect this <u>difference</u> from expected result due to chance or So this <u>difference</u> from expected result is not significant or So accept null hypothesis;	3	If incorrect number of degrees of freedom, still allow mp2 and mp3 with appropriate values 3. Ignore 'results' are due to chance 3. Ignore the 'results' are not significant

Question	Marking guidance	Mark	Comments
05.1	1. Chromatids/chromosomes cannot be separated by microtubules / spindle or Chromatids/chromosomes cannot join to microtubules; 2. Prevents mitosis / cell division;	2	If neither 1. nor 2. given, allow one mark for prevents spindle formation

Question	Marking guidance	Mark	Comments
05.2	Reduces/prevents mutation in proto-oncogene or in tumour suppressor gene;	1	Allow prevents activation of proto-oncogene or prevent inactivation of tumour suppressor gene

Question	Marking guidance	Mark	Comments
05.3	1. Mice vary in size / mass; 2. Gives same concentration in (body fluids of) each mouse; 3. Otherwise could not compare or could not obtain valid results;	3	

Question	Marking guidance	Mark	Comments
05.4	As a control (since resveratrol is dissolved in DMSO) or because group 2 has resveratrol and DMSO; Otherwise could not tell if effect (in group 2) was due to resveratrol or to DMSO;	2	

Question	Marking guidance	Mark	Comments
05.5	1. Vincristine is better than resveratrol – mice survive longer; 2. Resveratrol is ineffective as it gives similar results to control / DMSO; ----- 3. None survive more than 31 days so neither is very useful; 4. Dose of vincristine is much lower than dose of resveratrol (only 1/20); ----- 5. Only investigated one form of cancer / only leukaemia; 6. Do not know of any side effects; 7. Only tested on mice so do not know effect on humans; 8. Only 16 mice in each group or 48 total – may not be representative;	4 max	For full marks, must have at least one point from each of the 3 groups and any one other

Question	Marking guidance	Mark	Comments
06.1	Making carbohydrates available: 1. Digestion – starch to maltose using amylase in saliva or in pancreatic juice; 2. Digestion – maltose to glucose by membrane-bound maltase in small intestine; 3. Absorption – active transport or facilitated diffusion or co-transport with Na⁺ ions; 4. Transport from gut to cells in solution or in blood plasma; 5. Enters body cells by facilitated diffusion or via transport proteins or by active transport; Uses of carbohydrates: 6. Glucose as a source of energy/ATP – via respiration; 7. Glycogen (animals) for energy storage; 8. Glucose used for making other named substances; 9. Antibodies = glycoprotein – immune response to pathogens; 10. Antigens – eg ABO blood group antigens 11. Ribose in RNA / ATP / NAD(P); 12. Deoxyribose in DNA – genes and their expression; 13. Glucose for maintenance of osmotic potential of blood – maintain osmotic balance for body cells;	6 max	For full marks, must consider both making carbohydrates available and uses of carbohydrates 2. Allow references to other membrane-bound disaccharidases 6. Allow references to glycolysis / anaerobic and Krebs cycle / aerobic 6. Do not allow making energy 6. Allow further details, eg phosphorylation, oxidation via NAD, FAD, ETS 8. Allow conversion to glycerol and fatty acids and lipids Allow conversion to amino acids and proteins

Question	Marking guidance	Mark	Comments
06.2	Remove sample for testing 1. For starch: add I₂/KI solution; 2. Blue-black = positive for starch; (Filter remainder to remove starch) Test sample of filtrate with I₂ /KI solution If blue-black, re-filter until turns yellow remove sample from (starch-free) filtrate 3. Test for reducing sugar: Benedict's solution + heat; 4. Orange = positive for reducing sugar; 5. Spin down pellet of precipitate using centrifuge or filter Remove supernatant and add HCl + heat (Cool and) neutralise with alkali (test with indicator paper); 6. Add Benedict's solution + heat turns orange = positive for non-reducing sugar;	6	1. Allow iodine solution 4. Allow red/yellow 6. Only allow mp6 if an attempt to remove reducing sugars has been made

Question	Marking guidance	Mark	Comments
06.3	If glucose concentration is too high, it is lowered by: 1. Pancreas (detects and) releases <u>insulin</u> 2. Insulin combines with cell-surface membrane receptor 3. Glucose channel proteins inserted into membrane causing glucose uptake 4. Enzyme (/ phosphorylase) activated 5. Glucose turns into glycogen / glycogenesis 6. Glucose turns into fatty acids / lipid 7. Glucose used in respiration If glucose concentration is too low, it is raised by: 8. Pancreas (detects and) releases <u>glucagon</u> or Adrenal glands release <u>adrenaline</u> 9. Glucagon/adrenaline combines with cell-surface membrane receptor 10. Activates enzyme (/ adenylate cyclase): ATP turns into cAMP 11. (cAMP) activates (kinase) enzyme: glycogen produces glucose (phosphate) / glycogenolysis 12. Glycerol / fatty acids / AcCoA produces glucose or amino acids produce glucose / gluconeogenesis	6 max	Max 3 marks for lowering glucose concentration Max 3 marks for raising glucose concentration

Question	Marking guidance	Mark	Comments
06	<u>Quality of written communication</u> These are awarded for correct use of scientific terms and the ability to present a clear, logical account. They are not awarded for spelling, punctuation and grammar. <u>2 marks</u> for an answer in which technical terms are used correctly throughout and the accounts are presented clearly and logically. <u>1 mark</u> for an answer in which most technical terms are used correctly and most of the accounts are presented clearly and logically. <u>0 marks</u> for an answer in which few technical terms are used correctly or the accounts are seldom presented clearly and logically.	2	Award mark for overall performance in 06.1, 06.2 and 06.3