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INTERNATIONAL QUALIFICATIONS

INTERNATIONAL A-LEVEL

BIOLOGY (9610)

BL05

Unit 5 Synoptic paper

Mark scheme

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Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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Mark scheme instructions to examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the typical answer or answers which are expected
- extra information to help the examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit.

The extra information in the 'Comments' column is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme. At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for the same mark are indicated by the use of **OR**. Different terms in the mark scheme are shown by a/; eg allow smooth/free movement.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error/contradiction negates each correct response. So, if the number of errors/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (often prefaced by 'Ignore' in the 'Comments' column of the mark scheme) are not penalised.

3.2 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can usually be gained by correct substitution/working and this is shown in the 'Comments' column or by each stage of a longer calculation.

3.3 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.4 Errors carried forward, consequential marking and arithmetic errors

Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation ECF or consequential in the mark scheme.

An arithmetic error should be penalised for one mark only unless otherwise amplified in the mark scheme. Arithmetic errors may arise from a slip in a calculation or from an incorrect transfer of a numerical value from data given in a question.

3.5 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

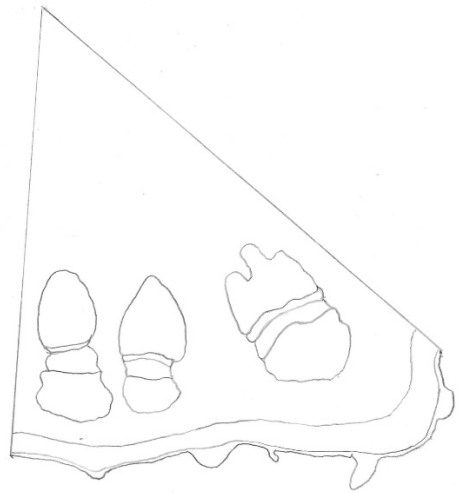
3.6 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.7 Ignore/Insufficient/Do <u>not</u> allow

Ignore or insufficient is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded

Question	Marking guidance	Mark	Comments
01.1	1. Drawing large and clear with smooth lines; 2. Correct shape including three vascular bundles drawn; 3. Correct internal details of tissues; 	**3**	1. Not sketchy / broken lines 2. No individual cells drawn 3. Distinction between xylem, cambium / phloem, fibres, cortex, hypodermis

Question	Marking guidance	Mark	Comments
01.2	6000 = 3 marks;;; 6000 but incorrect order of magnitude eg 600 or 6 = 2 marks;; Correct measurements: X-Y = 131-133 (mm) **and** scale bar = 21-23 (mm) = 1 mark; Correct calculation = 1 mark;	**3**	Allow 3 marks for an answer in the range 5696 to 6333 Allow 2 marks for answer derived correctly from incorrect measurements 1000 × (XY) ÷ Scale bar

Question	Marking guidance	Mark	Comments
01.3	Stem has xylem in separate groups (in a circle or towards the outside) **and** root has xylem in centre;	**1**	

Question	Marking guidance	Mark	Comments
01.4	1. Thick walls (for strength); 2. In separate groups to resist bending (in wind) **OR** Near outer edge to resist bending (in wind);	**2**	1. Allow lignified walls for strength 2. Allow description of strength – eg not easily bent / broken 2. Allow spread out (for separate)

Question	Marking guidance	Mark	Comments
01.5	1. Water enters <u>cells</u> (by osmosis); 2. High to low <u>water potential</u>; 3. Causing volume increase **OR** causing outward pressure **OR** causing pressure increase **OR** causing (high) turgor pressure;	**3**	2. Ignore reference to solute concentration or water concentration

Total		**12**	

Question	Marking guidance	Mark	Comments
02.1	1. Chemicals / CO_2 can penetrate algae (rapidly / easily); 2. Light penetrates / is absorbed (by) algae (rapidly / easily); 3. Algae can flow out of tap (easily); 4. Algae can be killed quickly **OR** photosynthesis / reaction(s) can be stopped quickly; 5. Can extract products from algae easily;	**2**	1. and 2. Allow reaching all parts of the algal cell

Question	Marking guidance	Mark	Comments
02.2	1. Ethanol / heat denatures enzymes / kills algae; **OR** Ethanol stops reactions / photosynthesis (instantly or at given time); 2. Ethanol extracts/dissolves the products of photosynthesis **OR** Ethanol damages cell membrane	**2**	2. Allow ethanol dissolves 'substances'

Question	Marking guidance	Mark	Comments
02.3	1. Reactions are rapid; 2. Need to isolate products in sequence **OR** If longer intervals, may not find earlier / intermediate products **OR** Need short intervals to find earlier / intermediate products **OR** Short intervals show changes in proportions of products with time; 3. Products appearing later are produced further along the metabolic pathway;	**3**	2. Allow need to isolate before converted to other products 3. Allow sequence of production = sequence in metabolic pathway

Question	Marking guidance	Mark	Comments
02.4	1. Mark origin in pencil; 2. Place drop of sample on origin (near one corner); 3. Repeated application of small amounts (+ drying); 4. Place paper in closed vessel containing 1st solvent; 5. Ensure meniscus of solvent is below origin; 6. Allow solvent to move up paper, remove and mark solvent front (in pencil); 7. (Once dry), turn through 90° and repeat with 2nd solvent;	**6 max**	For full marks must have MP7 4. Allow place in (chromatography) tank containing 1st solvent

Question	Marking guidance	Mark	Comments
02.5	^{14}C is in CO_2 so this is source of radioactivity in the compounds;	**1**	Compounds have radioactive carbon/^{14}C (which must come) from the (radioactive) carbon dioxide/$^{14}CO_2$ Do **not** allow ($^{14}CO_2$) carbon dioxide is in the compounds

Question	Marking guidance	Mark	Comments
02.6	1. Repeat chromatography with unknown compound and suspected named compound(s); 2. Both have the same solubility **OR** both have same R_f **OR** both move the same distance;	**2**	1. and 2. Allow Calculate R_f and compare with R_fs of known compounds for **2 marks**

Total		**16**	

Question	Marking guidance	Mark	Comments
03.1	1. (White blood cells) + fat / lipid / LDL / cholesterol / saturated fat; 2. In wall of artery **OR** below endothelium / epithelium;	**2**	2. Do not allow on the wall of the artery

Question	Marking guidance	Mark	Comments
03.2	Aorta;	**1**	

Question	Marking guidance	Mark	Comments
03.3	Same antigens (on cell surfaces) so no immune response **OR** Same antigens so no antibody production;	**1**	Allow same antigens (on cell surfaces) so no rejection Allow converse for veins from another person e.g. Antigens from another person cause immune response

Question	Marking guidance	Mark	Comments
03.4	1. Allows supply of oxygen **and** glucose (to heart muscles); 2. For (aerobic) respiration / energy release / ATP production (in heart muscles);	**2**	Allow oxygen **and** lipid / fat / fatty acids 2. Do **not** allow energy production 2. Do **not** allow ATP 'for' respiration

Question	Marking guidance	Mark	Comments
03.5	1. (Because reductase (gene) inhibited) less cholesterol produced; 2. (So greater) concentration gradient for uptake of cholesterol from blood plasma; 3. (Because less cholesterol produced) less inhibition of transporter gene **so** more transporter protein and uptake of cholesterol;	**3**	2. Allow (so) cholesterol diffuses into cell from blood plasma

Total		**9**	

Question	Marking guidance	Mark	Comments
04.1	1. Parental genotypes: $Z^{Re}Z^{Br}$ $Z^{Bl}W$ Gametes: Z^{Re} Z^{Br} Z^{Bl} W; 2. Offspring genotypes: $Z^{Re}Z^{Bl}$ $Z^{Re}W$ $Z^{Bl}Z^{Br}$ $Z^{Br}W$ Offspring phenotypes: Red male, Red female, Blue male, Brown female;	**2**	

	Marking guidance	Mark	Comments
04.2	Z^{Re} Z^{Bl};	**1**	Allow 'Re Bl' if given in **04.1**

Question	Marking guidance	Mark	Comments
04.3	Chi-squared / χ^2;	**1**	Ignore chi test

Question	Marking guidance	Mark	Comments
04.4	1. No significant difference between observed and expected because P > 0.05 **OR** No significant difference between observed and expected because P > critical value; 2. Any difference from expected is due to chance; 3. (Therefore) accept null hypothesis;	**3**	1. Do **not** allow 'results' are not significant 2. Allow P = 0.18 > 0.05 that difference is due to chance 2. Do not allow 'results' are due to chance

Question	Marking guidance	Mark	Comments
04.5	1. Cross male and female red pigeons; 2. (Test) cross each red male offspring by mating with brown / blue female; 3. Possible results of (test) cross: if all red then red male in mp2 may be $\mathbf{Z^{Re}\ Z^{Re}}$ / homozygous **and** if some of the other colour then red male in mp2 is heterozygous; 4. If (test) cross gives only red offspring, repeat test cross (with the red male from mp2) several times to confirm; 5. Cross red male from mp2 and red females (several times) to give stock of pure-breeding red pigeons;	**5**	If mp1 is given but mp2 is omitted: 3. Allow cross red male offspring with red female(s) again if any brown/blue (female) offspring, red male parent is heterozygous **and** if only red offspring, red male parent may be homozygous; 4. If cross gives only red offspring, repeat cross several times to confirm; 5. Repeat (several times) to give stock of pure-breeding red pigeons;

Total		**12**	

Question	Marking guidance	Mark	Comments
05.1	Nitrogen; Iron;	**2**	Allow 1 mark for N **and** Fe

Question	Marking guidance	Mark	Comments
05.2	15;	**1**	

Question	Marking guidance	Mark	Comments
05.3	3.75 / 3.8 × 10^6 = 2 marks;; Correct answer in standard form from candidate's incorrect count from Question 05.2 = 2 marks;; Correct answer **not** in standard form = 1 mark; Evidence of 3.75 / 3.8 in any other order of magnitude = 1 mark;	**2**	Evidence of other value from question **05.2** in any other order of magnitude = **1** mark

Question	Marking guidance	Mark	Comments
05.4	Repeat many times / several times / a few times **and** calculate mean;	**1**	If a number – at least twice more

Total		**6**	

Question	Marking guidance	Mark	Comments
06.1	1. Description of negative feedback as departure from norm / set point triggering mechanisms to restore the norm; 2. Via the blood (and tissue fluid) **OR** Via autonomic nervous system; 3. Role of receptors, effectors (/ described); + Any **three** examples from: 4. Blood glucose concentration – role of insulin to lower; 5. Blood glucose concentration – role of glucagon / adrenaline to raise; 6. Blood carbon dioxide concentration – via heart rate / breathing rate + effect of oxyhaemoglobin dissociation;	**6**	2. Accept endocrine / nervous coordination Allow any other valid examples eg 7. Temperature regulation – via the skin: description of vasodilation / vasoconstriction / sweating 8. Blood pH – via lungs / kidneys 9. Blood water potential – via kidney 10. Blood pressure – via carotid (sinus) / aorta

Question	Marking guidance	Mark	Comments
06.2	**For each type of amylase:** 1. Same volume / concentration of starch suspension and same volume / concentration of amylase solution; 2. Add pH buffer solution (for optimum pH); 3. Maintain a suitable range of temperatures with a water bath (at least 5) e.g. between 0 °C and 80 °C; 4. Pre-incubate starch and amylase in separate tubes at T °C; 5. Mix starch and amylase (and return to water bath) at T °C; 6. Remove samples and test at suitable intervals eg every ½ to 2 min with iodine-KI / iodine solution; 7. Record time taken until iodine-KI / iodine stays yellow / brown / non-blue-black; 8. Repetitions and mean (for each T °C); 9. Further repetitions at smaller intervals around T °C for shortest time taken **OR** Plot graph to find optimum T °C;	7	Max 5 marks if only one type of amylase used 1. Ignore 'amount' 7. Allow record time until a negative result (with iodine) 8. At least twice more

Question	Marking guidance	Mark	Comments
06.3	**Direct effects:** 1. Effect on enzyme-catalysed reactions - diurnal changes - seasonal changes; 2. Effect on photosynthesis – as a limiting factor **OR** Effect on respiration; 3. Effect on growth (rate); 4. Effect on reproduction (rate); 5. Effect on water evaporation / transpiration; 6. Effect on water availability from environment; **Indirect effects:** 7. Effect on primary consumers – eg invertebrate herbivores; 8. Effect on plant pathogens – eg bacteria and fungi;	5	Allow descriptions of examples of effects throughout 1. Allow ref. to kinetic energy / molecular speeds / movements / collisions 1. Allow high temp. denatures active site Allow other examples

Question	Marking guidance	Mark	Comments
06	Quality of written communication 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. 2 marks for an answer in which technical terms are used correctly throughout and the accounts are presented clearly and logically. 1 mark for an answer in which most technical terms are used correctly and most of the accounts are presented clearly and logically. 0 marks 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

Total		**20**	