OXFORD
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INTERNATIONAL A-LEVEL

BIOLOGY

BL05 (9610)

Unit 5 Synoptic paper

Mark scheme

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2 2 1 X B L 0 5 / M S

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.

Further copies of this mark scheme are available from oxfordaqaexams.org.uk

Level of response marking instructions

Level of response mark schemes are broken down into levels, each of which has a descriptor. The descriptor for the level shows the average performance for the level. There are marks in each level.

Before you apply the mark scheme to a student's answer read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1 Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer and not look to pick holes in small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level and then use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 content.

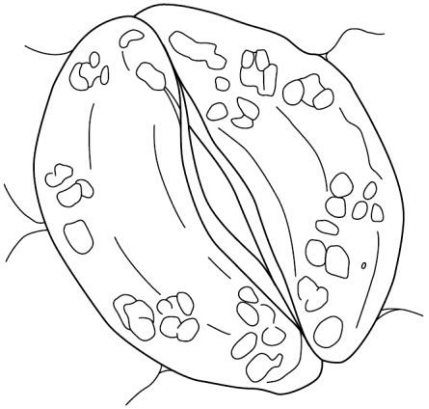
Step 2 Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the Indicative content to reach the highest level of the mark scheme.

An answer which contains nothing of relevance to the question must be awarded no marks.

Question	Marking guidance	Mark	Comments
01.1	Drawing: Large and clear with smooth lines; Shapes correct for guard cells and chloroplasts; Connections to adjacent cells drawn;	3	Not sketchy Example: 

Question	Marking guidance	Mark	Comments
01.2	Scanning electron (microscope);	1	Ignore SEM

Question	Marking guidance	Mark	Comments
01.3	2 250 (times);;;	3	Magnification Fig.1 = $\frac{75\,000}{50}$ = 1 500 $\frac{\text{Guard cell Fig.2}}{\text{Guard cell Fig.1}} = \frac{45}{30} = 1.5$ Magnification Fig.2 = 1 500 × 1.5 = 2 250 Allow 1 mark if all measurement correct: Allow measurements ± 1mm: scale bar 74 to 76mm guard cells 29 to 31mm (Fig.1) and 44 to 46mm (Fig.2) Allow possible range of answers = 2101 to 2411 (times)

Question	Marking guidance	Mark	Comments
01.4	Increase in malate^{2-} occurs before/at the same time as the increase in aperture Increase in K^+ concentration occurs in parallel with increase in aperture;	2	Allow concentration increases described in relation to dark to light transition

Question	Marking guidance	Mark	Comments
01.5	Increased (solute) concentration causes decrease in water potential; Causing water entry by osmosis / diffusion; (So) increased volume/turgor of guard cells **causes** bending due to thicker wall adjacent pore;	3	Allow ψ / ψ_s

Question	Marking guidance	Mark	Comments
01.6	From Fig.3: Malate^{2-} and K^+ concentration increase in guard cell before/as stoma opens (as in Fig.4); From Table 1: Malic acid → (malate^{2-} and) H^+ which leaves the guard cell (as in Fig.4) – hence decrease in pH (in apoplast) (in light); K^+ enters guard cell (as in Fig.4) – hence K^+ decrease in apoplast (in light);	3	

Question	Marking guidance	Mark	Comments
01.7	ABA (is produced in roots in drought and) transported to leaves; ABA causes K+ (and Cl^-) to leave the guard cells; (So) (water is lost from guard cells and) stomata close and less water (vapour) escapes;	3	

Question	Marking guidance	Mark	Comments
02.1	1. Boiling removes oxygen and oil keep out oxygen; 2. Otherwise (some) aerobic respiration would occur **or** to prevent aerobic respiration;	2	1. Ignore references to killing microorganisms 2. Allow to ensure conditions are anaerobic **or** so <u>only</u> anaerobic respiration can occur

Question	Marking guidance	Mark	Comments
02.2	1. Same volume of yeast suspension **and** same volume of glucose solution at each temperature; 2. Same volume of pH buffer 3. Method of maintaining each temperature; 4. Equilibrate yeast and glucose separately at the given temperature before mixing in the flask; 5. Record reading on gas syringe at 0 mins and at 30 min /for 30 min **or** Record volume of gas collected in gas syringe for 30 min 6. Repetitions and calculation of mean volume at each temperature;	5	1. and 2. Ignore 'amounts' 3. eg use of water bath

Question	Marking guidance	Mark	Comments
02.3	1. Line graph or scatter graph; 2. Since investigating relationship between continuous variables;	2	Reject mp2 if incorrect type of graph in mp1

Question	Marking guidance	Mark	Comments
02.4	Repeat at smaller temperature intervals; Around 30 °C or around the optimum;	2	eg every 2 °C / 5 °C

Question	Marking guidance	Mark	Comments
02.5	Anaerobic respiration does not consume any gas / oxygen **or** only gas / CO_2 production; Aerobic respiration consumes and produces the same volumes of gas (of O_2 consumption and CO_2 production) (so no net volume change);	2	Accept explanation from (balanced) chemical equations

Question	Marking guidance	Mark	Comments
03.1	1. Populations are (geographically) isolated (by sea); 2. Different environments **or** different abiotic / biotic factors **or** different selection pressures; 3. Mutations occurred (leading to phenotypic variation); 4. Better adapted survive and reproduce (more than others); 5. (Survivors) pass on (favourable) alleles; 6. (After several / many generations) foxes in the 2 locations are unable to breed with each other to give fertile offspring;	6	1. Allow allopatric speciation **or** no gene flow between populations **or** no gene flow between islands and mainland 2. Accept named examples 4. Allow natural selection occurs 5. Allow beneficial alleles increase in frequency

Question	Marking guidance	Mark	Comments
03.2	Mate foxes from one island with foxes from another island; Produces fertile offspring **or** offspring are able to reproduce;	2	

Question	Marking guidance	Mark	Comments
03.3	Similar environments so similar phenotypes survive;	1	Allow lack of selection pressure Allow foxes move island-to-island and interbreed (so similar genotypes) Allow not separated for long enough

Question	Marking guidance	Mark	Comments
04.1	1. Genetic material = RNA; 2. Capsid/protein coat encloses RNA/genetic material and enzymes; 3. Envelope of (host cell plasma) membrane **or** with lipid envelope (with glycoproteins);	3	Allow points from a labelled diagram 2. Allow reverse transcriptase / integrase / protease

Question	Marking guidance	Mark	Comments
04.2	**Reverse transcriptase inhibitor**: Prevents RNA being transcribed to (single-stranded) DNA; Prevents synthesis of viral proteins; **Protease inhibitor**: Prevents modification / cleavage / hydrolysis of proteins; Prevents synthesis of viral proteins;	3 max	Allow prevents synthesis of viral proteins once only

Question	Marking guidance	Mark	Comments
04.3	Virus mutates and 1st drug can no longer stop virus replication; (But) 2nd drug still works so the mutated virus cannot replicate (to form any more mutant virus particles); Unlikely that 2 mutations will occur in the same virus particle (to nullify the effect of both drugs at the same time);	3	

Question	Marking guidance	Mark	Comments
05.1	An allele expressed (in the phenotype) even in the presence of a second (recessive) allele **OR** Only need one copy of the allele to be expressed (in the phenotype) **OR** The allele that is expressed (in the phenotype) in a heterozygote;	1	Allow idea of if present (in genotype) then always expressed (in phenotype)

Question	Marking guidance	Mark	Comments
05.2	(Parental genotypes and) gametes correct: (**Aa** and **Aa**) **A** + **a** and **A** + **a** ; Offspring genotypes and phenotypes correct: **AA** + **Aa** + **Aa** + **aa** Black Black Black White;	2	

Question	Marking guidance	Mark	Comments
05.3	χ^2 / Chi-squared test;	1	

Question	Marking guidance	Mark	Comments
05.4	1. Since P > 0.05, the <u>difference</u> of the observed result from expected is not significant; 2. The <u>difference</u> from the expected is due to chance **OR** 2. the probability the <u>difference</u> occurred by chance = 0.25 / 25% **OR** 2. we expect results as <u>different</u> as these from the expected in 25% of cases due to chance;	2	Allow the <u>difference</u> of the observed result from the expected is not significant Do not accept the 'results' are due to chance / are not significant

Question	Marking guidance	Mark	Comments
06.1	**ROUTE A:** 1. Restriction endonuclease **or** restriction enzyme; 2. Cuts human DNA at specific base (recognition) sequence; 3. Produces sticky ends / unpaired bases / staggered cut; 4. Use **same** restriction enzyme on plasmid → same sticky ends; **AND** 5. Mix gene with cut plasmid → combine by complementary base-pairing; 6. Add ligase → (covalent) bonding (via phosphodiester links); 7. GM-plasmid mixed with bacteria (+ Ca^{2+} salt) and (some) bacteria take in GM-plasmid; 8. Bacteria replicate → clone of insulin-producing bacteria; 9. Insulin release from bacteria into growth medium and purification;	7 max	**OR ROUTE B:** 1. Reverse transcriptase ; 2. Make (1-stranded) (c-)DNA using insulin mRNA (from pancreas β-cells); 3. Use (DNA)-polymerase to make 2-stranded DNA; 4. Add sticky ends and cut plasmid with restriction enzyme → same sticky ends Allow addition of promoter / terminator base sequences Allow additional details re. identification of GM-bacteria using antibiotic-resistance markers in plasmid **OR** Separate production of A-chain and B-chain of insulin

Question	Marking guidance	Mark	Comments
06.2	1. (No need to slaughter animals to obtain pancreas – so) more ethical for vegetarians / for religious objectors; 2. Produces larger amounts of insulin **or** more quickly; 3. Insulin released by bacteria into growth medium – so easier to extract; 4. (Identical to human insulin –) avoid immune / allergic reaction; 5. Additional detail for example Can modify gene for insulin → different types of human insulin with different properties **OR** avoid possible transfer of disease–causing microorganisms **or** avoid transfer of disease;	5	Accept converse points about insulin from animals 5. Accept examples – eg fast-acting insulin or sustained-effect insulin

Question	Marking guidance	Mark	Comments
06.3	1. Heat DNA to high temperature (95 °C) which denatures the DNA or produces separated 1-stranded DNA; 2. Cool to moderate temperature (55 °C) and mix with primers so primers can bind to DNA; 3. (At 55 °C) primers bind to one end of each single strand by complementary base-pairing (but the 2 DNA strands remain separated); 4. Heat to higher temperature (72 °C) (and add (Taq-)DNA polymerase) Optimum temperature for (Taq-)DNA polymerase; 5. (Polymerase) adds new complementary nucleotides onto the primers → 2-stranded DNA; 6. Repeat cycle several/many times → millions of copies of DNA;	6	

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