OXFORD
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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.

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	Large, clear drawing of cell A with cell and nucleus correct shape; + Any **two** correct labels from: Nucleus Cytoplasm Cell (surface) membrane / plasma membrane;;	3 max	Not sketchy – no broken lines (See Practical Handbook, p.41) Ignore shading of nucleus Allow only labels of visible structures

Question	Marking guidance	Mark	Comments
01.2	(×) 1710;;;	3	Accept 1620 to 1710 Allow max.2 marks for any two from: 1. Magnification = $\frac{\text{Candidate's measurement* in mm} \times 1000}{10.5}$; 2. Correct answer from mp1 – eg 1714.2857...; 3. mp2 corrected to 3 sig. figs. Allow max. 2 marks for wrong order of magnitude **or** for wrong number of sig. figs.

Question	Marking guidance	Mark	Comments
01.3	1. Engulf microorganism/pathogen ; 2. Formation of a phagosome/vesicle around microorganism/pathogen; 3. Role of lysosomes – use of enzymes to digest/hydrolyse/break down microorganism/pathogen within vesicle;	3 max	Allow description Allow named enzyme – eg protease / lysozyme / lipase

Question	Marking guidance	Mark	Comments
01.4	1. Loss of <u>water</u>; 2. By <u>osmosis</u> / <u>diffusion</u>; 3. High to low water <u>potential</u> / $\psi_{cell} > -400$ kPa;	3	 Allow osmotic potential / solute potential / ψ / ψ_s Ignore concentration

Question	Marking guidance	Mark	Comments
01.5	Sensible hypothesis – eg: 1. Most cells may have ψ ~ –400 kPa; 2. (So) water enters and leaves cells at same rate; **OR** 3. May have (slightly) different proteins in cell membrane; 4. Causing greater rigidity / stability of membrane;	2	Mark in pairs 1 and 2 or 3 and 4 1. Allow isotonic/similar/same ψ as salt solution 2. Allow no net movement of water 2. Ignore no osmotic gain and loss Accept quantity or types

Question	Marking guidance	Mark	Comments
02.1	Rate of reaction = $\frac{1}{\text{Time taken}}$ / min^{-1} 0.000 0.050 0.125 0.333 0.125 1. Correct figures; 2. Correct number of decimal places;	2	1. Allow correct figures not to 3 decimal places for mp1 2. Allow only correct figures to 3 decimal places for mp2

Question	Marking guidance	Mark	Comments
02.2	1. Orientation + suitable scales; 2. Axes labelled including units; 3. Plots correct; 4. Line = smooth curve **OR** ruled point-to-point;	4	2. Allow rate / min^{-1} or 1/time / min^{-1} as a minimum + pH 3. ± ½-small square 4. Allow only if best fit through all 5 points 4. Allow reasonable extrapolation

Question	Marking guidance	Mark	Comments
02.3	Error bars plotted correctly on graph ;;	2	All 4 correct = 2 marks (Tolerance ± ½ small square) 2 or 3 correct = 1 mark 0 or 1 correct = 0 marks

Question	Marking guidance	Mark	Comments
02.4	Overlap of standard deviation;	1	Allow overlap of error bars Reject overlap of standard errors

Question	Marking guidance	Mark	Comments
02.5	1. More pHs at closer intervals; 2. Between pH 6 and pH 10 or around pH 8 ; 3. Control the temperature with a water bath; **or** Use of a standard for comparison;	3 max	3. Allow use of colorimeter with photo film method to measure increased absorption due to silver release

Question	Marking guidance	Mark	Comments
03.1	1. Range of concentrations of coffee/caffeine (in drink); 2. Any **two** variables kept constant: age / health / non-smokers gender / blind trial mass / BMI / volume of drink amount of exercise / ethnicity no coffee before / type of coffee;; 3. Record initial resting pulse rates; 4. Record pulse rates at set time after taking drink **OR** record pulse rates at intervals (over set time period) after drinking 5. Control described eg decaffeinated coffee **or** a drink with no caffeine; 6. Large number of people (in each group);	6 max	Allow variable number of caffeine tablets Allow 2 points from list in mp2 for 2 marks Ignore 'size' Allow (caffeine tablet compared with) placebo tablet 6. Allow group size of at least 5 people

Question	Marking guidance	Mark	Comments
03.2	1. Reference to plotting mean values for each group; 2. Plot **either** line graph of pulse rate for range of caffeine values **or** line graph of pulse rate vs time (2 or more lines on 1 graph) **or** bar graph of pulse rate for caffeine group + placebo group; 3. Add error bars to show SD or SE; 4. Reason: **either** line graph because 2 continuous variables **or** bar graph because categoric variables;	4	1. Allow average values for each group Allow bar graph of pulse rate for several caffeine values Allow sketch graph Reason must be appropriate for type of graph

Question	Marking guidance	Mark	Comments
03.3	**Either** SE and 95% confidence limits **or** t-test **or** Spearman-Rank / correlation coefficient; Because investigation involves looking for significant differences (between mean values) **or** Because looking for association/relation/correlation between pulse and amount of caffeine;	2	Statistical test must match method described in Question **03.1** Allow to show any difference is not due to chance (alone) Ignore results are significant **or** results not due to chance

Question	Marking guidance	Mark	Comments
04.1	1. Prevents passage of sodium ions **and** potassium ions; 2. Passage of sodium ions **and** potassium ions at nodes (of Ranvier) / gaps **OR** Depolarisation occurs at the nodes (of Ranvier); 3. Saltatory conduction (/ described) is faster (than in non-myelinated neurones);	3	Allow for 2 marks: sodium and potassium ions can pass through **only** at the nodes / gaps in myelin sheath (mp1 + mp2)

Question	Marking guidance	Mark	Comments
04.2	1. Frequency of babies with Tay-Sachs = q^2 – hence q; 2. p + q = 1 – hence p = 1 – q; 3. Frequency of heterozygotes / carriers = 2pq **OR** 1 in 29 = 1 in $\frac{1}{2pq}$;	3	

Question	Marking guidance	Mark	Comments
04.3	Homozygous recessives are not present in adult population **OR** Homozygous recessives die early so cannot mate **OR** Tay-Sachs is a selective disadvantage;	1	Allow reference to emigration / immigration – eg not just marrying within the community / small community **OR** Non-random mating **OR** Mutations have occurred Allow reference to a pre-requisite for applying the Hardy-Weinberg equation

Question	Marking guidance	Mark	Comments
05.1	Evidence from USA contradicted by evidence from Australia and New Zealand; Other pesticides / another factor could have caused cancer in the USA farm workers;	2	 Allow suitable named factor Allow correlation does not necessarily mean causation

Question	Marking guidance	Mark	Comments
05.2	Same conditions as the other flasks; But no 2,4-D **and** no DHT	2	Allow examples such as temperature / pH / ψ_s Allow add only tissue fluid **and** prostate cancer cells

Question	Marking guidance	Mark	Comments
05.3	Large range of values;	1	

Question	Marking guidance	Mark	Comments
05.4	1. (On its own, 2,4-D does not stimulate multiplication of cells) because (approx.) similar number of cells as the control / 100% of control number; 2. DHT stimulates cell multiplication by up to about 30(%) (at 10^{-8} – 10^{-7} mol dm^{-3}); 3. 2,4-D increases effect of DHT up to about 205(%) **or** up to about 58% increase **or** up to about 100% of the control; 4. Increase occurs at concentration of 2,4-D approx. 10^{-8} – 10^{-7} mol dm^{-3};	3 max	For full marks, must use numerical data Allow as 2,4-D increases number of cells stays (approx.) constant Accept alternative numerical comparisons Allow (about) 75(%) increase Allow concentrations from -9 **or** at -8 **or** -7 $\log_{10}$ mol dm^{-3}

Question	Marking guidance	Mark	Comments
05.5	1. Results in vitro may not be applicable in vivo; 2. Unethical to experiment on humans using 2,4-D; 3. Samples of cells may not indicate effect on whole organ; 4. Effect on cancer cells may not indicate effect on non-cancerous cells;	2 max	Eg exposure concentration in the field or concentration in the body is not the same as in the lab **OR** Cells in the body may act differently from in the lab Allow (many) other factors (affect human body)

Question	Marking guidance	Mark	Comments
06.1	1. Light – used in photosynthesis for photolysis of water **o**r electron excitation **or** making ATP/NADPH; 2. Temperature – affects rates of chemical/enzyme-catalysed reactions or named eg **or** increases kinetic energy **or** high temperature denatures enzymes; 3. Water – support / turgor **or** medium for reactions **or** solvent **or** for transport **or** reactant in photolysis/hydrolysis; 4. Ions – eg Mg^{2+} in chlorophyll / NO_3^- for amino acids/proteins/DNA / HPO_4^{2-} in DNA/RNA/ATP/phospholipids; 5. pH or acid rain– optimum for enzyme action/availability of ions **or** extremes cause enzyme denaturation; 6. Oxygen – aerobic respiration to make ATP or release energy **or** electron acceptor in (aerobic) respiration; 7. Carbon dioxide – combines with RuBP **or** makes GP **or** makes TP in photosynthesis; 8. Heavy metals – inhibition of enzymes;	7 max	Accept other uses – photoperiodism / phototropism Factor + effect for each mark

Question	Marking guidance	Mark	Comments
06.2	1. Suitable experimental set-up or apparatus described including method of varying light intensity – lamp distance/wattage; 2. Control variable – eg temperature **or** CO_2 concentration **or** size of leaf; 3. Method of measuring rate of photosynthesis – eg CO_2 uptake using ^{14}C **or** O_2 release by volume or bubble counting; 4. Repetition **and** mean values at each light intensity **and** compare results / statistical test;	4	1. eg leaf discs above hydrogencarbonate indicator in sealed test tubes 1. Ignore growth 2. Allow age of plants 2. Ignore number of leaves 3. eg colour change in hydrogencarbonate indicator – red to yellow **or** oxygen electrode

Question	Marking guidance	Mark	Comments
06.3	1. Common ancestor colonised both islands which are isolated from each other (by sea); 2. Genetic variability / <u>mutations</u> occur (in each population); 3. Different environment (on the two islands) – eg abiotic factors – light / temperature / water / ions in soil biotic factors – herbivores / competition with other plant species; 4. Some individuals (have beneficial allele(s) and) survive; 5. (Reproduce and) pass on (beneficial) <u>allele</u>(s) to offspring; 6. Over long time period (eg 600 000 years or many generations) leads to more genetic differences / more mutations; 7. Eventually individuals of the two populations cannot produce fertile offspring together (so now two species);	7	1. Allow geographic isolation **or** allopatric (speciation) 3. Allow different selection pressures 4. Allow 'survival of the fittest' / 'natural selection' 5. Ignore pass on beneficial characteristic(s)

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