OXFORD
INTERNATIONAL
AQA EXAMINATIONS

INTERNATIONAL A-LEVEL

BIOLOGY

BL05 (9610)

Unit 5 Synoptic paper

Mark scheme

January 2020

Version: 1.0 Final

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 Assessment Writer.

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.

<table>
<tr><th>Question</th><th>Marking guidance</th><th>Mark</th><th>Comments</th></tr>
<tr><td>01.1</td><td>
<table>
<tr><td>Concentration of sucrose solution / mol dm^{-3}</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Volume of 1.0 mol dm^{-3} sucrose solution / cm^3</td><td></td><td>4</td><td>8</td><td>12</td><td>16</td><td></td></tr>
<tr><td>Volume of water / cm^3</td><td></td><td>16</td><td>12</td><td>8</td><td>4</td><td></td></tr>
</table>
</td><td>2</td><td>Volumes sucrose solution and water all correct = 2 marks

2 or 3 volumes of sucrose solution and water correct = 1 mark</td></tr>
<tr><td>01.2</td><td>242;;</td><td>2</td><td>Correct answer = 2 marks
Allow in range 239 to 244 for 2 marks
Allow 1 mark for 2.42 / 0.242 / 241.8 / 241
Allow 1 mark for <u>0.26</u> x 93 x 1000 but incorrect answer
100</td></tr>
<tr><td>01.3</td><td>Diagram:

Overall shape of cell correct and wall drawn as 2 lines;

Shape of cytoplasm correct;</td><td>2</td><td>

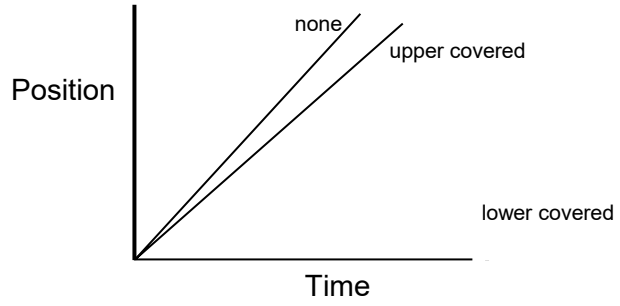
Smooth lines – if sketchy, max 1</td></tr>
</table>

01.4	Volume of vacuole is reduced (so) pigment is more concentrated; Water loss by osmosis / diffusion; High to low water potential / Ψ sucrose soln < Ψ cells;	3	Allow Ψ or Ψs

01.5	– 1030 kPa;	1	

01.6	1. Repeat at closer intervals of sucrose concentration (around Ψs of cells); 2. Count > 20 cells (each time);	2	2. Allow repetition and calculation of mean

Question	Marking guidance	Mark	Comments
02.1	1. Use of tap and syringe to move air bubble to lower end of scale 2. Measure time for progress of air bubble / meniscus up millimetre scale with no petroleum jelly (= rate for both surfaces); 3. Repetitions + mean; 4. To check degree of repeatability / for improved validity / improved reliability; 5. Repeat with petroleum jelly over one surface of leaves (= rate for the uncovered surface); 6. Calculation of rate for covered surface as rate without any jelly – rate with one surface covered; 7. Control of confounding variable – eg temperature / light;	5 max	Either measure time to move set distance **or** distance moved in set time **or** record position at several time intervals Either all leaves with upper surface covered or all leaves with lower surface covered Accept additional covering of both surfaces

02.2	Plot line graph of position of bubble/meniscus against time; Steepest gradient line for leaves with no petroleum jelly **and** **either** gradient for upper surface covered slightly less steep than with no petroleum jelly **or** gradient for lower surface covered much lower; Line graph plotted because the two variables are continuous; OR Plot bar graph of rate for each condition (**or** distance in a set time **or** time to move a set distance); Tallest column for leaves with no petroleum jelly **and** height of column for upper surface covered slightly less tall than with no petroleum jelly **and** height for lower surface covered much less tall; Bar graph plotted because treatments are distinct / categoric variables;	3	Example: 

Question	Marking guidance	Mark	Comments
03.1	Short = **S** Long = **s** Black = **B** White = **b**;	1	Accept any pairs of upper and lower case letters.
03.2	P genotypes: **SSBb** **SsBB**; g: **SB Sb** **SB sB**; Offspring genotypes: **SSBB SsBB SSBb SsBb**;	3	Accept letters corresponding to those defined in 03.1 Allow gametes correct for candidate's P genotypes Allow offspring genotypes correct for candidate's gametes
03.3	χ^2 tests significance of difference between observed and expected; **SE & 95% CL** tests significance of difference between 2 means;	2	
03.4	There is no significant difference between observed and expected **or** Any difference between observed and expected is due to chance;	1	

03.5	Yes, because: 1. With 1 degree of freedom ; 2. Closest to χ^2 = 2.25 is χ^2 = 2.71 for P = 0.10 / P > 0.05 ; **or** χ^2 < critical value of 3.84; 3. So expect this divergence from expected result due to chance **or** So this divergence from expected result is not significant (so accept null hypothesis);	3	

03.6	1. Cross male short black x female long white **and** Cross female short black x male long white; 2. If all offspring are short black, repeat cross several times to confirm and use the short black parents to establish breeding stock; 3. If some of different offspring types (long black &/or short white &/or long white), reject short black parents; 4. Then cross suitable short blacks (SSBB) together to build up stock;	4	

Question	Marking guidance	Mark	Comments
04.1	1. Respiration 2. Of stored food / starch **or** Release of carbon dioxide and water;	2	 Allow carbon dioxide and ethanol if anaerobic respiration Do not allow water if anaerobic respiration If no other marks, allow 1 mark for use of stored food
04.2	19;;	2	Correct answer scores 2 marks Allow in range 17 to 21 Allow 1 mark for appropriate working for tangent drawn on graph eg $\frac{(0.70 - 0.03)}{5 \times 7} \times 1000$ **or** $\frac{670}{5 \times 7}$
04.3	Competition for water / ions (/ named eg) / light;	1	Allow not enough water / ions / light Allow competition for nutrients
04.4	1. Repetition **and** calculate mean; 2. Larger number of barley seeds used each time; 3. Use different relative densities of barley and groundsel seeds;	2 max	Ignore control variables – eg temperature

Question	Marking guidance	Mark	Comments
05.1	Sensible suggestions – eg Gender Body mass (index) Health – eg no other health disorders / no other medication Amount of exercise Diet – amount / types of food eaten Ethnic group	2 max	Allow weight
05.2	Significantly higher blood glucose concentration; Significantly higher insulin concentration; More variable / higher SDs;	2 max	If no other marks awarded, allow max. 1 mark for higher blood glucose **and** higher insulin concentration
05.3	Mean ± SD uses all the measurements / shows spread about the mean / can be used in stats. test; Range = just extreme values – could be anomalous / atypical / non-representative;	2	Allow to show if difference between means is significant

05.4	HbA1c is a long-term measure so shows more typical / mean / average for the person; Blood glucose conc. is a one-off measure (at time of sampling); Blood glucose conc. could be atypical due to eating / fasting / exercise;	3	

05.5	Significant difference between Linagliptin and placebo; > 99.99% certain this is not due to chance;	2	

05.6	At start: 10.7; 24 weeks: 9.6;	2	Allow value in range 10.6 to 10.75 Allow value in range 9.6 to 9.7

05.7	Use other drugs – eg Metformin; or Reduced sugar intake in diet; or Increased exercise;	1	Allow inject insulin

Question	Marking guidance	Mark	Comments
06.1	1. Polymer of amino acids 2. (Amino acids) joined by condensation reaction -COOH to H_2N- / forming peptide bond 3. Primary structure – amino acid sequence 4. Secondary structure - α-helix or β-pleated sheet due to H-bonding (in 'backbone' of chain) –N-H --- O=C- 5. Tertiary structure – complex folding due to R–R interactions eg ionic, sulfhydryl, hydrophobic 6. Quaternary structure – polypeptide–polypeptide interactions 7. Some proteins are globular – eg enzymes, antibodies Some fibrous – eg collagen	6 max	Allow S – S bridge / disulfide bridge Allow more than one polypeptide chain Accept other suitable examples Allow reference to coenzymes / prosthetic groups

06.2	1. Amino acid sequence / primary structure determined by a gene 2. 3 bases code for one amino acid and sequence of triplets codes for amino acid sequence 3. Transcription → (pre-)mRNA via complementary binding of nucleotides (triphosphates) 4. Role of enzyme(s) – eg RNA-polymerase 5. Post-transcriptional modification **or** cutting out of introns / non-coding sequences → functional mRNA 6. mRNA binds to ribosome 7. Role of amino-acyl-tRNAs – via anticodon-codon complementary H-bonding 8. Role of start and stop codons 9. Folding of polypeptide chain – role of chaperone proteins	6 max	Accept ref. to AUG (start) and UAA/UAG (stop)

06.3	1. Structural proteins in tendons (inelastic, fibrous) and ligaments (elastic fibres) in cell membranes (cell surface + membrane-bound organelles) in ribosomes 2. Movement myosin and actin in muscle + in cyclosis within cells spindle fibres (microtubules) in mitosis/meiosis 3. Enzymes specific catalysts for all metabolic reactions 4. Transport across membranes protein channels – aquaporins + ion channels (eg Na+ & K+ in neurones) + co-transport / facilitated diffusion (eg Na+ & glucose) + active transport (eg Na+ activated ATP-ase) 5. Receptors for hormones (eg insulin / glucagon) for neurotransmitters (eg acetylcholine) 6. Defence - antibodies 7. Mass transport - haemoglobin + oxygen 8. Gene expression - repressors, histones 9. Maintenance of Ψs of blood plasma by serum albumins and globulins 10. Hormones – eg insulin	6 max	Allow any correct examples, throughout

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