OXFORD AQA
INTERNATIONAL QUALIFICATIONS

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BIOLOGY (9610)

BL01

Unit 1 The Diversity of Living Organisms

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 oxfordaqa.com

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	(A cell that contains) a single copy of each chromosome/a cell with one set of chromosomes;	1	Allow half the diploid number/half the normal number of chromosomes Allow it is the number in gametes or half the number needed to produce offspring Ignore numbers e.g. 23

Question	Marking guidance	Mark	Comments
01.2	1. 2 chromatids; 2. Joined by a centromere;	2	Allow correctly labelled diagram or description of chromatid

Question	Marking guidance	Mark	Comments
01.3	Chromosomes line up at equator individually rather than as homologous pairs **OR** chromatids separate **OR** centromere splits;	1	

Question	Marking guidance	Mark	Comments
01.4	1. 4 single chromosomes; 2. Each of a different size;	2	Do not accept chromosomes drawn with 2 chromatids

Question	Marking guidance	Mark	Comments
01.5	1. Homologous chromosomes pair up **OR** chromosomes/(non- sister) chromatids twist around each other; 2. Breaking and re-joining of (equal) lengths of chromatid;	2	Allow correctly labelled diagram 1. Allow bivalents form **OR** chiasmata form 2 Allow exchange part of chromatids or DNA/alleles 2. Do not allow exchange genes 2. Ignore new combinations of alleles

Question	Marking guidance	Mark	Comments
01.6	1. DNA/alleles are exchanged; 2. (Each chromosome has a) new combination of alleles/has alleles from both parents;	2	1. Allow genetic material but not genetic information instead of DNA 2. Ignore forms new alleles

Question	Marking guidance	Mark	Comments
01.7	Random fertilisation OR mutation;	1	

Question	Marking guidance	Mark	Comments
02.1	1. **E** – (aerobic) respiration **OR** ATP production; 2. **F** – modifies/transports proteins/lipids/carbohydrates; 3. **G** – store of water/cell sap;	3	1. Allow release of energy 1. Do not allow produces energy 2. Do not allow lysosomes 2. Do not allow makes proteins 3. **G** – allow turgor pressure/support, store of amino acids/ions/sugars/pigments

Question	Marking guidance	Mark	Comments
02.2	133;;	2	Allow ± 0.5mm on each measurement Allow **2 marks** for whole number in range of 128-139 Allow **1 mark** for magnification of x 400 Allow **1 mark** for correct answer but not whole number Allow **1 mark** for 250 × 150 **OR** 37500 **OR** 0.25 x 0.15 **OR** 0.0375 Allow **1 mark** for 1.33×10^{-4}

Question	Marking guidance	Mark	Comments
02.3	1. To calculate a reliable/reproducible/representative <u>mean</u> 2. Reduces the effects of anomalies/outliers;	2	1. Ignore accurate mean 2. To apply a statistical test **OR** to see if there is a significant difference;

Question	Marking guidance	Mark	Comments
02.4	1. Less water lost through transpiration/evaporation in the hottest part of the day; 2. More water available for photosynthesis/for cell shape/turgidity;	2	1. Allow prevent water lost through transpiration/evaporation in the hottest part of the day 2. Allow stomata open at night for gas exchange to occur

Question	Marking guidance	Mark	Comments
02.5	1. Curled leaves; 2. Hairs; 3. Small leaves/spines; 4. Thick waxy cuticle; 5. Sunken stomata; 6. Low water potential in the leaves; 7. Few stomata 8. Swollen/succulent leaves	3 max	Allow C_4 photosynthesis/crassulacean acid metabolism 5. Allow stomatal pits

Question	Marking guidance	Mark	Comments
03.1	1. Same width/diameter/radius/surface area of cylinder; 2. Only through one tissue **OR** through the same part of the carrot;	2	1. Allow the use of one size of cork borer 1. Allow same size/volume 1. Ignore shape

Question	Marking guidance	Mark	Comments
03.2	1. Stop evaporation; 2. So the concentration does not <u>increase</u> **OR** so the water potential does not <u>decrease</u>;	2	1. Allow stop loss of water vapour 2. Ignore concentration or water potential changes

Question	Marking guidance	Mark	Comments
03.3	So there is no further change in length **OR** there is enough change in length to measure;	1	Allow to reach equilibrium or 'time for osmosis to fully/completely occur'

Question	Marking guidance	Mark	Comments
03.4	16.7%;;	2	Allow **one mark** for (35–30)/30 **OR** (5)/30 **OR** 14/14.28/14.3 (divides by 35) **OR** correct answer not to 1 decimal place eg 17/16.66

Question	Marking guidance	Mark	Comments
03.5	1. Carrot cells have the lower <u>water potential</u>; 2. Water enters the cells by osmosis; 3. The cells in the carrot expand;	3	For full marks must mention cells at least once 1. Allow converse 3. Allow cells increase in length/become turgid/increase in size/enlarge

Question	Marking guidance	Mark	Comments
03.6	1. Draw a graph with concentration of salt on the x-axis **and** (percentage) change in length on the y-axis; 2. The point at which the line crosses the x-axis; **OR** 3. Draw a graph with concentration of salt on the x-axis **and** length on the y-axis; 4. The point at which y= 30mm;	2	1.Draw a graph with (percentage) change in length against concentration of salt 2. Allow the point at which the line crosses the (salt) concentration axis (eg if concentration given as y-axis) 4. Allow the point at which the line crosses the (salt) concentration axis (eg if concentration given as y-axis)

<table>
<tr><th>Question</th><th>Marking guidance</th><th>Mark</th><th>Comments</th></tr>
<tr><td>04.1</td><td>
<table>
<tr><th>Group</th><th>Nitrogen</th><th>Carbon</th><th>Oxygen</th><th>Hydrogen</th><th>Sulfur</th></tr>
<tr><td>R</td><td></td><td>✓</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>Amine</td><td>✓</td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>Carboxyl</td><td></td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
</table>
Mark as row.
All 3 correct for 2 marks;;
2 correct for 1 mark;
</td><td>2</td><td></td></tr>
</table>

Question	Marking guidance	Mark	Comments
04.2	1. Hydrogen/H bonds; 2. Between NH/amine group (of one amino acid) and C=O/carbonyl group (of a different amino acid) **OR** Forming β pleated sheets/α helix;	2	1. Allow as a diagram 1. Do not allow ionic / disulfide bridge / peptide bond 2. Do not allow R group

Question	Marking guidance	Mark	Comments
04.3	1. Different sequence of amino acids **OR** Different primary structure; 2. Forms ionic **OR** hydrogen **OR** disulfide **OR** hydrophobic bonds in different places **OR** bonds between different R groups;	2	2. Do not allow peptide bonds

Question	Marking guidance	Mark	Comments
04.4	153;	1	Allow answer that also includes start/stop codons 156/159

Question	Marking guidance	Mark	Comments
04.5	Disulfide (bridges/bond);	1	

Question	Marking guidance	Mark	Comments
04.6	1. Quaternary; 2. More than one polypeptide;	2	Do not allow primary/secondary/tertiary 2. Allow two polypeptide chains

Question	Marking guidance	Mark	Comments
04.7	1. Chaperone proteins assist in the folding (of polypeptides); 2. The polypeptide folds into the secondary/tertiary structure **OR** (Chaperone proteins) prevent incorrect hydrophobic interactions occurring;	2	2. Allow forms alpha-helix or beta-pleated sheets for secondary structure 2. Allow (enables) correct named interactions

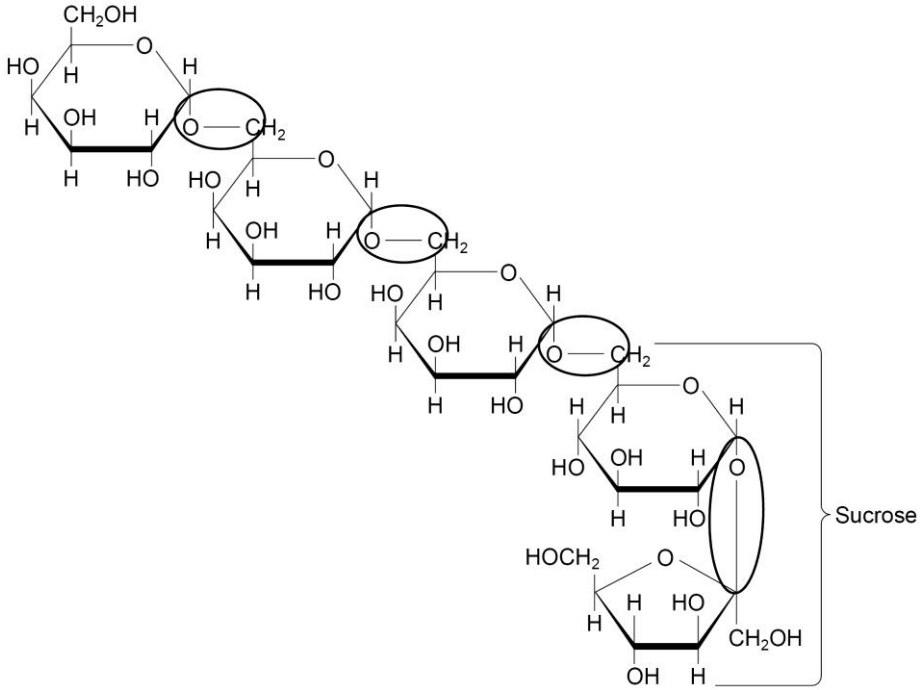
Question	Marking guidance	Mark	Comments
04.8	1. pH; 2. Temperature; 3. No inhibitors present; 4. Presence of same concentration of chaperone proteins/enzymes involved in folding; 5. Same concentration of insulin; 6. Same osmotic/water potential;	3 max	Ignore same volume of zinc ions 4. Ignore same amount of chaperone/enzymes 5. Ignore same amount/volume of insulin

Question	Marking guidance	Mark	Comments
04.9	(Different tertiary structure/3D shape therefore) channel wrong shape/charge to allow passage of substances;	1	Ignore channel no longer complementary without reference to reduced passage of substance Do not allow active site is wrong shape

Question	Marking guidance	Mark	Comments
05.1	Other reducing sugars (present);	1	Allow named reducing sugar (present)

Question	Marking guidance	Mark	Comments
05.2	Glucose and fructose joined by a glycosidic bond;	1	Allow α–1,2 glucosyl fructose

Question	Marking guidance	Mark	Comments
05.3	1. (A reaction that) joins (two) molecules together **OR** formation of a bond between (two) molecules; 2. (A molecule of) water is produced;	2	1. Ignore glycosidic bond 1. Ignore references to glucose, galactose or fructose

Question	Marking guidance	Mark	Comments
05.4	Appropriate bond circled;  	1	Allow any glycosidic bond

Question	Marking guidance	Mark	Comments
05.5	Alpha/α (glucose);	1	Allow fructose or galactose

Question	Marking guidance	Mark	Comments
05.6	1. Different bonds/substrates; 2. Different complementary active site shapes needed **OR** Different active sites needed to form E-S complexes; **OR** Different active sites needed to bind substrates;	2	1. Allow two named examples e.g. glucose-galactose bond and glucose-fructose bond and galactose-galactose bond Allow one part of the substrate 'fits' the active site of enzyme 1 and a different part 'fits' the active site of enzyme 2 for **two marks**

Question	Marking guidance	Mark	Comments
05.7	It is made up of many (similar) molecules/monomers/subunits (bonded together);	1	

Question	Marking guidance	Mark	Comments
05.8	1. Heat/boil with acid and then add alkali or to neutralise; 2. Heat/boil with Benedict's (solution); 3. Red precipitate/colour;	3	1. Allow named examples, eg HCl, $NaHCO_3$ 2. Allow use of enzyme for hydrolysis 2. Only allow mp2 if mp1 attempted 3. Allow other colours eg orange/brown/green

Question	Marking guidance	Mark	Comments
05.9	$C_{36}H_{62}O_{31}$;;	2	$C_6H_{12}O_6 \times 6$ / $C_{36}H_{72}O_{36}$ for one mark Allow 1 error in $C_{36}H_{62}O_{31}$ for one mark

Question	Marking guidance	Mark	Comments
06.1	Any **two** from: cilia, nucleus, mitochondria, lysosomes;	1	Do not allow cytoplasm or cell-surface membrane or ribosomes

Question	Marking guidance	Mark	Comments
06.2	Any **two** from: may not contain vacuole; (cellulose) cell wall; Chloroplasts; starch grains;	2	Allow contains cilia Allow contains lysosomes Allow are unicellular, not multicellular Do not allow cell-surface membrane, cytoplasm, nucleus, mitochondria

Question	Marking guidance	Mark	Comments
06.3	The complete set/all of the genes/DNA/genetic material/chromosomes in a cell/organism;	1	

Question	Marking guidance	Mark	Comments
06.4	(They) contain uracil (not thymine);	1	Allow U (and not T)

Question	Marking guidance	Mark	Comments
06.5	1. Three nucleotides/bases on tRNA; 2. Complementary to a codon on mRNA;	2	

Question	Marking guidance	Mark	Comments
06.6	AUU, AUC, ACU;	1	Allow any order

Question	Marking guidance	Mark	Comments
06.7	(UGA is a stop codon) therefore more than one would stop translation early **OR** result in shortened polypeptides;	1	Ignore so that translation stops at the end of the gene Allow so that translation only stops at the end of the gene

Question	Marking guidance	Mark	Comments
06.8	(The genetic code is) universal;	1	Allow description e.g. same code is used in all organisms