AS
BIOLOGY
7401/1

Paper 1

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 aqa.org.uk

Mark scheme instructions to examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for 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 or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

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.

<table>
<tr><th>Question</th><th>Marking Guidance</th><th>Mark</th><th>Comments</th></tr>
<tr><td>01.1</td><td><table><tr><th>Letter</th><th>Statement</th></tr><tr><td>B;</td><td>is a monomer in an enzyme’s active site</td></tr><tr><td>D;</td><td>is a monomer in cellulose</td></tr><tr><td>C;</td><td>is produced during photosynthesis and respiration</td></tr><tr><td>B;</td><td>forms a polymer that gives a positive result with a biuret test</td></tr></table></td><td>4</td><td>Must be in correct order</td></tr>
<tr><td>01.2</td><td>C = 18, H = 32, O = 16;</td><td>1</td><td>Accept only these answers</td></tr>
<tr><td>01.3</td><td>1. Heat with acid and neutralise;
2. Heat with Benedict's (solution);
3. Red precipitate/colour;</td><td>3</td><td>Accept boil/water bath for heat

Accept named alkali for neutralise

1. Accept named examples, eg HCl, $NaHCO_3$

3. Accept other colours eg orange/ brown/green</td></tr>
<tr><td>TOTAL</td><td></td><td>8</td><td></td></tr>
</table>

Question	Marking Guidance	Mark	Comments
02.1	1. Bilayer **OR** Water is present inside and outside a cell; 2. Hydrophobic (fatty acid) tails point away/are repelled from water **OR** Hydrophilic (phosphate) heads point to/are in/are attracted to water;	2	1. Accept annotated diagram for 'bilayer' Accept cytoplasm/tissue fluid for water Accept for two marks, annotated diagram of bilayer with water labelled on each side Ignore hydrophilic/phosphate heads protect hydrophobic/fatty acid tails
02.2	1. Condensation (reaction) **OR** Loss of water; 2. Between of glycerol **and** fatty acid;	2	Accept labelled diagram
02.3	1. High (specific) heat capacity; 2. Buffers changes in temperature;	2	2. Accept ideas such as a lot of energy needed/gained to change temperature
TOTAL		**6**	

Question	Marking Guidance	Mark	Comments
03.1	1. Engulfs; 2. Forming vesicle/phagosome **and** fuses with lysosome; 3. Enzymes digest/hydrolyse;	3	1. Accept endocytosis **OR** Description 1. Ignore 'taken in' 3. Accept lysozymes for 'enzymes'
03.2	1. (Cells from) other organisms/transplants; 2. Abnormal/cancer/tumour (cells); 3. (Cells) infected by virus;	2 max	Accept 'own cells' if autoimmune response suggested Accept APCs Accept non-self
03.3	'X' written at either or both ends of Y shape;	1	
03.4	Joins two (different) <u>polypeptides</u>;	1	Accept holds/attaches Accept 'prevents polypeptide chains separating'
TOTAL		**7**	

Question	Marking Guidance	Mark	Comments
04.1	1. DNA in nucleus is code (for protein); 2. Ribosomes/rough endoplasmic reticulum produce (protein); 3. Mitochondria produce ATP (for protein synthesis); 4 Golgi apparatus package/modify; **OR** Carbohydrate added/glycoprotein produced by Golgi apparatus; 5 Vesicles transport **OR** Rough endoplasmic reticulum transports; 6. (Vesicles) fuse with cell(-surface) membrane;	4 max	2. and 5. Accept rER for 'rough endoplasmic reticulum' 4. Accept body for 'apparatus' 6. Accept exocytosis at cell membrane
04.2	A section/slice (so nucleus in another part of cell) **OR** (Nucleus) not stained;	1	
04.3	**S** = Vacuole **T** = Chloroplast;	1	Reject thylakoid/granum Reject incorrect spelling
04.4	High**er** resolution **OR** View internal structures;	1	

04.5	Correct answer of 4.71 x 10^7 for **2 marks**;; Accept for 1 mark Any answer showing conversion factor of 100 000 000 / 10^8 **OR** Correct answer for any number divided by 150 eg 70.65 ÷ 150 / 0.471 **OR** Any answer including digits 471 in this order, irrespective of position of decimal place	2	
TOTAL		**9**	

Question	Marking Guidance	Mark	Comments
05.1	1. Diaphragm (muscle) contracts **and** external intercostal muscles contract; 2. (Causes volume increase and) pressure decrease; 3. Air moves down a pressure gradient **OR** Air enters from higher atmospheric pressure;	3	1. Ignore ribs move up and out 3. Ignore along
05.2	K = Bronchiole **and** L = artery/arteriole/vein/venule;	1	Reject capillary Ignore pulmonary
05.3	1. This/animal/lung tissue does not contain starch; 2. (Makes) nucleus visible; **OR** Nucleus contains DNA;	2	1. Accept cell(s) for 'tissue'
05.4	**In support** 1. (Link/risk with asthma and) living with cat or dog is (statistically) significant; 2. (Link with) obesity is most/highly significant; **Not supported** 3. (Link/risk with asthma and) burned wood (indoors) is not (statistically) significant;	3	Reject 'results are significant' Accept 'due to chance' for 'not significant' and converse
TOTAL		**9**	

Question	Marking Guidance	Mark	Comments
06.1	1. (Free RNA) nucleotides form complementary base pairs; 2. Phosphodiester bonds form; 3. By (action of) RNA polymerase;	3	1. Accept A-U, G-C **OR** combination of those pairs 2. Accept linkages for 'bonds'
06.2	Base/nucleotide/triplet sequence coding for polypeptide/sequence of amino acids/primary structure;	1	
06.3	Serine Alanine Glycine Proline;	1	Must be in this order Accept Ser Ala Gly Pro / S A G P
06.4	Mark as pairs. 1 and 2 **or** 3 and 4. (No) 1. G to C (in the second codon/for Glycine) **OR** CGT to CCT (in second codon/for Glycine); 2. (So), substitution (not addition mutation); **OR** 3. (If addition) frameshift / all triplets moved; 4. (So), affects more than one amino acid;	2	2. Reject if substitution of Glycine (for Alanine)
TOTAL		**7**	

Question	Marking Guidance	Mark	Comments
07.1	1. Replication of (circular) DNA; 2. Replication of plasmids; 3. Division of cytoplasm (to produce daughter cells);	3	1. Accept nucleoid 1. Reject chromosome 1. Reject mitosis 3. Ignore genetically identical
07.2	6.8×10^{-13};	1	
07.3	Correct answer of 660 = **2 marks**;; Accept for 1 mark, 18 (fg minute^{-1}) **OR** 0.30 (fg s^{-1}) **OR** Correct use of interpolation lines	2	
07.4	Principle of marking pairs: Named environmental variable; Correct effect on growth rate; Examples 1. Increased (concentration of) glucose; 2. Increased respiration; 3. Increased (concentration of) oxygen; 4. Increased respiration; 5. Increased temperature; 6. Increased enzyme activity; 7. Increased (concentration of) phosphate; 8. Increased ATP/DNA/RNA; 9. Increased (concentration of) nucleotides; 10. Increased DNA synthesis;	4 max	
TOTAL		**10**	

Question	Marking Guidance	Mark	Comments
08.1	**Histogram** 1. Linear scale for y axis; 2. Linear scale for x axis; 3. Correct bar widths **and** touching; 4. All bar heights plotted accurately; **OR** **Bar chart** accept for 3 marks, 5. Linear scale for y axis; 6. Labelled bars of equal width **and** not touching; 7. All bar heights plotted accurately; **OR** **Graph** accept for 2 marks, 8. Linear scale for y axis; 9. All co-ordinates plotted accurately for frequency density;	4	Reject answers where data for frequency density and birth mass not used
08.2	Correct answer for **2 marks** = 20 000;; Accept for 1 mark, rearranged equation (eg number of babies = frequency density × range of mass)	2	
08.3	1. Survival increases as the birth mass increases; 2. Survival decreases with smoking; 3. Effect of smoking (on number) similar at all birth masses;	3	
TOTAL		**9**	

Question	Marking Guidance	Mark	Comments
09.1	1. Expression of gene from different species; 2. (So) a new/one more protein (in set/range of proteins);	2	
09.2	1. More/increased aquaporin/channel protein (made) 2. Increased (water) permeability;	2	
09.3	**Advantage** 1. More carbon dioxide uptake; 2. More photosynthesis so faster/more growth; **Disadvantage** 3. More water loss/transpiration 4. Less photosynthesis so slower/less growth;	4	3. Accept plant wilts for 'more water loss' 4. Accept reduced metabolic/chemical reactions
09.4	Correct answer for 2 marks = x20;; Accept for 1 mark, any correct simplification of a correct ratio eg 6 : 150 = 1 : 25	2	
TOTAL		**10**	