AS BIOLOGY (7401/2)

Paper 2

Mark scheme v1.1

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 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 not 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	1. Push hard – spread/squash tissue; 2. Not push sideways – avoid rolling cells together/breaking chromosomes;	2	Neutral – to see cells clearly
01.2	No (no mark) Yes (no mark) 1. Chromosomes/chromatids are (in two groups) at poles of spindle/at ends of spindle; 2. V-shape shows that (sister) chromatids have been pulled apart at their centromeres/that centromeres of (sister) chromatids have been pulled apart;	2	1. Do not accept 'ends of cell'
01.3	28.8 / 29;	2	If incorrect, allow: $\frac{6}{200} \times 960 = 1$ mark

Question	Marking Guidance	Mark	Comments
02.1	0.22;	1	
02.2	1. Uptake in flask **G** much greater than in flask **F**; 2. Showing use of ATP in flask **G**; 3. Sodium ion concentration in flask **G** falls to zero; 4. Showing uptake against a concentration gradient;	4	
02.3	1. (Uptake of sodium ions occurring by) <u>facilitated</u> diffusion; 2. Equilibrium reached/sodium ion concentrations in solution and in cells the same;	2	

Question	Marking Guidance	Mark	Comments
03.1	Translation;	1	
03.2	Transfer RNA/tRNA;	1	
03.3	TAC; UAC;	2	
03.4	Have different R group;	1	Accept in diagram
03.5	1. Substitution would result in CCA/CCC/CCU; 2. (All) code for same amino acid/proline; 3. Deletion would cause frame shift/change in all following codons/change next codon from UAC to ACC;	3	

Question	Marking Guidance	Mark	Comments
04.1	1. Contraction of internal intercostal muscles; 2. Relaxation of diaphragm muscles/of external intercostal muscles; 3. Causes decrease in volume of chest/thoracic cavity; 4. Air pushed down pressure gradient;	4	
04.2	Accept answer given in range of 78–81(%);	1	
04.3	1. Muscle walls of bronchi/bronchioles contract; 2. Walls of bronchi/bronchioles secrete more mucus; 3. Diameter of airways reduced; 4. (Therefore) flow of air reduced;	4	

Question	Marking Guidance	Mark	Comments
05.1	**Two** suitable suggestions; Eg 1. (Are mammals so) likely to have same physiology/reactions as humans; 2. Small enough to keep in laboratory / produce enough milk to extract; 3. (Can use a) large number;	2 max	Ignore references to ethical issues
05.2	1. Hydrolysis of lipids produces fatty acids; 2. Which lower pH of mixture;	2	
05.3	1. (Bile-activated lipase/it) increases growth rate (of kittens); 2. Results for formula with lipase not (significantly) different from breast milk/are (significantly) different from formula milk alone; 3. Showing addition of (bile-activated) lipase is the likely cause (of increased growth); 4. Lipase increases rate of digestion of lipids/absorption of fatty acids;	3 max	

Question	Marking Guidance	Mark	Comments
06.1	4;	1	
06.2	2.68(6);	2	If answer incorrect: $\Sigma n(n-1) = 242$ = 1 mark $N(N-1) = 650$ = 1 mark
06.3	1. Take more samples and find mean; 2. Method for randomised samples described;	2	Allow larger area = 1 mark

Question	Marking Guidance	Mark	Comments
07.1	(No – no mark) Graph/bar chart only shows number of species, not the name of the species;	1	
07.2	(No – no mark) 1. Mutations are spontaneous/random; 2. Only the rate of mutation is affected by environment; 3. Different species do not interbreed/do not produce fertile offspring; 4. So mutation/gene/allele cannot be passed from one species to another;	4	Ignore references to correlation does not prove causation
07.3	1. Initially one/few insects with favourable mutation/allele; 2. Individuals with (favourable) mutation/allele will have more offspring; 3. Takes many generations for (favourable) mutation/allele to become the most common allele (of this gene);	3	

Question	Marking Guidance	Mark	Comments
08.1	1. Antibody has tertiary structure; 2. Complementary to binding site on protein;	2	
08.2	1. Prevents false negative results; 2. (Since) shows antibody **A** has moved up strip/has not bound to any *Plasmodium* protein;	2	
08.3	1. Person is infected with *Plasmodium*/has malaria; 2. Infected with (*Plasmodium*) *vivax*; 3. Coloured dye where antibody **C** present; 4. That only binds to protein from *vivax*/no reaction with antibody for *falciparum*;	4	Person is infected with *P. vivax*/ *Plasmodium vivax* = 2 marks (MP1 and MP2)

Question	Marking Guidance	Mark	Comments
09.1	1. Water potential becomes lower/becomes more negative (as sugar enters phloem); 2. Water enters phloem by osmosis; 3. Increased volume (of water) causes increased pressure;	3	
09.2	1. Rate of photosynthesis related to rate of sucrose production; 2. Rate of translocation higher when sucrose concentration is higher;	2	
09.3	1. Rate of translocation does not fall to zero / translocation still occurs after 120 minutes; 2. But sucrose no longer able to enter cytoplasm of phloem cells;	2	

Question	Marking Guidance	Mark	Comments
10.1	1. Vaccine contains antigen from pathogen; 2. Macrophage presents antigen on its surface; 3. T cell with complementary receptor protein binds to antigen; 4. T cell stimulates B cell; 5. (With) complementary antibody on its surface; 6. B cell secretes large amounts of antibody; 7. B cell divides to form clone all secreting/producing same antibody;	5 max	
10.2	1. Active involves memory cells, passive does not; 2. Active involves production of antibody by plasma cells/memory cells; 3. Passive involves antibody introduced into body from outside/named source; 4. Active long term, because antibody produced in response to antigen; 5. Passive short term, because antibody (given) is broken down; 6. Active (can) take time to develop/work, passive fast acting;	5 max	



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