AQA Qualifications

AS

Biology

Paper 2

Mark scheme

7401/2
Specimen Paper (set 2)

Version 1.0

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

Important - please note

This mark scheme has not been through the full standardisation process. As such, many of the phases described above have not been completed. The Instructions for examiners are also included as a guide to how the mark scheme will function as an operational document. The layout has been kept consistent so that future operational mark schemes do not appear different to the specimen materials.

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

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.

A bold **and** is used to indicate that both parts of the answer are required to award the mark.

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

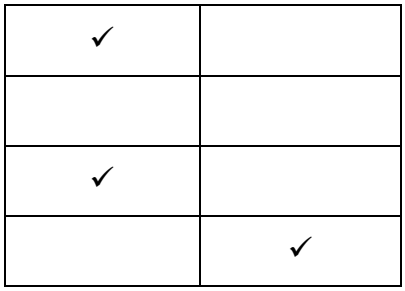
(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

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	Lactase hydrolyses lactose in to glucose (and galactose);	1	
01.2	No lactase in the milk **OR** Enzyme can be reused;	1	
01.3	100 cm^3 $minute^{-1}$ is too fast to bind to active site/converse for 50 cm^3 $minute^{-1}$;	1	
01.4	14.1(4);	1	
01.5	1. Galactose is a competitive inhibitor/attaches to the active site (of lactase); 2. Fewer enzyme substrate complexes formed;	2	

Question	Marking Guidance	Mark	Comments
02.1	× 20 000	1	Accept range from 18 000 to 22 000
02.2		2	1 mark for each correct column
02.3	1. DNA contains thymine **and** RNA contains uracil; 2. DNA contains deoxyribose **and** RNA contains ribose;	2	

Question	Marking Guidance	Mark	Comments
03.1	Student was measuring change in pH **OR** Buffer would maintain a constant pH;	1 max	
03.2	1. Volume of suspension of lipids; 2. Concentration of suspension of lipids; 3. Volume of lipase solution; 4. Temperature;	2 max	
03.3	Boiled lipase solution;	1	
03.4	–0.34 = 2 marks 0.34 = 1 mark	2	
03.5	1. Fatty acids produced; 2. Curve levels off as all substrate used up;	2	2. accept the lower pH inactivates/ denatures the enzyme
03.6	1. Faster fall in pH **and** levels off at same point; 2. More enzyme=substrate complexes formed; 3. Same amount of fatty acids produced/product;	3	

Question	Marking Guidance	Mark	Comments
04.1	1. DNA of eukaryotic cell has non-coding regions/introns within gene **OR** pre-mRNA contains non-coding regions/introns; 2. (After transcription/during modification) these regions are removed from (pre-)mRNA;	2	Ignore references to 'cells need/bacteria do not need' 1. Allow converse: (But) a prokaryotic cell does not have non-coding regions/introns in DNA;
04.2	1. mRNA longer **OR** Has more nucleotides than tRNA; 2. mRNA is a straight molecule but tRNA is a folded molecule/clover-leaf shaped molecule; 3. mRNA contains no paired bases/hydrogen bonds but tRNA has some paired bases/hydrogen bonds;	2 max	

Question	Marking Guidance	Mark	Comments
05.1	1. Elastic tissue to allow stretching/recoil/ smoothes out flow of blood/maintains pressure; 2. (Elastic tissue) stretches when ventricles contract **OR** Recoils when ventricle relaxes; 3. Muscle for contraction/vasoconstriction; 4. Thick wall withstands pressure OR stop bursting; 5. Smooth endothelium reduces friction; 6. Aortic valve/semi-lunar valve prevents backflow;	4 max	
05.2	1. Curve to the right so <u>lower</u> affinity/% saturation (of haemoglobin); 2. Haemoglobin unloads/dissociates <u>more</u> readily; 3. <u>More</u> oxygen to cells/tissues/muscles; 4. For greater/more/faster respiration;	4	4. Idea of a higher rate of respiration
05.3	16.5–18 (cm^3 $minute^{-1}$);;	2	Allow 1 mark if heart rate wrongly calculated but then multiplied by 0.03

Question	Marking Guidance	Mark	Comments
06.1	1. Between 0 and 0.1 calcium (ions) cannot enter by facilitated diffusion **OR** No diffusion gradient for entry into the cell; 2. Between 0.1 and 0.3 calcium (ions) enter by facilitated diffusion; 3. As calcium (ions) enter without oxygen **OR** Oxygen is not required for facilitated diffusion; 4. Between 0 and 0.1 calcium (ions) enter by active transport; 5. Movement is against the concentration gradient; 6. As calcium (ions) only enter in presence of oxygen/oxygen is required for active transport;	5 max	Accept 'they' refers to calcium ions
06.2	(She could have used) boiled (and cooled) water **OR** Layer of oil in top of solution;	1	

Question	Marking Guidance	Mark	Comments
07.1	Glucose (and glucose);	1	
07.2	(α1,4) Glycosidic;	1	
07.3	1. Headings correct – mol dm^{-3} **and** volume of water / cm^3; 2. Concentration correct. ie 0.2;	2	
07.4	Line of best fit drawn; Read off value at 0.45;	2	

<table>
<tr><th>Question</th><th>Marking Guidance</th><th>Mark</th><th>Comments</th></tr>
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<tr><td>08.2</td><td>2.45;;</td><td>2</td><td>Use of the correct denominator = 1 mark</td></tr>
<tr><td>08.3</td><td>1. More plant species;
2. More food sources/variety of food;
3. More habitats/niches;</td><td>3</td><td>Allow converse for barley field
3. More food = neutral</td></tr>
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Question	Marking Guidance	Mark	Comments
09.1	Binary fission;	1	Reject mitosis
09.2	1. Keep lid on Petri dish **OR** Open lid of Petri dish as little as possible; 2. To prevent unwanted bacteria contaminating the dish **OR** *L. monocytogenes* may be dangerous/may get out; **OR** 3. Wear gloves **OR** Wear mask **OR** Wash hands; 4. To prevent contamination from bacteria on hands/mouth **OR** Prevent spread of bacteria outside the lab; **OR** 5. Use sterile pipette **OR** Flame the loop **OR** Flame the neck of the container of the culture; 6. To maintain a pure culture of bacteria;	4 max	
09.3	Cinnamon;	1	

09.4	1. Thyme is the most effective/best (at 4 °C); 2. Clove and cinnamon same effectiveness at 4 °C as 35 °C (so suitable); 3. Bay and nutmeg are less effective at 4 °C than 35 °C (so unsuitable);	3	
09.5	Less kinetic energy **OR** Less movement of oil molecules/of phospholipid molecules;	1 max	

Question	Marking Guidance	Mark	Comments
10.1	(During prophase) 1. Chromosomes coil/condense/shorten/thicken/become visible; 2. (Chromosomes) appear as (two sister) chromatids joined at the centromere; (During metaphase) 3. Chromosomes line up on the equator/centre of the cell; 4. (Chromosomes) attached to spindle fibres; 5. By their centromere; (During anaphase) 6. The centromere splits/divides; 7. (Sister) chromatids/chromosomes are pulled to opposite poles/ends of the cell/separate; (During telophase) 8. Chromatids/chromosomes uncoil/unwind/become longer/thinner;	5 max	No marks for naming the stages Reject references to homologous chromosomes / pairing of chromosomes Ignore references to spindle formation during prophase
10.2	1. Homologous chromosomes pair up; 2. Independent segregation; 3. Maternal and paternal chromosomes are re-shuffled in any combination; 4. Crossing over leads to exchange of parts of (non-sister) chromatids/alleles between homologous chromosomes; 5. (Both) create new combinations of alleles;	5	