AS
Biology
7401/1

PAPER 1

Mark scheme

June 2017

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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, in which all associates participate, 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' answers. 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.

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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 that 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 must 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. This will be indicated in the 'Comments' column.

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	8;	1	Accept eight
01.2	Phosphodiester (bond);	1	Accept phonetic spellings
01.3	1. DNA helicase – (unwinding DNA and) breaking hydrogen bonds / bonds between chains / bases / strands; 2. DNA polymerase – joins (adjacent) nucleotides OR forms phosphodiester bond / sugar-phosphate backbone;	2	1. Accept H bonds. 1. Accept hydrolyses for breaks 2. Reject forms hydrogen bonds (between nucleotides / bases)
01.4	1. ATP has ribose **and** DNA nucleotide has deoxyribose; 2. ATP has 3 phosphate (groups) **and** DNA nucleotide has 1 phosphate (group); 3. ATP- base always <u>adenine</u> **and** in DNA nucleotide base can be different / varies;	2 max	Both parts of each MP needed 3.Reject Uracil / U 3. Accept C, T or G for different bases Accept annotated diagram for any of the three marks

Question	Marking guidance	Mark	Comments
02.1	1. So no contamination/ other bacteria; 2. So same number of bacteria transferred **<u>to</u>** allow comparison;	2	1. Accept sterilisation / kills all (bacteria) 2. Allow amount / concentration for number
02.2	6 000 000 OR 6×10^{6};;	2	1 mark for 3 000 000 OR 3×10^{6} Allow 1 mark for 600 (in $1cm^{3}$ of diluted culture)
02.3	1. (Several) values between 10 and 15 (units); 2. Repetitions of each;	2	1. Accept descriptions of this Ignore repeat the investigation / repeat at 10 and 15 units.

Question	Marking guidance	Mark	Comments
03.1	Diffusion	1	Automarker
03.2	1. **Droplets** increase surface areas (for lipase / enzyme action); 2. (So) faster hydrolysis / digestion (of triglycerides / lipids); 3. **Micelles** carry fatty acids and glycerol / monoglycerides to / through membrane / to (intestinal epithelial) cell;	3	1. Context is important 1. Reject micelles increase surface area 2. Ignore 'breakdown' 3.Ignore 'small enough' 3. Accept description of membrane 3. Reject any movement through membrane proteins
03.3	1. Golgi (apparatus); 2. Modifies / processes triglycerides; 3. Combines triglycerides with proteins; 4. Packaged for release / exocytosis OR Forms vesicles;	4	Ignore 'processes and packages' unqualified 2. Reject synthesises triglycerides 3. Accept 'forms / are lipoproteins'

<table>
<tr><th>Question</th><th>Marking guidance</th><th>Mark</th><th>Comments</th></tr>
<tr><td>04.1</td><td><table><tr><td></td><td>open</td><td>closed</td></tr><tr><td>Semi-lunar valves</td><td>2</td><td>3</td></tr><tr><td>Atrioventricular valves</td><td>4</td><td>1</td></tr></table></td><td>2</td><td>One mark for each correct column
General marker</td></tr>
<tr><td>04.2</td><td>(Acceptable range is) 6315.79 to 6400;;</td><td>2</td><td>Allow one mark for
(SV = 120 – 40 =) 80 (cm^3)
OR
(1 cycle = 1.24 – 0.48 =) 0.76 (s)
OR
79 / 80 (beats $minute^{-1}$)</td></tr>
<tr><td>04.3</td><td>1. Contraction of ventricle(s) produces high blood / hydrostatic pressure;
2. (This) forces water (and some dissolved substances) out (of blood capillaries);</td><td>2</td><td>1. Do not accept contraction/pumping of the heart
2. Reject blood / plasma / tissue fluid forced out</td></tr>
<tr><td>04.4</td><td>Excess tissue fluid cannot be (re)absorbed / builds up;</td><td>1</td><td>The idea of excess is important
Accept ‘drained’ for absorbed</td></tr>
</table>

Question	Marking guidance	Mark	Comments
05.1	Biuret;	1	Ignore any other detail Accept • Copper sulfate and sodium hydroxide • $CuSO_4$ + NaOH • Alkaline copper sulfate • Copper sulphate and sodium hydroxide • Alkaline copper sulphate • Biurette • Buiret • Biruet • Bieuret Reject burette or Beirut
05.2	Draw around $H_2N - \underset{\displaystyle H}{\underset{\vert}{C}} - COOH$;	1	
05.3	Nitrogen;	1	Ignore N
05.4	Choice: (Student's) *t*-test; Reason for choice: Looking for differences between two means; Explanation: Difference is significant / not due to chance because the P value is 0.04 / is less than 0.05;	3	Reason: Allow comparing contrasting two means Explanation: Assume 'it' means difference Explanation: Reject result / data is significant / not due to chance Explanation: do not accept P value is less than 0.04

Question	Marking guidance	Mark	Comments
06.1	D;	1	Automarked
06.2	1. Homologous chromosomes (pair); 2. One of each (pair) goes to each (daughter) cell / to opposite poles;	2	Ignore descriptions of the second division of meiosis.
06.3	6;	1	
06.4	1. Homologous pairs of chromosomes associate / form a bivalent; 2. Chiasma(ta) form; 3. (Equal) lengths of (non-sister) chromatids / alleles are exchanged; 4. Producing new combinations of alleles;	4	1. Accept descriptions of homologous pairs 2. Accept descriptions of chiasma(ta) e.g chromatids / chromosomes entangle / twist 2. Neutral Crossing / cross over 3. Reject genes are exchanged 3. Accept lengths of DNA are exchanged 4. Do not accept references to new combinations of genes unless qualified by alleles

<table>
<tr><th>Question</th><th>Marking guidance</th><th>Mark</th><th>Comments</th></tr>
<tr><td>07.1</td><td>1. Macerate / homogenise / blend / break tissues / cells (in solution);
2. Centrifuge;
3. At different / increasing speeds until chloroplast fraction obtained;</td><td>3</td><td>1. Accept any suitable method to break tissues / cells / release organelles
2. and 3. Allow ‘perform differential centrifugation until chloroplasts obtained.’ for 2 marks</td></tr>
<tr><td>07.2</td><td><table><tr><th>Feature</th><th>Mitochondrion</th><th>Chloroplast</th></tr><tr><td>Double outer membrane</td><td>✓</td><td>✓</td></tr><tr><td>Starch grains</td><td></td><td>✓</td></tr><tr><td>Diffusion of oxygen into the organelle</td><td>✓</td><td></td></tr></table></td><td>3</td><td>1 mark for each correct row
Crosses = blank space</td></tr>
<tr><td>07.3</td><td>The site of aerobic respiration (reactions)
OR
ATP is made / ADP is phosphorylated;</td><td>1</td><td>Reject ‘energy is produced’</td></tr>
<tr><td>07.4</td><td>1. Training made no difference to number (of mitochondria per μm^2);
2. Training led to an increase in the area (of inner mitochondrial membrane);</td><td>2</td><td>1. Accept Figure 7 as mean number of mitochondria per μm^2
2. Accept Figure 8 as area of inner mitochondrial membrane</td></tr>
</table>

Question	Marking guidance	Mark	Comments
08.1	Accept any three suitable properties e.g.: • Is a metabolite • Is a solvent • Has a (relatively) **high** heat capacity • Has a (relatively) **large** latent heat of vaporisation / evaporation • Has cohesion / hydrogen bonds between molecules;;;	3 max	No explanations are needed However do not accept 'polar' unqualified
08.2	Dilution series;	1	Accept serial dilution
08.3	1. Axes correct way round with linear scales; 2. Axes labelled with mol dm^{-3} and ratio without units; 3. Correct values correctly plotted and suitable curve drawn;	3	3. Accept point to point or smooth curve but no extrapolation **NFP** – 3. Graph starts just below 1.4 and finishes just above 0.7 and looks right.
08.4	1. (0.8 mol dm^{-3} sucrose) solution has a more negative / lower water potential than potato (cytoplasm); OR potato (cytoplasm) has a less negative / higher water potential than (0.8 mol dm^{-3} sucrose) solution; 2. (therefore) water moves out (of potato) into the (sucrose) solution by osmosis (so cells decrease in mass);	2	1. Accept sucrose solution is hypertonic / potato cytoplasm is hypotonic 2. Accept water moves **down** a water potential gradient

Question	Marking guidance	Mark	Comments
09.1	1. Species = (A group of) organisms that are able to produce fertile offspring; 2. Species richness = the number of (different) species in a community;	2	2. Accept in a habitat / ecosystem / area 2. Reject in a population 2. Ignore 'types' unqualified
09.2	5;	1	
09.3	1. Number of individuals of each species not known; 2. **Almost** all (of sample A / the 68%) could be of the same species; 3. Two / other samples have a higher number of species / higher species richness but a lower number of individuals / fish; 4. Other samples may have more individuals of each species;	3 max	2. If not stated otherwise, assume MP2 relates to sample A / 68%

Question	Marking guidance	Mark	Comments
10.1	1. Person (infected with HIV) has HIV DNA (in their DNA); 2. New HIV (particles) still made; 3. (AZT) inhibits reverse transcriptase; 4. (AZT) stops these (new HIV particles) from forming new HIV DNA; OR Slows / stops replication of HIV; 5. Stops destruction of more / newly infected T cells; 6. So immune system continues to work (and AIDS does not develop);	4 max	4. Context is important 4. Allow slows / stops (re)production of HIV 4. Reject (AZT) prevents DNA replication
10.2	1. Slows / stops the development of AIDS; 2. Because HIV **resistant to AZT** is damaged / destroyed / prevented from replicating (by other drugs); OR 3. AZT continues to work as a drug; 4. Because HAART prevents the spread of AZT-resistant HIV to rest of the human population; OR 5. No new HIV particles made; 6. Because HAART might interfere with viral protein synthesis;	4 max	Mark in pairs. Do not mix and match. 2. Neutral HIV killed 2. Accept other drugs prevent HIV resistant to AZT from infecting new / more cells 6. Accept blocks transcription / translation / synthesis of lipid envelope / aspect of viral structure
10.3	1. (Fewer mitochondria so) less (aerobic) respiration; 2. (Muscles receive) less ATP (so waste);	2	1. Ignore no respiration 2. Reject less energy produced 2. Ignore no ATP is made