AS
BIOLOGY
7401/2

Paper 2

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.

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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 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.

Question	Marking Guidance	Mark	Comments
01.1	1. Select at random; 2. Large sample/number (of snails)/>10;	2	1. Accept description of random technique 2. Ignore 'many'
01.2	Mean **and** standard deviation;	1	Accept **2** correct statistical values for 1 mark Accept any order Accept average for mean Accept standard error for standard deviation Accept interquartile range
01.3	(*Littorina* -) genus **and** (*littorea* -) species;	1	Accept phonetic spelling Accept genera
01.4	1. No (significant) difference between (mean) height (in these populations); 2. (Students) t-test;	2	Accept suitable null hypothesis
TOTAL		**6**	

Question	Marking Guidance	Mark	Comments
02.1	1. Condensation (reaction)/loss of water; 2. (Between) phosphate **and** deoxyribose; 3. (Catalysed by) DNA polymerase;	2 max	3. Reject if DNA polymerase joins AT/GC OR complementary nucleotides/bases OR forms hydrogen bonds
02.2	Correct answer for 2 marks = 70;; Accept for 1 mark, A = 42 **and** T = 42 **OR** 420 (total bases in gene) **OR** 210 (bases in template strand)	2	
02.3	Histone;	1	
02.4	1. DNA helicase; 2. Breaks hydrogen bonds between base pairs/ AT and GC/complementary bases OR Breaks hydrogen bonds between <u>polynucleotide</u> strands;	2	2. Reject <u>hydrolysis</u> of hydrogen bonds
TOTAL		**7**	

Question	Marking Guidance	Mark	Comments
03.1	1. Muscle contracts; 2. Constricts/narrows arteriole/lumen;	2	2. Accept decreases for constricts/narrows 2. Accept vasoconstriction for 1 mark
03.2	(Ventricles and arteries) 1. Ventricle (muscles) relaxed **OR** Arteries recoiled; 2. No (blood) backflow (into ventricles) **OR** No blood movement to/in/from arteries; (Atria and ventricles) 3. Atria (muscle) contracted; 4. Blood movement from atria (into ventricles);	4	Accept references to ventricle, artery or atrium (singular) 1. Accept no muscle activity **OR** Diastole **OR** Arteries smoothing blood flow 2. and 4. Accept flow/pumped for movement
03.3	Vena cava;	1	
03.4	2 marks for correct answer = 130 (beats min^{-1});; 1 mark for correct stroke volume = 104	2	
TOTAL		**9**	

Question	Marking Guidance	Mark	Comments
04.1	Measure temperature (in tube) at intervals **and** use appropriate corrective measure (if temperature has fluctuated);	1	Accept use thermometer/probe/ equivalent device for measure temperature
04.2	1. Length **and** diameter **OR** Surface area **OR** Volume **OR** Mass/weight (of cylinders); 2. Time in solution;	2	1. Ignore shape/size 2. Ignore 'time' if unqualified
04.3	1. 1; 2. Use instrument with closer/finer/smaller intervals/graduations/scale;	2	2. Accept correct numerical figure, eg <2 (cm^3) 2. Ignore 'higher resolution'
04.4	1. Water/25°C caused no damage/no pigment release (in E); 2. (Damage to) cell(-surface) membrane; 3. Ethanol/acid caused some/similar/identical damage **OR** 70°C caused most damage; 4. (By) ethanol dissolving phospholipid bilayer **OR** (By acid) altering membrane protein; 5. (By) 70°C denaturing/altering membrane protein **OR** (By) 70°C increasing fluidity/permeability of membrane;	4 max	1. Accept no colour/intensity change for 'pigment' Accept 'high temperature' for 70°C 1. and 3. Accept description of 'pigment release' for 'damage' 2. Accept description of membrane, eg phospholipid bilayer/bilayer 4. and 5. Accept carrier OR channel OR intrinsic OR extrinsic protein for membrane protein 5. Ignore reference to enzymes unless qualified as membrane bound

TOTAL		**9**	

Question	Marking Guidance	Mark	Comments
05.1	1. Starch (solution) in first column; 2. Headings for starch concentration/solution **and** time for (starch) hydrolysis/digestion with mg dm-3 **and** minutes/mins/min/m/seconds/s;	2	Ignore columns with replicates/ mean Ignore lines 2. Accept brackets for solidus 2. Ignore reference to enzyme 2. Reject graph
05.2	1. As starch concentration increases, time to hydrolyse/digest starch increases;	1	Accept converse
05.3	1. Inhibitor similar shape to substrate; 2. Fits/binds to active site; 3. Prevents/reduces <u>enzyme-substrate</u> complex forming;	3	1. Reject same shape 1. Accept 'complementary to active site'
05.4	1. Less hydrolysis of starch; 2. (To) maltose; 3. (So) less absorption (of glucose) **OR** (So) more egested (starch/carbohydrate);	3	1. Accept no hydrolysis 3. Accept description of egestion, eg lost in faeces
TOTAL		**9**	

<table>
<tr><th>Question</th><th>Marking Guidance</th><th>Mark</th><th>Comments</th></tr>
<tr><td>06.1</td><td>Correct answer of 960 to 1025 (mg) for 2 marks;;
Accept for 1 mark,
m = 4.18 to 5.00</td><td>2</td><td></td></tr>
<tr><td>06.2</td><td>Mark each column;;
<table><tr><th>Number of chromosomes</th><th>Mass of DNA / arbitrary units</th></tr><tr><td></td><td>50</td></tr><tr><td>80</td><td></td></tr><tr><td>40</td><td>12.5</td></tr></table></td><td>2</td><td></td></tr>
<tr><td>06.3</td><td>Independent segregation
OR
Crossing over;</td><td>1</td><td>Accept labelled diagram
Accept (eggs produced) have different combinations of maternal and paternal chromosomes</td></tr>
<tr><td>06.4</td><td>120;</td><td>1</td><td></td></tr>
<tr><td>06.5</td><td>1. Too many/extra set/three copies of chromosomes;
2. (Homologous) chromosomes do not pair
OR
(Homologous) chromosomes do not separate (evenly);
3. (So) no meiosis;</td><td>2 max</td><td>1. Accept 1 paternal, 2 maternal
2. Accept divide for separate</td></tr>
<tr><td>TOTAL</td><td></td><td>8</td><td></td></tr>
</table>

Question	Marking Guidance	Mark	Comments
07.1	1. Less/no antibody produced; 2. (Because HIV) destroys helper T cells; 3. (So) few/no B cells activated / stimulated **OR** (So) few/no B cells undergo mitosis/differentiate/form plasma cells;	3	2. Accept 'reduces number' for 'destroys'
07.2	**Not effective in treating AIDS because** 1. Number of T cells < 200 at 4 <u>months</u>; 2. (So) drug is not effective **OR** AIDS symptoms occur; 3. Does not remove (all) HIV (particles) **OR** Number of HIV (fairly) constant/stable **OR** (Slight) increase in HIV (over 16 months); 4. No stats test; 5. Only shows (results over) 16 months; 6. Only one person; 7. Unknown side effects (of drug); 8. No control group; **Effective in treating AIDS because** 9. Number of T cells > 200 after 5 <u>months</u> **OR** Number of T cells increasing after 4 <u>months</u>; 10. So drug is effective **OR** AIDS symptoms relieved/removed;	5 max	Max 4 if not one of 9. or 10. 1 Accept 3.5 - 5 months 1. and 9. Reject day/week only once 9. Accept any month after 5 months OR 'in the long term'
TOTAL		**8**	

Question	Marking Guidance	Mark	Comments
08.1	Correct answer for 2 marks = 14/14.02/14.024;; Accept for 1 mark, mean = 8.2 **OR** uncertainty = 1.15	2	
08.2	1. Sucrose actively transported (into phloem); 2. Lowering/reducing water potential **OR** More negative water potential; 3. Water moves (into phloem) by osmosis (from xylem);	3	
08.3	Phloem pressure falls as (rate of) water movement (in xylem) increases **OR** Inversely proportional;	1	Accept converse
08.4	1. High (rate of) transpiration/evaporation; 2. Water lost through stomata **OR** (High) tension in xylem; 3. (Causes) less water movement from xylem to phloem **OR** Insufficient water potential in phloem to draw water from xylem;	3	
TOTAL		**9**	

Question	Marking Guidance	Mark	Comments
09.1	1. Micelles contain bile salts and fatty acids/monoglycerides; 2. Make fatty acids/monoglycerides (more) soluble (in water) **OR** Bring/release/carry fatty acids/monoglycerides to cell/lining (of the iluem) **OR** Maintain high(er) concentration of fatty acids/monoglycerides to cell/lining (of the ileum); 3. Fatty acids/monoglycerides absorbed by <u>diffusion</u>; 4. Triglycerides (re)formed (in cells); 5. Vesicles move to cell membrane;	5	1. Ignore other correct components of micelles 2. Accept lipid/fat for fatty acid/ monoglyceride 3. Reject if absorbed by facilitated diffusion 3. Ignore if micelles themselves are being absorbed 4. Accept chylomicrons form 5. Accept exocytosis for 'vesicles move'
09.2	1. Structure is determmined by (relative) position of amino acid/R group/interactions; 2. Primary structure is sequence/order of amino acids; 3. Secondary structure formed by hydrogen bonding (between amino acids); 4. Tertiary structure formed by interactions (between R groups); 5. Creates active site in enzymes **OR** Creates complementary/specific shapes in antibodies/carrier proteins/receptor (molecules); 6. Quaternary structure contains >1 polypeptide chain **OR** Quaternary structure formed by interactions/bonds between polypeptides;	5 max	3. Accept alpha helix/β-pleated sheet for 'secondary structure' 1., 4. and 6. Accept for 'intereactions', hydrogen bonds/ disulfide bridges/ionic bonds/hydrophobic-hydrophilic interactions 6. Accept prosthetic (group)
TOTAL		**10**	