2012 Biotechnology

Intermediate 2

Finalised Marking Instructions

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GENERAL MARKING ADVICE: BIOTECHNOLOGY

The marking schemes are written to assist in determining the 'minimal acceptable answer' rather than listing every possible correct and incorrect answer. The following notes are offered to support Markers in making judgements on candidates' evidence, and apply to marking both end of unit assessments and course assessments.

1. There are no **half marks**. Where three answers are needed for two marks, normally one or two correct answers gain one mark.

2. In the mark scheme, if a word is **underlined** then it is essential; if a word is (**bracketed**) then it is not essential.

3. In the mark scheme, words separated by / are **alternatives**.

4. There are occasions where the second answer negates the first and no marks are given. There is no hard and fast rule here, and professional judgement must be applied. Good marking schemes should cover these eventualities.

5. Where questions on data are in two parts, if the second part of the question is correct in relation to an incorrect answer given in the first part, then the mark can often be given. The general rule is that candidates should not be penalised repeatedly.

6. If a numerical answer is required and units are not given in the stem of the question or in the answer space, candidates must supply the units to gain the mark. If units are required on more than one occasion, candidates should not be penalised repeatedly.

7. Clear indication of understanding is required, so:

   - if a description or explanation is asked for, a one word answer is not acceptable
   - if the questions ask for **letters** and the candidate gives words and they are correct, then give the mark
   - if the question asks for a word to be **underlined** and the candidate circles the word, then give the mark
   - if the result of a calculation is in the space provided and not entered into a table and is clearly the answer, then give the mark
   - **chemical formulae** are acceptable eg CO_2, H_2O
   - contractions used in the Arrangements document eg DNA, ATP are acceptable
   - words not required in the syllabus can still be given credit if used appropriately eg metaphase of meiosis.

8. Incorrect **spelling** is given. Sound out the word(s):

   - if the correct item is recognisable then give the mark
   - if the word can easily be confused with another biological term then **do not** give the mark eg ureter and urethra
   - if the word is a mixture of other biological words then **do not** give the mark, eg mellum, melebrum, amniosynthesis.

9. **Presentation of Data:**

- if a candidate provides two graphs or bar charts (eg one in the question and another at the end of the booklet), mark both and give the higher score
- if the question asks for a line graph and a histogram or bar chart is given, then do not give the mark(s). Credit can be given for labelling the axes correctly, plotting the points, joining the points either with straight lines or curves (best fit is rarely used)
- if the *x* and *y* data are transposed, then do not give the mark
- if the graph uses less than 50% of the axes, then do not give the mark
- if 0 is plotted when no data is given, then do not give the mark (ie candidates should only plot the data given)
- no distinction is made between bar charts and histograms for marking purposes (For information: bar charts should be used to show discontinuous features, have descriptions on the *x* axis and have separate columns; histograms should be used to show continuous features; have ranges of numbers on the *x* axis and have contiguous columns)
- where data is read off a graph it is often good practice to allow for acceptable minor error. An answer may be given 7.3 $\pm$ 0.1.

10. **Extended response questions:** if a candidate gives two answers where there is a choice, mark both and give the higher score.

11. **Annotating scripts:**

- put a 0 in the box if no marks awarded – a mark is required in each box
- indicate on the scripts why marks were given for part of a question worth 3 or 2 marks. A ✓or x near answers will do.

12. **Totalling scripts:** errors in totalling can be more significant than errors in marking:

- enter a correct and carefully checked total for each candidate
- do not use running totals as these have repeatedly been shown to lead to more errors.

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Marking scheme

Section A

1.	B	14.	D
2.	A	15.	B
3.	D	16.	C
4.	B	17.	A
5.	B	18.	D
6.	C	19.	D
7.	C	20.	C
8.	D	21.	D
9.	B	22.	C
10.	A	23.	A
11.	C	24.	C
12.	A	25.	B
13.	B		

Section B

<table>
<tr><th>Question</th><th>Acceptable Answer</th><th>Mark</th><th>Unacceptable Answer</th><th>Negates</th></tr>
<tr><td>1 (a)</td><td>D C A E B

5 correct = 2 marks
4/3/2 correct = 1 mark</td><td>2</td><td></td><td></td></tr>
<tr><td>(b)</td><td><table><tr><th></th><th>Bacteria</th><th>Viruses</th></tr><tr><td>Cytoplasm</td><td>YES</td><td>NO</td></tr><tr><td>Cell wall</td><td>YES</td><td>NO</td></tr><tr><td>DNA</td><td>YES</td><td>YES</td></tr><tr><td>Protein coat</td><td>NO</td><td>YES</td></tr><tr><td>Cell membrane</td><td>YES</td><td>NO</td></tr></table>
4 correct rows = 2 marks
3/2 correct rows = 1 mark</td><td>2</td><td></td><td></td></tr>
<tr><td>(c)</td><td>200 bacterium : 1 virus</td><td>1</td><td></td><td></td></tr>
</table>

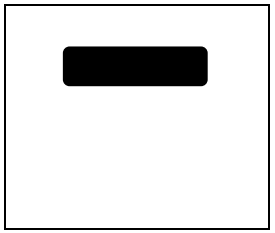
<table>
<tr><th colspan="3">Question</th><th>Acceptable Answer</th><th>Mark</th><th>Unacceptable Answer</th><th>Negates</th></tr>
<tr><td colspan="3">(d)</td><td>
<table>
<tr><th>Statement</th><th>True</th><th>False</th><th>Correction</th></tr>
<tr><td>Asexual reproduction in bacteria results in non-identical cells.</td><td></td><td>✓</td><td>identical</td></tr>
<tr><td>Bacteria reproduce by binary fission</td><td>✓</td><td></td><td></td></tr>
<tr><td>Asexual reproduction leads to a slow increase in number of bacteria.</td><td></td><td>✓</td><td>rapid/fast/ quick</td></tr>
</table>
</td><td>3</td><td>not bigger number</td><td></td></tr>
<tr><td>2</td><td>(a)</td><td>(i)</td><td>Area less than that in 20°C dish/no growth (with arrow)</td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Denatured/denaturation</td><td>1</td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td>Area/size of inoculum OR type/volume/depth of agar OR pH of agar</td><td>2</td><td></td><td></td></tr>
<tr><td></td><td>(c)</td><td></td><td>Growth may not be regular OR growth could include height/ depth as well as area OR growth thinner/uneven/less dense</td><td>1</td><td></td><td></td></tr>
<tr><td></td><td>(d)</td><td></td><td>Repeat experiment OR more agar plates at these temperatures</td><td>1</td><td></td><td></td></tr>
</table>

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
3 (a)	<table><tr><td>*State of agar*</td><td>*Temperature(ºC)*</td></tr><tr><td>***Melting/Liquid***</td><td>95</td></tr><tr><td>Pouring</td><td>***50 - 55***</td></tr><tr><td>***Setting/Solid***</td><td>42</td></tr></table> 3 correct = 2 marks 2/1 correct = 1 mark	**2**		
(b) (i)	D B A C E	**1**		
(ii)	Feature: Uncontaminated/flat or smooth surface/no condensation Use aseptic technique when pouring or example of this Make sure that work surface is flat OR agar at correct temperature for pouring Store agar place at correct temperature/at room temperature	**1**		
(c)	Provide an updraught/air current	**1**		
	For sterilising tops of bottles/equipment	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
4 (a)	40mm	**1**		
(b)	More cells seen	**1**		
(c)	<table><tr><th>Eyepiece lens</th><th>Objective lens</th><th>Total magnification</th></tr><tr><td>(X) 10</td><td>X 4</td><td>(X) 40</td></tr><tr><td>(X) 10</td><td>(X) 10</td><td>(X) 100</td></tr><tr><td>(X) 10</td><td>(X) 40</td><td>(X) 400</td></tr></table> 1 mark per column	**3**		
(d)	Advantage – cells attach to slide OR allows cells to take up stain more easily	**1**		
	Disadvantage – kills cells	**1**		
5 (a) (i)	20%	**1**		
(ii)	*Lactobacillus*			
	Lower (final) pH value of grass/more rapid drop in pH/	**1**	comparison needed	
(iii)	Amount/volume/mass of grass OR species of grass OR volume of bag OR volume/concentration/number of bacteria added OR temperature	**2**		
(b)	Create anaerobic conditions OR remove/reduce amount of air/oxygen	**1**		
(c)	(Lactic) <u>acid</u>	**1**		
(d)	(Winter) feeding of livestock/cattle	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
6 (a)	*Penicillium* or other appropriate name	**1**		
(b)	Fermenters can also be set up for continuous flow processing, which involves { a closed / **an open** } system.			
	Continuous flow can use { **immobilised** / Denatured } cells which			
	will make the separation of { cells / **Products** } easier.	**2**		
(c)	pH/temperature/oxygen	**2**		
(d) (i)	Pass through the (acidic) stomach/digestive system when entering human body	**1**		
(ii)	Narrow spectrum act on a narrow range of/few species of bacteria	**1**		
	Broad spectrum act on a wide range of/many species of bacteria	**1**		
(e)	To inhibit the growth of other/competing micro-organisms OR to reduce competition	**1**	to kill micro-organisms	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
7 (a) (i)	Enzymes	**1**		
(ii)	Glucose/sugar	**1**		
(iii)	*Saccharomyces/yeast*	**1**		
(b)	Distillation	**1**		
(c) (i)	Photosynthesis	**1**		
(ii)	Wood (chip) (waste)	**1**		
(iii)	Less pollution/uses up waste/renewable	**1**		
(d)	Genetic modification involves transferring a desirable { protein / **gene** } from one organism into the { **chromosome** / capsule } of another organism.	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
8 (a) (i)	<table><tr><th>Variable</th><th>Change (increase/decrease)</th></tr><tr><td>Number of Saccharomyces</td><td>increase</td></tr><tr><td>Starch concentration</td><td>decrease</td></tr><tr><td>Carbon dioxide concentration</td><td>increase</td></tr><tr><td>Lactic acid concentration</td><td>increase</td></tr></table> 4 correct = 2 marks 3/2 correct = 1 mark	**2**		
(ii)	Amylase	**1**		
(iii)	Allow production of carbon dioxide OR allow micro-organisms to respire OR 220°C would denature enzymes needed for micro-organisms to respire/make CO_2 OR allows dough to rise	**1**		
(iv)	Respiration/fermentaton	**1**		
(b) (i)	Bacterium/bacteria/bacillus	**1**		
(ii)	*Rectangular shape* 	**1**	NOT spherical/oval/irregular	
(iii)	Preservatives			

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
9 (a)	x-axis scale and y-axis label and scale	**1**		
	Points plotted accurately and joined	**1**		
(b)	Temperature/carbon dioxide (concentration)	**1**		
(c) (i)	Amino acids/proteins/enzymes	**1**		
(ii)	Allows proteins or enzymes or amino acids to be synthesised OR <u>increased</u> growth	**1**		

Section C

1 A

1 Substrate – ethanol/alcohol
2 Micro-organism – bacteria
3 Name of micro-organism – Acetobacter
4 Product – Vinegar/acetic acid/ethanoic acid
5 Used as a preservative
6 Used in flavouring
7 Increases shelf-life of food
8 Removal of (hazardous) waste

Points 1 – 4: maximum of 3 marks
Points 5 – 8: maximum of 3 marks **5**

OR

1 B

1 Biological filters/filtration OR trickle filter/biofiltration
2 Micro-organisms break down/the sewage/organic waste.....
3 .....break down of sewage is aerobic/by aerobic respiration
4 Stones provide surface/attachment for micro-organisms
5 Packing of stones allows air spaces/plenty of air/oxygen
6 Trickling of sewage creates aerobic conditions
7 Rotating arm/spraying mixes sewage with air/oxygen or oxygenates sewage
8 (Aerobic) breakdown of sewage produces harmless waste products

Points 1 – 8: 5 marks **5**

2 A

1 Nucleus present/appropriate labelled diagram
2 Cytoplasm present/appropriate labelled diagram
3 Plasma/cell membrane present/appropriate labelled diagram
4 Vacuole present/appropriate labelled diagram
5 Cell wall present/appropriate labelled diagram
6 Asexual reproduction.....
7 .....by budding
8 Nucleus divides

Points 1 – 5: maximum of 3 marks
Points 6 – 8: maximum of 2 mark **5**

OR

2 B

1 Feeds on dead/dying/decaying (organisms)
2 Saprophyte produces/releases enzymes
3 Enzymes are extra-cellular/external
4 Enzymes digest (dead/dying/decaying organisms)
5 Digested products absorbed
6 Saprophytes obtain energy/raw materials from digested products
7 Energy/raw materials used for growth of saprophytes
8 Environmental benefit – recycling of materials/carbon/nitrogen

Points 1 – 8: maximum of 5 marks **5**

[END OF MARKING INSTRUCTIONS]