



2011 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 CO₂, H₂O
 - 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 ± 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.

2011 Biotechnology Intermediate 2

Marking scheme

Section A

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

Marking Instructions

Biotechnology Intermediate 2

Section B

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
1	(a) Bacterium	1		
	(b) X capsule/slime layer Y cytoplasm	1 1		
	(c) <i>Flagellum</i> Movement <i>DNA</i> Controls cell activities or functions/ stores genetic information	1 1		
	(d) <u>protein coat</u>	1		
2	(a) (i) Prevents transfer of micro-organisms from hands to cultures OR stops contamination of cultures.	1		
	(ii) Easy to disinfect/sterilise	1		
	(iii) Creates an updraught.	1		
	(b) (i) Steak plating.	1		
	(ii) Separation of the different species OR separation of colonies/production of isolated/single colonies.	1		
	(iii) Pick up sample of bacteria (from broth culture with a loop). Apply (loop to area X) in back and forth/repeated movement.	2		
(c)	<i>Bacillus subtilis</i> rod (shaped)	1		
	<i>Micrococcus luteus</i> round (shaped)	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates										
3 (a) (b) (c) (d) (i) (ii)	Stage 3 Pick up bacteria with loop	1												
	Stage 7 Pass slide (back and forward) through flame	1												
	To make bacteria visible OR to make parts of bacteria more visible OR improves contrast (in slide).	1												
	Vital (stain).	1												
	Letter X	1												
	<table border="1" data-bbox="454 708 1189 1192"> <thead> <tr> <th data-bbox="454 708 792 775"><i>Part of microscope</i></th> <th data-bbox="792 708 1189 775"><i>Function</i></th> </tr> </thead> <tbody> <tr> <td data-bbox="454 775 792 845">Stage/Stage clips</td> <td data-bbox="792 775 1189 845">To hold microscope slide</td> </tr> <tr> <td data-bbox="454 845 792 949">Eyepiece lens</td> <td data-bbox="792 845 1189 949">Magnifying image/ bacteria</td> </tr> <tr> <td data-bbox="454 949 792 1086">Mirror/light source</td> <td data-bbox="792 949 1189 1086">Shine light on stage/ slide/bacteria OR makes stage/slide/bacteria easier to see.</td> </tr> <tr> <td data-bbox="454 1086 792 1192">(Coarse or fine) focus</td> <td data-bbox="792 1086 1189 1192">To change distance between stage and objective lens</td> </tr> </tbody> </table>	<i>Part of microscope</i>			<i>Function</i>	Stage/Stage clips	To hold microscope slide	Eyepiece lens	Magnifying image/ bacteria	Mirror/light source	Shine light on stage/ slide/bacteria OR makes stage/slide/bacteria easier to see.	(Coarse or fine) focus	To change distance between stage and objective lens	
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	4 correct = 2 marks 3/2 correct = 1 mark 1/0 correct = 0 marks	2												

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates	
4	(a) (i)	Chloroplast	1	No carbon dioxide No pollution	
	(ii)	Starch/cellulose.	1		
	(b)	Reduces carbon dioxide/greenhouse gas levels/global warming OR carbon neutral OR renewable OR <u>less</u> pollution.	1		
	(c) (i)	x axis names 1 mark y axis labels and scales 1 mark Blocks plotted accurately 1 mark	3		
	(ii)	24 : 1 algae : soya bean	1		
5	(a) (i)	<i>Glucose</i> Provides a source of energy OR substrate for respiration	1	Provides food.	
		<i>Nitrogen compounds</i> Used for amino acids/proteins (synthesis)/enzymes/DNA/RNA.	1		
	(ii)	(Create) <u>aerobic</u> conditions OR (allow) <u>aerobic</u> respiration.	1		
	(iii)	Optimum/best conditions for <u>enzymes</u> .	1		
		Results in increased growth of fungus OR higher production of SCP.	1		
	(b) (i)	22.5 g	1		
	(ii)	Correct number of segments for each food. Segments correctly labelled with name of foods.	1 1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates															
6 (a) (i) (ii) (iii) (iv) (b)	As glucose concentration decreases, amylase concentration increases.	1																	
	From 5 hours to 10 hours.	1																	
	No glucose/energy available.	1																	
	75%	1																	
	<table border="1" data-bbox="452 571 1162 1018"> <thead> <tr> <th data-bbox="452 571 736 608"><i>Statement</i></th> <th data-bbox="736 571 831 608"><i>True</i></th> <th data-bbox="831 571 943 608"><i>False</i></th> <th data-bbox="943 571 1162 608"><i>Correction</i></th> </tr> </thead> <tbody> <tr> <td data-bbox="452 608 736 711">The enzyme amylase breaks down <u>glucose</u>.</td> <td data-bbox="736 608 831 711"></td> <td data-bbox="831 608 943 711" style="text-align: center;">✓</td> <td data-bbox="943 608 1162 711" style="text-align: center;">starch</td> </tr> <tr> <td data-bbox="452 711 736 812">Enzymes are <u>specific</u> for their substrate.</td> <td data-bbox="736 711 831 812" style="text-align: center;">✓</td> <td data-bbox="831 711 943 812"></td> <td data-bbox="943 711 1162 812"></td> </tr> <tr> <td data-bbox="452 812 736 1018">Saprophytes are micro-organisms which use <u>intracellular</u> enzymes to digest food sources.</td> <td data-bbox="736 812 831 1018"></td> <td data-bbox="831 812 943 1018" style="text-align: center;">✓</td> <td data-bbox="943 812 1162 1018" style="text-align: center;">extracellular</td> </tr> </tbody> </table>	<i>Statement</i>	<i>True</i>	<i>False</i>	<i>Correction</i>	The enzyme amylase breaks down <u>glucose</u> .		✓	starch	Enzymes are <u>specific</u> for their substrate.	✓			Saprophytes are micro-organisms which use <u>intracellular</u> enzymes to digest food sources.		✓	extracellular	3	
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Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
7	<p>(a) Stage 4: Factor VIII is purified/separated/isolated/removed.</p> <p>(b) (i) Plasmid.</p> <p>(ii) <i>E.coli</i>.</p> <p>(iii) Large quantities can be made OR no animal products involved OR no contamination with viruses OR less/no allergic reactions OR unlimited supply.</p> <p>(c) (i) Insulin.</p> <p>(ii) Number of children = 13,650</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>		
8	<p>(a) (Disinfectant could) kill micro-organisms/anaerobic bacteria (in organic waste).</p> <p>Less/no gas would be produced.</p> <p>(b) (i) Animal waste/faeces/dung OR slurry/manure.</p> <p>(ii) Methane.</p> <p>(iii) Heating/fuel/producing electricity etc.</p> <p>(c) Anaerobic respiration takes place when oxygen is { present } releasing { less } energy than aerobic { absent } { more } respiration. Anaerobic respiration in yeast cells produces { ethanol } and carbon dioxide. { lactic acid }</p> <p>3 correct = 2 marks 2/1 correct = 1 mark</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p>		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
9	(a) (i) Beakers: W and Y	1		
	(ii) Prevent micro-organisms/contamination/bacteria in air entering.	1		
	(b)	2		
	(c) (i)	1		
	(ii)	1		
	(d)	2		

<i>Beaker letter</i>	<i>pH at start</i>	<i>pH after 4 hours</i>
W	6	4.5
Y	6	4
X	6	6
Z	6	6

3 correct = 2 marks
2/1 correct = 1 mark

<i>Name of micro-organism</i>	<i>Product</i>	<i>Use of product</i>
Aspergillus (niger)	citric acid	anti-oxidant
<i>Acetobacter</i>	vinegar/ acetic acid	flavour/ preservative

3 correct = 2 marks
2/1 correct = 1 mark

Section C

1. A

- 1 yeast/*Saccharomyces (cervisiae)*
- 2 X is nucleus
- 3 Y is vacuole

- 4 reproduction is asexual
- 5 cells are identical/the same
- 6 budding/bud forms
- 7 description of budding with nuclear division OR labelled diagram
- 8 reproduction is rapid

Points 1 – 3: maximum of 2 marks

Points 4 – 8: maximum of 3 marks

OR

1 B

- 1 Structures are (root) nodules
- 2 Micro-organism is a bacterium/Rhizobium
- 3 Micro-organisms convert nitrogen to nitrates
- 4 process is called nitrogen fixation

- 5 Plant gets/absorbs nitrates (from a bacterium/*Rhizobium*)
- 6 Plants use nitrates to make amino acids/protein/enzymes/DNA/RNA
- 7 Plants can survive in soil with little nitrate/infertile OR in low nutrient/poor soil.

Points 1 – 4: maximum of 3 marks

Points 5 – 7: maximum of 2 marks

2 A

- 1 green crops/grass used
- 2 crops compressed (at start)
- 3 anaerobic/fermentation/oxygen excluded
- 4 (fermentation) increases temperature
- 5 sugar broken down
- 6 *Lactobacillus*/other appropriate bacteria used or use of new technology
e.g. addition of inoculum or sugars
- 7 (lactic) acid produced/pH drop

- 8 (lactic) acid preserves nutritional value of silage
- 9 (lactic) acid prevents putrefaction OR preserves grass

Points 1 – 7: maximum of 4 marks

Points 8 – 9: maximum of 1 mark

OR

2 B

- 1 organisms (chosen) with desired characteristic/appropriate example
- 2 breeding repeated over generations
- 3 more offspring have desired characteristic/enhanced desired characteristics OR reduce undesirable characteristics
- 4 takes long time
- 5 trial and error or variable results

- 6 identifies (location/function of) genes
- 7 increases chance of desired result
- 8 speeds up selective breeding/increases success rate

Points 1 – 5: maximum of 4 marks

Points 6 – 8: maximum of 2 marks

[END OF MARKING INSTRUCTIONS]