2015 Biotechnology

Intermediate 2

Finalised Marking Instructions

Part One: General Marking Principles for: Biotechnology Intermediate 2

This information is provided to help you understand the general principles you must apply when marking candidate responses to questions in this Paper. These principles must be read in conjunction with the specific Marking Instructions for each question.

(a) Marks for each candidate response must always be assigned in line with these general marking principles and the specific Marking Instructions for the relevant question. If a specific candidate response does not seem to be covered by either the principles or detailed Marking Instructions, and you are uncertain how to assess it, you must seek guidance from your Team Leader/Principal Assessor.

(b) Marking should always be positive ie, marks should be awarded for what is correct and not deducted for errors or omissions.

GENERAL MARKING ADVICE: Biotechnology Intermediate 2

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 question asks 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 words(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.

2015 Biotechnology Intermediate 2

Part Two: Marking Instructions for each Question

Section A

Question	Expected Answer(s)	Max Mark
1.	B	**1**
2.	A	**1**
3.	C	**1**
4.	D	**1**
5.	A	**1**
6.	D	**1**
7.	B	**1**
8.	D	**1**
9.	A	**1**
10.	B	**1**
11.	A	**1**
12.	C	**1**
13.	C	**1**

Question	Expected Answer(s)	Max Mark
14.	B	**1**
15.	B	**1**
16.	D	**1**
17.	A	**1**
18.	B	**1**
19.	C	**1**
20.	C	**1**
21.	A	**1**
22.	D	**1**
23.	C	**1**
24.	D	**1**
25.	B	**1**

Section B

<table>
<tr><th colspan="3">Question</th><th>Expected Answer(s)</th><th>Max Mark</th><th>Additional Guidance</th></tr>
<tr><td>1.</td><td>(a)</td><td>(i)</td><td>1. Protozoa(n) 1
2. Yeast/fungus 1</td><td>2</td><td></td></tr>
<tr><td>1.</td><td>(a)</td><td>(ii)</td><td>M – Controls entry/exit of materials 1
N – Site of chemical reactions 1</td><td>2</td><td></td></tr>
<tr><td>1.</td><td>(b)</td><td></td><td>
<table>
<tr><th>Statement</th><th>True</th><th>False</th><th>Correction</th></tr>
<tr><td>Asexual reproduction in yeast involves <u>budding</u>.</td><td>✓</td><td></td><td></td></tr>
<tr><td><u>Sporangia</u> are involved in asexual reproduction in Mucor.</td><td>✓</td><td></td><td></td></tr>
<tr><td>Sexual reproduction in Mucor involves the fusion of <u>zygospores</u>.</td><td></td><td>✓</td><td>gametes</td></tr>
</table>
</td><td>3</td><td></td></tr>
<tr><td>2.</td><td>(a)</td><td></td><td>x-axis label and scale 1
y-axis label and scale 1
points plotted accurately and joined 1</td><td>3</td><td></td></tr>
<tr><td>2.</td><td>(b)</td><td></td><td>As the concentration of bacterial culture increased, the yield of faba beans increased up to 40%, then yield levelled it</td><td>1</td><td></td></tr>
<tr><td>2.</td><td>(c)</td><td></td><td>Nitrogen fixation by micro-organisms involves the conversion of {<u>nitrogen</u> / oxygen} into ammonia. The ammonia produced is then converted to nitrite and finally to nitrate in a process known as {denitrification / <u>nitrification</u>}. Nitrates are used as a source of nitrogen for the synthesis of {glucose / <u>amino acids</u>}</td><td>2</td><td></td></tr>
</table>

Question			Expected Answer(s)	Max Mark	Additional Guidance
3.	**(a)**		Find out the effect of temperature on the production of amylase/enzyme **OR** find out the effect of temperature on growth of bacteria/*Bacillus subtillis*	**1**	
3.	**(b)**	**(i)**	Same volume of nutrient broth/same volume of bacteria/same volume of inoculum/same type of nutrient broth/same concentration of inoculum/same pH of nutrient broth	**1**	
3.	**(b)**	**(ii)**	Same volume of nutrient broth/same diameter of wells/same incubation temperature	**1**	
3.	**(c)**		Nutrient broth without bacteria/*Bacillus subtilis*	**1**	
3.	**(d)**	**(i)**	Clear zones are not regular (circles)	**1**	
3.	**(d)**	**(ii)**	More/higher concentration of enzyme produced at 30°C/No enzyme produced at 0°C/50°C/Less enzyme made at 10°C/20°C than 30°C/More/higher concentration of enzyme produced at 10°C/20°C than 0°C/50°C	**1**	
3.	**(d)**	**(iii)**	75%	**1**	
3.	**(e)**	**(i)**	Extracellular (enzyme)	**1**	
3.	**(e)**	**(ii)**	Enzymes (produced) denatured/less growth of bacteria at 50°C	**1**	

Question			Expected Answer(s)	Max Mark	Additional Guidance
4.	**(a)**		Step: Hands washed/hair tied back/lab coat put on **1** Reason: as appropriate **1**	**2**	
4.	**(b)**	**(i)**	Placed in autoclave/put in autoclave bag	**1**	
4.	**(b)**	**(ii)**	Scalpel dipped in disinfectant **OR** lid of dish placed on bench	**1**	
4.	**(c)**	**(i)**	Description: Using acetate grid/square paper and counting number of boxes with growth **1** Limitation: Growth not regular/boxes not completely full **OR** growth of height not taken measured **1**	**2**	
4.	**(c)**	**(ii)**	Smaller area of growth	**1**	
5.	**(a)**		Part X (Coarse) focus Function Magnify/resolve specimen **1** Part Y Stage Function Holds microscope slides/where microscope slides are placed **1**	**2**	
5.	**(b)**	**(i)**	2 1 2 5 2 4 3	**2**	
5.	**(b)**	**(ii)**	To fix the bacteria	**1**	
5.	**(b)**	**(iii)**	To show up bacteria/parts of bacteria **OR** to improve contrast	**1**	
5.	**(c)**		Cells are alive/not dead	**1**	

<table>
<tr><th colspan="3">Question</th><th>Expected Answer(s)</th><th>Max Mark</th><th>Additional Guidance</th></tr>
<tr><td>6.</td><td>(a)</td><td>(i)</td><td>Alga(e)</td><td>1</td><td></td></tr>
<tr><td>6.</td><td>(a)</td><td>(ii)</td><td>Removal of waste material/pollutant</td><td>1</td><td></td></tr>
<tr><td>6.</td><td>(b)</td><td>(i)</td><td>Whey
OR
Molasses</td><td>1</td><td></td></tr>
<tr><td>6.</td><td>(b)</td><td>(ii)</td><td>Cheese/dairy industry
OR
sugar refining industry</td><td>1</td><td></td></tr>
<tr><td>6.</td><td>(c)</td><td>(i)</td><td>Fungus</td><td>1</td><td></td></tr>
<tr><td>6.</td><td>(c)</td><td>(ii)</td><td>Meat substitute/Quorn</td><td>1</td><td></td></tr>
<tr><td>6.</td><td>(d)</td><td></td><td>
<table>
<tr><th>Statement</th><th>True</th><th>False</th><th>Correction</th></tr>
<tr><td>Proteins are synthesised from building blocks called <u>fatty acids.</u></td><td></td><td>✓</td><td>amino acids</td></tr>
<tr><td>To synthesise proteins, cells require a source of carbon and <u>nitrogen.</u></td><td>✓</td><td></td><td></td></tr>
<tr><td>Cellulose is a complex carbohydrate synthesised from <u>glucose.</u></td><td>✓</td><td></td><td></td></tr>
</table>
</td><td>3</td><td></td></tr>
</table>

Question			Expected Answer(s)	Max Mark	Additional Guidance
7.	**(a)**		Green plants are responsible for the {**fixation** / release} of energy into biomass. Biomass can be used as a {**renewable** / non-renewable} energy source.	**1**	
7.	**(b)**	**(i)**	**M** Amylase **1** **N** Ethanol/alcohol **1**	**2**	
7.	**(b)**	**(ii)**	**Separation method** Distillation **1** **Fuel** Gasohol **1**	**2**	
8.	**(a)**	**(i)**	*Penicillium* produces higher yield of antibiotics than *Streptomyces* **1** Glycerol produces the highest yield of antibiotic/Mannitol produces the lowest yield of antibiotic **1**	**2**	
8.	**(a)**	**(ii)**	3:2	**1**	
8.	**(a)**	**(iii)**	Oxygen/temperature/pH/nutrient levels **Any 2; 1 mark for each condition**	**2**	
8.	**(b)**	**(i)**	To kill/stop growth of bacteria **OR** to treat bacterial infections	**1**	
8.	**(b)**	**(ii)**	Kill/stops growth of few types/species of bacteria	**1**	

<table>
<tr><th colspan="3">Question</th><th>Expected Answer(s)</th><th>Max Mark</th><th>Additional Guidance</th></tr>
<tr><td>9.</td><td>(a)</td><td>(i)</td><td>Conventional breeding involves {genetic modification / <u>selective breeding</u>}.
This type of breeding takes a {short / <u>long</u>} period of time and {guarantees / <u>does not guarantee</u>} the production of plants with disease resistance.</td><td>2</td><td></td></tr>
<tr><td>9.</td><td>(a)</td><td>(ii)</td><td>Genome mapping</td><td>1</td><td></td></tr>
<tr><td>9.</td><td>(b)</td><td>(i)</td><td>Fungicide S</td><td>1</td><td></td></tr>
<tr><td>9.</td><td>(b)</td><td>(ii)</td><td>Less leaf area damaged (in each of the four years)</td><td>1</td><td></td></tr>
<tr><td>9.</td><td>(b)</td><td>(iii)</td><td>Differences between the fungicides was not always the same</td><td>1</td><td></td></tr>
<tr><td>9.</td><td>(c)</td><td>(i)</td><td><table><tr><th>Year</th><th>Leaf area damaged (%)</th></tr><tr><td>2010</td><td>85</td></tr><tr><td>2011</td><td>35</td></tr><tr><td>2012</td><td>25</td></tr><tr><td>2013</td><td>75</td></tr></table></td><td>1</td><td></td></tr>
<tr><td>9.</td><td>(c)</td><td>(ii)</td><td>55%</td><td>1</td><td></td></tr>
</table>

Section C

Question			Expected Answer(s)	Max Mark	Additional Guidance
1	**A**		1. Requires organic waste 2. Requires (methane producing) micro-organisms 3. Anaerobic conditions needed 4. Micro-organisms break down/ferments (organic) waste 5. Sources of organic waste – domestic rubbish/food waste 6. Use: fuel/used for cooking/heating/energy source 7. Benefit: decreases greenhouse gases/renewable energy/decreases pollution/replaces natural gas **Points 1 − 5: maximum of 4 marks** **Points 6 − 7: maximum of 2 marks**	**5**	
1	**B**		1. Lactobacillus is the type of bacteria involved in silage production 2. Raw material is grass 3. Grass is preserved/pickled 4. Anaerobic conditions created/air excluded 5. Process is fermentation 6. Increases temperature 7. Lactic acid produced 8. Lactic acid production determines the quality of silage/limits production 9. Lactic acid preserves nutritional value/prevents putrefaction **Points 1 − 6: maximum of 4 marks** **Points 7 − 9: maximum of 2 marks**	**5**	

Question			Expected Answer(s)	Max Mark	Additional Guidance
2	**A**		1. Carbon dioxide is a raw material/substrate/used up 2. Water is a raw material/substrate/used up 3. Light (energy) required 4. Glucose/starch/carbohydrate is a product 5. Oxygen is a product 6. Chlorophyll absorbs light (energy) 7. Light (intensity) is a rate limiting factor 8. Carbon dioxide (concentration) is a rate limiting factor 9. Temperature is a rate limiting factor **Points 1 − 5: maximum of 3 marks** **Point 6: maximum of 1 mark** **Points 7 − 9: maximum of 2 marks**	**5**	
2	**B**		1. Glucose/carbohydrate is a raw material/substrate in aerobic respiration 2. Oxygen is a raw material/substrate only in aerobic respiration 3. Carbon dioxide is product in aerobic respiration 4. Water is product in aerobic respiration 5. Glucose/carbohydrate is a raw material/substrate in anaerobic respiration 6. Carbon dioxide is product in anaerobic respiration 7. Ethanol/alcohol is product in anaerobic respiration 8. Energy yield is higher in aerobic respiration or converse **Points 1 − 4: maximum of 3 marks** **Points 5 − 7: maximum of 2 marks** **Point 8: maximum of 1 mark**	**5**	

[END OF MARKING INSTRUCTIONS]