2013 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 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.

. 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.

Part Two: Marking Instructions for each Question

Section A

Question			Expected Answer/s	Max Mark	Additional Guidance
1			A		
2			D		
3			C		
4			D		
5			A		
6			C		
7			B		
8			A		
9			B		
10			C		
11			C		
12			B		

Question			Expected Answer/s	Max Mark	Additional Guidance
13			D		
14			C		
15			A		
16			A		
17			B		
18			C		
19			D		
20			B		
21			B		
22			A		
23			D		
24			C		
25			B		

Section B

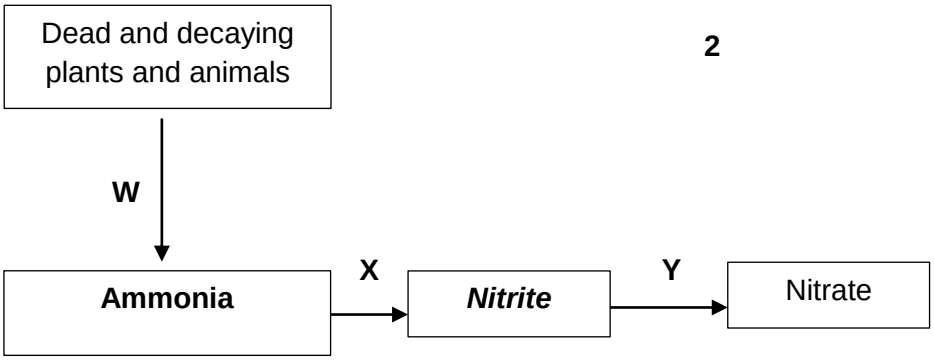
Question			Expected Answer/s	Max Mark	Additional Guidance
1	**a**		Bacillus/bacilli	**1**	**NOT** rod/cylinder
1	**b**	**i**	Conjugation	**1**	
1	**b**	**ii**	Plasmid	**1**	**NOT** DNA
1	**b**	**iii**	This process results in **non-identical** (identical) cells and leads to **increase/decrease** in variation in bacterial populations.	**1**	
1	**c**		**D E A C** B	**1**	
2	**a**		x-axis – labels y-axis – label and scales blocks plotted accurately	**3**	
2	**b**	**i**	Temperature/light (intensity)/sunlight	**1**	**NOT** heat
2	**b**	**ii**	(Factor) increases (rate of) photosynthesis Photosynthesis leads to increased cell division/ binary fission/growth OR food/glucose/energy increases reproduction OR Increased/optimum temperature increases growth.	**1** **1**	
2	**c**	**i**	P: chloroplast Q: plasma/cell membrane	**1**	
2	**c**	**ii**	Binary fission	**1**	

Question			Expected Answer/s	Max Mark	Additional Guidance
3	**a**	**i**	**Error:** opening window **OR** washing work top/disinfectant not used **OR** storing plates in fridge **OR** using Bunsen on yellow/safety flame **OR** no hand washing.	**2**	
3	**a**	**ii**	**Opening window:** allows contamination to blow onto plates. **Washing work top:** doesn't necessarily remove micro-organisms from bench **Storing plates in fridge:** contaminant growth may not show/not be visible on plates **Yellow Bunsen flame:** not hot enough to flame sterilise instruments **OR** less updraught. **No hand wash:** wash hands (with soap).	**1**	
3	**b**		**Problem A:** Use the smallest/lowest power objective lens first. **Problem B:** light/lamp not switched on/alter mirror **OR** lenses not lined up **OR** iris/diaphragm in condenser closed.	**1**	
3	**c**		Stain/staining (the cells) **OR** appropriate stain.	**1**	**NOT** dye/negative stain

<table>
<tr><th colspan="3">Question</th><th>Expected Answer/s</th><th>Max Mark</th><th>Additional Guidance</th></tr>
<tr><td>4</td><td>a</td><td></td><td>
<table>
<tr><th>Step</th><th>Description</th></tr>
<tr><td>1</td><td>Person and work space prepared</td></tr>
<tr><td>2</td><td>Bottle of sterile liquid agar cooled to pouring temperature</td></tr>
<tr><td>3</td><td>Label plate (with details)</td></tr>
<tr><td>4</td><td>Remove top and flame neck of bottle</td></tr>
<tr><td>5</td><td>(Partially) lift lid of plate</td></tr>
<tr><td>6</td><td>Pour liquid agar into plate</td></tr>
<tr><td>7</td><td>Replace agar plate lid</td></tr>
</table>
</td><td>2</td><td></td></tr>
<tr><td>4</td><td>b</td><td></td><td>54-56˚C</td><td>1</td><td></td></tr>
<tr><td>4</td><td>c</td><td></td><td><u>Feature</u>
Uneven surface OR water/condensation on surface OR contaminated OR bubbles in agar.
<u>Error</u>
Uneven surface: agar not at correct temperature for pouring
Water on surface: agar plate stored at wrong temperature/poured at too high a temperature
Contamination: poor aseptic technique OR example of such.
Bubbles in agar: plate poured too quickly</td><td>1

1</td><td>

NOT bench surface not level</td></tr>
<tr><td>4</td><td>d</td><td></td><td>Name of micro-organism Student’s name/initials
Type of agar Date</td><td>2</td><td></td></tr>
</table>

Question			Expected Answer/s	Max Mark	Additional Guidance
5	**a**	**i**		**2**	
5	**a**	**ii**	<table><tr><th>*Step*</th><th>*Micro-organisms involved*</th><th>*Micro organisms **not** involved*</th></tr><tr><td>**W**</td><td>✓</td><td></td></tr><tr><td>**X**</td><td>✓</td><td></td></tr><tr><td>**Y**</td><td>✓</td><td></td></tr></table>	**2**	
5	**b**		Nitrate(s)/NO^-_3 Nitrogen/N_2	**1** **1**	
6	**a**	**i**	**Choice of apple:** same mass/weight/size/volume/SA **OR** same age **OR** apples picked at same time **OR** stored for same time. **Starch test:** same concentration/% of iodine **OR** same time for staining **OR** same batch/bottle of iodine.	**1** **1**	 **NOT** volume of iodine
6	**a**	**ii**	Use more apples in the experiment/repeat the experiment.	**1**	

Question			Expected Answer/s	Max Mark	Additional Guidance
6	**b**	**i**	**Apple:** A	**1**	
6	**b**	**ii**	**Apple:** B	**1**	
6	**b**	**iii**	Measure diameter/radius of staining **OR** use a ruler **OR** use grid with squares (and count).	**1**	
6	**c**		Amylase.	**1**	
6	**d**	**i**	Slow down ripening **OR** increase time taken to ripen.	**1**	
6	**d**	**ii**	Reduce enzyme/amylase activity **OR** slows down starch to sugar conversion.	**1**	**NOT** at optimum temperature
7	**a**	**i**	Fungus	**1**	
7	**a**	**ii**	Amino acids/protein/enzymes	**1**	
7	**a**	**iii**	All materials placed in fermenter at start of process **OR** products/antibiotics removed at the end	**1**	

Question			Expected Answer/s	Max Mark	Additional Guidance
7	**b**		Narrow spectrum only work on a few species/types/ different micro-organisms/infection/disease. Broad spectrum work on a wide range of species/types/ different micro-organisms/ infection/disease.	**1** **1**	**NOT** virus
7	**c**	**i**	Increases (from day 2) to day 8, then stays level (from day 8) to day 10.	**2**	
7	**c**	**ii**	Lack of nutrients/raw materials/food/sugar/compounds containing nitrogen **OR** build-up of wastes/CO_2.	**1**	**NOT** ammonia
7	**c**	**iii**	100%	**1**	
8	**a**	**i**	(Plant) tissue culture.	**1**	
8	**a**	**ii**	Production of large number of plants **OR** only requires a small starting sample **OR** can grow plants that are difficult to reproduce by other methods **OR** identical plants/clones	**1**	
8	**a**	**iii**	Dipped in alcohol/ethanol and flamed.	**1**	
8	**b**		***Advantage*** maximizing desired characteristics/ reducing undesirable features **OR** suitable example. ***Disadvantage*** Takes much generations/long time **OR** is a chance effect.	**1** **1**	

<table>
<tr><th colspan="4">Question</th><th>Expected Answer/s</th><th>Max Mark</th><th>Additional Guidance</th></tr>
<tr><td>8</td><td>c</td><td></td><td>
<table>
<tr><th>Statement</th><th>True</th><th>False</th><th>Correction</th></tr>
<tr><td>Genome mapping is a method of identifying the function and location of <u>proteins.</u></td><td></td><td>✓</td><td>genes</td></tr>
<tr><td>Genetic modification involves the transfer of desirable genes into <u>chromosomes.</u></td><td>✓</td><td></td><td></td></tr>
</table>
</td><td>2</td><td></td></tr>
<tr><td>9</td><td>a</td><td>i</td><td>Correct size of segments</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Correct labelling of segments</td><td>1</td><td></td></tr>
<tr><td>9</td><td>a</td><td>ii</td><td>1 : 2 : 4
Manure Crops Breweries</td><td>1</td><td></td></tr>
<tr><td>9</td><td>b</td><td>i</td><td>Break down/eat/feed/respire materials in (organic waste) (producing methane).</td><td>1</td><td></td></tr>
<tr><td>9</td><td>b</td><td>ii</td><td>Used as a fuel/energy source OR example of use as a fuel e.g. heating, cooking etc.</td><td>1</td><td></td></tr>
<tr><td>9</td><td>b</td><td>iii</td><td>Detergents/<u>heavy metals</u>/correct examples of.</td><td>1</td><td></td></tr>
<tr><td>9</td><td>b</td><td>iv</td><td><u>Kill</u> micro-organisms/bacteria (present in waste)
OR
<u>sterilise</u> (waste).</td><td>1</td><td></td></tr>
<tr><td>9</td><td>c</td><td></td><td>Less pollution (added to the environment) OR used as fertiliser</td><td>1</td><td></td></tr>
</table>

Section C

Question			Expected Answer/s	Max Mark	Additional Guidance
1			**Answer either A or B**		
	A		1. Person/space preparation 2. Select appropriate sterile instrument 3. Sterilise appropriate instrument 4. Lift lid slightly 5. Work close to Bunsen 6. Use scalpel/sterile instrument to cut out agar block with fungus 7. Remove sample and place on new agar plate 8. Disinfect or dispose of instrument correctly	**5**	**NOT** loop
			OR		
	B		1. Person/space preparation 2. Select appropriate sterile instrument i.e. loop 3. Sterilise loop 4. Initial heavy inoculum/"make a well" 5. Sterilise loop 6. Continue to produce (2) further streaks 7. Streaks must cross/start in previous streak 8. Flame loop at the end of set of streaks	**5**	

Question			Expected Answer/s	Max Mark	Additional Guidance
2			**Answer either A or B**		
	A		1. Micro-organism used is a bacterium 2. ……..called *Acetobacter* 3. Raw material used is wine/beer/cider 4. ……..ethanol/alcohol (in wine/beer/cider used) 5. Environmental advantage **OR** economical advantage 6. Used as a flavour enhancer 7. Acts as a food preservative. **OR**	**5**	
	B		1. Micro-organism used is a bacterium 2. ……..called *Lactobacillus* 3. Raw material used is milk 4. ……..glucose/lactose/sugar (in milk) 5. Increases shelf-life of (dairy) product **OR** economic advantage 6. Used as a flavour enhancer **OR** antioxidant **OR** acidity regulator 7. Acts as a food preservative **OR** used in yoghurt/cheese production.	**5**	

[END OF MARKING INSTRUCTIONS]