2009 Biotechnology

Intermediate 2

Finalised Marking Instructions

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 ± 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 ✕ 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.

2009 Biotechnology Intermediate 2

Marking scheme

Section A

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

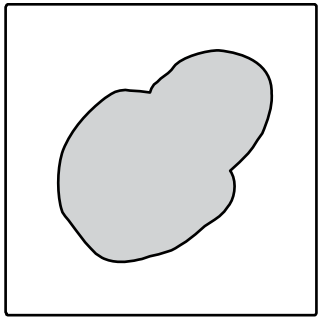
Section B

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
1 (a) (i)	Nitrite	**1**		
(ii)	W	**1**		
(iii)	Arrow from Nitrates to Atmospheric nitrogen	**1**		
(b) (i)	4 times	**1**		
(ii)	Soya	**1**		
	Soya has 2x increase while chickpeas have 4x and field beans 7x/Soya smaller percentage increase/Chick peas and field beans have bigger percentage increase	**1**		
(c)	*Rhizobium*	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
2 (a)	Incubation temperature/pH of agar/same type of *Mucor*/ same size of *Mucor* inoculant/time/concentration of agar/volume of agar	**2**	light/size of plate	
(b)	Easier to remove sample/same size or volume of sample removed from plates/lid open for less time	**1**	less contamination	
(c) (i)	*Mucor* grows in irregular shape/does not form a regular circle	**1**		
(ii)	(Overlay a) grid/square paper OR trace onto paper and weigh	**1**		
(d)	*Mucor* grows better/faster on malt agar	**1**		
(e)	*In Mucor*, the fusion of gametes in {asexual / (**sexual**)} reproduction gives rise to {sporangia / (**zygospores**)}	**2**		

<table>
<tr><th colspan="2">Question</th><th>Acceptable Answer</th><th>Mark</th><th>Unacceptable Answer</th><th>Negates</th></tr>
<tr><td>3</td><td>(a)</td><td>x-axis scale – 1mark
y-axis scale and label – 1mark
points plotted correctly and joined together – 1mark</td><td>3</td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td>16 units</td><td>1</td><td></td><td></td></tr>
<tr><td></td><td>(c) (i)</td><td>Light (intensity)</td><td>1</td><td></td><td></td></tr>
<tr><td></td><td>(ii)</td><td>Temperature/carbon dioxide</td><td>1</td><td></td><td></td></tr>
<tr><td></td><td>(d)</td><td>
<table>
<tr><th>Statement</th><th>True</th><th>False</th><th>Correction</th></tr>
<tr><td>Water and glucose are the raw material needed for photosynthesis</td><td></td><td>✓</td><td>Carbon dioxide</td></tr>
<tr><td>The type of micro-organism that makes a major contribution to global photosynthesis is algae</td><td>✓</td><td></td><td></td></tr>
</table>
</td><td>2</td><td></td><td></td></tr>
</table>

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
4 (a)	<table><tr><td>Stage 1</td><td>Human insulin gene isolated</td></tr><tr><td>Stage 2</td><td>Human insulin gene inserted into plasmid</td></tr><tr><td>Stage 3</td><td>***Plasmid (re)inserted into bacteria***</td></tr><tr><td>Stage 4</td><td>Bacteria grown and human insulin produced</td></tr><tr><td>Stage 5</td><td>***(Human) insulin purified/separated***</td></tr></table>	**2**		
(b)	Genetic engineering/modification	**1**	genome mapping	
(c)	*E. coli*	**1**		
(d)	No "allergic" response/no viral contamination or pure/large quantities can be produced/no animals involved/ethical or religious reasons.	**2**	cheaper	
5 (a)	Streak plate/streaking (out)	**1**		
(b)	(Inoculating) loop	**1**		
(c)	Bacteria can be separated (Individual/pure) colonies can be obtained	**2**		
(d)	Loop not flamed before each streak/too much inoculum on plate at start	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
6 (a)	Z	**1**		
(b)	Holds slide Magnifies specimen/allow different magnifications	**2**		
(c)	600	**1**		
(d) (i)	Spirillum	**1**		
(ii)	Any rod shaped bacterium	**1**		
(iii)	Yeast cells bigger/bacteria smaller	**1**		
7 (a) (i)		**1**		
(ii)	The yeast cells shown in stage 3 will be { **identical** / non-identical }. These cells are produced { Sexually / **asexually** } by { conjugation. / **budding** }	**2**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
(b) (i)	glucose + **oxygen** → energy + carbon dioxide + **water**	**1**		
(ii)	Aerobic	**1**		
(iii)	Can survive/grow in anaerobic or aerobic conditions	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
8 (a) (i)	Obtain energy/food/nutrients/carbohydrates	**1**		
(ii)	Obtain nitrates/minerals	**1**		
(b)	Mycorrhiza(e)	**1**		
(c)	Mycelium/hyphae	**1**		
9 (a)	3	**1**		
(b)	Photosynthesis	**1**		
(c)	Sugar/glucose	**1**	starch	
(d)	Distillation	**1**		
(e)	*Zygomonas*	**1**		
(f)	Renewable/can be produced from waste material/production can reduce pollution/less pollution than fossil fuels/to produce gasohol or mix with petrol/can be used when fossil fuels run out	**2**	cheaper	

<table>
<tr><th colspan="3">Question</th><th>Acceptable Answer</th><th>Mark</th><th>Unacceptable Answer</th><th>Negates</th></tr>
<tr><td>10</td><td>(a)</td><td>(i)</td><td>Bacteria/Lactobacillus</td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Lactic acid/acetic acid</td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(iii)</td><td>Lowers pH/stops the growth of other bacteria/prevents putrefaction or spoilage</td><td>1</td><td>preservation</td><td></td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>Same mass/type of fresh grass/stored for same time/stored under same conditions/at same temperature/oxygen volume or concentration</td><td>2</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>
<table>
<tr><th>Factor</th><th>Decrease</th><th>Stay the same</th><th>Increase</th></tr>
<tr><td>Sugar concentration (%)</td><td>✓</td><td></td><td></td></tr>
<tr><td>pH</td><td>✓</td><td></td><td></td></tr>
<tr><td>Temperature (^{o}C)</td><td></td><td></td><td>✓</td></tr>
</table>
3 correct – 2 marks; 2/1 correct – 1 mark</td><td>2</td><td></td><td></td></tr>
</table>

Section C

1 A

1 Both cells contain cytoplasm
2 Both cells contain cell membrane
3 Both cells contain cell wall
4 Bacterial cell contains (circular) DNA/fungal cell contains nucleus/both cells contain DNA/RNA
5 Bacterial cell contains capsule/fungal cell does not
6 Bacterial cell contains flagella/fungal cell does not
7 Bacterial cell contains plasmids/fungal cell does not
8 Fungal cell contains vacuole/bacterial cell does not

Points 1 – 3: maximum of 2 marks
Points 4 – 8: maximum of 3 marks

OR

1 B

1 Enzymes are protein catalysts/speed up reactions
2 Enzymes act on substrates
3 Enzymes are specific for one substrate or example of this/explanation of active site or lock and key model
4 Enzyme is unchanged by reaction
5 Substrate is changed/broken down into product(s)
6 Extracellular enzymes are released/work outside micro-organisms
7 Extracellular enzymes digest food/large molecules
8 Digested molecules absorbed or equivalent

Points 1 – 6: maximum of 4 marks
Points 7 – 8: maximum of 2 marks

2 A

1 Person/space preparation
2 Flame/sterilise loop
3 Flame/sterilise neck of bottle
4 Remove sample onto slide
5 Flame/sterilise neck of bottle or replace cap
6 Flame/sterilise loop
7 Smear sample or equivalent description
8 Fix by flaming

Point 1 – 1 mark
Points 2 – 8: maximum of 4 marks

OR

2 B

1 Person/space preparation
2 Liquid agar cooled to 55^{o}C/pouring temperature
3 Label plate/type of agar or date or initials
4 Flame/sterilise neck of bottle
5 Partly remove agar plate lid
6 Pour agar into plate
7 Replace lid on plate
8 Allow agar to set before moving/storing or store plates upside down

Point 1 – 1 mark
Points 2 – 8: maximum of 4 marks

[END OF MARKING INSTRUCTIONS]