2010 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 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.

2010 Biotechnology Intermediate 2

Marking scheme

Section A

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

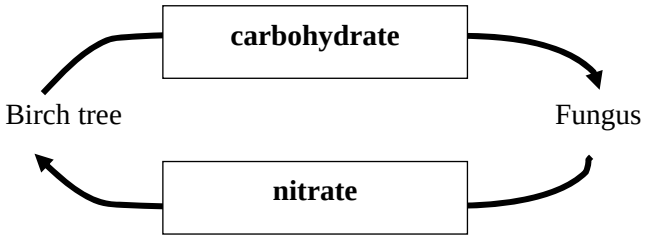
Section B

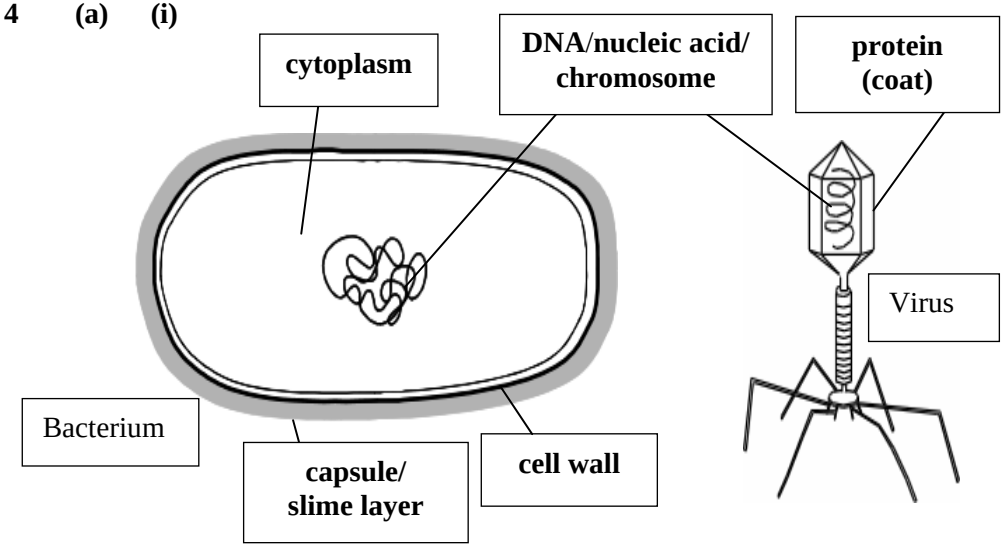
<table>
<tr><th colspan="2">Question</th><th>Acceptable Answer</th><th>Mark</th><th>Unacceptable Answer</th><th>Negates</th></tr>
<tr><td>1</td><td>(a)</td><td>The type of micro-organism shown in the diagram is algae.
<u>protozoa</u>

This cell has food vacuoles which contain <u>enzyme</u>/<u>molecules</u>.
DNA

These molecules are involved in <u>digestion</u> reactions.
synthesis</td><td>2</td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td>X cell membrane
Y nucleus</td><td>1
1</td><td></td><td></td></tr>
<tr><td></td><td>(c)</td><td>Binary fission</td><td>1</td><td></td><td></td></tr>
<tr><td></td><td>(d)</td><td><table><tr><th>Factors</th><th>Used up</th><th>Produced</th></tr><tr><td>carbon dioxide</td><td></td><td>✓</td></tr><tr><td>glucose</td><td>✓</td><td></td></tr><tr><td>oxygen</td><td>✓</td><td></td></tr><tr><td>water</td><td></td><td>✓</td></tr></table>4 correct = 2 marks
3/2 correct = 1 mark</td><td>2</td><td></td><td></td></tr>
</table>

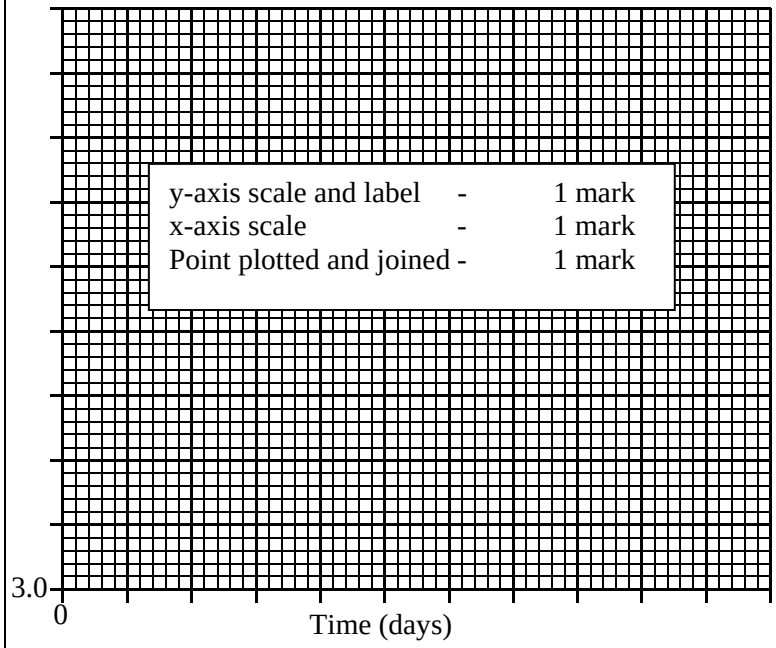
Question			Acceptable Answer	Mark	Unacceptable Answer	Negates
2	**(a)**		To allow (enough) light to pass through.	**1**	Make cells visible/clearer	
	(b)	**(i)**	By passing smear through (yellow) Bunsen/flame.	**1**		
		(ii)	Bacteria become attached to slide/don't wash off (when staining).	**1**	NOT fix	
	(c)		Show up bacteria more clearly/improve contrast/highlight (with background)/shows up parts of bacteria.	**1**	Makes cells visible	
	(d)	**(i)**	Cells are still alive/not dead.	**1**		
		(ii)	Place slide in disinfectant/discard jar/autoclave.	**1**	Teacher/technician disposable	

<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>Mycorrhiza/Mycorrhizal</td><td>1</td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td> 
</td><td>2</td><td></td><td></td></tr>
<tr><td></td><td>(c) (i)</td><td><u>Dead</u> or <u>decaying</u> organisms, or examples</td><td>1</td><td>Protein</td><td></td></tr>
<tr><td></td><td>(ii)</td><td><table>
<tr><th>Statement</th><th>True</th><th>False</th><th>Correction</th></tr>
<tr><td>In saprophytic nutrition, digestion is <u>external</u></td><td>✓</td><td></td><td></td></tr>
<tr><td>Digestion in saprophytic nutrition requires <u>intracellular</u> enzymes</td><td></td><td>✓</td><td>extracellular</td></tr>
<tr><td>In saprophytic nutrition, the products of digestion are <u>absorbed</u></td><td>✓</td><td></td><td></td></tr>
</table></td><td>3</td><td></td><td></td></tr>
</table>

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
4 (a) (i)	 5 = 3 marks 3/4 = 2 marks 2/1 = 1 mark	**3**		
(ii)	Does not contain cytoplasm or cell membrane OR can't reproduce on its own.	**1**	Protein coat/nucleus/other organelles	
(b)	increasing order of size → **viruses** → **bacteria** → **protozoa**	**1**		

<table>
<tr><th>Question</th><th>Acceptable Answer</th><th>Mark</th><th>Unacceptable Answer</th><th>Negates</th></tr>
<tr><td>(c)</td><td>
<table>
<tr><th>Stage</th><th>Description of stage</th></tr>
<tr><td>1</td><td>Virus attaches to host cell</td></tr>
<tr><td>2</td><td>Injection of viral DNA into a host cell</td></tr>
<tr><td>3</td><td>Viral <u>DNA</u> copied/viral <u>proteins</u> synthesised/virus takes control of host cell</td></tr>
<tr><td>4</td><td>New viruses are assembled</td></tr>
<tr><td>5</td><td>Viruses are released from host cell</td></tr>
</table>
</td><td>2</td><td></td><td></td></tr>
</table>

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
5 (a)	Mycelium	**1**	Hypha(e)	
(b)	Volume mass/size/area/diameter of fungal threads/agar OR temperature OR time (of incubation) OR type of agar/pH/ volume of agar	**2**	Amount of agar/threads of fungi	
(c) (i)	Measure <u>diameter/radius/area</u> of "circle of growth" OR (trace) area of growth onto <u>squared</u> paper.	**1**	Ruler	
(ii)	Growth does not form a perfect circle OR counting parts of squares will lead to inaccuracies.	**1**	Accurate/precise/exact	
(d)	Area of growth would be less/reduced.	**1**		
6 (a)	Less allergic/adverse reactions OR no animal products used OR no contamination/more pure OR higher availability OR ethical.	**1**	Cheaper/cost	
(b) (i)	Plasmid	**1**	DNA	
(ii)	Cut it open/allow (space to put) gene/DNA in.	**1**		
(iii)	Bacterium N contains human insulin gene/DNA, (bacterium M does not).	**1**		
(iv)	*E.coli*	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
7 (a) (i)				
(ii)	Species A	**1**		
	pH drops more quickly/pH lower at day 20.	**1**		
(iii)	Sugar concentration: **<u>decreases</u>**/no change/increases	**1**		
	Temperature: decreases/no change/**<u>increases</u>**	**1**		
(b)	Chlorella **<u>Lactobacillus</u>** Rhizobium Zygomonas	**1**		
(c)	Acids stop/reduce growth of other bacteria/micro-organisms.	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
8 (a) (i)	To find out which liquid preserves the peas (best).	**1**		
(ii)	Time (of incubation)/temperature/type of peas.	**2**	NOT size of tube/volume of preservative/number of peas	
(b)	Prediction (Very) cloudy	**1**		
	Explanation <u>Micro-organisms</u>/bacteria able to grow/not killed.	**1**		
(c)	*Micro-organism* — *Preservative produced* lactic acid *Acetobacter* → vinegar *Aspergillus* → citric acid	**2**		Extra line

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
9 (a)	Starch	**1**		
(b)	Anaerobic conditions lead to <u>ethanol</u> production/aerobic conditions do not lead to <u>ethanol</u> production.	**1**		
(c)	To separate ethanol (from liquid contents of fermenter)/to purify ethanol/to extract.	**1**		
(d)	Used to make gasohol/as a fuel/biofuel/as renewable energy source. Combine with petrol/as an alcoholic drink/sterilising agent.	**1**		
(e) (i)	**15** hours to **20** hours	**1**		
(ii)	300%	**1**		

<table>
<tr><th>Question</th><th>Acceptable Answer</th><th>Mark</th><th>Unacceptable Answer</th><th>Negates</th></tr>
<tr><td>10 (a)</td><td>
<table>
<tr><th>Statement</th><th>True</th><th>False</th><th>Correction</th></tr>
<tr><td><u>Tissue culture</u> can be used to produce many plants from a small sample</td><td>✓</td><td></td><td></td></tr>
<tr><td><u>Selective breeding</u> can be used to introduce desirable characteristics from different species into an organism.</td><td></td><td>✓</td><td>genetic engineering/ genetic modification</td></tr>
<tr><td>Genome mapping is used to identify desirable <u>chromosomes</u> for breeding.</td><td></td><td>✓</td><td>genes</td></tr>
</table>
</td><td>3</td><td></td><td></td></tr>
<tr><td>(b)</td><td>Soil inoculant — Agricultural use
Rhizobium inoculant → Increases yield of legumes
Mycorrhizal inoculant → Establishes plants in land reclamation
Improves preservation of silage’s nutritional value</td><td>2</td><td></td><td>Extra line</td></tr>
</table>

Section C

1. A

1 Person preparation/workspace preparation OR example of this
2 Label bottle
3 (Sterilise) loop in flame
4 Lift lid (partially) off agar plate and/or return lid to plate after sampling
5 Sample/lift (colony of) bacteria
6 Remove lid from bottle (with hand holding loop)
7 Flame top of bottle
8 Put loop into nutrient broth (and remove)
9 Flame top of bottle and replace lid
10 Sterilise loop in flame

Any 5 from points 1 - 9

Points 1 – 5: maximum of 3 marks
Points 6 – 10: maximum of 3 marks

1 B

1 Person preparation/workspace preparation OR example of this
2 Label plate
3 (Sterilise) loop/loop in flame
4 Flame top of bottle
5 Initial heavy inoculum/"make a well"
6 Flame loop after using loop
7 (Three) streaks drawn out of (initial) well
8 (Continue to) produce (2) further streaks
9 Streaks must cross/start in previous streak
10 Sterilise loop in flame

Clear, labelled diagrams acceptable for points 5, 7, 8 and 9

Any 5 from points 1 - 9

Points 1 – 4: maximum of 2 marks
Points 5 – 10: maximum of 4 marks

2 A

1 requires oxygen
2 requires (suitable/appropriate) pH
3 requires suitable nutrients/food source
4 requires (suitable/appropriate) temperature
5 oxygen needed for growth/aerobic respiration (of *Penicillium)*
6 suitable/optimal/best/correct/value number/range pH needed for enzyme activity (involved growth) (of *Penicillium)*
7 nutrients/food source needed for growth/aerobic respiration (of *Penicillium)*
8 suitable/optimal/best/correct/value number/range of temperature needed for enzyme activity (of *Penicillium)*

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

2 B

1 process involves micro-organism/bacteria/fungi
2 raw materials are waste products/cheap
3 example is whey (from cheese industry)
4 example is molasses (from sugar industry)
5 use of waste products reduces pollution/is inexpensive
6 SCP has high protein content/low fat content
7 SCP can be used as animal/human food product
8 SCP can be used as a meat substitute/eaten by vegetarians

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

[END OF MARKING INSTRUCTIONS]