

# Mark Scheme (FINAL)

## Summer 2008

GCE

GCE Biology (6101/01)

## General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

PRE-STANDARDISATION MARK SCHEME - UNIT 1 (6101)  
AS BIOLOGY / BIOLOGY (HUMAN) June 2008

STRICTLY CONFIDENTIAL

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Question Number	Answer	Mark															
1	<table border="1" data-bbox="379 338 1104 745"> <thead> <tr> <th data-bbox="379 338 663 443">Process</th> <th data-bbox="663 338 874 443">Requires transport proteins</th> <th data-bbox="874 338 1104 443">Requires energy in the form of ATP</th> </tr> </thead> <tbody> <tr> <td data-bbox="379 443 663 517">Simple diffusion</td> <td data-bbox="663 443 874 517">✘</td> <td data-bbox="874 443 1104 517">✘</td> </tr> <tr> <td data-bbox="379 517 663 591">Facilitated diffusion</td> <td data-bbox="663 517 874 591">✓</td> <td data-bbox="874 517 1104 591">✘</td> </tr> <tr> <td data-bbox="379 591 663 665">Osmosis</td> <td data-bbox="663 591 874 665">✘</td> <td data-bbox="874 591 1104 665">✘</td> </tr> <tr> <td data-bbox="379 665 663 745">Active transport</td> <td data-bbox="663 665 874 745">✓</td> <td data-bbox="874 665 1104 745">✓</td> </tr> </tbody> </table> <p data-bbox="357 779 903 815"><b>NB</b> 1 mark for every two correct answers</p>	Process	Requires transport proteins	Requires energy in the form of ATP	Simple diffusion	✘	✘	Facilitated diffusion	✓	✘	Osmosis	✘	✘	Active transport	✓	✓	(4)
Process	Requires transport proteins	Requires energy in the form of ATP															
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Question Number	Answer	Mark
2	<p>1. hydrophobic / non-polar / not charged ;</p> <p>2. glycerol / propan-(1,2,3)-triol ;</p> <p>3. (saturated / unsaturated) fatty acids ;</p> <p>4. ester / covalent ;</p> <p>5. insulation / buoyancy / energy store / protection / source of metabolic water ;</p> <p><b>Comments</b>  mp 1: <b>ACCEPT</b> un-polar  mp 4: <b>ACCEPT</b> esther, easter  mp 5: do <b>NOT</b> accept energy source</p>	(5)

Question Number	Answer	Mark															
3	<table border="1" data-bbox="300 324 1157 1205"> <thead> <tr> <th data-bbox="300 324 510 430">Name of cell structure</th> <th data-bbox="510 324 885 430">Description of cell structure</th> <th data-bbox="885 324 1157 430">Diagram of cell structure</th> </tr> </thead> <tbody> <tr> <td data-bbox="300 430 510 555">nucleolus ; (1)</td> <td data-bbox="510 430 885 555"></td> <td data-bbox="885 430 1157 555"></td> </tr> <tr> <td data-bbox="300 555 510 757"></td> <td data-bbox="510 555 885 757"></td> <td data-bbox="885 555 1157 757">pair of cylinders ;  at right angles to each other ; (2)</td> </tr> <tr> <td data-bbox="300 757 510 1064"></td> <td data-bbox="510 757 885 1064">1. spherical (structures) ;  2. single membrane ;  3. containing {hydrolytic / eq} enzymes ; max (2)</td> <td data-bbox="885 757 1157 1064"></td> </tr> <tr> <td data-bbox="300 1064 510 1205">microtubules; (1)</td> <td data-bbox="510 1064 885 1205"></td> <td data-bbox="885 1064 1157 1205"></td> </tr> </tbody> </table> <p data-bbox="300 1236 443 1267"><b>Comments</b></p> <p data-bbox="300 1305 434 1337"><u>Centrioles</u></p> <ol data-bbox="300 1341 1102 1576" style="list-style-type: none"> <li>1. cylinders can be represented as 3D cylinders, a 2D rectangle, or two parallel lines and a circle</li> <li>2. <b>ACCEPT</b> cylinders shown as 9 sets of triplets</li> <li>3. penalise mp 1 for any incorrect labelling</li> <li>4. if any other structures are shown, then they must have labelled the centrioles for marks to be awarded</li> </ol> <p data-bbox="300 1543 1102 1576"><b>NB</b> An email will be circulated showing acceptable diagrams</p> <p data-bbox="300 1615 437 1646"><u>Lysosomes</u></p> <p data-bbox="300 1648 979 1747">mp 1: if size given, do not accept larger than 1 <math>\mu\text{m}</math>. <b>ACCEPT</b> vesicles, circular, round or globular reference to 'molecules' negates the mark</p> <p data-bbox="300 1783 1082 1850">mp 2: <b>ACCEPT</b> one or a membrane, but <b>NOT</b> 'a membrane-bound organelle'</p> <p data-bbox="300 1886 906 1953">mp 3: <b>ACCEPT</b> lysozyme or digestive enzymes <b>ACCEPT</b> a description of its function</p>	Name of cell structure	Description of cell structure	Diagram of cell structure	nucleolus ; (1)					pair of cylinders ;  at right angles to each other ; (2)		1. spherical (structures) ;  2. single membrane ;  3. containing {hydrolytic / eq} enzymes ; max (2)		microtubules; (1)			(6)
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Question Number	Answer	Mark
4(a)	<ol style="list-style-type: none"> <li>1. size - drawing is correct length ;</li> <li>2. shape is accurate ;</li> <li>3. cell content - nucleus drawn in correct position with nucleoli shown ;</li> </ol> <p><b>Comments</b>  mp 1: <b>ACCEPT</b> 7.8 - 8.8cm, measuring the length of cell across the middle  if more than one cell drawn, do not award this marking point unless cell A is labelled</p> <p>mp 2: look for (i) slight curve of left-hand wall and (ii) 2 small projections drawn left of centre</p> <p>mp 3: one or two nucleoli shown  nucleus should be roughly in centre of cell, displaced to the top  <b>NB</b> do <b>NOT</b> award this mp if additional organelles shown, but <b>IGNORE</b> shading / stippling</p>	(3)

Question Number	Answer	Mark
4(b)	<ol style="list-style-type: none"> <li>1. {fatty acids / tails} are {hydrophobic / non-polar / eq} ;</li> <li>2. (so orientate themselves) away from {water / polar environment / eq} ;</li> <li>3. {phosphate/heads} are {hydrophilic / polar / eq} ;</li> <li>4. (so orientate themselves) towards {water / polar environment} ;</li> <li>5. idea that phospholipids arranged in bilayer due to aqueous environment on both sides of membrane / eq ;</li> </ol> <p><b>Comments</b>  mp 1: <b>ACCEPT</b> insoluble and water-hating</p> <p>mp 2: need some reference of orientation due to water or environment, not just a reference to facing each other</p> <p>mp 4: need some idea of orientation towards water</p>	max (3)



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Question Number	Answer	Mark
5(a)	<p>1. cell cycle is shorter in A than B /eq ;</p> <p>2. {interphase / eq} is shorter in A than B / eq ;</p> <p>3. {mitosis / eq} is shorter in A than B / eq ;</p> <p>4. {S phase / eq} is the same duration ;</p> <p>5. comparative figures ;</p> <p><b>Comments</b>  mp 1-4: <b>IGNORE</b> wrongly quoted figures</p> <p>mp 1-3: statements must be comparative: 'but' and 'whereas' are <b>NOT</b> enough  <b>ACCEPT</b> converse arguments</p> <p>mp 1: do <b>NOT</b> accept reference to 'gap between cycles'</p> <p>mp 2: <b>ACCEPT</b> interphase or a description of interphase, G1 or G2</p> <p>mp 5: figures to accept  (i) cell cycle time of A is 20 hours and B is 28 hours  OR 8 hour difference  (ii) S phase in A is 4 hours and B is 4 hours  <b>UNITS ARE UNNECESSARY</b></p> <p><b>NB</b> "S phase (or a description of S phase) in both plants is 4 hours" gets m pts 4 &amp; 5</p>	<p><b>max (3)</b></p>

Question Number	Answer	Mark
5(b)	<ol style="list-style-type: none"> <li>1. cells preparing to divide /eq ;</li> <li>2. reference to S phase ;</li> <li>3. reference to replication (of DNA) ;</li> <li>4. reference to semi-conservative (replication) or a description of it ;</li> <li>5. idea that new cells will have same quantity of DNA as parent / eq ;</li> </ol> <p><b>Comments</b>  mp 1: <b>ACCEPT</b> preparing for mitosis / prophase  mp 2: <b>ACCEPT</b> synthesis phase  mp 3: <b>ACCEPT</b> reference to formation of chromatids  mp 5: needs a reference to the parent cell or original parent</p>	<b>max (2)</b>

Question Number	Answer	Mark
5(c)	<ol style="list-style-type: none"> <li>1. chromosomes {move to / at} opposite poles of cell / eq ;</li> <li>2. ref to formation of nucleus / eq ;</li> <li>3. ref to formation of cell {plate / wall} ;</li> <li>4. {cell splits in two / eq} / reference to cytokinesis;</li> </ol> <p><b>Comments</b>  mp 1: <b>ACCEPT</b> chromatids or centromeres  <b>ACCEPT</b> sides, ends or edges  mp 2: <b>ACCEPT</b> reference to nucleolus / nuclear membrane re-forming</p> <p><b>NB</b>  <b>IGNORE</b> references to meiosis  <b>IGNORE</b> references to prophase and metaphase</p>	<b>max (2)</b>

Question Number	Answer	Mark
6(a)(i)	<p>1. solution A contains starch <b>but</b> neither reducing sugar nor protein / contains <b>ONLY</b> starch ;</p> <p>2. solution B contains a reducing sugar <b>but</b> neither protein nor starch / contains <b>ONLY</b> reducing sugar ;</p> <p><b>Comments</b> If candidate refers to A containing starch <u>and</u> B containing a reducing sugar, but does not tell us what the solutions <u>don't</u> contain, then award <b>1 mark</b> only</p>	(2)

Question Number	Answer	Mark
6(a)(ii)	<p>1. {starch / (named) non-reducing sugar} has been {hydrolysed / eq} ;</p> <p>2. to form a reducing sugar ;</p> <p><b>Comments</b> mp 1: do <b>NOT</b> accept starch is reduced <b>ACCEPT</b> glycosidic bonds have been hydrolysed but <b>NOT</b> bonds have been hydrolysed - we want the idea that carbohydrate is present mp 2: <b>ACCEPT</b> glucose, maltose, monosaccharides or references to free aldehyde or ketone groups</p>	(2)

Question Number	Answer	Mark
6(a)(iii)	<p>solution C contained a lower concentration of (reducing) sugar than solution B ;</p> <p><b>Comments</b> <b>ACCEPT</b> stronger solution, but not stronger sugar</p>	(1)

Question Number	Answer	Mark
6(b)	<ol style="list-style-type: none"> <li>1. use equal volumes of each (protein) solution ;</li> <li>2. use equal {volumes / concentrations} of biuret reagent /eq ;</li> <li>3. {purple / lilac / mauve / violet} colour produced /eq ;</li> <li>4. {compare intensity of colour / eq} / use a colorimeter ;</li> <li>5. (deeper colour / eq) shows higher protein (concentration) / eq ;</li> </ol> <p><b>Comments</b></p> <p>mp 2: <b>ACCEPT</b> description of biuret reagent as biuret A and biuret B OR NaOH / KOH followed by CuSO<sub>4</sub> reference to heating negates this mp</p> <p>mp 3: <b>IGNORE</b> references to formation of precipitates</p> <p>mp 4: reference to <u>cal</u>orimeter negates this mp  <b>IGNORE</b> references to time, <b>EXCEPT</b> timing how long it takes to change colour, as this would not work</p> <p>mp 5: <b>ACCEPT</b> solutions with least transmission OR most absorbance has higher protein concentration</p> <p><b>NB</b></p> <ol style="list-style-type: none"> <li>1. If candidate gives wrong reagent then penalise mp</li> <li>2. If the wrong colour is given, mp 3 is not awarded but mps 4 &amp; 5 can still be awarded</li> <li>2. A statement such as 'the solution that goes the deepest purple has the highest protein concentration' gets mps 3, 4 &amp; 5</li> </ol>	<p>max (3)</p>

Question Number	Answer	Mark
7(a)	<ol style="list-style-type: none"> <li>1. idea that part of the DNA helix unwinds ;</li> <li>2. DNA strands separate ;</li> <li>3. hydrogen bonds are broken ;</li> <li>4. idea of one strand acting as a template ;</li> <li>5. (RNA) (mono)nucleotides line up against complementary (DNA) bases ;</li> <li>6. reference to formation of phosphodiester bonds / eq ;</li> <li>7. correct reference to {RNA polymerase / DNA helicase} ;</li> <li>8. reference to detachment of mRNA (molecule) from the DNA ;</li> </ol> <p><b>Comments</b>  mp 2: <b>ACCEPT</b> DNA unzips</p> <p>mp 5: <b>ACCEPT</b> reference to nucleotides bonding to complementary bases  we want the term 'complementary'</p> <p>mp 6: <b>ACCEPT</b> a description of bonds forming between the nucleotides, but do <b>NOT</b> accept references to deoxyribose sugars</p> <p>mp 7: DNA helicase cannot be awarded if in the context of mp 4-6, RNA polymerase cannot be awarded if in the context of mp 1</p>	<p><b>max (4)</b></p>

Question Number	Answer	Mark
7(b)	<ol style="list-style-type: none"> <li>1. reference to translation / eq ;</li> <li>2. mRNA becomes {associated / eq} with ribosomes ;</li> <li>3. idea that a ribosome hold two transfer RNA molecules ;</li> <li>4. reference to transfer RNA attached to amino acid;</li> <li>5. peptide bonds formed (between adjacent amino acids) ;</li> <li>6. reference to ribosome moving along mRNA ;</li> </ol> <p><b>Comments</b>  mp1 : for a description of translation, do <b>NOT</b> accept 'involved in protein synthesis'  mp 2: enters / builds / attaches all give the idea of an association, simple references to 'moves to ribosome' is not sufficient  mp 5: do <b>NOT</b> accept polypeptide or dipeptide bonds  mp 6: <b>ACCEPT</b> mRNA moves along ribosome</p>	max (3)

Question Number	Answer	Mark
7(c)(i)	GGG CGC UCG AAA;; [1 mistake : 1 mark] <b>IGNORE</b> anything written in T5 box	(2)

Question Number	Answer	Mark
7(c)(ii)	(glycine) arginine serine lysine;; [1 mistake : 1 mark]	(2)

Question Number	Answer	Mark
7(c)(iii)	ATT / ATC / ACT;	(1)

Question Number	Answer	Mark
8(a)(i)	<p>1. A: can be re-used ; E: reduces overall cost / more economical / eq ;</p> <p>2. A: process is continuous / eq ; E: saves time / can be automated / reduces cost ;</p> <p>3. A: enzymes more stable ; E: less likely to be {denatured / affected by temperature changes / affected by pH changes} ;</p> <p>4. A: enzymes can be used at higher temperatures ; E: faster reaction / saves time ;</p> <p>5. A: enzymes does not have to be separated from product / eq ; E: reduces cost / saves time ;</p> <p>6. A: more than one enzyme can be fixed in order ; E: greater control over process / saves time / more efficient ;</p> <p>7. A: idea that enzyme is safer to handle e.g. allergic reaction / irritant ; E: enzyme only activated when in use ;</p> <p><b>HOW TO MARK THIS QUESTION</b></p> <ol style="list-style-type: none"> <li>Two advantage marks</li> <li>Explanation must be linked to appropriate advantage</li> <li>Read through answer looking for the advantages that have correct explanations, to give candidates the highest mark possible</li> <li>Two advantages in a statement with a correct explanation gets 4 marks</li> </ol> <p><b>NB Comments appear on the next page</b></p>	<p>max (4)</p>

	<p><b>Comments</b>  mp 1: A: do <b>NOT</b> accept 'not used up'  E: <b>ACCEPT</b> references to cheap or cheaper</p> <p>mp 3: A: <b>ACCEPT</b> 'does not change shape'  E: <b>ACCEPT</b> references to resistant or tolerant to temperature or pH changes</p> <p>mp 4: A: <b>ACCEPT</b> wider range of temperature</p> <p>mp 5: A: <b>ACCEPT</b> easily separated and does not contaminate product  <b>CHECK</b> they say 'product' and not 'substrate'</p>	
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Question Number	Answer	Mark
8(a)(ii)	<ol style="list-style-type: none"> <li>1. lactose {hydrolysed / eq} to glucose and galactose / eq ;</li> <li>2. production of lactose-reduced milk / eq ;</li> <li>3. reference to lactose intolerance / eq ;</li> <li>4. reference to (change in) sweetness / use in confectionery industry / eq ;</li> </ol> <p><b>Comments</b>  mp 3: <b>ACCEPT</b> can't digest lactose or can't produce lactase</p> <p>mp 4: other uses include cats milk, whey syrup and ice-cream</p>	<p><b>max</b>  <b>(3)</b></p>



Question Number	Answer	Mark
8(b)(i)	<ol style="list-style-type: none"> <li>1. formic acid binds to active site of cyanidase ;</li> <li>2. {linear / eq} up to 38/40 (minutes) ;</li> <li>3. decrease in rate between 38/40 and 68/70 minutes / eq ;</li> <li>4. maximum concentration {reached at 68/70 (minutes) / is 0.325 (au) } ;</li> <li>5. maximum rate is 0.0069 au per minute ;</li> </ol> <p><b>Comments</b>  mp 2: eqs for linear include proportional, rapid, constant rate and concentration (<b>NOT</b> rate) increases steadily</p> <p>mp 4: <b>ACCEPT</b> plateau for maximum concentration  <b>ACCEPT</b> no more formic acid produced</p> <p><b>NB</b></p> <ol style="list-style-type: none"> <li>1. Consequential error applies to mp 3 if figures wrong in mp 2, and for mp 4 if figures wrong in mp 3</li> <li>2. Do <b>NOT</b> accept references to the line or the graph going up / plateauing etc</li> <li>3. <b>ACCEPT</b> figures without units in mps 2, 3 &amp; 4. Units must be given for mp 5</li> </ol>	max (3)

Question Number	Answer	Mark
8(b)(ii)	<ol style="list-style-type: none"> <li>1. idea that substrate has to penetrate into gel / bead / support material;</li> <li>2. idea that not all active sites may be on / near surface of bead;</li> <li>3. immobilised enzyme has little kinetic energy / {fewer / less energetic} collisions ;</li> <li>4. fewer enzyme-substrate complexes formed;</li> </ol> <p><b>Comments</b>  <b>IGNORE</b> references to surface area of enzymes / active sites</p>	max (2)