

**General Certificate of Education (A-level)  
June 2011**

**Biology**

**BIOL1**

**(Specification 2410)**

**Unit 1: Biology and Disease**

**Final**

***Mark Scheme***

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| Question | Marking Guidance   | Mark  | Additional Guidance   |
|----------|--|-------|---|
| 1(a)(i)  | Hydrolysis;  | 1     | Accept phonetic spelling.<br>Ignore reaction.   |
| 1(a)(ii) | (Alpha) glucose;   | 1     | Accept $\alpha$ glucose.<br>Reject $\beta$ glucose / beta glucose   |
| 1(b)(i)  | Add Benedict's (reagent) <u>and</u> heat / warm;<br>Red/orange/yellow/green (colour);  | 2     | Reject Add HCl<br>Accept brown, reject other colours  |
| 1(b)(ii) | 2 products / 2 sugars produced;  | 1     | Look for idea of <b>two</b><br>Accept named monosaccharides produced.<br>"More" insufficient for mark<br>Neutral if incorrect products named<br>Neutral "lactose is a polysaccharide"<br>Neutral "lactose is not a reducing sugar"<br>Neutral: Reference to surface area.         |
| 1(c)     | <ol style="list-style-type: none"> <li>1. Galactose is a similar shape / structure <u>to lactose</u>/both complementary;</li> <li>2. (Inhibitor / Galactose) fits into / enters / binds with <u>active site</u> (of enzyme);</li> <li>3. Prevents/less substrate fitting into / binding with (active site) / fewer or no E-S complexes;</li> </ol> | 2 max | <ol style="list-style-type: none"> <li>1. <b>Q</b> Reject: <u>Same</u> shape / structure</li> <li>2. Accept blocks active site</li> </ol> Look for principles: <ol style="list-style-type: none"> <li>1 Shape</li> <li>2 Binding to active site</li> <li>3 Consequence</li> </ol> |

|      |   |   |  |
|------|---|---|--|
| 1(d) | Low / decreased <u>water potential</u> (in gut);<br>Water enters gut / lumen / leaves cells by <u>osmosis</u> ; | 2 | Neutral ref to concentrations<br>Accept $\psi$ for water potential |
|------|---|---|--|

| Question | Marking Guidance   | Mark  | Additional Guidance  |
|----------|--|-------|--|
| 2(a)     | In one country where the percentage of fat (in the diet) is 35%, the death rate (from breast cancer) is 20 per 100 000;  | 1     | <u>Must</u> have reference to country<br>Accept ....1 per 5 000 / 0.02%  |
| 2(b)     | <ol style="list-style-type: none"> <li>1. No. of deaths from breast cancer divided by total population <math>\times 100\,000</math>;</li> <li>2. No. of deaths from breast cancer divided by all deaths <math>\times 100\,000</math>;</li> <li>3. Sample and count deaths from breast cancer in 100 000 people;</li> </ol>   | 1 max | If sample not 100 000 then must scale appropriately  |
| 2(c)     | <ol style="list-style-type: none"> <li>1. Positive correlation;</li> <li>2. But correlation does not show causation / some other (named) factor may be involved;</li> <li>3. Evidence against positive correlation e.g. different death rates at same % fat / similar death rates at different % fat / some countries with higher death rate have lower fat intake;</li> </ol> | 3     | <ol style="list-style-type: none"> <li>1. Accept description of positive correlation / directly proportional.<br/>Accept positive relationship.</li> <li>2. Do not accept casual in place of causal.</li> <li>3. Answer must be consistent with data.</li> </ol> |

| Question  | Marking Guidance   | Mark  | Additional Guidance  |
|-----------|--|-------|--|
| 3(a)(i)   | Increase to 30°C/31°C <u>and</u> then decreases / optimum or max rate at 30°C/31°C;  | 1     | Accept: peak at 30°C/31°C  |
| 3(a)(ii)  | <ol style="list-style-type: none"> <li>1. Enzyme denatured / hydrogen bonds/bonds holding tertiary structure broken / tertiary structure changed;</li> <li>2. Change in shape of <u>active site</u> (of enzymes);</li> <li>3. Substrate / protein no longer fits / binds (into active site) / few or no ES complexes;</li> <li>4. More enzyme (molecules) denatured as temperature increased;</li> </ol> | 3 max | <ol style="list-style-type: none"> <li>1. Reject: Peptide bonds broken<br/>Denatures active site = 2 marks for mp 1 and 2</li> <li>2. <b>Q</b> Only allow second point if active site is used correctly<br/>Accept: active site no longer complementary</li> <li>3. Accept: Substrate cannot bind to enzyme</li> </ol> |
| 3(b)(i)   | Use <u>buffer</u> / test pH (at end/ at intervals);  | 1     | Accept a method of measuring pH.<br>Reject litmus.   |
| 3(b)(ii)  | (30°C/31°C )Maximum rate / optimum temperature;  | 1     | Accept other valid answers e.g. temp below 30°C as enzyme not denatured.   |
| 3(b)(iii) | Works best at pH 6 / at higher pH activity decreases;  | 1     | Accept converse<br>Insufficient: pH 6 had largest clear area   |

| Question | Marking Guidance   | Mark  | Additional Guidance  |
|----------|--|-------|--|
| 4(a)     | Volume (of air in lungs) decreases;  | 1     | Accept: Results decrease   |
| 4(b)     | Correct answer 1.4;;<br>Incorrect answer showing (vol. air breathed out = ) $6.5 - 2.3 / 4.2$ (dm <sup>3</sup> );  | 2     |  |
| 4(c)     | Reduced flow rates / less air breathed out / more air left in lungs (after breathing out);   | 1     | Insufficient: More air in lungs / high volume of air in lungs  |
| 4(d)     | <ol style="list-style-type: none"> <li>1. Alveoli break down / collapse / rupture / fewer alveoli / larger alveoli or alveolar wall/epithelium walls thicken;</li> <li>2. Reduced surface area / increased diffusion pathway;</li> <li>3. (So) less diffusion;</li> <li>4. Less elastin / elastic (tissue) / not recoiling / loss of elasticity / elastin permanently stretched;</li> <li>5. Reduced flow rate / less air expelled;</li> <li>6. So small / reduced diffusion or concentration gradient;</li> </ol> | 4 max | <ol style="list-style-type: none"> <li>1. Neutral: Damage. Accept alveoli burst</li> <li>Less surface area for diffusion = 2 marks (mark points 2 and 3)</li> <li>3. Accept diffusion less efficient. Reject diffusion of air.</li> <li>4. Elastic tissue must be in context of lungs.</li> <li>6. Accept: Not maintaining a steep diffusion/ concentration gradient.</li> </ol> |

| Question | Marking Guidance   | Mark  | Additional Guidance  |
|----------|--|-------|--|
| 5(a)     | 1. Uses energy / ATP;<br>2. Against concentration gradient / low to high concentration;<br>3. Does not use channel proteins / <u>only</u> uses carrier proteins; | 2 max | Assume “it” refers to active transport.<br>1. Facilitated diffusion is passive - neutral<br>2. Along / across concentration gradient- neutral<br>Accept up/ down concentration gradient<br>Accept AT does not need concentration gradient. |
| 5(b)(i)  | To see the effect of the drug / effect not due to anything else in the tablet;   | 1     | Neutral “to compare results”   |
| 5(b)(ii) | Placebo / dummy drug / tablet without drug;<br>(Otherwise) treated the same;   | 2     | No drug - neutral<br>Accept: Example e.g. tablet given at same time  |
| 5(c)     | Decrease for 3 hours;  | 1     | Accept decreases from 1 - 4 hours  |



| Question | Marking Guidance   | Mark | Additional Guidance   |
|----------|--|------|---|
| 6(a)     | 0.1 and 0.5;<br>Pressure in ventricle greater (than pressure in atrium);                         | 2    | Both figures must be correct.<br>Comparison needed  |
| 6(b)     | 1. (Ventricle has) thick wall / more muscle;<br>2. So <u>contractions</u> are stronger / harder; | 2    | 2. Neutral: Contracts to produce more pressure<br>2. Neutral: Pump harder.<br>2. Neutral: Reference to a need to pump blood further/round the body. |
| 6(c)     | 85 / 86 / 85.7;  | 1    | Ignore additional decimal places  |

| Question | Marking Guidance   | Mark  | Additional Guidance  |
|----------|--|-------|--|
| 7(a)     | <ol style="list-style-type: none"> <li>1. <u>Coronary</u> artery / vessel is blocked/narrows;</li> <li>2. Restricts oxygen supply to heart muscle / cells / tissue;</li> <li>3. Prevents respiration / ATP production / or (heart) muscle / tissues/cells die;</li> </ol>  | 3 max | <ol style="list-style-type: none"> <li>1. <b>Q</b> Do not accept references to veins or capillaries.</li> <li>3. Do not accept “Heart dies”</li> </ol>           |
| 7(b)(i)  | <p><u>Protein</u> on (surface of) <u>chlamydia</u>;<br/>That initiates an immune response (in mice) / causes antibody production;</p>  | 2     | <p>Neutral “foreign protein”<br/>Do not accept glycoprotein.<br/>2. Accept description of initiating immune response.</p>  |
| 7(b)(ii) | <ol style="list-style-type: none"> <li>1. Antibodies/memory cells against chlamydia (protein/antigen) are present;</li> <li>2. Protein on heart (muscle) similar to chlamydia protein/antigen;</li> <li>3. T cells / antibodies (attack heart muscle cells);</li> </ol>  | 2 max | <ol style="list-style-type: none"> <li>2. Look for idea that both proteins are similar</li> <li>3. Detail of what is attacking the heart muscle cells</li> </ol> |
| 7(c)     | <p><b>FOR</b></p> <ol style="list-style-type: none"> <li>1. Prevents / reduces heart disease/attacks;</li> <li>2. Cheaper to vaccinate than treat heart disease;</li> </ol> <p><b>AGAINST</b></p> <ol style="list-style-type: none"> <li>3. Vaccination costly;</li> <li>4. Don’t know frequency of chlamydia infection;</li> <li>5. Research in mice might not be replicated in humans / humans might have a different protein;</li> <li>6. Vaccine could cause heart disease or immune response against heart (muscle);</li> </ol> | 3 max | <p>2 max for arguments against</p> <p>Accept other valid answers</p>   |

| Question | Marking Guidance   | Mark  | Additional Guidance  |
|----------|--|-------|--|
| 8(a)     | <ol style="list-style-type: none"> <li>1. Phagocyte attracted to bacteria by chemicals / recognise antigens on bacteria as foreign;</li> <li>2. Engulf/ingest bacteria;</li> <li>3. Bacteria in vacuole / vesicle;</li> <li>4. Lysosome fuses with / empties enzymes into vacuole;</li> <li>5. Bacteria digested / hydrolysed;</li> </ol>  | 4 max | <ol style="list-style-type: none"> <li>1. Accept names chemical e.g. toxin</li> <li>2. Allow description of engulfing</li> <li>3. Accept: bacteria in phagosome.</li> <li>5. Neutral: Break down</li> <li>5. Accept digestive enzymes destroy bacteria</li> <li>5. Do not accept “destroy bacteria” as it is in question stem</li> </ol>                   |
| 8(b)     | <ol style="list-style-type: none"> <li>1. Microvilli;</li> <li>2. Large/increased surface area;</li> <li>3. Many mitochondria;</li> <li>4. (Mitochondria/respiration) produce ATP / release or provide energy (for active transport);</li> <li>5. Carrier proteins for active transport;</li> <li>6. Channel / carrier proteins for facilitated diffusion;</li> <li>7. <u>Co-transport</u> of sodium (ions) and glucose or symport / carrier protein for sodium (ions) and glucose;</li> <li>8. Membrane-bound enzymes digest disaccharides / produce glucose</li> </ol> | 6 max | <ol style="list-style-type: none"> <li>1. Reject villi on epithelial cells</li> <li>1. Accept brush border</li> <li>2. Accept large SA:vol ratio</li> <li>3. Need idea of “lots”</li> <li>4. Reject: energy produced</li> <li>5. Accept Na<sup>+</sup>K<sup>+</sup> pump</li> <li>7. Neutral: Channel proteins</li> <li>8. Accept named example</li> </ol> |