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**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**

GCE Advanced Subsidiary/Advanced Level

# MARK SCHEME for the November 2005 question paper

## 9700 BIOLOGY

**9700/02** **Paper 2** **maximum raw mark 60**

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which Examiners were initially instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the *Report on the Examination*.

The minimum marks in these components needed for various grades were previously published with these mark schemes, but are now instead included in the Report on the Examination for this session.

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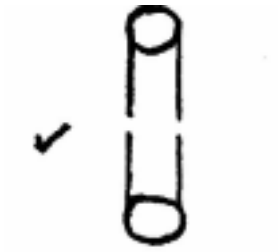
| Question | | Expected Answers | Marks |
|---|---|---|---|
| 1 | (a) | **A** – Golgi, body/apparatus/complex;<br>**B** - Nucleolus;<br>**C** – Mitochondrion. | **[3]** |
| | (b) | Trachea/bronchus; **A** bronchiole **R** nasal epithelium etc. | **[1]** |
| | (c) | **P** to line between 2 amino acids;<br>**G** to line between 2 sugars *or* between first sugar and amino acid. | **[2]** |
| | (d) | Lines surface (of epithelium);<br>Sticky;<br>Traps, dust/spores/bacteria/AW;<br>Moved by cilia;<br>Towards throat/away from lungs;<br>Protects, alveoli/gas exchange surface. | **max [3]** |
| | (e) | Cell recognition site;<br>Receptor/receptor molecule;<br>For cell adhesion;<br>Stabilise membrane structure/form hydrogen bonds with water molecules;<br>(Cell surface) antigen; **A** cell marker. | **max [1]** |
| | | | **[Total: 10]** |

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**Question** **Expected Answers** **Marks**

**2** **(a)** Bilayer/two layers;
Hydrophilic part/polar head/phosphate/choline, faces, water/outside cell/tissue fluid/cytoplasm;
Hydrophobic part/fatty acid chains, face each other/AW.

*Accept annotated diagram*



✓ Ref to outside/cytoplasm/ Water/tissue fluid etc.

**[2]**

**(b)** *Phospholipid has*
Phosphate/phosphorus;
Two fatty acid chains;
Fatty acids of different lengths; (different numbers of carbon atoms in each chain);
Different fatty acids/one is unsaturated/one has a double bond;
Choline/nitrogen/base. **max [2]**

**(c)** Long hydrocarbon chain/mostly $CH_2$ units repeated/many C-H bonds;
**A** many C-H bonds
Higher proportion of hydrogen/more highly reduced/few oxygen/AW;
Generates much energy (when respired)/twice as much energy as carbohydrate;
**A** 15-17 kJ v 37-40 kJ
Compact;
Can be stored in anhydrous form;
Higher calorific value/more energy per unit mass/smaller mass per unit energy. **max [2]**

**(d)** *Penalise once if minutes not used*
**(i)** 5 minutes. **[1]**

**(ii)** 10 - 11 minutes. **[1]**

**(e)** Fatty acids are released.; **[1]**

**(f)** Steeper decrease from 5 minutes;
Levels off at pH 7.0.; **[2]**

**[Total: 11]**

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| Question | | | Expected Answers | Marks |
|---|---|---|---|---|
| 3 | (a) | (i) | *2 marks for the correct answer – leeway on measurement to be decided.*<br><br>$\frac{10\text{ mm}}{100\,000}$ ;<br><br>100 nm. | **[2]** |
| | | (ii) | Good/high, resolution. **A** short wavelength | **[1]** |
| | (b) | | (T lymphocyte) makes viral, protein/enzyme;<br>Cell needs more enzymes for replicating, DNA/protein synthesis/AW;<br>AVP. | **max [1]** |
| | (c) | | Sexual intercourse;<br>Infected, blood/blood products;<br>Sharing/re-using, hypodermic needles;<br>Across placenta/from mother to foetus;<br>Breast milk;<br>AVP. | **max [3]** |
| | (d) | | No cure/no vaccine;<br>Drugs are expensive.<br><br>*Problems with*<br>Symptomless carriers (spreading the virus);<br>Testing people for HIV status;<br>Providing, condoms/femidoms;<br>Educating about risks;<br>Tracing contacts (of infected people);<br>Screening blood donations;<br>Treating blood to kill HIV;<br>AVP. | **max [3]** |
| | | | | **[Total: 10]** |

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| Question | | Expected Answers | Marks |
|---|---|---|---|
| 4 | (a) | *Double* – blood passes through the heart twice during one circulation;<br>*Closed* – blood travels inside blood vessels. | [2] |
| | (b) | *One mark for an advantage and one mark for a disadvantage.*<br><br>*Advantage*<br>More space, for haemoglobin/to carry oxygen;<br>*Idea that rbcs* can change shape, to fit through capillaries.<br><br>*Disadvantage*<br>Cannot carry out, protein synthesis/replication/repair;<br>Short life span;<br>Cannot, divide/replace themselves. | [2] |
| | (c) (i) | Mitosis. | [1] |
| | (ii) | Bone (marrow). | [1] |
| | (iii) | Antigen. | [1] |
| | (iv) | **X** plasma cell;<br>**Y** antibody ; **A** immunoglobulin | [2] |
| | (v) | Memory cell.<br><br>Remains in, lymph node/blood/lymph/lymphatic system/body;<br>Recognises next infection by same, antigen/(measles) virus;<br>Secondary response;<br>(More) rapid (than primary);<br>Immunological memory;<br>AVP. | [1]<br><br>max [2] |
| | | | [Total: 12] |

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| Question | Expected Answers | Marks |
|---|---|---|
| 5 (a) | Total, mass/volume, is, constant/same/same as the larger cube;<br>**R** control/fair test. | [1] |
| (b) | *One or both lines on the graph*<br>Rapid increase in mass, for first three hours;<br>Slower increase, between 3-25 hours/levels out after 25 hours over rest of time;<br><br>*Comparison*<br>Larger percentage increase in 8 cubes;<br>Ref to data to show how much greater. | max [3] |
| (c) | Cell volume increases/ref to mass of water;<br>Lower, water/solute, potential of yam cells; **A** more negative<br>Water entered yam by osmosis;<br>Down water potential gradient/described (from high to low water potential);<br>Through partially permeable membranes (around cells);<br>Potato (yam) (cells) contain, solutes/salts/ions/ sugars/osmotically active substances. | max [3] |
| (d) | Greater surface area: volume ratio;<br>6:1 not 3:1; **A** 2:1;<br>Greater surface, exposed to water/for water to diffuse through/move through by osmosis (for every 1 $cm^3$ of volume);<br>Therefore more water per unit time (at least initially);<br>Outer cells of large cube may have become fully turgid so restricting inner cells from, enlarging/absorbing water/becoming fully turgid;<br>**A** tissue tensions restrict uptake. | max [2] |
| | | [Total: 9] |

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| Question | | Expected Answers | Marks |
|---|---|---|---|
| 6 | (a) | *Assume answers are about globular proteins*<br>Soluble;<br>Ref hydrophilic groups;<br>Compact;<br>Ref tertiary structure;<br>AVP. | **max [2]** |
| | | | |
| | (b) | *2 marks if all correct, 1 mark if one wrong, no marks if two or more wrong*<br><br>leu \| thr \| pro \| glu \| lys \| ser | **[2]** |
| | | | |
| | (c) | **1 & 2** Names of four bonds; *award one mark for three named bonds.*<br>**3** (Hydrogen bond) between polar groups;<br>**4** (Ionic bond) between amines and carboxylic acid groups;<br>**5** (Disulphide bond) between cysteines;<br>**6** (Hydrophobic interactions) between non-polar side chains;<br>**7** AVP; e.g. folding sites in $1^{o}$ structures. | **max [4]** |
| | | | |
| | | | **[Total: 8]** |

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