UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Level and GCE Advanced Subsidiary Level

MARK SCHEME for the May/June 2006 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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UNIVERSITY of CAMBRIDGE
International Examinations

1 (a)

	cell **A**	cell **B**	cell **C**
name of cell	phagocyte / neutrophil / AW;	squamous epithelial (cell) / endothelial (cell);	
function of cell			transports, oxygen / carbon dioxide;
diameter / μm	*to be added*		

[4]

(b) **D** mitochondrion;
E lysosome / (Golgi) vesicle; **R** vacuole
F nucleus; **[3]**

(c) *oxygen*
diffuses, down concentration gradient / from high concentration to low concentration;
through, phospholipid bilayer; **R** protein channels

glucose
(pressure) filtration / AW; e.g. 'forced out by blood pressure'
through pores, in capillaries / between capillaries;

facilitated diffusion;
through channel proteins / idea;
through cytoplasm; **[max 3]**

(d) *assume answer is about vein unless told otherwise*

thicker wall / more cells / more than one cell thick;
A more, squamous epithelium / endothelium
valve(s);

three layers / described;

to max 2
(smooth) muscle;
collagen;
elastic tissue / elastin;

R references to size, width, size of lumen, amount of blood etc. **[max 3]**

[Total: 13]

2 (a) (i) **G** sieve tube (element),
H companion cell; **[1]**

(ii) *vessels have*

thicker walls;
thickening in walls (e.g. spiral, annular, reticulate);
wider lumen;
no cytoplasm; **R** dead (not structure)
pits;
no cross walls / no sieve plates / no sieve pores;
lignin; **[max 3]**

(b) (sucrose) loaded at, source / leaf;
role of companion cells;
further detail, e.g. H^+ pumped out, sucrose moves in through co-transporter;
absorption of water / water enters by osmosis;
hydrostatic pressure builds up;
mass flow;
(sucrose) unloaded at, sink / fruit / root / AW;
gives a difference in pressure (between source and sink); **[max 4]**

(c) sucrose used in respiration;
stored as starch;
used to make, cellulose; **A** used to make cell walls
stored as / converted to, organic acids (in vacuoles);
converted into named other substances; e.g. lipid / protein / AW **[max 1]**

[Total: 9]

3 **(a)** *one mark per row*

statement	protein	DNA	messenger RNA	cellulose
hydrogen bonds stabilise the molecule	✓	✓	x	✓ ;
glucose is the subunit molecule	x	x	x	✓ ;
subunits are joined by peptide bonds	✓	x	x	x ;
may be hydrolysed to amino acids	✓	x	x	x ;
contains uracil	x	x	✓	x ;

[5]

(b) CAG; **[1]**

(c) tRNA, combines with amino acid / carries amino acid to ribosome;
idea of specificity; e.g. each type of tRNA is specific to an amino acid
anticodon matches amino acid idea;
example from Fig. 3.1;
codon on messenger RNA pairs with anticodon on tRNA;
example from Fig. 3.1;
two sites on ribosome;
further detail; e.g. P and A site (and E)
leave ribosome after amino acid joins polypeptide;
continually reused; **[max 5]**

(d) variable region;
binding region to antigen;
<u>shape</u> is specific to, choleragen / antigen;
<u>complementary</u>;
ref to R groups on amino acids (in polypeptide / protein);
different, sequences of amino acids / primary structures;
ref to, folding of the molecule / secondary structure / tertiary structure; **[max 3]**

(e) poor sanitation / no treatment of faecal waste;
contamination of (drinking) water supply;
poverty / poor living conditions / poor hygiene / poor (health) education;

ref to natural disasters; e.g. assistance / aid / medical help / AW, cannot arrive in time

no rehydration therapy available (at time when needed);
no (effective) vaccine;
further detail; (bacteria live in gut, where immune system is not effective) **[max 3]**

[Total: 17]

4 **(a)** (15,000 / 0.5)
x 30,000; **[1]**

(b) starch grain;
grana / thylakoids / internal membranes;
shape, qualified; 'typical chloroplast shape' is minimum acceptable
length; **A** range of appropriate lengths, e.g. 5 to 10 μm **[max 2]**

(c) *make*
ATP; **A** combine with ADP
phospholipids;
DNA / RNA / nucleotides / named nucleotide;
phosphorylated sugars / triose phosphate; **[max 1]**

(d) condensation (reaction) / described as elimination of water;
glycosidic, bond / link;
1:4 in, amylose / amylopectin / both;
amylose, helix / unbranched; **A** curved chain **R** straight chain
amylopectin, branched;
1:6 links (to give branches); **[max 4]**

(e) (raw material) for photosynthesis; **A** for photolysis
maintains turgidity / provides support;
pushes chloroplasts to edge of cell;
used in hydrolysis reactions;
solvent for, ions / named ion / pigment / named pigment; **[max 3]**

[Total: 11]

5 **(a)** (bacterial urease converts) urea → ammonia;

ammonia → nitrite;
Nitrosomonas;
nitrite → to nitrate;
Nitrobacter;

nitrification;
oxidation / chemosynthesis; **[max 3]**

(b) **(i)** **6** ; **[1]**
(ii) **5** ; **[1]**
(iii) **3** ; **[1]**

(c) curve starting at 0;
but lower;
reaches same plateau but at higher concentration of urea; **[2]**

(d) inhibition is reversible;
enzyme is still active;
inhibitor fits into active site temporarily;
substrate is broken down (reaction does proceed);
same end point;
just takes longer / reaction is slower with inhibitor; **[max 2]**

[Total: 10]

[Total mark for paper: 60]