CAMBRIDGE
INTERNATIONAL EXAMINATIONS

November 2003

GCE AS/A LEVEL

MARK SCHEME

MAXIMUM MARK: 50

SYLLABUS/COMPONENT: 9700/02

BIOLOGY
Paper 2 (Theory 1)

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

KEY

a semi colon ;	indicates a separation of marking points
an oblique line /	indicates alternative wording or acceptable alternative
R	means reject
A	means accept
AW	means 'alternative wording'
underlined with a straight line	accept this word only, no alternative word is acceptable
D	represents quality mark(s) awarded for diagrams, as indicated on the Mark Scheme
L	represents mark(s) awarded for labels on diagrams, as indicated on the Mark Scheme
ora	or reverse argument accepted.

Question	Expected Answers	Marks
1 (a)	thicker wall; smaller / narrower lumen; more muscle / more elastic tissue / more / thicker tunica media; ref to 'crinkly' / crenulated / wavy / folded, lining / endothelium / tunica intima; R. epithelium ref to wall to diameter ratio e.g. thicker wall to diameter ratio; more collagen fibres / more tunica adventitia / externa; circular / rounded shape compared to irregular shape; A. converse points for vein	**max 3**
(b)	provide a large surface area / surface area to volume ratio; for gas exchange / carbon dioxide out and oxygen in; short diffusion distance across capillary wall / one cell thick capillary wall / 1-2μm c. wall / thin endothelium; R. epithelium R. thin wall unqualified small size enables blood to be as close as possible to lung cells / air in alveolus / capillaries in close contact with alveolus (wall); (so) diffusion is efficient / takes place easily / maximises efficiency of diffusion;	**max 3**
(c)	destroys / paralyses / inhibits / weakens cilia; R. kill mucus glands / goblet cells produce more mucus; tar contains carcinogens / chemicals which damage DNA / genes / oncogenes; ref cancer / tumour; epithelium / lining replaced by scar tissue;	**max 3**
		[Total 9]

Question	Expected Answers	Marks
2 (a)	14 147;	1
(b)	3.74%;	1
(c)	more energy available at lower trophic levels / less energy available at higher levels / energy lost between trophic levels; any two figs from fig. 3.1 to qualify above statement (comparison req, no units needed); therefore can sustain a larger population; greater variety of food / not have to rely on one food source; less chance of starvation / more chance of survival / less competition for food; may feed on detritus / dead organisms / waste materials (dead leaves, faeces, urine);	max 2
(d)	breakdown / decay / feed on / digest / secrete hydrolytic enzymes onto, organic molecules / dead plant / animal / excreted / egested, material; R. decomposing starch / cellulose, to sugars; respire; release carbon dioxide; protein to amino acids; deamination (of amino acids); (release) ammonia (NH_3) / ammonium ions (NH_4^+) / ammonium compounds / ammonification; (becomes available for) nitrification / ammonia -> nitrite -> nitrate / ammonia -> nitrates / ammonium -> nitrates; R. nitrifying / named bacteria unqualified / ammonia -> nitrite	max 4
		[Total 8]

Question	Expected Answers	Marks
3	*Vibrio cholerae / V. cholerae*; (correct spelling required) ignore upper case / lower case diarrhoea (phonetic spelling req); A. vomiting / 'rice water' only R. loss of fluid / loss of water and salts (contaminated) food / water; R. drinks R. cooking utensils immune response; antibodies / immunoglobulins;	
		[Total 5]

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

4 (a) *one mark per row*

statement	starch	glycogen	cellulose
glycosidic bonds between monomers	✓	✓	✓
monomer is β glucose	✗	✗	✓
stored within chloroplasts	✓	✗	✗
stored in muscle cells	✗	✓	✗
exists in two forms - branched and unbranched chain	✓	✗	✗

Do not penalise where <u>all</u> ✗ <u>or</u> ✓ s are omitted
Do penalise each row if a mixture of ✗ , ✓, and blanks

5

(b) take samples at <u>timed</u> intervals e.g. every minute;
test with iodine <u>solution</u> / potassium iodide <u>soln</u> / **or** Benedicts ;
determine the end point, eg continue until no blue / black (colour) / yellow / brown appears **or** continue until brick red / colourless ;
<u>time</u> taken to reach end point e.g. record the time;
ref to use of colorimeter (for precise results) (for both experiments) **or** standards / green -> yellow -> orange -> red;
plot amount of starch remaining **or** glucose / maltose / reducing sugar produced / transmission / absorption against time / sketch graph with labelled axes;
ref to initial rate / rate calculation (e.g. $^1/_t$ or gradient from graph);

max 4

[Total 9]

Question	Expected Answers	Marks

5 (a) *max 3 for glycoproteins and carrier proteins combined*

glycoproteins
receptors / receptor molecules;
for hormones / neurotransmitters / named hormone / neurotransmitter (e.g. insulin, acetyl choline, noradrenaline);
idea of (cell surface) antigens / (cell surface) markers / cell recognition / cell adhesion;
help to stabilise membrane structure / forms H bonds with water molecules;

carrier proteins
allow named substance (e.g. glucose / amino acids) / polar substance / ion(s) / hydrophilic / water soluble substance (to pass through membrane);
(ref) against concentration gradient / active transport;
energy / ATP (req for transport);
(and) facilitated diffusion / faster than simple diffusion (for ions / polar molecules);

cholesterol
maintains / regulates fluidity of membrane / prevents membrane being too rigid or fluid / mechanical stability (qualified) / prevent ions / polar / water soluble / named molecule, passing / leaking through membrane;

max 4

(b) *max 3 for each of the following*
A
active transport;
carrier / transport protein;
(pumped) against concentration gradient / low to high conc;
using energy / ATP;
detail (eg binding to specific receptor sites / idea of conformational change);
B
diffusion; R. facilitated difffusion
ATP not used; R. energy not needed
through lipid bilayer / phospholipids / hydrophobic region;

max 4

Question	Expected Answers	Marks
5 (c)	(bacteria) adhere / stick / bind / attach , to surface (of phagocyte); ref to receptors / receptor proteins (on phagocytes) / (detect) bacteria 'marked' by antibodies / opsonins; ref to pseudopodia / extensions of cytoplasm; R. invagination unqualified engulfed / enveloped / endocytosis / phagocytosis, to form <u>vacuole</u> / <u>vesicle</u> / <u>phagosome</u>; A. marking points from <u>annotated</u> diagram(s)	**max 2**
(d)	contain (hydro)lytic / digestive / named enzymes / digestion of <u>bacteria</u> / <u>pathogens</u>;	**1**
		[Total 11]

Question	Expected Answers	Marks
6 (a)	greater / increased / more demand for energy / ATP; in muscles; aerobic respiration; **max 2**	
(b)	oxygen debt; R. deficit A. dept lactate / lactic acid; respired in the liver; A. heart converted to glucose / pyruvate / glycogen; (re)oxygenation of myoglobin; (re)oxygenation of haemoglobin; increased / still high rate of, metabolism / respiration (after exercise); **max 4**	
(c)	rejection / ref to immune system; R. may not match unqualified shortage of donors; shortage of, trained personnel / appropriate facilities; idea of high cost of surgery / aftercare / drugs; A. expensive greater risk of surgery; **max 2**	
		[Total 8]

Total mark for paper = 50