UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2007 question paper

9700 BIOLOGY

9700/02 Paper 2 (AS Structured Questions), maximum raw mark 60

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UNIVERSITY of CAMBRIDGE
International Examinations

1 (a)

function	Structure
facilitated diffusion of glucose	**B**
creates a current to move mucus	**A ;**
aerobic respiration	**C ;**
makes ribosomes	**E/C ;**
a site of transcription	**G/E/C ;**
packages proteins into lysosomes	**J ;**

[5]

(b) *alveoli – accept ora for bronchus*

thin, cells/walls/epithelial lining/epithelium (for alveoli) ; **A** 1 cell thick **A** 0.5μm
short diffusion distance ;
well supplied/better supplied, with blood/capillaries ;
(alveoli provide) large surface area (when expanded) ;
less/no/thinner layer of, mucus ; [max. 3]

(c) less/no/damaged, cilia ; **A** paralysed/not beating **R** killed
flat cells/squames/squamous epithelium ;
layers of cells ; **R** thicker unqualified
scar tissue ;
much mucus ;
inflamed ; **R** infected **A** goblet cells enlarged
deposits of tar (idea of) ; [max. 3]

[Total: 11]

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2 (a) catalyst ;
active site ;
complementary (to specific substrate) ;
lock and key/induced fit, correctly described ;
enzyme-substrate complex ; **A** E-S complex
lowers activation energy ; **A** Ea
further detail of active site ; e.g. role of **R** groups in active site/catalytic/
binding, site/mechanism to lower Ea [max. 4]

(b) (i) (idea of) presence of starch ; [1]

(ii) control ;
to show, enzyme involved/enzyme catalysed reaction/not spontaneous/**AW** ;
enzyme denatured by boiling ; [max. 2]

(c) A starch, broken down/converted to glucose (1-) phosphate/AW ; ora for **B**

A at pH 6.5/nearly neutral/AW, enzyme is active idea/AW ;
e.g. ref to optimum at or near 6.5

(B) at pH 2.0/acidic qualified, enzyme is inactive idea/AW ;
e.g. well away from optimum
further detail e.g. specific effects of pH / bonds affected by hydrogen ions;
C enzyme denatured, by boiling/high temperature ;
ref to bonds broken by high temperature ;

(D) glucose phosphate gives, no reaction with iodine/negative
result ; **A** no starch/no substrate added gives, no reaction with iodine/negative result
[max. 4]

(brackets) denote the letter not required for mark

[Total: 11]

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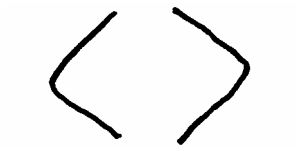
3 (a) (i) 6 ; [1]

(ii) centromere ;

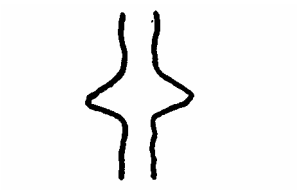
site of attachment to, microtubules/spindle fibres ;
A holds chromatids together **R** ref to centromeres dividing [2]

(iii) any pair shaded in ; **A** more than one pair [1]

(iv) *either*



or



two daughter chromosomes shown ;
centromeres leading as shown above ; [2]

(b) chromosome, unravels/becomes chromatin/AW (during telophase) ;
transcription ;
described/mRNA produced ;
replication/new DNA produced ;
semi-conservative/description e.g. unzips and bases pair up ;
ref to histone proteins ; [max. 3]

(c) halved/6 -> 3 ; A diploid -> haploid/2n -> n

to restore diploid number at fertilization/
to avoid chromosome number doubling in every generation ; [2]

[Total: 11]

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4 (a) (i) source = leaf/mesophyll/palisade/spongy qualified
sink = flower/fruit/seed/stem/bud/root/tuber/storage organ/young leaf/meristem/pollen/nectary/AW ; [1]

(ii) **C** sieve, (tube) element/cell,
D companion/transfer, cell ; [1]

(b) ***source to cell C***
correct ref (sucrose) loaded ;
H^+ pumped out, sucrose moves in through co-transporter ;
role of companion cells in moving sucrose into sieve tube element ;
sucrose diffuses down concentration gradient (anywhere) ;
ref to plasmodesmata ; [max. 2]

cell C to sink
water enters by osmosis/water moves down its Ψ gradient ;
hydrostatic pressure builds up ;
(idea that sucrose) unloaded/used at sink ;
water follows by osmosis ;
idea there is a difference in pressure/pressure gradient (between source and sink) ;
mass flow ; [max. 2]

(c) small surface area : volume ratio *ora* ;
accept described

idea of distances too great for diffusion/diffusion rate too slow ;

idea of
cells requiring, substances/named substances, are at a distance from site production/ absorption ;

idea of
mass *or* bulk transport/described ; [max. 2]

[Total: 8]

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5 **(a)** **A** passive artificial ;
B active artificial ;

if artificial omitted score one mark if passive and active are correct [2]

(b) mark **(i)** and **(ii)** together

(i) antibody, destroyed/broken down ;
antibody excreted ;

(ii) no antigen entered body ;
no immune response ;
no, (active) B cells/plasma cells/memory cells ;
no antibody made ;

AVP ; e.g. further detail of lack of immune response /
no stimulation of B cells by T helper cells/no cloning [max. 3]

(c) *line drawn on graph to show*

increase occurs faster than in primary response ;

higher peak of concentration than in primary response ; [2]

(d) antibody is specific (for tetanus) ;
further detail ; e.g. variable region
always some (circulating) antibody molecules, linked with qual ;; [max. 2]

[Total: 9]

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6 **(a)** 7.0 nm ; [1]

(b) **K** permits movement of, ions/(small) water soluble molecules/ charged/polar/hydrophilic/any e.g. ;
facilitated diffusion/active transport ; [max. 1]

L cell recognition/(surface) antigen/receptor/cell adhesion/cell marker/ binding site ;
forms hydrogen bonds with water to stabilize membrane structure ; [max. 1]

M barrier to, water soluble compounds/ions ;
allows passage of lipid soluble substances / named e.g. ;
ref hydrophobic interactions with integral proteins ;
ref structure of fatty acid tails maintains fluidity ; [max. 1]

N regulates, fluidity/stability ;
storage ;
restricts movement of phospholipids ;
influences permeability of membrane ; [max. 1]
[4]

(c) idea of large molecule ;
polar ;
<u>water</u> soluble/not lipid soluble ; **A** hydrophilic
A not able to pass through phospholipid bilayer / AW [max. 2]

(d) *facilitated diffusion because* the rate of uptake increases with increasing glucose concentration, up to a plateau/constant rate ; **A** figs to explain because no more proteins available/all proteins in use ;
if passive diffusion rate would continue to rise ;
cannot be active transport as rate would be independent of concentration (except at low concentration) ; [max. 2]

(e) (active transport) uses, energy/ATP, to move (substance) against a concentration gradient ; *ora* [1]

[Total: 10]

[Total mark for paper = 60]

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