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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the October/November 2006 question paper

9700 BIOLOGY

9700/02 Paper 2 (Theory 1), 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 instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began.

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 grade thresholds for various grades are published in the report on the examination for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses.

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UNIVERSITY of CAMBRIDGE
International Examinations

1 (a) **H;**
C;
G;
B; **[4]**
R multiple answers.

(b) *oxygen to max 3*

from, air/atmosphere, into pneumatophores/breathing roots;
A roots suitably qualified.
diffusion, down concentration gradient/from high concentration to low concentration;
through/between, cells;
air spaces between cells;

water to max 3

osmosis;
from soil/mud into, root hair/epidermal cell/epidermis;
down water potential gradient/from high water potential to low water potential;
A into lower water potential/more negative water potential
root cell (vacuoles) have, salts/solutes/ions/minerals, to lower water potential/lower solute potential; **[5]**

[Total: 9]

2 (a) nucleus/nuclear membrane/nuclear envelope/nucleolus;
ER/SER/RER;
Golgi (body/apparatus)/lysosomes;
larger ribosomes/80S ribosomes;
linear DNA/chromosomes/protein + DNA (in chromosomes);
mitochondrion/mitochondria;
cell wall made of cellulose; **R** cell wall unqualified
microtubules; **A** spindle fibres/centriole
large vacuole/tonoplast;
plasmodesmata; **[max 3]**

(b) high(er) resolution;
because of shorter wavelength;
more detail can be seen/much clearer, at the same magnification/can see two points that are close together/quote appropriate figs;
can see cell structures, that are not visible in the LM/
A e.g. ribosomes/membranes;
can see detail of structures just visible in LM with e.g.
A mitochondrion/chloroplast; **[max 2]**

(c) nitrogen fixation; **A** fixes nitrogen
converts nitrogen to ammonia; **A** NH_3/NH_4^+
further detail; e.g. nitrogenase/anaerobic conditions/ATP needed/H^+ needed
ammonia converted to amino acid(s);
(amino acids) exported to cells of legume;
in return for carbohydrate/sugars/sucrose/glucose/fructose;
symbiosis/mutualism;
helps legume survive in areas with low, N/nitrates;
A competitive advantage **[max 3]**

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(d) they have the same/similar function, to combine with oxygen;
idea of similar/same, primary sequence/sequence of amino acids;
idea of same/similar, tertiary structure/3D shape; **A** quaternary

common ancestry/both are eukaryotes,because they share some of the same genes; **[max 2]**

[Total: 10]

3 (a) **A** to cilia; **R** basal body
B to nuclear membrane;
C to ER; **[3]**
must have label lines which touch appropriate place

(b) cilia are, absent/destroyed/damaged/not functioning; **R** killed
mucus is not moved/swept away;
mucus, remains/accumulates, in airways qualified e.g. lungs/alveoli/bronchi;
pathogens/bacteria/viruses/fungi, are not carried away/are trapped;
pathogens, reproduce/divide/multiply/spread;
ref to conditions for their growth; **[max 3]**

(c) there is no positive correlation AW e.g. no link/no direct connection,between increased cigarette consumption and number of deaths;
use of comparative figures to support this; **both no of cigarettes and deaths must be quoted (2 sets of figs needed)**

Any one other valid mark from the following:
people die before COPD develops (sufficiently);
only 20 countries;
cause of death may not be recorded accurately/maybe other cause(s) recorded on death certificate;
COPD contributed to death but not main cause;

maybe other factors contribute to developing COPD eg. air pollution/occupation/ climate/population density;

maybe other factors involved with smoking are more important e.g. number of years smoked/number of cigarettes smoked by smokers;

ref to correlation coefficient;
for the data it is 0.05 **[max 3]**

[Total: 9]

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4 **(a)** *ignore references to prophase*
at D/during metaphase

chromosomes arrange, on metaphase plate/at equator/on equatorial plate; **R** middle of cell
chromosomes with two (sister) chromatids/AW;
chromosomes attached to spindle at centromeres; **[max 2]**

at E/during anaphase

centromere(s), break/divide/duplicate; **R** replicate/split chromosomes/ chromatids, move/separate to opposite poles; **R** ends
ref microtubules/spindle (fibres), with centromeres leading;

[max 2]

(b) chromosomes uncoil/AW; e.g. become longer and thinner
nuclear, membrane/envelope reforms/AW;
new cell membrane formed;
cell plate/(new) cell wall/middle lamella, forms;
cytokinesis; **R** if say cytoplasm constricts as ref to animal cells **[max 3]**

(c) mitotic index decreases from 0.11 to 0.016, as distance from tip increases/from 0.1 to1.9mm;
any ref to comparision plus distance from tip figs ;;
e.g. steep/AW decrease 0.6 to 0.7 mm
small/AW decrease 0.7 to 1.3 mm
slight/AW increase 1.3 to 1.8 mm
A for 1 mark if describe main pattern plus 2 overall ref points
R rapid or slow increases and decreases
if mm not used at least once, penalise once **[max 3]**

(d) during, interphase/S phase/before, mitosis/prophase, replication of DNA;
semi-conservative replication;
some ref to base pairing/any example, to template strand;
(during anaphase), sister chromatids are separated/move to opposite poles/go into separate cells";
new cells have same number, and kind of chromosomes/AW e.g. same, genes/DNA/chromosomes as parents; **[max 3]**

[Total: 13]

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5 (a) (i) 700 000/5 400 000 x 100; AW e.g. 6,100,000/5,400,000 = 112.96% – 100 (= 12.96%)

13; **R** 12.96
1 mark for working, 1 mark for correct answer **[2]**

(ii) (more red cells =) more haemoglobin;
more oxygen can be carried (per unit volume of blood);
at altitude the partial pressure of oxygen is, low/lower than at sea level;
A less oxygen at altitude **R** ref to lower Hb saturation
more red cells/more haemoglobin, compensates for lower saturation, of haemoglobin; **A** affinity **[max 2]**

(b) *phagocytes*
ingest/engulf/digest, bacteria; **R** destroy/kill/phagocytosis unqualified act as APC (Antigen Presenting Cell) to stimulate B/T cell response; [max 1]

T helper cells
secrete/release, cytokines/lymphokines;
to activate/stimulate B lymphocytes to produce plasma cells/antibodies/memory cells, or stimulate/activate phagocytosis; [max 1]

[2]

(c) resistance; **R** bacteria become immune
ref to selection of resistant bacteria;
antibiotic, can then not be used/are ineffective/no longer kill bacteria;
ref to multiple resistance;

R answers that suggest people become resistant **[max 2]**

[Total: 8]

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6 (a) (i) **F** vena cava;
G pulmonary artery; **[2]**

(ii) 75; **R** inappropriate units e.g.dm^3/min **[1]**

(iii) ventricles pump blood, to lungs/to whole body/further;
atria pump blood, to ventricles/shorter distance;
correct reference to pressure; e.g. ventricles have to push blood further so blood under higher press or <u>create</u> higher press
R atria at lower press or ventricles receive blood at higher press **[max 2]**

(b)

	left atrium	left ventricle	atrio-ventricular valve	aortic valve
H	*contracts to force blood into left ventricle*	Diastole/relaxes, filling with blood/receives blood, <u>from left atrium</u>;	*open*	*closed*
J	Diastole/relaxes, fills with blood/receives blood, <u>from pulmonary veins</u>;	Systole/contracts, forcing blood <u>into aorta</u>;	*closed*	open
K	Diastole/relaxes, fills with blood/receives blood, <u>from pulmonary veins</u>;	*relaxes and fills with blood from left atrium*	*open*	closed;

[6]

[Total: 11]

[Total mark for paper = 60]

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