UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2010 question paper

for the guidance of teachers

9700 BIOLOGY

9700/23 Paper 2 (AS Structured Questions), maximum raw mark 60

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UNIVERSITY of CAMBRIDGE
International Examinations

1 (a) **A** nucleus **;** **A** (eu)chromatin **R** nucleolus
B mitochondrion **;** **A** mitochondria
C (rough) endoplasmic reticulum **;** **A** (R)ER **R** smooth/S [3]

(b) (i) protein/polypeptide, synthesis/AW **;** **A** protein, transport/modification
A ecf if **C** is identified as Golgi or SERor ribosomes in **1 (a)** [1]

(ii) *ignore refs to magnification*
resolution/resolving power, low(er) **;** ora
200 nm compared to 0.5 nm **; A** resolution quoted in range 100-300 to 0.2-1.0 nm
ref. to visibility of structure **C ;** e.gs.
wavelength of light longer than size of, ribosomes/membrane
ribosomes/membrane, cannot be seen as less than 200nm diameter
ribosomes only 20–30 nm diameter **A** 15–20 nm
membranes 7–10 nm thick
small size linked to explanation of resolution [2 max]

(c) *any one relevant disadvantage e.g.*

only dead specimens can be viewed **;**
mounted in vacuum/pre-treatment, may distort delicate structures **; A** artefacts
expensive, qualified **;** e.g. to buy, maintain, increased cost electricity, costs associated with, time/training
requires, more electrical power **;**
requires stable, high voltage supplies/currents **;**
sensitive to external magnetic fields **;**
difficult to operate/requires technical training **;**
samples more difficult to prepare **; A** examples e.g. thin sections
lengthy preparation time **;**
monochrome/black and white only **;**
not portable/can only be used in specific locations (e.g. with voltage supplies) **;** [1 max]

(d) *allow +/- 1 mm in reading the line*
award two marks if correct answer is given

20 000/6 µm = (3333.3) **A** 19 000/6 = (3 166.7) **A** 21 000/6 = (3 500.0)

3 333 (x)**;;** **A** 3 167 (x) **A** 3 500n(x)

award one mark if answer is given to one or more decimal places or
award one mark if correctly measured and divided by 6 µm but incorrectly converted [2 max]

[Total: 9]

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2 (a) semilunar valve **;** **A** pulmonary valve

prevents backflow (of blood) **;**
from the pulmonary artery/into the right ventricle **;**
or
ensures one-way flow of blood **;**
from the right ventricle/into the pulmonary artery **;** [3]

(b) (**Y**/wall of left ventricle) contains <u>more</u> (cardiac) muscle **;** ora
left ventricle/ventricle beside **Y**, pumps blood to, whole body / further **;** ora
at higher pressure with more force (than right) **;** ora
resistance to blood flow is greater in systemic circulation **;** ora [3 max]

(c) *any two of* SAN, AVN, Purkyne tissue/Bundle of His *in correct context* **;**

SAN/(primary) pacemaker, sends out, waves of excitation/impulses **;**
A electrical (im)pulses
R once only nervous impulse(s)/pulse(s)/signal(s)
R if brain stimulates SAN to send out impulses
spreads across atria **;**
atria contract/atrial systole **;**

fibrous ring/non-conducting tissue/insulating tissue **;**
prevents, it reaching the ventricles/ventricles contracting at the same time (as atria)**;**

atrio-ventricular node/AVN, acts as 'relay station'/sends wave of excitation to ventricles**;**
A in correct context – impulse reaches AVN and is passed on
(therefore) time delay to allow, atria to empty/atria to complete contraction/ventricles to fill//
atria and ventricles do not contract at the same time **;**
time ref. 0.1 – 0.2 seconds **;**

Purkyne tissue bundle of His, conducts, excitation/impulses, to base of, septum/ventricles **;**
A apex of heart
spreads upwards in ventricle (walls) **;**
(so) ventricles contract from base upwards/ventricles force blood up from base **;** [5 max]

[Total: 11]

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3 **(a)** **(i)** primary ; **A** first
quarternary ; **A** fourth [2]

(ii) disulfide (bonds/bridges) ; [1]

(b) peptide bond broken ;
correct involvement of water ;
free –COOH/–COO^- and free –NH_2/–NH_3^+ shown ; [3]

[Total: 6]

4 **(a)** *any one correct description (1 mark) with explanation (1 mark) e.g.*

any named biological control method e.g *B. thuringiensis* ;
kills mosquito larvae ;

use of insecticides ;
kills (adult) mosquitoes ;

elimination of standing water ;
removes, mosquito breeding sites/egg-laying areas ;

use of oil on water ;
prevents maturation of/kills, mosquito larvae ; [2 max]

(b) (malarial) parasite/pathogen/*Plasmodium*, has many antigens ;
eukaryotic/many genes ;
many different stages of life cycle ;
ref. to more than one *Plasmodium* species/strain of each species ;
mutation changes antigens (over time)/antigenic shift/antigenic drift ;
parasite only vulnerable, at certain stages of life cycle/when free in plasma ;
antigenic concealment/described ;
AVP ; e.g. changes antigens which are expressed (through gene switching) [3 max]

(c) percentage of, parasites killed/growth inhibition, increases with drug concentration for both parasites ;
effect is greater on chloroquine-resistant parasites/AW ;
chloroquine-sensitive parasites not affected until 1 μmol dm^{-3} ;
further use of data from Fig. 4.1 to illustrate ;
further detail of difference in trend(s) ; **A** descriptive or figures [3 max]

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(d) **(i)** (percentage) increase in malaria is high(er) in, countries in the, south/south and east **;**
ora **A** named countries **R** more malaria

ref. (percentage) increase correlates with countries where HIV incidence is higher **;**
penalise once if no ref to increase

data quote **;** [2 max]

(ii) HIV, infects/AW, T (helper)–lymphocytes/T-cells **;**
qualified ref. to immune system **;**
(HIV and) malaria may be contracted via blood transfusion **;**
ref. to reduced number of workers so malaria prevention not carried out **;** [2 max]

[Total: 12]

5 **(a)** conversion of/AW, nitrogen (gas)/N_2 **;** *in context of atmospheric nitrogen*
(to) ammonium (ions/compounds)/NH_4^+/amino acids **;**

further detail **;** e.g. nitrogenase (enzyme)/ref. conversion from unreactive (nitrogen) to reactive (compound)/reduction of nitrogen/ATP required/anaerobic conditions required for enzyme function [3]

(b) **(i)** ammonification/putrefaction/decomposition/decay **;** [1]

(ii) supplies, ammonia/ammonium ions, for, nitrifying bacteria/nitrification **;**
ammonia/ammonium ions, converted/oxidised/AW **;**
to nitrite **;**
to nitrate **;**
Nitrosomonas/*Nitrobacter* **;** *in correct context*
ref. nitrate useable form for plants ; [2 max]

(c) **(i)** to check that urea is not hydrolysed/broken down, without enzyme **;** ora
A there is no reaction without enzyme [1]

(ii) hydrolysis reduces, substrate/urea, concentration **;**
urea, hydrolysed/broken down, more quickly in Tube **A** than in Tube **B;**
A ref. to differences in reaction rates

*Tube **A*** enzyme can bind with substrate normally/ES complexes forming (at fast rate) **;**
ora *Tube **B***
shape of active site complementary to (shape of) substrate/AW **;**

*Tube **B*** (competitive) inhibitor, occupying/binding at/AW, active site **;**
ref. substrate unable to enter active site/AW **;**

correct data quote from either column to illustrate **;** [4 max]

[Total: 11]

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6 (a) *1 mark each correct row*

	lined with cilia	reinforced with cartilage	site of gas exchange	contains smooth muscle	
trachea	✓	✓		✓	;
bronchus	✓	✓	×	✓	;
bronchiole	✓	×	×		;
alveoli	×	×	✓	×	;

[4]

(b) good/circulating, blood supply **;**
good ventilation/breathing movements **;** [2]

(c) (i) stretch/expand/lengthen, on inspiration and, recoil/shorten, on expiration ;
A alternatives for inspiration and expiration
R contract and relax
(stretch) to increase, surface area/volume of air, for, diffusion/gas exchange **;**
(recoil) to help, expel air/force air out **;** ***ignore*** contract
prevent alveoli, bursting/breaking/AW **; R** collapsing [1 max]

(ii) emphysema **;** [1]

(d) (cause) mutations **;**
uncontrollable, division/mitosis/cell replication/cell growth **;**
lack of contact inhibition/no apoptosis *or* described/(proto)oncogenes **;**

goblet cells secrete, excess/more/AW, mucus **;**
destroys/weakens/paralyses/AW, cilia **;**
development of scar tissue **;**
inflammation **;**
increased chance of infection/AW **;** [3 max]

[Total: 11]

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