UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2008 question paper

9700 BIOLOGY

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

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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.

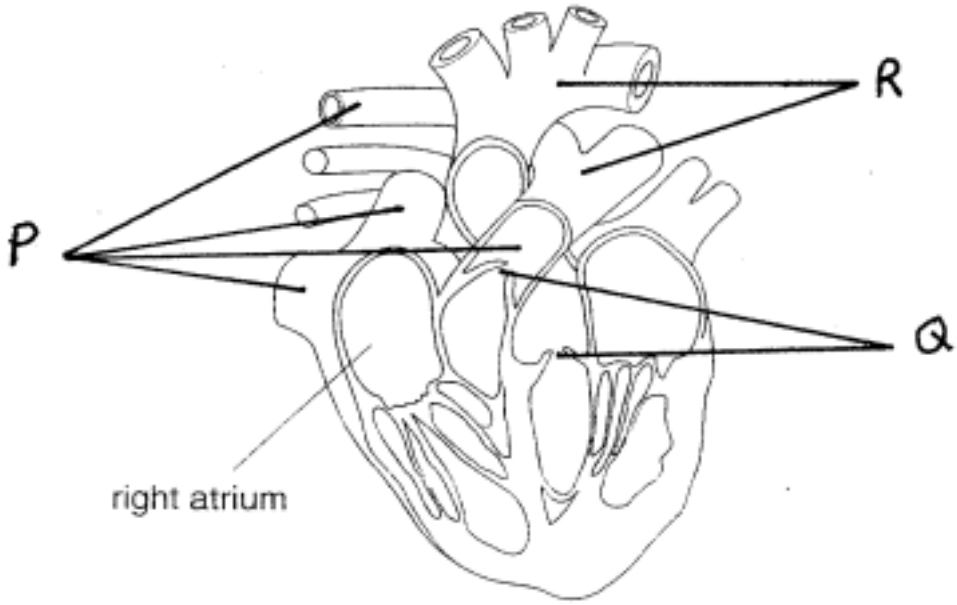
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UNIVERSITY of CAMBRIDGE
International Examinations

1 **(a)** *accept without label lines if not ambiguous e.g. if written correctly on diagram*
*only accept more than one line for each if **all** are correct*



[3]

(b) (both) atria pump blood to ventricles ;
same / short, distance ;

right ventricle pumps blood to lungs ;
short distance / at low(er) pressure / at approx 3.2 kPa / at approx 24 mmHg ; ora i.e. (left ventricle) greater distance / high(er) pressure / at approx 15.8 kPa / at approx 120 mmHg
less resistance, in lungs *or* pulmonary circulation / greater resistance in the systemic circulation ;
left ventricle pumps to, whole body / AW ;
correct ref. to (muscular) walls ; e.g. same (thickness) in atria
thicker / thinner, in ventricles
more / less, muscular, in ventricles
right ventricle pumps with lower / less, force ; **ora** [4 max]

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(c) *accept once only for either nicotine or carbon monoxide*
damages lining of arteries ;
promotes, atheroma / atheromatous plaques / fatty plaques / arteriosclerosis / atherosclerosis ;

nicotine
increases heart rate ;
increases blood pressure ;
makes platelets 'sticky' ;
increases chance of blood clotting / promotes thrombosis ;
decreases flow of blood to, extremities / AW ;
constriction of blood vessels ; **R** contraction **R** capillaries (2 max)

carbon monoxide
combines with haemoglobin / forms carboxyhaemoglobin / higher affinity for haemoglobin (than oxygen); **R** absorbed, reacts with, bonds to
reduces oxygen carrying capacity (in context of, haemoglobin / blood) ;
promotes release of damaging free radicals / peroxides / super oxides / oxidising agents ;
causes platelets and neutrophils to stick together / platelets to stick to endothelium ;
hypoxia can damage heart muscle ; (2 max) [4 max]

[Total: 11]

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2 **(a)** **A** – nuclear, membrane / envelope ; **R** nucleus (unqualified)
B – mitochondrion ; **A** crista(e)
C – (Golgi) vesicle / (small) vacuole ; **A** lysosome [3]

(b) (during), mitosis / meiosis / nuclear division ; ignore 'cell division' / phases
replicate, after / before, each division ; **A** at interphase
move / separate, to poles ;
assemble / organise, microtubules ;
centre for growth of / forms, spindle fibres / for formation of spindle / AW ;
modified centrioles found elsewhere such as in flagella / cilia ; [3 max]

(c) (EM has) greater / higher, resolution / resolving power ; **ora**
explanation of resolution as ability to differentiate between two points (close together) ;
width of membranes is 7 nm (±1) ;
(resolution of) LM is 200 nm (0.2 μm) and EM is 0.5 nm (0.0005 μm) ;
A 0.5 to 1 nm (0.001 μm)
ref to shorter wavelength ; **ora**
resolution is equal to half the wavelength ; [3 max]

(d) **(i)** general trend described linking temperature and percentage transmission ;
A negative correlation (with link) **R** inversely proportional
use of comparative figures (using data from both axes) to support trend ;
between 20 °C and 60 °C percentage transmission decreases, from 95% to 70% ;
between 60 °C and 70 °C, decrease is, significant / steep / from 70% to 19% ;
between 70 °C and 80 °C, decrease is, less steep / more steeply than initial temperature range / from 19% to 6% ; [3 max]

(ii) at (temperatures above) 60 °C, cell / vacuolar, membranes damaged / AW;
A tonoplast
(membrane) proteins, denatured / altered tertiary structure ;
increased fluidity (of membrane) / phospholipid bilayer more fluid ;
(so) diffusion / AW, of, betalain / pigment (out) ;
as temperature increases, rate of diffusion increases / diffusion occurs more quickly ;
[3 max]

[Total: 15]

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3 (a)

Statement	Letter
an amino acid that is a major constituent of collagen	**J**
a component of RNA	**G ;**
a molecule polymerised to form glycogen	**D ;**
a molecule with a peptide bond	**H ;**
an important store of energy, insoluble in water	**K ;**
a molecule with hydrophilic and hydrophobic regions	**F ;**
an amino acid that forms disulfide (disulphide) bonds in proteins	**E ;**

[6]

(b) *Assume the answer is about DNA unless indicated otherwise. A comparison is not required. Information given below is for <u>either</u> DNA <u>or</u> collagen features.* ***A*** *ideas from either column. Do not penalise if points are not corresponding on one line / sentence as long as biologically correct. Only reject if biologically incorrect. If no attempt at 2 can* ***A*** *both marks from 1 if biologically correct.*

DNA	Collagen
4 (different) monomers ;	more than four (different) monomers
(monomers =) nucleotides / polynucleotides ;	(monomers =) amino acids / polypeptides
double helix ; **A** two strands	triple helix **A** three stands
right handed helix ;	left handed helix
loose helix ;	tightly coiled
sugar ;	no sugar
phosphate / phosphorus ;	no phosphate / phosphorus **A** sulfur (sulphur) present
base(s) ;	no base(s)
phosphodiester bonds ;	peptide bonds
antiparallel strands ;	strands not antiparallel

A sugar phosphate backbone for 2 marks if nothing written by 2. [2]

[Total: 8]

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4 **(a)** volume of air breathed, in / out, with one breath ; **A** volume of air exchanged in one breath
ignore refs to at rest [1]

(b) (tidal volume and) vital capacity are measurements associated with, exercise / fitness ;
vital capacity is total volume of air that can be expired after maximum inspiration / vital capacity is sum of inspiratory reserve + tidal volume + expiratory reserve ;
differences between the groups (in tidal volume) could be due to larger, lung / vital, capacity ;
AVP ; [2 max]

(c) before / after recovery from, exercise ;

either
measure tidal volume, by breathing out into a bag ;
multiply by number of breaths per minute ; **A** total tidal volume in x minutes ÷ x

or
use a spirometer / described ;
ref to taking recordings from a trace / use of a, kymograph / datalogger ; [2 max]

(d) (bigger lungs so) more alveoli ; **A** greater surface area (of alveoli)
more, bronchioles / airways ; **R** more bronchi
wider, bronchioles / airways ;
larger number / higher density, of capillaries (around alveoli) ;
thinner wall / shorter distance, between air and blood / AW ; [2 max]

(e) partial pressure of oxygen is low ; **A** low concentration of oxygen / less oxygen
more haemoglobin (is required / produced / synthesised / available) ;
compensates for smaller volume of oxygen absorbed / compensates for lower saturation of haemoglobin / more oxygen can be carried (per unit of blood) ;
ref to, EPO / erythropoeitin ; [2 max]

[Total: 9]

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5 (a) female *Anopheles* mosquito ;
either takes blood meal / AW, from infected person *or* parasites enter mosquito in blood meal from infected person ;

takes blood meal / AW, from uninfected person ;
parasite / pathogen / plasmodia, transferred in mosquito's, saliva / anticoagulant ;
ref. to transfusion malaria / congenital or mother-foetus malaria / needle sharing / needle stick injury for max 1 ; [3 max]

(b) (i) (protein is) antigen ;

following vaccination
(clonal) selection for, appropriate / corresponding / specific, B cell ;
clonal expansion / divide (by mitosis) (to form B cell clone) ;
memory cells ;

on infection by parasite
(B cells / plasma cells) secrete antibody ; **A** immunoglobulin / Ig
secondary response (qualified) / higher levels of antibody / rapid production of antibody ;
ref. to antigen-antibody specificity ;
antibody attaches to, surface protein / antigen, on parasite ;
prevents attachment to red blood cell ; **A** prevents entry into red blood cell [4 max]

(ii) genetic complexity of *Plasmodium* ; **A** ref to *Plasmodium*, being eukaryotic / having many genes
many antigens ;
many stages in life cycle (within human) ;
antigens change / antigenic variation, in different stages ;
Plasmodium / parasite, lives within cells ; **A** antigenic concealment
A only briefly free in the blood stream
antibodies cannot work against stages within cells ; [2 max]

(c) *use only one mark scheme as appropriate*

drug is either
competitive inhibitor / effect described in terms of competition ;
drug molecule has, same / similar / shape, as, substrate / surface protein ;
A complementary shape to active site
R same / similar, structure, as substrate
drug molecule fits into active site ;
blocks access to active site / prevents formation of ES complex ;

or
non-competitive inhibitor / described in terms of not competing ;
drug molecule fits into, another site (not the active site) / allosteric site ;
active site changes shape so cannot accept, substrate / surface protein ;
permanent (irreversible) / reversible ;

or
combines permanently with active site ;
e.g. by covalent bonding ;
blocks access to active site / prevents formation of ES complex ;
increasing, substrate / surface protein, has no effect ; [3 max]

[Total: 12]

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6 (a) (i) *any **two** of the following for one mark*

amphipods
shrimps
Arctic cod
little auk ; [1]

(ii) some animals feed at different (trophic) levels / animals do not obtain all their food from one (trophic) level ; **A** correct reference to at least two consumer levels
animals may feed on different (trophic) levels at different, times / seasons ;
some food chains, do not start from primary producers / start from decomposing matter ;

named examples from food web ; [2]

(b) proportion of, phytoplankton / copepods, that is digested / some remains undigested ;
phytoplankton have cell walls ;
proportion that is absorbed after digestion ;
loss in, egestion / faeces ; } *in terms of energy loss or energy availability*
loss in, excretion ;
loss in, respiration / heat (by copepods) ;
energy losses in movement / AW ;
AVP ; e.g. denser phytoplankton means less energy loss in feeding [2 max]

[Total: 5]

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