UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2012 question paper

for the guidance of teachers

9700 BIOLOGY

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

This mark scheme is published as an aid to teachers and candidates, 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, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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Mark scheme abbreviations:

;	separates marking points
/	alternative answers for the same point
R	reject
A	accept (for answers correctly cued by the question, or by extra guidance)
AW	alternative wording (where responses vary more than usual)
underline	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given
ora	or reverse argument
mp	marking point (with relevant number)
ecf	error carried forward
I	ignore

1 **(a)** capillary **;**

plus one of
ref. to size relative to size of red blood cell (in lumen) **;** **A** small diameter / narrow lumen *if capillary correctly identified*
(wall is) one cell thick **;** **A** ref. to, only one layer / only endothelium / thin endothelium
[max 2]

(b) **(i)** red blood cell / erythrocyte **;** **A** red blood corpuscle [1]

(ii) water **;** **A** plasma [1]

(iii) nucleolus **;** **A** nucleus [1]

(c) *if working shown, award one mark only if measurement is incorrect*
7 (μm) **;;**

one mark if correct working is shown but answer not to whole number or incorrect conversion used
39 mm / 6000 **A** ± 1 mm in measurement [2]

[Total: 7]

2 **(a)** potometer **;** **A** transpirometer **R** photometer **R** spirometer [1]

(b) *idea that*
water taken up may not all be lost in transpiration / transpiration is water loss (as water vapour) from (aerial parts / leaves, of) the plant **;**

example of use of water taken up **;;** e.g.
photosynthesis
hydrolysis reactions
maintaining turgidity / AW
cell, elongation / increase in size

ref. to water uptake rate and transpiration rate differing because of (changing) environmental conditions **;** **A** examples e.g. higher transpiration rate than uptake rate in hot and dry external conditions [max 2]

(c) (i) *if no mp 1 and 2, accept increased rate of transpiration for one mark*

1 increased rate of evaporation **;** **A** description of evaporation
R evaporation, from leaf / from stomata / through stomata
2 increased rate of diffusion **;** *in context of water vapour out through stomata*
3 (rise in temperature), lowers (relative) humidity / decreases water potential of air (outside leaf) **;**
4, 5 AVP **;;** e.g. increased kinetic energy
steeper water potential gradient established *in correct context*
details of cohesion-tension theory linked to increased, transpiration / water uptake, rate
increased rate of photosynthesis
replacing water lost from cells in leaf [max 3]

(ii) humidity **;**
wind (speed) **;** **A** air movements
light intensity **;**
(air) pressure **;** [max 2]

(d) 1 stomata (must be) open for, gas exchange / uptake of carbon dioxide **;** **A** release of oxygen
2 carbon dioxide for photosynthesis **;** **A** oxygen from photosynthesis (when rate exceeds rate of respiration)
3 (most) water vapour, diffuses / AW, out, via / AW, (open) stomata **;**
A most transpiration occurs when stomata are open
R if incorrect transport mechanism used e.g. osmosis [3]

[Total: 11]

3 (a) (i) quarternary (structure) **;** [1]

(ii) alpha / α, helix **;** [1]

(b) (i) facilitated diffusion **;** [1]

(ii) osmosis **;**
increasing, ion / solute, concentration in lumen (of intestine) lowers water potential **;** ora water follows, from a high(er) to a low(er) water potential / down a water potential gradient**;** [3]

(c) (i) *must have ref. to organism at least once to gain max*
bacteria / pathogen / *V. cholerae,* in faeces (of infected person) / in sewage containing faeces (from infected people) **;** AW
bacteria / pathogen / *V. cholerae,* ingested / taken in orally (by uninfected person), in (contaminated) food / water **;**
A faecal – oral route *for one mark if previous two mps not given* [2]

(ii) general ref. to problems associated with increased numbers of people and lack of infrastructure **;**
examples **;;**
e.g. problem providing, safe / uncontaminated, drinking water **;**
faeces / sewage, mixing with drinking water **; A** no / poor, sanitation
unable to practise good hygiene **; A** example e.g. hands not washed after defaecation
infected people sharing latrines with uninfected / AW **;**
lack of, medical care / treatment, leading to larger pool of infected people (at any one time)
lack of, health services / drugs / antibiotics / ORT / skilled personnel
unable to supply sufficient vaccines
lack of food / poor diet, so vaccines less effective

credit relevant examples linked to a particular type of disaster [max 2]

[Total: 10]

4 (a) 1 important in contributing to 3-D structure of molecule / AW **;**
2 many hydrogen bonds so, gives stability / strands not easily separated / long lasting **;** AW
3 (individual) hydrogen bonds (more) easily broken (than covalent bonds) **; A** hydrogen bonds weak / hydrogen bonds can be broken

consequence
4 (so strands can be separated) for (DNA) replication **; A** description
5 (so strands can be separated) for (DNA) transcription **; A** description

6 hydrogen bonds only form between, specific bases / named base pairs, so, few mistakes / faithful replication / AW **;**
7 *idea that* hydrogen bonds can easily re-form (without chemical reaction) **;** [max 4]

(b) **P** = transcription
Q = translation **;** [1]

(c) (i) sequence will not (spontaneously) change / AW **;** **A** decreases chance of mutation
(so) gene products / proteins, produced will always be functional **;**
maintains all, genetic information / AW, throughout life of cell **;**
same, genetic information / AW, passed on to, daughter cells / offspring **;**
AVP **;** e.g. maintains size so still enclosed within nucleus [max 2]

(ii) translation / protein synthesis, will stop when mRNA breaks down **;**
allows re-use of nucleotides (for other mRNA) ;
ref. to control of gene expression **;** **A** prevents too much product forming
ref. to control of cell activity / fast response to changing rquirements **;**
ref. to efficiency in energy use **;** [max 2]

[Total: 9]

5 (a) 1 ref. vaccines contain antigens **;**
2 antigens are (mostly), proteins / glycoproteins **;**
3 antigens, denatured by heat / not denatured by radioactivity **;** **A** proteins denatured *in context of antigenic proteins*
R parasite is denatured
4 detail e.g. loss of tertiary structure / bonds break **;**
5 shape to be maintained for specificity of immune response / AW **;**
6 AVP **;** e.g. ref. to production of memory cells (for immunity) [max 3]

(b) 1 first form of, pathogen / parasite, free / exposed, in plasma **;**
A not inside cells
2 second form of, pathogen / parasite, concealed / hidden, in liver / red blood cells **;**

for either mp 2 or 3
3 ref. to degree of exposure to antibodies / lymphocytes

idea that
4 fewest number of parasites to destroy **/** earlier defence always more effective **;**

5 vaccination against form leaving liver would, not protect against liver invasion / still cause liver damage **;**
6 AVP **;** e.g. suggestion that first form of parasite is easier to harvest [max 3]

(c) 1 primary (immune) response / artificial active response **;**
2 antigen presentation / described **;**
3 clonal selection / described **;** e.g. **A** specificity to malarial antigen
4 clonal proliferation / B-lymphocyte division by mitosis / AW **;** **A** B cell
5 detail of changes occurring from B-lymphocyte to plasma cell **;**
6 B-lymphocytes / B cells / plasma cells, produce antibody **;**
7 correct ref to role of T_h cells in context **;** [max 5]

[Total: 11]

6 (a) (i) *max 3 if no reference to examples in passage*

habitat
location / place / area *or* (type of) local / AW, environment **;**
characterised by, its physical features / the freshwater environment / its dominant producers**;**
where, an organism / a population, lives **;**

commmunity
all populations of all species / AW **;**
within a specified area / AW, at a particular time **;** [max 4]

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

(iii) *accept plants for phytoplankton*

1 photosynthetic / carry out, photosynthesis / carbon fixation **;** **A** autotrophic
2 conversion of light energy to chemical energy **;**
3 equation **;**
4 have light-absorbing pigments **;** **A** chlorophyll
5 ref. to independence *or* dependence of other organisms **;** *in context of energy*
6 ref. to input of energy to ecosystem **;**
7 base of the food chain(s) / first trophic level / AW **;** **A** consumed by, herbivores / primary consumers [max 3]

(b) (i) *energy losses*
in, egestion / faeces / undigested material **;**
in excretion **;** **A** urine / urea
heat from respiration **;**

energy other uses
ref. maintenance **;;** e.g active transport / metabolic reactions / digestion
for, muscle contraction / movement **;** [max 3]

(ii) *any one valid suggestion e.g.*
more confined space so less movement **;**
move more so greater energy loss (through respiration / as heat) **;**
more predators so use more energy escaping from them **;** [max 1]

[Total: 12]