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.

- Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2012 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.
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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
(ii) water; A plasma
(iii) nucleolus; A nucleus

(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

(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) quaternary (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 requirements ; 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;

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

(ii) phytoplankton;

(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]