MARK SCHEME for the May/June 2010 question paper
for the guidance of teachers

<table>
<thead>
<tr>
<th>9700 BIOLOGY</th>
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<tbody>
<tr>
<td>9700/22 Paper 2 (AS Structured Questions), maximum raw mark 60</td>
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</table>

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.

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

CIE is publishing the mark schemes for the May/June 2010 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.
1 (a)  plant cell because presence of
   cell wall;
   plasmodesma;
   tonoplast;
   large/central, vacuole;  
   A cellulose cell wall  
   A plasmodesmata
   A vacuolar membrane
   ignore permanent  [2 max]

(b)  name of organelle | diagram of organelle(s) as seen under the electron microscope (not to scale) | one function of organelle | cell type(s) in which organelle is located
---|---|---|---
centrioles;  
A centriole  
A centrosome | all 3 for one mark
oval/circular shape and
two membranes close together and
inner membrane infolded as two or more cristae ; | aerobic respiration/ATP, production/synthesis ;
A oxidative phosphorylation
A ref. β oxidation fats
A ref. urea/ornithine cycle
R any answer that refers to synthesis/production, of energy | animal ;

chloroplast ; | both for one mark
two membranes and
ribosomes on external surface ;
R if ribosomes are excessively large | processing/modification/AW/ packaging, of, proteins/ molecules ;
A description of modification e.g. glycosylation
A production of, secretory/Golgi, vesicles
A production of lysosomes
R protein synthesis | animal and plant/both ;

[Total: 10]
2 (a)  (i) right, atrium/auricle and left ventricle; correctly labelled
          left hand side box         right hand side box [1]

          (ii) right atrium has (ora for left atrium)
                lower, concentration/partial pressure/AW, of, oxygen ;  R no oxygen
                A (right) deoxygenated blood (versus oxygenated blood)
                A higher saturation of haemoglobin with oxygen

                higher concentration/AW of, hydrogen carbonate ions/carbon dioxide ;
                A more carbaminohaemoglobin

                higher concentration of water molecules/high(er) water potential/less negative water potential ;

                higher concentration/AW, of glucose ; [2 max]

(b) reject if more than one letter for each disease
    pulmonary stenosis       = G ;
    coarctation of the aorta  = D ;
    ventricular septal defect = F ; [3]

(c) accept ora where relevant

    suggest
    1 blood flows from aorta to pulmonary artery ;
    2 increased volume of / more, blood to lungs ;  A blood to lungs at higher pressure
    3 oxygenated and deoxygenated mix ;
    4 oxygenated blood / blood from aorta, to lungs ;

    explain (why blood flows from aorta to pulmonary artery)
    5 left ventricle thicker wall (than right ventricle) ;
    6 (so) contraction generates greater force (than right ventricle)/AW ;
    7 higher pressure in aorta (than pulmonary artery) ; [3 max]

    [Total: 9]

3 (a)  53 % ;;  2 marks for correct answer

    max 1 mark for correct calculation but, no/incorrect, answer
    or not to nearest whole number

    72.4 – 33.9 = 38.5
    (38.5 / 72.4) x 100 = 53.18 / 53.2 [2]
(b) R greater wealth unless linked to points below  
any two valid reasons e.g. accept answers written as ora

1 more educated population; in context of health  
2 better/greater access to, health care/AW;  
3 higher level of preventive medicine; e.g. immunisation programmes  
4 better diet; A ref. to less malnourished  
A ref. to access to food supplies  
5 greater access to, therapeutic medicines/drugs; A antibiotics  
6 better/less overcrowded, housing/living conditions;  
7 better, sanitation/sewage treatment;  
8 greater access to uncontaminated drinking water;  
R clean water unqualified  
9 fewer, fatal diseases/AW;  
10 ref. to effects of, civil war/war;  
11 ref. to natural disaster;          [2 max]

(c) (i) rank of % positive (of countries) is different to rank of difference in decrease in life expectancy;  
data quote to support; e.g. Kenya 6th highest % positive but 3rd highest decrease in life expectancy  
S. Africa 4th highest % positive but 6th highest decrease in life expectancy  
countries with, similar/same, decrease (in life expectancy) have different % positive;  
data quote to support; e.g.  
Malawi 17.8 years decrease, 16%, cf South Africa 17.5 years, 19.9%  
Kenya 20.1 years, 14%, cf Zambia 20.1 years, 20%;  

with ref. to decrease in life expectancy and % positive  
Kenya, does not fit general trend/AW;  
South Africa, does not fit general trend/AW;  
data quote to support; e.g.  
Kenya larger decrease than, Malawi/South Africa, but lower % positive  
Kenya 20.1 years decrease but only 14.0 %, compared to, Malawi 17.8 with 16.0%/  
South Africa 17.5 with 19.9 %;          [2 max]

(ii) any two relevant factors e.g.  

1 anti HIV drug therapy/AW;  
2 ref. to treatment of AIDS-related diseases;  
3 ref. to education to prevent, transmission/spread;  
4 use/provide free, condoms/femidoms; A dental dams  
5 avoid promiscuity; A one sexual partner  
6 HIV mothers avoid breast feeding;  
7 heat treat/screen, blood (for transfusion);  
8 needle-exchange schemes/AW; A ref. to sterile syringes  
9 use of sterile equipment, qualified e.g. in surgery/tattooing/piercing;  
10 testing for HIV status/contact tracing;  
11 ref. to vaccine development;          [2 max]

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4 (a) (i) describes the) sequence of amino acids (in a polypeptide chain); A order/arrangement

(ii) H₂O/water, released;
         (correct) bond formation between (lysine) carboxyl group and (valine) amino group;
         dipeptide (of lysine and valine) and formed with correct structural formula;

(b) (i) secondary
         1 regular order/pattern, based on H-bonds;
         2 between CO– group of one amino acid and NH– group of another;
         3 alpha-helix and β-pleated sheet;

         tertiary to max 4
         1 folding coiling;
         2 interactions between, R groups side chains;
         3 two correctly named bonds; e.g. hydrogen bonds, disulfide, bonds/bridges, ionic
           bonds, hydrophobic interactions
         4 further description of bonds; e.g. disulfide between cysteine (S–H) groups
           hydrogen between polar groups (NH– and CO–)
           ionic between ionised amine and carboxylic acid groups
           hydrophobic interactions between non-polar side chains

         5 ref. active site, specific/precise, shape;
         6 ref. globular/AW, shape; A spherical/ball
         7 ref. amino acids with, hydrophilic/polar, R groups facing to outside; ora

(ii) enables (protein to) function/AW; A enables antimicrobial action/AW
         A biological catalyst, qualified

         provides active site;
         qualified ref. to specificity; [1 max]

(c) altered, (mRNA) codon(s)/triplet(s);
         A named type of mutation
         changed/AW, amino acid(s);
         ref. to effects of stop codon; e.g. shortened polypeptide chain
         different, primary structure/described;
         A ref. to differences in, transcription/translation
         ref. to different properties of, R group / side chain (of normal v replaced amino acid);
         altered tertiary structure/AW;
         A different R group interactions
         A change/loss of, active site
         idea of globular to fibrous change/hydrophilic R groups no longer to outside;

[Total: 13]
5 (a) one mark for each correct row ; ; ;

<table>
<thead>
<tr>
<th>cartilage</th>
<th>ciliated epithelium</th>
<th>elastic fibres</th>
<th>goblet cells</th>
<th>smooth muscle</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>B</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>×</td>
<td>✓</td>
<td>×</td>
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(b) goblet cells to max 3
- synthesise/produce/secrete/release, mucus;
- mucus, sticky/AW;
- (mucus) traps/AW, pathogens/AW, dust/particles/AW, pollen;
- A named organism types/microorganisms
- R cilia traps
- increased secretion when, inflamed / infection;
- qualified ref. to role of mucus; e.g.
- increases distance (e.g. of pathogen) to reach (epithelial) cells
- acts as barrier/prevents, entry/attachment to, cells
- prevent, infections/pathogens reaching alveoli allow once only in either section

cilia to max 3
- waft/move/AW, mucus;
- synchronous/metachronal, rhythm; AW
- movement towards back of throat for, swallowing/coughing out;
- qualified ref. to role of cilia in health; e.g. ref. to, normal air flow/ventilation/keeping airways clear

[Total: 8]
6 (a) Galapagos hawk

animals in correct boxes;
all five animals to hawk;
all animals except hawk to snake;
(only) short-horned grasshopper to lava lizard
xerophyte to short-horned grasshopper and land iguana
kelp to marine iguana

max 3 if all correct but one arrow head missing
max 2 if arrow heads, mixed in incorrect direction/missing

(b) kelp and xerophytes; allow ecf for next two mps if only one organism
both, photosynthetic/autotrophic/fix carbon/AW; A both have chlorophyll
both are, at the start of the food web/at the first trophic level/the source of energy to rest of
food web/AW;

[Total: 7]