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) 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.g.s.
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]
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 more (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]
3 (a) (i) primary ; A first quartenary ; A fourth [2]

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

(b) peptide bond broken ; correct involvement of water ; free –COOH/–COO and free –NH₂/–NH₃⁺ 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]
(d) (i) (percentage) increase in malaria is high(er) in, countries in the, south/south and east; or A named countries R more malaria

ref. (percentage) increase correlates with countries where HIV incidence is higher; penalty 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)/N₂ ; in context of atmospheric nitrogen (to) ammonium (ions/compounds)/NH₄⁺/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]
6 (a) 1 mark each correct row

<table>
<thead>
<tr>
<th></th>
<th>lined with cilia</th>
<th>reinforced with cartilage</th>
<th>site of gas exchange</th>
<th>contains smooth muscle</th>
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<tr>
<td>trachea</td>
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<td>✗</td>
<td>✓</td>
<td>✗</td>
</tr>
</tbody>
</table>

(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;
destroyss/weakens/paralyses/AW, cilia;
development of scar tissue;
inflammation;
increased chance of infection/AW; [3 max]

[Total: 11]