

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

9700 BIOLOGY

9700/23

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

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Page 2	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE AS/A LEVEL – May/June 2010	9700	23

- 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 SER or 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.gs.
 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

$$20\,000/6\ \mu\text{m} = (3333.3) \quad \mathbf{A}\ 19\,000/6 = (3\,166.7) \quad \mathbf{A}\ 21\,000/6 = (3\,500.0)$$

$$3\,333\ (x);; \quad \mathbf{A}\ 3\,167\ (x) \quad \mathbf{A}\ 3\,500n(x)$$

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]

Page 3	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE AS/A LEVEL – May/June 2010	9700	23

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]

Page 4	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE AS/A LEVEL – May/June 2010	9700	23

- 3 (a) (i)** primary ; **A** first
quarternary ; **A** fourth [2]
- (ii)** disulfide (bonds/bridges) ; [1]
- (b)** peptide bond broken ;
correct involvement of water ;
free -COOH/-COO^- and free $\text{-NH}_2/\text{-NH}_3^+$ 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 $1 \mu\text{mol dm}^{-3}$;
further use of data from Fig. 4.1 to illustrate ;
further detail of difference in trend(s) ; **A** descriptive or figures [3 max]

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	GCE AS/A LEVEL – May/June 2010	9700	23

- (d) (i) (percentage) increase in malaria is high(er) in, countries in the, south/south and east ;
ora **A** named countries **R** more malaria

ref. (percentage) increase correlates with countries where HIV incidence is higher ;
penalise 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]

Page 6	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE AS/A LEVEL – May/June 2010	9700	23

6 (a) 1 mark each correct row

	lined with cilia	reinforced with cartilage	site of gas exchange	contains smooth muscle
trachea	✓	✓		✓
bronchus	✓	✓	x	✓
bronchiole	✓	x	x	
alveoli	x	x	✓	x

;
;
;
;

[4]

(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 ;
destroys/weakens/paralyses/AW, cilia ;
development of scar tissue ;
inflammation ;
increased chance of infection/AW ;

[3 max]

[Total: 11]