

## **MARK SCHEME for the October/November 2007 question paper**

### **9700 BIOLOGY**

**9700/02**

Paper 2 (Theory 1), maximum raw mark 60

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All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

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**A** = accept  
**R** = reject  
 AW = alternative wording  
*ora* = or reverse argument  
 AVP = additional valid point

**1 (a)** no membrane-bound organelles / no named organelle(s) ;  
 murein / peptidoglycan, in cell wall ;  
 smaller / 70s / 18nm, ribosomes ;  
 no nucleus / no nucleolus / no nuclear envelope ;  
 loop of DNA / circular DNA / no chromosomes / naked DNA / no histones ;  
 mesosome ;  
 plasmid ;  
 capsule ; **A** slime / mucilage, around cell wall ; [3 max]

**(b) (i)** growth ;  
 repair ;  
 regeneration ;  
 replacement / renewal ;  
 asexual / vegetative, reproduction / propagation ; [3 max]

**(ii)** idea that identical / sister chromatids, separate (in anaphase) :

*identical because*

semi-conservative replication ;  
 base pairing / A – T and C – G ;  
 idea that each, strand / polynucleotide, of DNA acts as a template ;  
 two double helices produced are identical ;  
 cells have same, genotype / alleles / DNA / number and kind / set of chromosomes ;  
 no valid aspect of meiosis ; [3 max]

**[Total: 9]**

**2 (a) (i)** haem / prosthetic group ; **A** porphyrin

site of attachment of / binds with / carries / combines with / joins with / takes up / transports, oxygen ;

**R** absorbs / reacts with / stores

(oxygen binds to) iron ion / Fe<sup>2+</sup> / FeII (in haem) ;

**A** atom, of iron / ferum [3]

**(ii)** *tertiary*

(each) polypeptide / protein, with complex 3D shape ;  
 folding of secondary structure / folded alpha helices ;  
 polypeptide / protein, coiled / folded / curled up / compact ;

*1 max*

*quaternary*

more than one polypeptide / AW ; [2]

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(b) (i) 58 ;  
100 ; [2]

(ii) partial pressure of oxygen in tissues is low ; **A** concentration percentage saturation decreases sharply ;  
**A** appropriate ref to 'steepest part of the curve'  
small decrease in partial pressure of oxygen / 6 to 2 kPa, causes very large change in % saturation with oxygen ;  
78–80 to 22–24% saturated ; **A** appropriate figure(s)  
this = range of partial pressures of oxygen in (respiring) tissues ;  
(oxy)haemoglobin, dissociates / 'gives up its oxygen', at low partial pressures of oxygen ;  
ref to, distortion of haemoglobin molecule and ability to release oxygen / allosteric effect / cooperative binding ; [4 max]

(c) *accept curve drawn on Fig. 2.3*  
same shape as existing curve – begins at origin, ends at 95%–100% ;  
to the **right** of existing curve ; [2]

[Total: 13]

3 (a) (i) tube-like / tubular / hollow / empty / no obstructions / no cell contents, so little resistance, easy movement ;  
**R** mass flow, continuous column  
wide / large diameter / large lumen, so large volume / amounts of water can be transported ;  
thickening of the walls, to prevent collapse (under tension) ; [2 max]

(ii) evaporation of water inside, leaf / within mesophyll ;  
ref to mesophyll cell walls ;  
lowers water potential ;  
water moves down water potential gradient ;  
cohesion between water molecules / AW ;  
adhesion of water molecules to vessel walls / AW ;  
water pulled up under tension / transpiration pull ;  
transpiration, stream / column ; **A** continuous column  
(water moves up xylem) from high to low hydrostatic pressure ; [4 max]

(b) nicotine,  
increases heart rate / raises blood pressure / constriction of blood vessels /  
increases stickiness of platelets (so cause clots) /  
decrease in blood flow to, hands / feet / fingers / extremities /  
is addictive / damages, endothelium / lining of blood vessels ;

carbon monoxide,  
combines with haemoglobin to form carboxyhaemoglobin / reduces amount of oxygen that can be transported in the blood ;

carcinogens / named carcinogen (e.g. benzpyrene / phenol), cause mutations / AW ;

tar,  
inhibits / weakens action of / destroys / paralyses, cilia / stimulates, goblet cells /  
mucous glands, to secrete more mucus ;

**A** excess [3 max]

[Total: 9]

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4 (a) sino-atrial node / sinu-atrial node / sinoatrial node / SAN ; [1]

(b) myogenic, explained (e.g. contracts and relaxes without stimulation) ;  
 SAN / pacemaker, sends out, waves of excitation / impulses ;  
 spreads across atria (and causes atria to contract) ;  
 fibrous ring / non-conducting tissue / insulating tissue, prevents it reaching the ventricles ;  
 time delay to allow, atria to empty / ventricles to fill or time ref. (0.1–0.2 seconds) ;  
 atrio-ventricular node / AVN, acts as ‘relay station’ ;  
 relays impulse to Purkyne tissue / bundle of His ;  
 Purkyne tissue conducts impulse to, base / apex of heart / septum / ventricles; [4 max]

(c) 60 / 0.8 ;  
 75 ; [2]

(d) lower / less, resistance (within pulmonary tissue) ; *ora*  
 lower / less force needed ; *ora*  
 short distance / only has to pump blood to lungs ; *ora* ;  
 because RV wall is, thinner / less muscular ; *ora* [2 max]

[Total: 9]

5 (a) (i) *Mycobacterium, tuberculosis / bovis* ;  
**A** *M. tuberculosis / M. bovis* [1]

(ii) (infected person) coughs / sneezes / spitting / sputum / breathes out ;  
aerosol / droplets / moist air, inhaled / breathed in by (uninfected) person ; [2]

(b) make fair / valid comparison ; **A** easier to, compare /  
 interpret total populations of regions are different ;  
 calculate, incidence / prevalence (rates) ;  
 so can see where impact (of TB) is greatest ; [2 max]

(c) disease of, poverty / the poor ;  
 people, living / sleeping, in close proximity / overcrowded conditions ;  
 HIV / AIDS / malnutrition, weakens immune system / AW ;  
 TB is opportunistic disease / described ; e.g. easily infects / increased susceptibility to TB  
 HIV infection rates are highest in, Africa / S-E Asia ;

control regimes / vaccination programmes for TB are better in, some countries /  
 regions, than others ; *ora*  
 ref to (WHO) DOTS scheme ;  
 ref to availability / combination of / length of treatment / resistance, re antibiotics / drugs ;

use of comparative data to support a statement ;  
**A** either quote figures or calculation, e.g. percentage

AVP ; e.g. general ref to provision of health services  
 ref to HIV and, T cells / lymphocytes  
 ref to, cost / complexity, of providing treatments  
 ref to lack of, knowledge / education [3 max]

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- (d) vaccine (BCG) is not effective ;  
 does not always give lasting protection / effectiveness decreases with years unless exposure to TB ;  
 no worldwide vaccination programme (as there was for smallpox) ;  
 endemic all over the world ;  
 many, carriers / symptomless people ;  
 bacteria remain in the body for a long time ;  
 intracellular parasite / lives in lung cells ;  
 AVP ; e.g. lack of protein in diet means it is difficult to produce antibodies /  
 difficult to produce herd immunity / some ref to antigenic variation / bacteria can live in animals  
 [3 max]

**[Total: 11]**

**6 (a) definition of ecosystem**

- community (of organisms) ;  
 physical / abiotic, factors / environment ;  
 ref to interaction between organisms ;  
 ref to interaction between organisms and physical environment ;  
 ref to 'self-contained' / delimited by some physical feature ;  
 use of named example to illustrate one above point ;  
 [3 max]

- (b) these (fierce) animals are, at the top of food chain / last in food chain ;  
 secondary / tertiary, consumer / top carnivores ;  
 ref to energy loss along food chains / energy lost between trophic levels /  
 insufficient energy transfer ;  
 further detail, e.g. little energy trapped by (primary) producers / only 10% transfer /  
 loss in, respiration / decomposition ;  
 large animals, require much energy / find it difficult to obtain sufficient energy ;  
 need large habitat to provide sufficient food ;  
 ref to fierce and maintaining territories ;  
 AVP ; e.g. hunting / competition  
 [3 max]

- (c) (legumes have) Rhizobium ;  
 in their root nodules ;  
 carry out nitrogen fixation ;  
 (legumes) not dependent on nitrate ions from soil ;  
 nitrogen / ammonium / nitrate, required for making, amino acids / proteins ;  
 ref to growth / reproduction ;  
 AVP ; e.g. have mycorrhiza  
 [3 max]

**[Total: 9]**