

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 / Fe²⁺ / 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]