

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the October/November 2008 question paper

9700 BIOLOGY

9700/02

Paper 2 (Theory 1), maximum raw mark 60

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- 1 (a) check column **A** and **B** for correct ref. to feature if not clear in first column e.g. gives description

feature	phagocyte (A)	plasma cell (B)
<u>rough</u> endoplasmic reticulum / <u>R</u> ER <i>allow ER if rough / RER stated in next column(s) R <u>S</u>ER</i>	small quantity / AW A few, less	large quantity / AW ; A many, more
ribosomes	few <i>or</i> ref. to free	many ; <i>or</i> not free / fixed
lysosomes	some / present / ✓	none / absent / x ;
vacuoles / vesicles / phagosomes	some / present / ✓	none / absent / x ;
nucleus	lobed / AW A irregular, not round R curved, elongated, no definite shape	round / not lobed / not irregular / AW ; A spherical, circular
Golgi (body)	absent / x	present / ✓ ;
plasma / cell (surface), membrane	with, endocytotic / pinocytotic / phagocytic / exocytotic, vesicles / vacuoles A invaginations, infoldings R indentations	without, endocytotic / pinocytotic / phagocytic / exocytotic, vesicles / vacuoles A no invaginations, no infoldings R no indentations
mitochondria	less / few / 3	more / many / 7 ;

[3 max]

- (b) (to nearest whole number) (x) 6000 ;; **A** 5900 – 6100
allow 1 mark for correct working if answer incorrect / not to whole number
e.g. length of scale bar in mm × 1000, divide by actual size
60 mm × 1000 / 10 **A** 59 – 61 mm

[2]

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- (c) *phagocyte*
 move to sites of infection ;
 ingest / engulf / pseudopodia enveloping / phagocytosis of / endocytosis of, bacteria /
 microbes / pathogens / AW ;
R antigens, virus
 (form) phagocytic / endocytotic, vacuoles ;
A vesicles, phagosomes
 ref to lysosomes ;
 enzymes / named (hydrolytic) enzymes ;
digest / hydrolyse, (bacteria / AW) ;
 antigen presentation / description ; [3 max]

- plasma cell*
 produce / secrete / release / synthesise , antibodies ; **A** make
 into, plasma / tissue fluid / lymph ; **A** blood
 antibodies are proteins ;
 ref to, RER / ribosomes ;
 specificity qualified e.g. of, antibodies / lymphocyte / plasma cell
 or description e.g. each type of plasma cell produces one type of antibody ;
 Golgi (body) packages antibodies / ref to formation of (Golgi) vesicles ; [3 max]

- (d) (bacteria likely to be) resistant to (at least) one antibiotic (so useless) ;
 less likely to be resistant to all / chance that bacteria will develop resistance to all
 antibiotics used is very small ;
 ref to mutation / change to DNA ;
 (bacteria are) inside cells where protected from antibiotics ;
 (mycobacteria) divide / grow, slowly ;
 ensures all bacteria killed / reduces below critical level ;
 otherwise, bacteria remain / reservoir of infection ;
 (so) prevents development of antibiotic resistance ; [4 max]

[Total: 15]

- 2 (a) *treat refs to mechanisms as neutral*
 (soil to) root hair ;
 idea of across, cortex / cortical cells (root) ;
 apoplast / along cell walls ;
 symplast / via, cytoplasm / plasmodesmata ;
 through, endodermis / endodermal cells, by symplast pathway ;
 (because of) suberin / Casparian strip ;
 ref to passage cells ;
 apoplast into the xylem ; [4 max]

- (b) (i) stomata are open (to allow diffusion / gas exchange) ;
 (for) entry of CO₂ / release of O₂ ; AW
 large surface area inside leaf (for gas exchange) ;
cell surfaces / walls, in (palisade / spongy) mesophyll ;
 moist / damp / wet ;
 correct ref to evaporation ;
 water vapour, diffuses out / AW; **A** water if linked to evaporation [3 max]

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(ii) *adaptations*

(epidermal) hairs / trichomes ; **R** spikes, spines
stomata in, pits / cavities / chambers ; **R** sunken stomata

reduced air movement / still air ;
holds water vapour / has high(er) humidity / AW ; **A** holds moist air
(therefore) less steep, water potential / vapour pressure / diffusion, gradient ;
A qualified ref to diffusion shells between air inside leaf and air in pits ;

thick / waxy, cuticle (on upper, epidermis / surface) ;
multilayered, epidermis / hypodermis ;
thick walled epidermal cells ;
cuticle reflects sunlight ;
stomata only on lower surface / no stomata on upper surface ;

[3 max]

[Total: 10]

3 (a) (i) tertiary (structure) ; **A** 3° [1]

(ii) secondary (structure) ; **A** 2°, alpha / α, helix [1]

(b) active site ; **A** catalytic site [1]

(c) (i) mRNA CGU ; UGC / UGU **GAA**
DNA **GCA** ACG / ACA CTT ; [3]

(ii) many / several / more than one, triplet for each amino acid ; **A** codon
an e.g. from Table 3.1 ;
degenerate code / description e.g. 64 possible triplets for 20 amino acids ; **A** codons
AVP ; e.g. may be an intron in this region, different nucleotides at the beginning
(signal sequence) [2 max]

(d) (i) *reject references to time e.g. rapid, slowly*
as the concentration of, enzyme / lysozyme, increases the percentage of
bacteria surviving decreases / AW ; **R** if only 1 named
steep, decline / decrease, 0 to 10 / first two concentrations, for *E. coli* ;
A large percentage difference in *E.coli* surviving at 0 to 10 / first two concentrations
less steep / more gradual, decline / decrease, from 10 to 150 for *E. coli* ;
decline / decrease, shallower / less steep from 0 – ,40 / 60 / 70 / 80, for *S. aureus* ;
A small percentage difference in *S. aureus* surviving from 0 – , 60 / 70 / 80
decline / decrease, more significant / steeper / more abrupt, from 60 / 70 / 80, up to 150
for *S. aureus* ; **A** large percentage difference *in S.aureus* surviving from 60 / 70 / 80,
up to 150
always more *S. aureus* than *E. coli* ; ora
all bacteria survive with no lysozyme ;
lysozyme is more effective, at killing / against, *E. coli* / AW ; **A** ora
all *E. coli* killed, at 150 pmol dm⁻³ (of lysozyme) / at highest concentration ;
comparative data quote ; *both axes, both curves*
comparative data quote ; *penalise once for lack of units in both* [4 max]

(ii) different, polysaccharides / peptidoglycans, in cell walls ;

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S. aureus, does not have / has less, polysaccharides / peptidoglycans, in cell wall ;
 ref to shape of active site ;
 ref to shape of, polysaccharide / peptidoglycan (to fit into active site) ;
S. aureus has a capsule / ora ; **A** protective lipids
 AVP ; e.g. *S. aureus* produces inhibitor

[2 max]

[Total: 14]

- 4 (a) blood passes through the heart twice during one (complete) circuit of the body ;
A one cycle / one circulation **R** cardiac cycle
A systemic / body, and, pulmonary / lung, circulation

[1]

- (b) withstands high(er) blood pressure ;
 maintains blood pressure ;
 ref to more, elastin / collagen / (smooth) muscle ;
A thicker muscle

[2 max]

- (c) vasoconstriction / contract / constrict / close / narrow, to, stop /
 control / reduce, blood flowing through capillaries ;
 blood, diverted / shunted, elsewhere ;
 any suitable e.g. ; diverted from, skin when cold / gut during exercise

vasodilation / relax / dilate / open / widen, to allow blood to flow through capillaries ;
 blood required in tissue to deliver, oxygen / glucose *or* to remove, lactate / carbon dioxide ;

[1 max]

- (d) pores / gaps / perforations, in / between, (endothelial) cells ;
A pores in capillary wall **R** spaces, holes
 water / ions / glucose, move out ; **A** named small soluble substances
R list which contains incorrect substance / red blood cells

hydrostatic pressure of blood is greater than (hydrostatic) pressure of tissue fluid ;
 (causing) pressure filtration / AW e.g. forced out under pressure / ultrafiltration ; **R** leaking
 pinocytosis across capillary wall ;

[3 max]

- (i) *any three of the following*
 more / plasma, proteins ;
 more glucose ; **R** sugars
 more, fat / fatty acids / glycerol ;
 lower, water / solute, potential ; **R** water concentration
 lower carbon dioxide concentration / lower concentration of HCO_3^- ;
 higher oxygen concentration ;
 AVP ; e.g. cell secretes substance that is in higher concentration in tissue fluid,
 another named solute, higher pressure

[3 max]

- (ii) lymph / lymphatic fluid ;

[1]

[Total: 11]

5 (a) one mark for each row

statement	haemoglobin	DNA	phospholipids	antibodies
contains iron	✓	x	x	x
contains phosphate	x	✓	✓	x
able to self-replicate	x	✓	x	x
hydrogen bonds stabilise the molecule	✓	✓	x	✓
contains nitrogen	✓	✓	✓	✓

[5]

(b) AVP answers must be in context to a watery external environment

ref to molecules held together / strong attraction / AW ;

A cohesion between water molecules

detail of hydrogen bonding, e.g. slight -ve charge on O, slight +ve charge on H ;

A water molecules are polar

high boiling point / boils at 100°C ;

high latent heat of vaporisation ;

so water is liquid over wide range of temperatures ;

(liquid so) provides, support / buoyancy ;

high (specific) heat capacity ;

stable temperature / temperature of water does not change quickly ;

large amount of energy needed to be transferred from water for it to freeze / high latent heat of fusion ;

maximum density at 4°C / less dense at 0°C ;

provides surface tension ;

ref solvent ;

AVP ;

AVP ;

e.g. ref to surface dwellers, less need for support tissue,

stable habitat qualified, ref upwelling currents

ice floats / insulates

[5 max]

[Total: 10]