CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the October/November 2012 series

9700 BIOLOGY

9700/23 Paper 2 (AS Structured Questions), maximum raw mark 60

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 should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Mark scheme abbreviations:

;	separates marking points
/	alternative answers for the same point
R	reject
A	accept (for answers correctly cued by the question, or by extra guidance)
AW	alternative wording (where responses vary more than usual)
underline	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given
ora	or reverse argument
mp	marking point (with relevant number)
ecf	error carried forward
I	ignore
AVP	alternative valid point (examples given)

1 *accept first on row*
accept phonetic spellings

A *name* — mitochondrion ;
A mitochondria

function (site of) ; — ATP, synthesis / production / AW
aerobic respiration
link reaction
Krebs cycle
oxidative phosphorylation
AVP
R ATP energy

B *name* — Golgi (apparatus / body / complex) ;
A dictyosome **A** Golgi

function (site of) ; — modification of protein / glycosylation / described
modification of lipid
pack(ag)ing (of), protein / lipids
production of (Golgi / secretory) vesicles / lysosomes
ignore synthesis of protein
(incorrect name)
lysosome function = contains / storage of hydrolytic / digestive, enzymes
Golgi / secretory, vesicles = transport, protein / lipids

C *name* — chloroplast(s) ;

function (site of) ; — photosynthesis
light-dependent, reactions / stage (of photosynthesis)
light, absorption / AW
light-independent, reactions / stage (of photosynthesis)
Calvin cycle
carbon fixation
photophosphorylation
A ATP synthesis
ignore *(treat as neutral) ref. to, glucose / oxygen, synthesis*
ignore *chlorophyll*
R light / dark, stage / reactions

D *name* — rough endoplasmic reticulum ;
R RER or rough ER **R** endoplastic

function (site of) ; — protein / polypeptide, synthesis
translation
modification of protein / described (e.g. folding)
protein transport (to Golgi)
(incorrect name)
smooth endoplasmic reticulum = lipid / steroid / cholesterol, synthesis / AW
endoplasmic reticulum = ecf as above for RER / SER

[Total: 8]

2 **(a)** cholera and TB ;
ignore *any other underlined diseases* [1]

(b) *must answer in context of antibiotics, not antibodies*
look for bacteria in answer if not clear in mp 1

1 (to ensure) all bacteria are, killed / removed / eliminated / destroyed / AW ;
R virus / bacteria and virus
ignore antigen or pathogen or disease
'all' *may be implied e.g. award if gain mp 2,3,4*
2 (so) no reservoir of infection remains / AW / ora ;
3 (disease) cannot be transmitted / cannot infect others / AW e.g. spread / ora ;
4 no recurrence / disease does not return ; *in context of same person*
5 to reduce chance of / AW, (antibiotic / drug) resistance developing ;
R *idea that human becomes resistant to antibiotics*
6 ref. to mutation in context of resistance ; [max 3]

(c) **(i)** binds with / fits into / AW, active site ; **R** collides with / reacts with
complementary shape to active site / similar shape to substrate ;
A same shape as substrate / same *or* similar structure as substrate
fewer, enzyme-substrate / E – S, complexes ;
A no ESC in context of one enzyme
A fewer successful collisions between enzyme and substrate
A prevents formation of E – S complexes
reduces rate of / slows (enzyme) reaction ;
A reduced enzyme activity / **A** less product formed [max 3]

(ii) *ideas that*
(humans) do not have the enzyme for cell wall synthesis ;
A penicillin only inhibits bacterial enzymes
penicillin will not inhibit any human enzyme ;
(human cells) do not have cell walls ; [max 1]

(iii) cell wall synthesis will stop / slow / be inhibited ;
A inhibit, murein / peptidoglycan, synthesis
ref. to uptake of water by osmosis ;
cell cannot withstand osmotic stress / cell cannot withstand turgor pressure / lysis / bursting / AW ;
A cell wall weakened
bacteria die / are killed / destroyed ;
stops bacteria dividing / reproducing / 'replicating' ;
AVP ; e.g. detail of action of penicillin (e.g. prevents cross-links forming),
(penicillin) only works on growing cells [max 3]

[Total: 11]

3 (a) *look at quoted data to confirm qualitative statements if unclear*

1 people who never smoked have the lowest percentage of deaths (due to lung cancer) ;
must be comparative

for age
2 *either*
the younger / earlier the person starts smoking the higher the percentage of deaths
or
the older / later the person starts smoking the lower the percentage of deaths
(due to lung cancer) ;

for number of cigarettes per day
3 *either*
increasing / AW, the number of cigarettes smoked per day increases the percentage of deaths
or
decreasing / AW, the number of cigarettes smoked per day decreases the percentage of deaths ;

different 'start' ages for the two types of smokers
4 highest percentage deaths is for those with an early start and smoke, 21–39 (cigarettes per day) / the most / AW ;

5 greatest difference in percentage deaths occurs in those that start smoking early ; **ora**
[max 4]

(b) (i) 1 forms carboxyhaemoglobin ;
2 reduces affinity of Hb for oxygen / Hb has higher affinity for CO than for oxygen ;
ignore 'picks up CO rather than oxygen', if mp3 is given then allow
3 reduces quantity of oxygen transported (in blood) / AW ;
R prevents
4 damages lining of arteries ;
A promotes / AW, atheroma / atherosclerosis / plaque [max 2]

(ii) raises, heart rate / blood pressure ;
reduces diameter of arterioles ;
decreases blood flow to body extremities ;
increases 'stickiness' of platelets / promotes, blood clotting / thrombosis ; [max 2]

(iii) *goblet cells*
enlarge / swell up ;
A become bigger / dilate
R inflamed
produce more / excess, mucus ;
A lots of
AVP ; e.g. any cellular detail such as more mitochondria / Golgi bodies or vesicles

cilia:
paralysis / destruction ;
A damages **R** kills ***ignore*** 'tar coats…'
no / less beating / sweeping (action) / moving mucus ;
R in context of moving air [max 4]

[Total: 12]

4 **(a)** (×) 400 ;;
if answer incorrect or not to nearest 100 allow one mark for correct working
e.g. (scale bar) 19 000–21 000 divided by 50
award max one mark if a unit (e.g. μm) is included [2]

(b) 1 thick(ened) / lignified, walls prevent, collapse ;
ignore *strenghtened*
A withstands, compression / negative pressure
ignore bursting
2 lignified (wall), prevents leakage / provides waterproofing ;
3 cellulose, wall / lining, allows adhesion of water (molecules) ;
A hydrogen bonding / hydrophilic
4 (relatively) large diameter / large cross-sectional area / wide / large lumen ;
5 hollow / empty / no contents / no cytoplasm ;
6 no end walls / continuous 'tubes' / AW ;
7 elongated ;
A *if referenced to cells or vessels* **A** cells end to end (to make tubes)
only allow mps 4–7 in terms of ease / efficiency of water movement
mp 4 e.g. more space allows a greater volume to flow / greater volume per unit time
or mp 5–6 e.g. *minimal resistance to flow, allows unimpeded flow, allows free flow of water*
8 pits / pitted walls, to allow lateral movement ;
R pores [max 3]

(c) 1 water moves, down a <u>water potential</u> gradient / from a high(er) water potential to a low(er) water potential, accept ψ for water potential ;
2 apoplast pathway, described / used in correct context ;
3 symplast pathway, described / used in correct context ;
4 evaporation from <u>mesophyll cell walls</u> ;
A surface of mesophyll cells
5 into air space(s) ;
must be linked to evaporation / water vapour
6 water <u>vapour</u> diffuses (out) ;
accept if no vapour but follows from evaporation
7 out / through / via <u>stoma</u>(ta) ;
R 'evaporates from the stomata'
8 **AVP** ; ref. to water leaves unlignified terminals of xylem vessels [max 5]

[Total: 10]

5 **(a)** *all points except mp3 may be taken from a labelled/annotated diagram*
1 ref. to, attachment / AW, to mRNA ;
2 *idea of* two codon attachment, sites / space, for six bases *or* nucleotides ;
3 mRNA has code for sequence of amino acids (in a polypeptide) ;
4 (ribosome) provides sites for attachment of two tRNA (molecules) ;
A implied
5 each tRNA has a specific amino acid / AW ;
6 (mRNA) codon – anticodon (tRNA), binding ;
A description in terms of complementary base pairing
A 'matching'
7 formation of peptide bonds (catalysed by peptidyl transferase) ;
8 *idea of* ribosome moving along mRNA one codon at a time ; [max 4]

(b) **(i)** GGC ; [1]

(ii) CTA ; [1]

(c) 1 amino acid coded by codon 2 changed ;
2 *idea of* every subsequent <u>codon</u> changed ;
3 amino acids / protein sequence, up to and including codon 1 unaffected / AW
ora amino acid sequence from codon 2 onwards is changed ;
4 *idea of* premature chain termination (if stop codon further on) / AW ;
5 *idea of* change in, <u>primary</u> / <u>secondary</u> / <u>tertiary</u>, structure of protein ;
6 *idea of* protein non-functional ;
ignore 'affect / effect'
A in context of enzyme not functioning
R if this point is out of context
7 **AVP** ; e.g. <u>frameshift</u> (mutation) [max 3]

[Total: 9]

6 **(a)** biotic and abiotic, components / AW ;
A alternatives to biotic and abiotic
including commumity / AW for biotic and habitat / environment, for abiotic
interacting / AW ; *idea of* interactions between organisms *or* interactions between organisms and abiotic environment
in an identifiable / a defined / a self-contained area / place / unit / environment / AW ;
A *idea of place if qualified with correct example* [2]

(b) **(i)** grasses / shrubs / trees ;
A singular or plural [1]

(ii) spider / predatory insect ;
A singular or plural [1]

(c) *energy loss at each level because of*
1 inedible parts / not all of the organism can be eaten ;
2 indigestible parts / not all is digested / egestion / faeces ;
3&4 *energy / heat, losses from* ;;
respiration **R** energy used for respiration
movement **A** energy used for movement
excretion
digestion
ignore *energy not utilised by plants by e.g. reflection from leaves, etc.* [max 3]

(d) *following death of organisms or excretion of nitrogenous waste*
1 decomposers / saprotrophs / bacteria / fungi / scavengers / detritivores ;
2 digest / breakdown / hydrolyse, protein / urea ;
3 *idea of* assimilation in / growth of, decomposers / AW ;
4 deamination ;
5 production of ammonium (ions) / ammonification ; **A** ammonia / NH_3
6 nitrification described *or* denitrification described ;
A formulae for ammonium ions, nitrite ions and nitrate ions but must be correct including signs
A nitrification described in terms of ammonium (ions) to nitrate (ions)
ignore nitrogen fixation as used correctly (N_2 to fixed N)
ignore uptake of nitrate ions or ammonium ions by plants
do not credit nitrification if any confusion with nitrogen fixation [max 3]

[Total: 10]