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.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2012 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.
Mark scheme abbreviations:
;
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

(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 ;

(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

(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 ;

(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

[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
deads
   or
   decreasing / AW, the number of cigarettes smoked per day decreases the percentage of
deads ;

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) \(\times\) 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. \(\mu\)m) is included

   [2]

(b) 1 thick(ened) / lignified, walls prevent, collapse;
   *ignore strengthened*
   - 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]
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(c) 1 water moves, down a water potential gradient / from a high(er) water potential to a low(er) water potential, accept $\psi$ for water potential;
2 apoplast pathway, described / used in correct context;
3 symplast pathway, described / used in correct context;
4 evaporation from mesophyll cell walls;
   A surface of mesophyll cells
5 into air space(s);
   must be linked to evaporation / water vapour
6 water vapour diffuses (out);
   accept if no vapour but follows from evaporation
7 out / through / via stoma(ta);
   R 'evaporates from the stomata’
8 AVP; ref. to water leaves un lignified terminals of xylem vessels

[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;

[Total: 4]

(b) (i) GGC;
(ii) CTA;

(c) 1 amino acid coded by codon 2 changed;
2 idea of every subsequent codon 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, primary / secondary / tertiary, 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. frameshift (mutation)

[Total: 3]
6  (a) biotic and abiotic, components / AW ;
   A alternatives to biotic and abiotic
   *including community / 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 ;
   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 / NH₃
   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 (N₂ 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]