UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the October/November 2011 question paper for the guidance of teachers

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 must be read in conjunction with the question papers and the report on the examination.

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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

1 (a) 40 000 **;;**
if no answer, incorrect answer or answer to too many significant figures, award one mark for correct measurement – 2 cm / 20 mm / 20 000 µm divided by 0.5
20 000 / AW or 89 (000) × 0.5 = 2.225, 89 000 **A** 90 000
0.5 20 (000) 2.225 2.25
A correct use of standard form [2]

(b) *Mark the first answer on each line if more than one;*
If one answer line or two answers left blank, mark first three answers that stand.

features must be structures present in animal cells (look for the positive)

mitochondrion / mitochondria **;**
nucleus / nuclear membrane / nuclear envelope **;** ***ignore*** 'lying free'
nucleolus **;**
DNA associated with, histone(s) / protein(s) **;** **A** chromosomes / linear DNA
ignore 'not naked DNA'
(smooth / rough) endoplasmic reticulum **;** **A** ER / SER / RER **;**
Golgi (body / apparatus / complex) **;**
lysosomes / Golgi vesicles / secretory vesicles **;**
ignore (double) membrane-bound organelles
large(r) / 80S, ribosomes **;** **A** anything between 20 and 30 nm centrioles **;**
AVP **;** e.g. cytoskeleton, (9 + 2) microtubules, microfilaments, proteasome, peroxisome, cilium / cilia, flagellum / flagella [max 3]

(c) cells not sectioned in LS **; ora**
A cross-section shown / depends on angle of cut / cut in different planes / end view [1]

(d) (i) glycosidic **;** ***ignore*** covalent / qualifications of glycosidic1

(ii) *accept any two likely effects on vegetables or vegetable plants*
ignore killed or death

1 breakdown, of, calcium pectate / middle lamella **;** **R** breakdown of pectin
2 production of (correctly named), sugars / disaccharides / monosaccharides **;**
3 (plant) cells will not be 'stuck together' to each other / AW / described **;**
A tissue disintegrates / cells not attached to each other
R cells disintegrate
4 vegetable will become, soft / mushy / inedible / lose firmness *or* turgidity / AW **;**
5 vegetable susceptible to other, infections / diseases **;**
6 starts, rotting / being decomposed **;**
7 so, change in appearance **;** *needs to be linked to mp4, 5 or 6*
8 AVP **;**
9 AVP **;**
e.g. ref to impaired, transport ***ignore*** photosynthesis / respiration
e.g. give off a bad smell / low yield [max 2]

[Total: 9]

2 (a) (i) acts as a pacemaker / regulates heartbeat **;**
A ref. to myogenic / described e.g. as rythmn / AW

releases / AW, waves of excitation / depolarisation / (electrical) impulses / action potentials **;**

R nerve impulses / signals / messages / waves unqualified

atrial systole / atrial contraction(s) **;** **A** initiates, heart beat / cardiac cycle
ref. to nervous innervation allowing changes **;** [max 2]

(ii) delays, impulse / AW **;**
R nerve impulses / signals / messages / waves unqualified
A *ecf* from **(i)**

sends impulse to, Purkyne fibres / Bundle of His / ventricles / septum **;**

allows atrial systole to complete before ventricular, systole / contraction(s) **;**
A *idea that* allows ventricles to fill (before they contract)
A *idea that* allows atria to, empty completely / complete contraction [max 2]

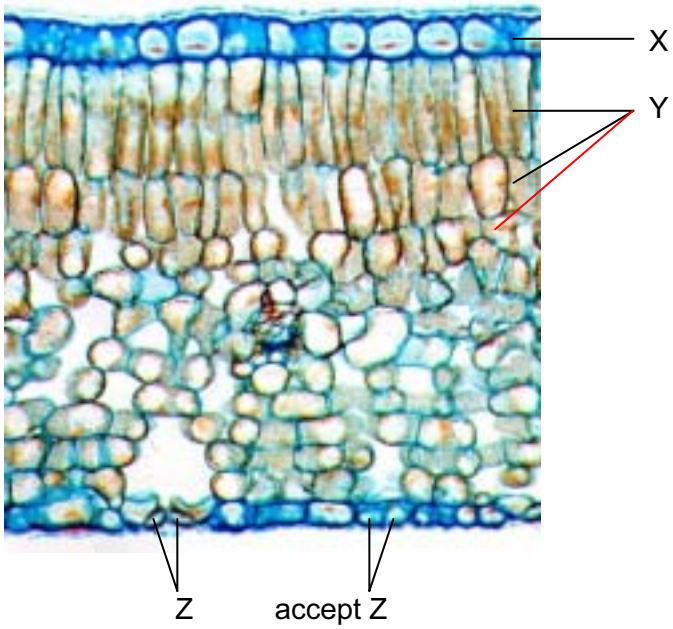
(iii) *either*
stops backflow (of blood) **;**
(stops backflow) from ventricle to atrium **;** **R** if ref. to right

or
allows one-way flow of blood **;**
allows flow from atrium to ventricle **;** **R** if ref. to right [max 2]

(b) C **;**
G **;**
G **;**
B / C **;** [4]

[Total: 10]

3 **(a)** correct labelling



X ;
Y ;
Z ;

A names instead of labels
A if letters put on the appropriate structures without using label lines, letter must be within each cell
ecf max one mark *if use brackets for X* ***and*** *Y enclosing upper epidermis and one, two or three layers of palisade mesophyll* [3]

(b) **1** (water) moves out of, cell / **Q**, by osmosis / down a water potential gradient **;**
2 through the, cell (surface) / plasma, membrane **;**
3 to, surface / cell wall of, the spongy mesophyll cell, cell **Q ;**
4 <u>evaporates</u> into (sub-stomatal) air space **;** **A** water changes to water vapour
5 water vapour diffuses out through (open) stomata **;**
A moves out down a, water potential / water vapour concentration, gradient

if evaporates, then do not insist on vapour [max 4]

(c) thick (waxy) cuticle **;**
large / big / thick, upper epidermis / upper epidermal cells **;**
many / two / three, layers of palisade cells **;**
thick leaf **;**
densely packed with spongy mesophyll / many spongy mesophyll cells **;**
fewer / small, air spaces **;**
no, stomata / guard cells, on upper surface **;** ***ora*** <u>only</u> on lower surface
many chloroplasts (within spongy mesophyll cells) **;**
R xeromorphic features **NOT** visible, e.g. sunken stomata [max 3]

[Total: 10]

4 (a) (i) *(estimated) number of newly infected people*

1 increases (steeply) (from 1990) until 1996 / 1997 **;**
2 peaks at, 3.5 million / any figure between 3 and 4 million / 3 to 4 million **;**
3 (gradual) decrease from, 1996 / 1997 **;**
4 number of new cases in 2008 is greater than in 1990 **;** [max 3]

(ii) *stated precaution(s) to reduce risk of infection by*

1 using, condoms / femidoms **;**
A safe(r) sex / use protection during sexual intercourse
2 abstinence / monogamy / less promiscuity **;**
3 not sharing needles / using sterile needles / needle exhange **;** **A** syringes
4 not breast feeding **;**
5 (heat) treated blood (products) / testing potential blood donors or donated blood **;**

6 ref to contact tracing **;**
7 increased awareness of, precautions / risks / transmission **;**
8 increased use of (antiviral) drugs reduces transmission **;**
9 some strains are less infective than others **;**
10 less reporting of new cases **;**
11 AVP **;** e.g. fewer HIV+ babies born (to HIV+ mothers)
improved, screening / detection, qualified [max 3]

(b) *idea that* estimates are subject to large uncertainty / AW **;**

idea that needed for any use of the data for planning health services / AW **;**

AVP **;** e.g. *explanation of mp 1 rather than general statement, such as*
symptomless carriers
many new cases not diagnosed
many new cases not reported
remote areas [1]

(c) 1 increase in new infections of HIV linked to increase in deaths from HIV/AIDS **;** ora
in context of time delay
A small number deaths in 1990 as few infected eight years before
2 HIV/AIDS may take several years to develop after HIV infection **;**
3 peak for new infections is in 1997 and for deaths is 2005 (delay of 8/9/10 years) **;**

number of deaths in always lower than number of new infections
4 comparative data quote in support of lower number of deaths than infections **;**
5 not all HIV+ people die from HIV/AIDS (over period of study) **;**
6 not all HIV+ people, have / develop, AIDS **;**
7 many deaths of HIV+ people recorded as due to, (named) opportunistic infections **;**
8 (antiviral) drugs delay, AIDS / opportunistic infections / AW **;**

9 AVP **;** e.g. cheaper drugs / greater availability of drugs [max 4]

[Total: 11]

5 (a) (i) box drawn round one phosphate, sugar and base **;** [1]

(ii) label P to circle **; A** phosphate / no label but clear a circle is intended [1]

(b) **1** DNA (double helix), unwinds / AW **; A** uncoil
2 hydrogen bonds between (complementary) bases broken **;**
ignore DNA unzips
3 complementary, base / nucleotide, pairing **; A** A-T **and** C-G
4 phosphodiester bonds **;**
5 both strands used as templates **; A** both strands are copied
6 produces two identical DNA molecules **; A** 'DNAs'
7 semi-conservative / each new DNA = one 'old' and one 'new' strand **;**
8 ref to DNA polymerase **;**
9 correct ref to other named enzyme **;** e.g. helicase (unwinds), topoisomerase (cuts backbone), ligase (formation of phosphodiester bonds)
10 ref to Fig. 5.1 **;** e.g. described dotted lines as H bonds that need to be broken
look for annotations on Fig. 5.1
11 AVP **;** e.g. replication fork(s), replication bubble(s), antiparallel nature, Okazaki fragments, activated nucleotides (3 phosphate groups) [max 5]

(c) **1** tRNA carries amino acid to ribosome **;**
2 ref to specificity of amino acid carried **;**
3 <u>anti-codon</u> on tRNA complementary to <u>codon on mRNA</u> **;**
A example for complementary, e.g. AUG and UAC
4 ref to two sites / P(eptidyl) and A(mino-acyl) sites, of ribosome **;**
5 peptide bond is formed between amino acids **; R** 'polypeptide bond'
6 tRNA, can be re-used / collects another amino acid **;** [max 3]

[Total: 10]

6 (a) (i) population ; [1]

(ii) ecosystem ; [1]

(iii) denitrification ; [1]

(b) (i) *if more than one answer – take first answer only*

secondary consumer ; **A** second consumer / 2° consumer
A third trophic level **R** carnivore [1]

(ii) *do not award marks unless it is clear there are energy losses in the crabs (not the mangrove)*
energy losses in
respiration ;
movement / muscle contraction ;
reproduction / AW ;
digestion ;
egestion / food not absorbed / loss in faeces ;
excretion / loss in urine / ref to named excretory product ;
ecdysis / moulting ;
(named) inedible parts ; *there is energy in shells*
dead crabs eaten by, other consumers / detritivores / decomposers ; [max 2]

(c) **1** protein / amino acids, (in leaf litter) ;
2 ref to, decomposition / decay / decomposers / saprobiotic bacteria or fungi ;
3 deamination ;
4 amino acid converted to, ammonia / ammonium ;
5 ammonia / ammonium, converted / oxidised , to nitrite (ions) / NO_2^- ;
6 nitrite (ions) / NO_2^-, converted to, nitrate (ions) / NO_3^- ;
7 by, nitrification / nitrifying bacteria / named example ; e.g. *Nitrosomonas / Nitrobacter*
8 nitrate (ions) / NO_3^-, taken up / absorbed, by mangrove / plant (roots) ;
9 AVP ; e.g. ammonia / ammonium, taken up [max 4]

[Total: 10]