UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2006 question paper

0610 BIOLOGY

0610/03 Paper 3 (Extended Theory), maximum raw mark 80

This mark scheme is published as an aid to teachers and students, 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.

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.

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

The grade thresholds for various grades are published in the report on the examination for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses.

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Q1 **(a)** CHECK FIG. 1.1 FOR ANSWERS

C (Clethrionomys glareolus) ;
D (Oryctolagus cuniculus) ;
E (Sciurus caroliniensis) ;
A (Sorex araneus) ;
B (Talpa europaea) ; **max. 4**

Bracket the first two answers together for the first tick

(b) ref. to presence of fur / hair ;
ref. to mammary gland / breast / udders / nipples / breast feeding / production of milk (to feed young) / suckling ;
ref. to external ears / presence of pinna ; **A** description **max. 2**

total max. 6

Q2 **(a)** **(i)** root(s) ; **1**

(ii) molar ; **R** premolar
ref. to the presence of (a number of) cusps / description of cusps ;
A refs to bumps / dents **R** ridges
ref. to presence of three roots / more than two roots ; **3**

(iii)
i. ref. to crown ;
ii. ref. to (upper part has) enamel / lower part does not have enamel ;
iii. root / lower part + covered with cement / dentine ;
iv. enamel is harder than + dentine / cement ; **A** stronger
v. root AW is more soluble / less resistant to acid / more easily penetrated AW ; **A** converse answer **max. 3**

(b) i. (the toothpaste) has an alkaline pH / pH 8.5 ; **R** high pH
ii. which neutralises acids in the mouth / maintains alkaline conditions / so pH in mouth is raised ; linked to i.
iii. ref. to (the toothpaste contains) fluoride ; **R** fluorine
iv. fluoride hardens enamel AW : linked to iii.
R fluoride hardens tooth unqual.
v. ref. to (the toothpaste contains) anti-bacterial agent ;
vi. kills bacteria + that produce acid AW ; linked to v. **max. 4**

(c) i. regular visits to the dentist AW ; **A** ref. to doctor qual.
ii. use of dental floss / tooth pick ;
iii. avoiding + eating sugary food / eating between meals ;
iv. ref. to fluoride + drinking water / mouthwash ;
v. use (antibacterial) mouthwash / (antiseptic) mouthwash ;
vi. eat + apples / crisp fruit ;
vii. eat foods containing calcium / phosphate / vitamin D / vitamin C ;
viii. do not open bottles / crack open nuts + with teeth
ix. rinse mouth with water after eating ;
x. brush or massage gums ; R brushing teeth
xi. have teeth coated with protective coating ; **max. 2**

total max. 13

Q3 (a) (i) deforestation / slash and burn ; **1**

(timber use) (land use)(spaces) **(ii)** ref. (to timber) for housing / furniture / wood / paper / fence posts AW ;
ref. to (timber for) fuel AW ; **A** burn to keep warm
ref. to roads / industry / housing / airports / other use of land ; **max. 2**

(iii)

i. ref. to soil erosion / mudslides / silting of rivers / desertification / dust bowl ;
ii. due to lack of (tree) roots to stabilise soil ; (linked to i.)
iii. ref. to increased risk of flooding ;
iv. due to lack of trees to slow down water ; (linked to ii.) **A** leaf litter absorbs water
v. ref. to leaching of soil / minerals washed out / soil becomes infertile ;
vi can lead to eutrophication of rivers / lakes AW ;
vii. less photosynthesis / burning or rotting wood ;
viii. less CO_2 absorbed from atmosphere / more CO_2 produced / in atmosphere ;
ix. ref. to global warming / greenhouse effect ; (linked to vii. or viii.)
x. ref. to drop in oxygen in atmosphere AW ;
xi. less rain (change in weather) ;
xii. due to less transpiration AW ; (linked to xi.)
xiii. ref. to reduction of habitats AW / habitats split up AW ;
xiv. ref. to disruption of food chains / loss of food ;
xv. so animals / plants + can become extinct or numbers depleted / loss of biodiversity ;
xvi. ref. to loss of genes / sources of chemicals for medicines AW ;
xvii. ref. to more pollution + due to smoke / road traffic / factories AW ;
xviii. ref. loss of income + tourism **max. 6**

(b) (i) MAX. 3 IF ONLY ONE NUTRIENT IS USED
IGNORE ENERGY REFS PROTEIN

(fat)
i. soya contains less fat ; **A** both sets of figures
ii. ref. to less cholesterol ;
iii. less risk of atherosclerosis / blockage of arteries / atheroma / stroke ;
iv. less risk of a heart attack / heart disease AW ;
v. ref. to less risk of obesity ; (O.R.A.)

(fibre)
vi. soya contains (more) fibre ; **A** both sets of figures
vii. so there is less risk of constipation (prevents) ;
vii. less risk of colon cancer ;
viii. fibre absorbs or removes toxins ; (O.R.A.) **max. 4**

(ii) FOOD CHAINS MUST USE NAMED ORGANISMS **R** plant etc.
i. (soya food chain) soya → human ; **A** description
ii. (corned beef food chain) grass → cow → human ; **A** description
iii. beef food chain has an extra level AW / has extra link / beef food chain longer ;
iv. energy lost through food chain / 90% energy lost at each level;
v. more energy is lost in beef chain ;
vi. example of energy loss e.g. body heat / movement of animal / not all food digested / energy lost in faeces / urinating / excretion / respiration / egestion ;
vii. in food chain there is more biomass in soya than in cows ; **R** more producers than consumers unqual. **R** less energy in beef than soya **max. 4**

total max. l7

Q4 **(a)** **(i)** (resistance) has increased / more resistant ;
ref. to doubled every 2 years / x 4 over 5 years / 20% more bacteria are resistant / 400% increase in resistance / exponential rise / geometric rise ; **A** figures quoted e.g. 7, 14, 28 (+1 -1 on figure)

(ii)

i. ref. to mutation / variation / DNA change ;
ii. (new strain) has resistance ; linked to i. **A** refs to immunity
iii. (new strain) not killed by treatment ;
iv. ref. to natural selection / survival of fittest / less competition for resistant bacteria if most of normal bacteria have died ;
v. (new strain) reproduces ;
vi. increased numbers of population have resistance ;
vii. ref. to over-prescription / not completing antibiotic course ;
viii. ref. to use in animal husbandry ; **max. 4**

(b) **(i)** yoghurt ;
cheese ;
curds / sour milk ;
tofu ;
single cell protein / SCP ; **max. 1**

(ii)

i. ref. to nitrogen-fixing bacteria ; **I** refs to being in root nodules
ii. change nitrogen into + nitrate / ammonium salts ; **A** ammonia
iii. ref. to role of saprophytes / decay / decomposition / release of nutrients or named minerals AW ;
iv. ref. to nitrifying bacteria ;
v. ref. to nitrification / conversion of ammonia to nitrates AW ; **max. 3**

(c)

description of the stage	number of the stage
all the plasmids are removed from the bacterial cell	5;
a chromosome is removed from a healthy human cell	2;
plasmids are returned to the bacterial cell	8;
restriction endonuclease enzyme is used	3 / 6;
bacterial cells are allowed to reproduce in a fermenter	9;

5

total max. 15

Q5 **(a)** order needs to be correct for one mark ; TICK TO LEFT OF TABLE
All numbers correct for **two** marks ; ; * NUMBER TO MATCH TISSUE
Three correct for **one** mark

	tissue	number of chloroplasts	
	upper epidermal cells	none	+
	palisade mesophyll	many	+
✓	spongy mesophyll	some / many	✓
	guard cells	some	✓

3

(b) **(i)** ONE MARK FOR SYMBOLS CORRECT **R** energy
ONE MARK FOR CORRECT BALANCING

$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$ **2**

(ii)
i. internal factor / external factor / environmental variable / named factor (CO_2 / H_2O / light / temp) ;
ii. which restricts the effects of others AW / limits rate of reaction ;
A converse answer **R** photosynthesis / growth
iii. it is the one in short(est) supply ; **max. 2**

(iii) carbon dioxide / CO_2 ; **1**

(c) **(i)**
i. ref. to long / tubular / formed as a vessel AW / lumen present / hollow ;
ii. ref. to absence of end walls ;
iii. ref. to dead cells / lack of cell contents / named part(s) (cytoplasm / nucleus) ;
iv. ref. to lignified walls ;
v. ref. to tracheids ; **max 3**

(ii) MAX. 3 IN EITHER SECTION
(xylem)
i. ref. to transport / carry ; AWARD ONCE
ii. ref. to water ;
iii. ref. to mineral salts / named salts / ions ; **R** nutrients unqual.
iv. from roots to leaves :
v. provides structural support AW ;
vi. ref. to transpiration ;

(phloem)
vii. ref. to transport ; (IF NOT ALREADY GIVEN)
viii. ref. to amino acids ;
ix. ref. to sugars / sucrose / organic materials ; **R** glucose, food, nutrients
x. from leaves to storage area or place of use AW ; **R** up the plant
xi. ref. to translocation ; **max 4**

(d) ref. to reduce (less / no) + water loss / wilting / transpiration ; **1**

total max. 16

Q6 **(a)** MUST USE LABEL LINES
ACCEPT NAMES AS WELL AS LETTERS
S. – any point in the vagina ;
D. – the cervix ;
M. – the ovary ;
F. – the oviduct ;
E. – any point on the surface of the uterus or in cavity ;
R if line is in muscular wall **5**

(b) **(i)** (ovum)
i. ref. to fallopian tube / oviduct ;
ii. ref. to presence of ciliated cells / cilia (in wall) ;
iii. ref. to (ovum) wafted down / propelled / moved / conveyed AW / sweep ; **R** passed unqual. **R** transport
iv. ref. to peristaltic movement AW of oviduct ; **max 2**

(ii) (sperm)
i. ref. to presence of tail + to swim / move AW ;
ii. ref. to mitochondria + to provide energy / power ;
iii. ref. to sperm streamlined / light / very small ; **2**

(iii) (zygote)
i. ref. to a fertilised egg / fused egg and sperm (nucleus) ;
ii. contains chromosomes of egg and sperm ;
iii. egg and sperm / gametes / sex cells + are both haploid / have half normal number of chromosomes / have 23 chromosomes / (both) formed by meiosis ; **max 2**

(iv) ref. to progesterone ;
secreted / produced by + placenta ; **2**

total max. 13