

CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the November 2003 question papers**0610 BIOLOGY**

0610/01	Paper 1 (Multiple Choice), maximum mark 40
0610/02	Paper 2 (Core), maximum mark 70
0610/03	Paper 3 (Extended), maximum mark 70
0610/05	Paper 5 (Practical), maximum mark 40
0610/06	Paper 6 (Alternative to Practical), maximum mark 40

These mark schemes are published as an aid to teachers and students, to indicate the requirements of the examination. They show the basis on which Examiners were initially instructed to award marks. They do not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

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*.

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the November 2003 question papers for most IGCSE and GCE Advanced Level syllabuses.

Grade thresholds taken for Syllabus 0610 (Biology) in the November 2003 examination.

	maximum mark available	minimum mark required for grade:			
		A	C	E	F
Component 1	40	-	34	28	25
Component 2	70	-	36	23	18
Component 3	70	50	39	-	-
Component 5	40	32	26	19	17
Component 6	40	26	19	13	11

The threshold (minimum mark) for B is set halfway between those for Grades A and C.
The threshold (minimum mark) for D is set halfway between those for Grades C and E.
The threshold (minimum mark) for G is set as many marks below the F threshold as the E threshold is above it.

Grade A* does not exist at the level of an individual component.

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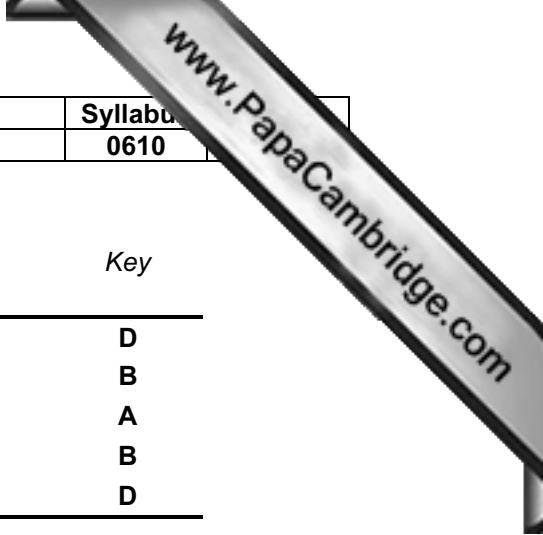
MARK SCHEME

MAXIMUM MARK: 40

SYLLABUS/COMPONENT: 0610/01

BIOLOGY
Paper 1 (Multiple Choice)

Page 1	Mark Scheme	Syllabus
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<i>Question Number</i>		<i>Question Number</i>	<i>Key</i>
1	A	21	D
2	C	22	B
3	B	23	A
4	C	24	B
5	A	25	D
6	A	26	D
7	B	27	A
8	B	28	C
9	C	29	C
10	C	30	A
11	C	31	C
12	D	32	C
13	B	33	C
14	B	34	D
15	B	35	D
16	A	36	C
17	D	37	B
18	B	38	A
19	B	39	D
20	A	40	B

TOTAL 40

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MARK SCHEME

MAXIMUM MARK: 70

SYLLABUS/COMPONENT: 0610/02

BIOLOGY
Paper 2 (Core)

Page 1	Mark Scheme	Syllabus
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- 1
- A** – *Anax*;
- B** – *Aranea*;
- C** – *Pandalina*;
- D** – *Cancer*;
- E** – *Buthus*
- F** – *Musca*;
- Ignore use of common names – e.g. crab, spider, fly etc
Any four correct – 1 mark each [4]
- Total [4]
- 2 (a) (i) **Y** – exponential (phase) / log (phase); [1]
- (ii) animals take time to adjust / get used to the new habitat / A/W;
few (reproducing) individuals present;
individuals may be widely dispersed / A/W;
Any two – 1 mark each [2]
- (b) food / water supply;
disease;
predators / parasites;
availability of space / named example;
climate qualified / habitat qualified; Ignore ref. to pollution
Any three – 1 mark each [3]
- Total [6]
- 3 (a) (i) label to upper region of vagina / near to cervix; [1]
- (ii) label to upper third of oviduct; [1]
- (iii) label to uterine lining; [1]
- (iv) label to ovary; [1]
- (b) development of breasts / mammary glands;
widening of hips;
thicker layer of fat (under skin);
growth of axillary / pubic hair;
inhibition of FSH production;
Any three – 1 mark each [3]

Page 2	Mark Scheme	Syllabus
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- (c) ✓ / yes
 ✗ / or left blank / no
 ✓ / yes; [1]
 (Note – only 1 red tick to show correct response)
- Total [8]
- 4 (a) (i) formation of amino acids / proteins / polypeptides; [1]
 (ii) nitrates lost with crop plants / by leaching;
 must be replaced / to increase yield / increase growth; [2]
- (b) plants / algae grow rapidly / algal bloom;
 cover surface;
 cut out light so submerge plants die; Ignore ref. to water turbidity.
 dead plants decomposed;
 bacteria multiply;
 (bacteria) use up oxygen;
 pond / water becomes anaerobic;
 animals die; Ignore ref. to suffocation
 eutrophication;
 Any five – 1 mark each [5]
- Total [8]
- 6 (a) (i) lipase; [1]
 (ii) fatty acids and glycerol; [1]
 (iii) (fatty acids) increase acidity of mixture / make it acidic;
 to below pH5 / lowers pH; [2]
- (b) enzyme activity faster at 35 °C / collisions occur more frequently / A/W / ORA;
 (fatty) acids released more rapidly / sooner / ORA; [2]
- (c) (i) 5 °C – yellow;
 55 °C – blue; [2]
 (ii) 5 °C – enzyme inactive / working very slowly in cold;
 works faster / digests / breaks down (oil when warmed);
 55 °C – enzyme destroyed / denatured / damaged /
 ref. to active site changes; R - killed
 permanent change / not reversed when cooled (and no digestion of oil);
 [4]
- Total [12]

Page 3	Mark Scheme	Syllabus
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- 5 (a) (i) (parent genotypes -) Gg, Gg;
- (gamete genotypes -) G, g, G, g;
- (offspring genotypes -) GG, Gg, Gg, gg;
- (offspring phenotypes -) green, green, green, white; [4]
 Accept - normal chlorophyll / normal for green, lacks chlorophyll for white
- (ii) green – 375 white – 125; [1]
 (Note – only 1 red tick to show correct response)
- (b) 20 seeds not viable etc./ do not germinate;
- 75% / 360 of seedlings to be green;
- 25% / 120 white seedlings die;
- because they lack chlorophyll;
- * thus no photosynthesis;
- * seedlings use up reserves / run out of food / cannot make own food;
- the two points with * can be awarded as converse statements in relation to green seedlings if not already awarded
- Any five – 1 mark each [5]
- Total [10]
- 7 (a) (i) **X** – aorta;
- Y** – pulmonary vein; [2]
- (ii) prevent backflow / give one-way flow / control direction of flow of blood; [1]
- (iii) has to generate greater pressure;
- to push / pump blood all round body / further; [2]
- (b) (i) open closed;
- closed open; [2]
 Note – mark across each row)
- (ii) (tricuspid valve -)
 pressure in (right) atrium / 2 units, greater than in (right) ventricle / 0 units;
- (semilunar valve -)
 pressure in pulmonary artery / 3 units, greater than in (right) ventricle / 0 units; [2]
- Total [9]

Page 4	Mark Scheme	Syllabus
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- 8 (a) (i) X – sensory neurone;
Y – relay / intermediate / connector / internuncial / multipolar neurone;
Z – motor neurone;
- (ii) muscle / named muscle / gland / named gland; [1]
- (b) slower;
blood;
electrical;
sense organ/ receptor; [4]
- Total [8]
- 9 (a) user becomes dependent upon drug / description of dependency;
(this can be physiological, physical or psychological dependency)
user suffers withdrawal symptoms if denied drug / craving for drug;
Note - Ignore vague statements
Any one – 1 mark [1]
- (b) periods of drowsiness / stupor / “ not with it” / slow responses to surroundings;
damage to blood vessels in nose / blue veining;
damage to blood vessels in limbs / bruising / injection marks;
abscesses on limbs where injecting;
constricted pupils / black “panda” eyes;
very happy / relaxed but with mood swings;
no desire for food / drink / lack of sexual appetite;
constipation;
Any two – 1 mark each [2]
- (c) inhaling – damage to membranes / cilia of nose / throat;
injecting –risk of infection by hepatitis / HIV / septicemia; [2]
- Total [5]

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INTERNATIONAL GCSE

MARK SCHEME

MAXIMUM MARK: 70

SYLLABUS/COMPONENT: 0610/03

BIOLOGY
Paper 3 (Extended)

Page 1	Mark Scheme	Syllabus
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- Q1 (a) (A) testa/seed coat
 (B) plumule; Ⓐ embryonic shoot Ⓜ shoot unqual.
 (C) radicle; Ⓐ embryonic root Ⓜ root unqual.
 (D) cotyledon; Ⓐ food store Ⓜ endosperm [4]
- (b) ovary; Ⓜ gynoeceium/pistil/carpel/ovule [1]
- (c)(i) ref. to transfer / AW, of pollen;
 from anther to stigma ; [2]
- (ii) ref. to large petals; Ⓜ flower
 ref. to coloured petals;
 ref. to petals as landing stage;
 ref. to presence of guide lines on petals;
 ref. to scent;
 ref. to production of nectar/presence of nectary;
 ref. to large amount of pollen; max. 2
- (iii)
 i. ref. to more variation / AW;
 ii. due to genetic mixing / AW / hybridisation;
 iii. ref. to natural selection/greater ability to adapt;
 iv. so more chance of survival/ref. to resistance to disease; max. 2
 Ⓐ other suitable benefits of variation
- (d)(i) allows pollen tube to enter ovule; Ⓜ ovary wall
 ref. to male + gamete/nucleus; Ⓜ pollen nucleus
 to reach/fertilise + ovum/egg (nucleus)/female gamete / AW; max. 2
- (ii) allows water to enter (seed) / AW;
 ref. to weak point for exit of radicle / AW; [1]
 Ⓜ refs to root or shoot
- (e) ref. to digestion/be broken down/convert into soluble products
 changed to (simple) sugars; [1]
- Total 15**
- Q2 (a) carbon + hydrogen + oxygen ; Ⓜ chemical symbols [1]
- (b)(i) sweet potato ; Ⓜ potato unqual. [1]
- (ii) peas; Ⓜ chick peas [1]

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- (c)(i) sweet potato; ® potato unqual. [1]
- (ii) **AWARD TWO MARKS FOR CORRECT ANSWER, WITH NO CALCULATION MAX 1 WITH NO UNIT**
MARK ANSWER BASED ON THAT GIVEN FOR (c)(i)
some working involving: $20.5 - 8.9 = 11.6$ or 11.6×5
58g ; [2]
- (d)(i) energy level would increase / AW;
potato gains fat/oil from frying;
fat/oil is an energy source / AW; max. 2
- (ii) i. animal fats contain cholesterol;
ii. which can build up in arteries/arterioles;
Ⓐ ref. to atheroma/atherosclerosis/arteriosclerosis/hardening of arteries
Ⓐ ref. to fatty substances ® refs to fats
iii. to obesity/overweight;
iv. which can lead to heart disease or attack//strain on heart/
high blood pressure/joint problems/diabetes; max. 2
- (e)(i) 400g; ® with no unit [1]
- (ii) cabbage/other names green vegetable;
citrus fruit/named citrus fruit;
blackcurrants;
tomatoes;
kiwi fruit; max. 1
- (iii) ref. to skin covered with bruises/ulcers/ref. to broken skin/sores;
ref. to soft/bleeding + gums;
ref. to loss of teeth;
ref. to poor healing of wounds;
ref. to bleeding around connective tissue AW;
ref. to heart failure;
ref. to anaemia; max. 2

Total 14

- Q3 (a) **MAX. 1 EACH FOR (i) AND (ii) WITH NO LETTERS**
- (i) at point X it starts to drop;
then increases towards Y;
drops again towards Z; max. 2
- (ii) at point X it increases (sharply) / AW
drops/returns (nearly) to original level between Y and Z / AW; [2]
- (b)(i) ref. to respiration by + sewage fungus/bacteria;
lack of algae/water plants + to produce oxygen;
ref. to increase in temperature; max. 1
- (ii) ref. to lack of sewage fungus/bacteria;
photosynthesis by algae;
ref. to water turbulence AW; max. 1

- (c)(i) i. (ref. to suspended solids/sewage) + blocks light for algae / AW / algae cannot photosynthesise;
ii. ref. to lack/shortage + of nitrate in water; ⓐ no nitrate
iii. ref. to possible presence of toxins in sewage/ref. to disease;
iv. ref. to possible increase in temperature or unsuitable temperature;
max. 2
- (ii) ref. to shortage of nitrates;
ref. to grazing by (aquatic) herbivores AW;
ref. to possible drop in temperature;
max. 2
- (d) ref. to herbicides will kill + algae/water plants/other organisms;
ref. to disruption of food chains AW;
ref. to eutrophication or description;
max. 1

Total 11

- Q4 (a) i. internal intercostal muscles + contract;
ii. external intercostal muscles + relax;
iii. so ribcage + drops(s)/goes down or in; (linked to i. or ii.)
iv. diaphragm (muscles) relax(es);
v. diaphragm + rises/becomes dome-shaped;
vi. volume of chest cavity decreases AW; ⓐ ref. to lungs/thorax
vii. internal pressure increases;
viii. ref. to lower pressure outside lungs AW;
ix. so air is forced out AW + of lungs; (linked to vi., vii. or viii.)
max. 7

- (b) table with suitable headings;
ACCEPT WITHOU G TEASONS COLUMN
ⓐ symbols for gases
MAX. 2 FOR COMPARISONS WITHOUT PERCENTAGES
CAN AWARD MARK FOR ONE % PLUS CHANGE FOR EACH GAS

gas	inhaled air %	exhaled air %	reason
nitrogen	78 ± 1	78 ± 1;	not used in respiration/insoluble/not used by body/not absorbed by blood;
oxygen	21 ± 1	16 ± 1;	used up in respiration/absorbed by blood/ref. to diffusion gradient;
carbon dioxide	0.04 ± 0.01	4 ± 1;	waste product of respiration/released from blood in lungs/excreted by lungs/ref. to diffusion gradient;
water vapour	variable	higher;	product of respiration/evaporates (from surface of alveoli AW)/ref. to diffusion gradient;

ⓐ ref. to diffusion gradient ONCE

max. 8

Total 15

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- Q5 (a)(i) food chain with FOUR suitable NAMED organisms in correct order;
 Ⓐ parasite/decomposer at end of chain, if named
 starts with producer; (ignore sun/light if included)
 arrows all correct ; [3]
- (ii) i. solar/light + energy trapped/absorbed + by producer; Ⓒ sun unequal.
 ii. ref. to photosynthesis;
 iii. changed to chemical energy/stored in food AW/used to make starch or glucose;
 iv. primary consumer + eats producer;
 v. some energy stored in p. consumer;
 vi. ref. to respiration;
 vii. some used for movement;
 viii. e.g. to find a mate/find food/escape from predators;
 ix. ref. to not all energy extracted from food/not all parts of organism eaten/undigested food egested AW;
 x. secondary consumer + eats primary consumer;
 xi. ref. to 90% of energy lost at each stage;
 xii. ref. to other forms of energy loss e.g. through excretion/heat;
 xiii. tertiary consumer + eats secondary consumer;
 xiv. ref. to arrows show direction of energy flow; max. 8
- (b)(i) suitable species named;
 valid reason for its conservation; [2]
- (ii) suitable habitat named;
 valid reason for its conservation [2]

Total 15

- Q6 (a) (FUNCTION)
 i. defence against + disease/foreign bodies;
 ii. ref. to pathogens/bacteria/viruses/fungi;
- (ANTIBODY PRODUCTION)
 iii. antibodies produced by lymphocytes;
 iv. lymphocytes + produce antitoxins/inhibit toxins AW;
 v. lymphocytes made in + lymph nodes/named nodes;
 vi. in response to presence of pathogens/foreign bodies/toxins;
 (linked to v.)
 vii. ref. to presence of antigens on surface of foreign cells AW;
 viii. antibodies + kill pathogens/make them clump/prepare them for action by phagocytes;
 ix. ref. to remain in blood to provide long-term protection AW;
- (PHAGOCYTOSIS)
 x. ref. to phagocytes/granulocytes/polymorphs;
 xi. move to site of infection;
 xii. ingest/engulf + bacteria/pathogens/foreign bodies;
 xiii. and kill them by + digestion/breaking them down AW; max. 9

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- (b)
- i. transplanted organ may be a different tissue type;
 - ii. so there is a chance of rejection;
 - iii. ref. to need for similar tissue type/good match/same blood group;
 - iv. e.g. from close relative AW;
 - v. ref. to use of immunosuppressant drugs;
 - vi. ref. to loss of protection from disease for patient AW;
 - vii. so patient needs to be kept in isolation AW; (linked to vi.)
 - viii. ref. to use of genetic engineering/cloning + to produce organs;
 - ix. ref. to use of other animal organs/xenotransplantation/use of own vein to repair e.g. heart;
 - x. ref. to shortage of organs for transplantation/creates black market/ref. to high cost/use of data base to locate suitable organ
- max. 6

Total 15

Q7 (a) **MAX. 2 WITHOUT NAMED EXAMPLE**

named tissue; Ⓡ blood
 made up of a group of cells;
 of the same type;
 performing the same function;

max. 3

(b) **MAX. TWO IF PART IS NOT NAMED**

- i **A** = upper epidermis;
 - ii ref. to a single layer of cells;
 - iii produces/secretes wax/cuticle;
 - iv to make leaf waterproof/decreases transpiration; (linked to iii)
 - v ref. to transparent nature of + cells/cuticle; ⓐ ref. to lack of chloroplasts
 - vi to allow light to pass through; (linked to v.)
 - vii ref. to acting as a barrier against + bacteria/fungi AW; max. 3
 - viii **B** = palisade mesophyll;
 - ix cells are very long/columnar AW;
 - x cells contain many chloroplasts/much chlorophyll; AWARD ONCE
 - xi ref. to photosynthesis; AWARD ONCE max. 3
 - xii **C** = spongy mesophyll;
 - xiii cells are rounded;
 - xiv ref. to presence of air spaces (between cells)/cells loosely packed;
 - xv cells contain + chloroplasts/chlorophyll; AWARD ONCE
 - xvi ref. to photosynthesis; AWARD ONCE
 - xvii ref. to gaseous exchange AW; ⓐ description max. 3
 - xviii **D** = guard cells/stoma(ata);
 - xix ref. to presence of guard cells in pairs;
 - xx guard cells surround a + pore/hole/stoma;
 - xxi and control its opening or closing;
 - xxii ref. to gaseous exchange AW;
 - xxiii ref. to control of transpiration;
 - xxiv cells contain + chloroplasts/chlorophyll; AWARD ONCE
 - xxv ref. to shape of guard cells/irregular thickness of cell wall;
 - xxvi correct ref. to role of turgor in cells; (can award for **A, B, C** or **D**)
- max. 3

Total 15

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MARK SCHEME

MAXIMUM MARK: 40

SYLLABUS/COMPONENT: 0610/05

**BIOLOGY
(Practical)**

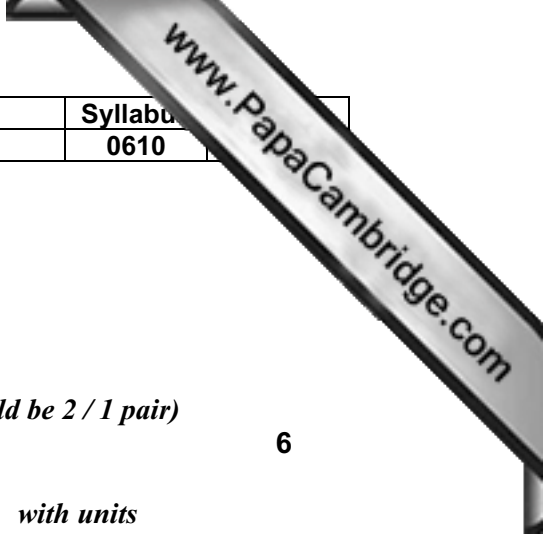
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- 1 (a) × *lose these marking points if no table*
- × use of ruled lines for columns and rows ;
 - × time (table heading) ;
 - × temperature (table heading) ;
 - record of units temp and min/clock times ;
 - readings taken at 2 min intervals ; (*6 readings in total*)
 - records for both A and B ;
- max 5**
- (b) ✓ *only credit these marking points if bar chart drawn*
- × *lose these marking points if axes the wrong way round AND award max 4*
- ✓ × orientation of axes ; (*time horizontal, temp vertical*)
 - ✓ labels for axes including units ; (*A*) *clock times*
 - × plotting data using suitable scale ; *c. half the paper min., linear scale, sensible scale, grid capable of plotting their results*
- plotting data for A (points visible, no obvious error, not (0,0)) ;
 plotting data for B (points visible, no obvious error, not (0,0)) ;
- clear lines ; *correctly drawn, not extending beyond data plots*
- each curve identified/use of key ;
- max 5**
- (c) (i) temperature decreases ;
 comment on decrease ;
- 2**
- (ii) temp. of A decreases more than B/converse ;
 more heat lost from A/converse ;
 B remains almost the same/use of comparative figs./
 comment on gradient/comment on rate ;
- max 2**
- (iii) animal at the centre of a group will retain, heat/warmth ;
 solitary animal will lose more heat ;
 crowding is better to retain heat (in cold conditions) ;
 ref. to surface area (of individual v. group) ;
- max 2**
- (iv) suggestion ;
 explanation/detail ;
 suggestion ;
 explanation/detail ;
Credit any reasonable suggestion such as ...
- increase time/change starting temperature/
 - change the no. of tubes/repeats/
 - cover tubes with different material/
 - other suitable suggestion
- 4**

[Total : 20]

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- 2 (a) (i) Drawing ~ clear outline W1 ;
at least 5 cm in one direction ;
3 body sections shown ;
- Labels ~ legs ; (*should be 6/3 pairs*)
antennae/compound eyes ; (*should be 2 / 1 pair*)
head/thorax/abdomen ; 6
- (ii) length of drawing measured correctly (± 2 mm) ; *with units*
clear measurement line shown ;
correct calculation of “drawing length \div specimen length” ;
to 1dp
(allow .25 or .75 exactly)
no units 3
- (b) *Credit any reasonable suggestion together with reason, such as*
- cover top with vegetation ;
camouflage ;
- make sure that container is deep enough ;
to prevent insects from escaping ;
- put water in container ;
kill insects/stop insects escaping ;
- smooth/slippery side ;
stop insects escaping ;
- bait ;
to attract insects ;
- other valid suggestion ; ; max 4
- (c) (i) **W1** thick/tough/sturdy/shape ref. ;
W2 thin / delicate / shape ref. ; 2
- W1** biting/chewing/cutting/holding/grasping/ etc. ;
W2 sucking/equivalent ; 2
- (ii) *Credit any suitable comparison, such as ...*
- W1 has no outstretched wings and W2 has outstretched wings ;
W1 has hard casing and W2 does not ;
W2 has longer antennae ;
W2 has more delicate legs ;
other suitable comparison ; ; ; max 3

[Total : 20]

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MARK SCHEME

MAXIMUM MARK: 40

SYLLABUS/COMPONENT: 0610/06

BIOLOGY
(Alternative to Practical)

Page 1	Mark Scheme	Syllabus
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Question 1

(a) (i) Graph

- O** - axes to show correct orientation;
 - S** - suitable scale to fill the printed grid; [at 10 mins scale should cover 2½ large squares]
 - L** - label axes correctly with appropriate unit;
 - P + P** - correct plotting [minus 1 for 1 error, minus 2 for 2 errors]
 - D** - ruled straight lines from point to point / smooth line of best fit [R. wavy lines. No extrapolation back to axes. Allow extra line past 10 min for label line]
 - K** - identify lines by labels or use of a key;
- Histogram** allow **L, O, K** to max 3. [7]

(ii) temperature drops faster at first / AW;
 temperature continues to drop but slower / AW;
 but if A loses heat with no further detail, max 1 mark
no credit for a description comparing A with B and C [2]

(iii) reference to one tube having dropped more / lower / faster than another;
 A compared with B / A compared with C / B compared with C;
(if just final temperatures given with no working = 0)

(iv) reference to animals or tubes *with idea of* transfer of heat/trap warm air/keep them warm
 /maintain body temperature;
 use of appropriate scientific term – insulation/conduction/radiation/convection; [2]

(b) shield tubes from draughts/move apparatus out of draught;
 use of lids [to reduce loss of heat from too exposed surface];
 stir the water before taking temperature reading;
 replication/average/ accept measure more tubes in outer ring C;
 more frequent readings; [*ignore longer periods*]

R. leave longer/use more test tubes or larger groups/use of animals or blood instead of water/lagging tubes/alter volume of water. MAX [2]

[Total: 15]

Question 2

(a) (i) **Drawing:** **clear outline of whole animal;** *R sketchy outlines and excessive artistic shading*
proportions; *R. obvious gross errors/extra detail not present e.g. open carapace*
detail; *check 3 parts to body and 3 pairs of segmented legs.*

Labels: *number and structure for 1 mark*
 6 legs/3 pairs/6 jointed appendages;
 2 antennae/feelers; *R. anthers/tentacles;*
 3 parts to body / head and thorax and abdomen;
R. segmented body alone
 2 pairs of wings (accept 1 pair of wings / wing covers)
ignore mouthparts/carpace/hard case.

MAX [5]

(ii) measurement of Fig 2.1 3 to 4.2 cm max. AND
 measurement of the candidate's drawingcm [to include units **once**];
 working to calculate magnification;
 magnification;
check answer, must be times or x in front of figure without units.
if answer is incorrect look for correct working accept a ratio if correct [3]

(b) **TWO** precautions and explanations from:-

traps must be checked early and regularly;
so animals do not become eaten/escape;

use of suitable fluid;
to kill the insects/to stop carnivorous insects/predators/large animals eating beetles;

suitable covering/mesh;
animals washed away/eaten; rain;

container deep enough/grease sides of pit;
so beetles cannot escape/trap insects;

R. bait/food to attract insects/identification of insects/exit holes for rain/glass pits/position of pits/gap around tin/sharp edge/use of gloves. MAX [4]

(c) **THREE** visible differences between beetle in Fig. 2.1 and the butterfly in Fig. 2.3

Need points from **both** insects to be compared – statements **MUST** be paired.

Feature	Beetle fig 2.1	Butterfly fig 2.3
wings	one pair / no wings / folded wings	2 pairs of wings [alone] / bigger / visible wings / unfolded / upright wings;
wing covers	present	wings exposed / absent;
antennae (<i>accept ecf for incorrect name already penalised</i>)	shorter / smaller / no swellings / segmented	longer / larger / swellings at tip / not segmented;
mouthparts	pincers / claws / piercing parts / AW	proboscis / tongue / sucking;
eyes	none / not visible / small <i>R. simple eyes</i>	compound / visible / large;
body	accept small	accept large;
abdomen	not visible (<i>accept not segmented segments not visible</i>)	visible / segmented; <i>R. striped/shaded</i>
legs	hairy / claws <i>R. length of legs</i>	not hairy / no claws;

MAX [3]

[Total: 15]

Question 3

- (a) Award 1 + 1 mark in pairs (i.e. second mark can only be awarded with its own first mark)
 ONE of:-
 Cover with petroleum jelly;..... Plant will not wilt;
 Cover with polythene bag/bell jar/bottle;..... condensation/drops of water will collect; R. water vapour
 Use of photometer;..... bubble movement/level of capillary water;
 Shoot in container;..... water taken up; [needs for water to be covered with oil to prevent evaporation/covered with polythene].
 Cobalt chloride paper;..... colour change – to pink;
 Anhydrous copper sulphate...colour change – to blue; R. *litmus/universal indicator* [2]
- (b) to prevent / minimise loss of moisture / water from the soil / pot by evaporation; [1]
- (c) similar apparatus including same sized/mass plants/equal number of leaves; *ignore ref. to same bags*
 same conditions of water added before starting investigation;
 same time for readings/one day;
 same conditions of light;
 same temperature;
 same humidity;
 same air movement;
 data analysis/comparison of graphs;
if candidate describes a different experiment, then max 2 for 2 controlled conditions MAX [4]

(d)

feature	description	comment relating to adaptation
leaves	no leaves / small leaves / small surface area / spines / thorns; hairs [or stem or plant];	to reduce water loss / transpiration; for protection / to prevent being grazed / eaten; to trap water;
stem (R. bulb)	swollen / thick / fleshy / succulent; green / ref. chlorophyll;	stores water; for photosynthesis [as leaf area reduced];
cuticle / skin	thick/waxy; R. <i>hard alone</i>	stops water loss;
roots	long / tap; shallow / network / fibrous / many roots;	to trap / absorb water from deep; to trap/absorb water over wide area; R. <i>store water</i>
hairs/spines	on stem / plant / surface;	traps moist air; reduce transpiration;
stomata	not in direct light / sunken / less in number;	reduce water loss / reduce transpiration;
plant shape	width / thickness / less surface area to volume ratio / reduce surface area; <i>ignore compact</i>	stores water / reduce water loss;

3 valid features without adaptation comment = max 1
 R. *big roots / main root / light reflecting / shiny / ribs / grooves*

MAX [3]

[Total: 10]