Location Entry Codes

UNIVERSITY of CAMBRIDGE
International Examinations

From the June 2007 session, as part of CIE's continual commitment to maintaining best practice in assessment, CIE has begun to use different variants of some question papers for our most popular assessments with extremely large and widespread candidature, The question papers are closely related and the relationships between them have been thoroughly established using our assessment expertise. All versions of the paper give assessment of equal standard.

The content assessed by the examination papers and the type of questions are unchanged.

This change means that for this component there are now two variant Question Papers, Mark Schemes and Principal Examiner's Reports where previously there was only one. For any individual country, it is intended that only one variant is used. This document contains both variants which will give all Centres access to even more past examination material than is usually the case.

The diagram shows the relationship between the Question Papers, Mark Schemes and Principal Examiner's Reports.

Question Paper	Mark Scheme	Principal Examiner's Report
Introduction	Introduction	Introduction
First variant Question Paper	First variant Mark Scheme	First variant Principal Examiner's Report
Second variant Question Paper	Second variant Mark Scheme	Second variant Principal Examiner's Report

Who can I contact for further information on these changes?
Please direct any questions about this to CIE's Customer Services team at: international@cie.org.uk

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2007 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 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.

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 May/June 2007 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

UNIVERSITY of CAMBRIDGE
International Examinations

INSTRUCTIONS FOR EXAMINERS

Spellings

Accept phonetic spellings except where indicated or if there is confusion with another term
Accept wayward spelling if words are recognisable

Marking questions where a specified number of responses is indicated

Mark first answer on each row unless considered neutral
If several answers on first line and no answers on subsequent lines, mark all answers on first line up to the number specified in the question

Do not mark answers in excess of number indicated by the question

Calculations

Allow tolerance as indicated if figure(s) have to be taken from drawing / diagram / graph

Award full marks for correct answer even if no working shown

If incorrect measurement is taken then award one mark for correct method if shown

Errors carried forward

Examples:

If structure is identified incorrectly, then apply error carried forward rule for subsequent answers

If parental genotypes identified incorrectly, then apply error carried forward rule for gametes and F_1 to a maximum of 2

Vague answers

Reject ‘affects’, ‘effect’, ‘influences’ unless qualified

Do not allow ‘particles’ in place of molecules

1 (a) *assume answer is about plant cells unless told otherwise, allow reverse argument*

(large / sap) vacuole **;** **A** 'animal cell has small vacuoles' **R** sap unqualified
chloroplasts **;** **R** chlorophyll
(cellulose) cell wall **;**
starch grain(s) **;** **R** starch unqualified [max. 2]

(b) (i) **B ;**
E ;
F ;
A ;
D ; [5]

(ii) *award two marks if correct answer (x 990 to 1010) is given, ignore units*

ecf – award one mark if incorrect measurement or 10 cm is divided by 0.1
if answer is correct put two ticks on answer
if answer is incorrect but the denominator is 0.1, place a tick on the working

100 / 0.1 **;** **A** 99 - 101
= (x) 1000 **;** **A** 990 - 1010 [2]

(c) *do not award the function mark unless the cell name is correct*

(animal cell) red blood cell / erythrocyte **;**
(function) transports, oxygen / carbon dioxide **;** *haemoglobin is neutral*

either

(plant cell) xylem (cell / vessel) **;**
(function) transports, water / minerals / named mineral / AW **;** **A** provides support

or

(plant cell) phloem (cell) **;** **A** sieve tube **R** companion cell
(function) transports, sugars / sucrose / amino acids / minerals / AW **;** [4]
ignore water **R** glucose / nutrients

[Total: 13]

2 (a) (i) accept other valid responses – must be long-term and not behavioural / social

1 liver, damage / failure / disease / cirrhosis ; **R** destroys **A** hardens
2 brain damage / loss of brain cells / loss of neurones / loss of memory / AW ;
3 cancer of correct named part of body ;
mouth / pharynx / oesophagus / gut / pancreas / liver / breast
4 stomach ulcers ;
5 heart disease / stroke / AW ;
6 high blood pressure / hypertension ;
7 alcoholism / addiction / dependence / tolerance ;
8 (risk of) damage, to fetus / pregnant woman's baby / fetal alcohol syndrome / AW ;
e.g. low birth weight / poor mental development
9 increased risk of miscarriage ;
10 malnutrition / named deficiency disease(s) ;
11 obesity / weight gain ;
12 loss in weight / wasting ; [max. 2]

(ii) (500 x 2 =) 1000 (cm^3) ; [1]

(b) (i) (nutrients are) large molecules / need to be small molecules ;
A complex / simple, molecules
(some nutrients are) insoluble / need to be soluble ;
must pass through, intestine wall / capillary wall ;
R ref. to absorption unqualified by wall(s) [max. 2]

(ii) small intestine / ileum / villi ; **A** duodenum [1]

(iii) fatty acids / glycerol / maltose / peptides / AW ; **R** fat / lactose / sucrose [1]

(c) (i) (x) 9.0 (%) ; [1]

(ii) as blood alcohol content of blood increases, so does risk of accident / AW ;
relevant comment on part of graph ;
use of figures ;
little increase in risk up to, 0.05 / 0.075, g 100 cm^{-3}
greater increase in risk above, 0.05 / 0.075, g 100 cm^{-3}
comparative use of figures – must use figures from both axes [max. 2]

(iii) 1 depressant ;
2 slows down nerve impulses ; **R** 'signals' / 'messages'
3 slows down / increases, reaction / response, time(s) ;
A ref to reflexes **R** reaction time decreases
4 e.g. for stimulus *or* response – traffic lights / braking / swerving / stopping / AW ;
5 blurred / double / impaired / poor, vision AW ;
6 poor / lack of, co-ordination / AW ; **A** dizziness
7 overconfidence / poor decision making / memory impaired ;
8 poor judgment (of distances) ;
9 sleep / drowsiness / less conscious / AW ;
10 poor concentration / less aware ; [max. 3

[Total: 13]

3 (a) (i) fur / hair / whiskers / vibrissae ; **A** teat / nipple / breast / AW
external ears / pinna(e) ; **A** ear flaps [max. 1]

(ii) internal development / young develops in uterus / 'gives birth to live young' / AW ;
sweat glands ;
feeding of young with milk / breast feeding ;
mammary glands / breasts / nipples ; **R** if given in **(i)**
four types of teeth / named teeth (incisors, canines and molars) ; **A** two sets of teeth
three, bones in (middle) ear / ossicles ;
diaphragm ;
red blood cells without nuclei ;
neocortex ;
seven neck vertebrae ;
external testes ;
dentary / single bone forming lower jaw / secondary palate ; [max. 1]

(b) (i) (light conditions) bright / AW ;
(explanation) narrow / small, pupils ; **A** enlarged iris [2]

(ii) *answer must be linked with answer given in **(i)***
less light enters eyes / prevents too much light entering eyes ;
receptors / retina / rods / cones / light sensitive cells, protected from damage / AW;
R 'damage to eyes'
*allow ecf if **(b)(i)** incorrect*
more light enters eyes ;
enough light to stimulate, retina / rods / cones ; [2]

(c) ref. to, no cones present / <u>only</u> rods ; **R** 'many rods' **R** no, yellow spot / fovea [1]

(d) ref to image (of zebras) on, fovea / retina ; **R** 'picture'
ciliary body / ciliary muscles, relax ; **R** 'cilia muscle'
suspensory ligament(s) becomes taut / AW e.g. 'pulled' ; **R** 'contract', 'stretched'
lens is, made thin(ner) / less convex / flat(ter) / AW ; *ignore* long
less refraction of light ; **A** bending, correct ref to focal length

R if answer implies that the iris is responsible for shape of lens
R change in iris for depth of field (would not change in this bright light) [max. 3]

(e) maintains natural habitat / AW ; e.g. prevent, human interference / development
prevention of extinction ;
less, hunting / poaching / killing / AW ;
tourism / economic reason ;
maintain (bio)diversity ;
maintain, gene, pool / diversity ; **A** ref to source of genes / alleles
maintain, food chains / balanced ecosystems ;
available for scientific study / AW ;
retain for future generations / AW ; e.g. aesthetic value
R any aspect(s) of management of reserves [max. 3]

[Total: 13]

4 (a) (i)

process	materials moved	source of materials in the plant	sink for materials in the plant
transpiration	water + (mineral) salts / AW **;** **A** ions / minerals / named ion **R** nutrients	roots / root hairs **;**	leaves / shoot / stem **;** **A** flowers / fruits named, cell(s) / tissue(s)
translocation	*two from* sugars / sucrose amino acids ions / minerals / AW hormones / named hormone**;** **R** glucose **R** nutrients	leaves / (named) storage organ / seed(s) / cotyledon **;**	roots / stem / shoot / named growing region / (named) storage organ **;** **A** buds / flowers / fruits / tubers **A** named cell(s) / tissue(s)

[6]

(ii) *answer needs to make clear which structures are source and sink*

during germination / AW, (source is) seed / cotyledon **;**
idea that leaves grow and start to photosynthesise (so become source) **;**

leaves may, be shed / die / be shaded / AW **;**
leaves may stop photosynthesising (so become sink) / AW **;** **A** 'slow down'

(in early growth) root (is sink) **;**
(later) flowers / fruits / seeds / tubers / AW (become sinks) **;** [max. 2]

[Total: 8]

5 (a) (i) *accept converse argument*
(more) black moths eaten (by, predators / consumers) **;**

(because) black moths, are not camouflaged / do not 'blend in' / AW **;** [max. 1]

(ii) ***either***
more black moths would be caught **;** **A** numerical answer – see Table 5.1

black moths have better camouflage / AW **;**

accept converse argument

or
less of both varieties recaptured **;**

death due to the pollution **;** [max. 2]

(b) (i) (first heading) phenotype **;**
(second heading) genotype **;** [2]

(ii) (dominant wing colour) pale / speckled **;** **A** white [1]

(explanation)

(pale / speckled) appears when,
the dominant allele / **G**, is present **;**
in, heterozygous / **Gg** (moths) **;**

accept black only appears when, homozygous / **gg** / AW **;** [max. 1]

(c) 1 discontinuous variation **;**
2 (wing colour determined by) a, gene / few genes **;** **A** ref to alleles
3 black is recessive / pale is dominant **;**
4 explanation of inheritance **;** *must include ref. to, terms / genotypes*
(black) inherited when parents are, homozygous recessive / **gg**, or heterozygous
(pale) inherited when only one parent has, dominant allele / **G** / AW **;**
5 ref to, sexual reproduction / meiosis **;** **A** mating / breeding / fertilisation [max. 3]

(d)

- *accept other letters*
- *ignore any row headings in candidate answers*
- *answer may be given with a Punnett square*
- *gametes may be accepted in the Punnett square even if not labelled as such*
- *gametes do not have to be circled*
- *accept contents of Punnett square as F_1 genotypes*

- *allow ecf if incorrect parental genotypes but only for gametes and F_1 to max 2*
- *allow ecf if no genotype for parent and gametes are wrong – allow F_1 and phenotype to max 2*

put ticks and crosses in a column on right hand side of answer

genotype of parents Gg x Gg ;

gametes G g x G g ;

lines must be correct for F_1 genotype mark

F_1 GG Gg Gg gg ;

phenotypes pale pale pale black ;

proportion 0.25 / ¼ / 25% / 1 in 4 ;

A 1 black to 3 pale but **(R)** 1 in 3 or 3:1 [5]

(e) (i) <u>mutation</u> ; [1]

(ii) UV light / (ionising) radiation / X rays / (named radioactive) chemical(s) ;
A nuclear fall out [max. 1]

[Total: 17]

6 **(a)** *idea that* gene(s) are transferred **;** **A** genetic information / DNA **R** chromosome
from one, species / organism, to another, species / organism **;** [2]

(b) DNA / RNA / nucleic acid **;** [1]

(c) **(i)** testosterone **;** **R** spellings with 'oge' [1]

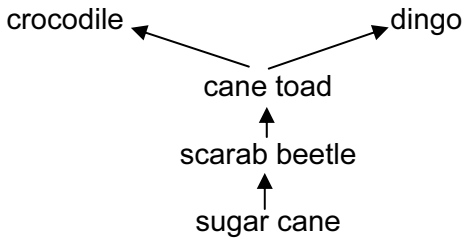
(ii) voice will break / AW **;**
hair on, chest / face / under arms / in pubic area / around sex organs **;**
shoulders broaden **;**
muscle develops **;**
penis enlarges **;**
testes / scrotum, enlarge **;** } **A** genitals, grow / enlarge
produce, sperm / seminal fluid / AW **;**
named behavioural change **;** [max. 2]

(d) **(i)** (x axis) time / years / months **;**
(y axis) number of toads / number of individuals / population / AW **;**
R 'toads' unqualified **A** 'amount of toads'
S shaped curve **;**
exponential / log, phase labelled on straight part of curve (bracket or line) **;** [4]

put ticks and crosses in a column on right hand side of answer

(ii) (lack of) food / prey **;** **A** fewer scarab beetles
ref. to habitat change or damage **;**
change in temperature / global warming **;**
ref. to pollution **;**
(bacterial) disease / parasite **;**
(lack of) breeding places **;**
shortage of water / drought **;** [max. 1]

(e) **(i)** *ignore references to virus*



ignore dingo → crocodile / ora

i. arrows must point from food to feeder (even if incorrect organisms) **;**
ii. all five organisms included in correct order with lines even if no arrows **;**
A if more organisms included [2]

(ii) *no other answers are acceptable*
(carnivore) cane toad + dingo + crocodile **;**
(herbivore) scarab beetle **;**
(producer) sugar cane **;** [3]

[Total: 16]

1 (a) (i) **P** = red (blood) cell / erythrocyte / red corpuscle **;** **R** RBC
Q = lymphocyte / T cell / B cell / monocyte **;**
R = phagocyte / granulocyte / neutrophil / polymorph **;** [3]

(ii) *max. 3 for either **Q** or **R***
allow ecf rules as follows:

*if **Q** is identified as phagocyte and **R** as lymphocyte accept correct functions for the names*
*if **Q** is identified as phagocyte and **R** as lymphocyte with functions as below – then allow to max. 4*
*If no names given in **(i)** allow functions as given below*

ref. to, fighting disease / defence against disease **;** **A once only**
A destroy / kill, pathogen / named pathogen / bacteria / antigen / foreign body
R 'kill, infections / diseases'
(Q)
releases / produces / AW, antibodies **;**
ref. to specificity **;**
any function of antibodies **;**
agglutination / described e.g. 'clumping' of bacteria
causing bacteria to burst / lysins
neutralising toxins / antitoxins
preventing viruses entering cells
immobilising bacteria
(R)
ingest / engulf / surround, bacteria / AW **;** **R** 'eats'
ref. to digestion of bacteria / AW **;** [max. 4]

(b) (i) **1** *idea that* the body recognises transplanted skin as, foreign / different / harmful **;**
A ref. to recognition of antigen(s)
2 *idea of the* response of the immune system **;** e.g. 'immune system attacks...'
3 further detail **;**
e.g. white cells / named white cells, migrate to transplanted skin
ref. to antibodies
white cells attach to, foreign / transplanted, cells / tissue
foreign / transplanted, cells, killed / destroyed / AW

ignore ref to blood groups [max. 2]

(ii) ref. to means of protecting body from, foreign organism / disease / pathogen / parasites / AW **;** **A** 'attacks' [1]

(iii) the body is unable to fight other infections / AW **;** [1]
A the body is more prone to developing, cancer / tumours
A 'there is no immunity against…'
A 'unable to fight pathogens'

[Total: 11]

2 (a) (i) accept other valid responses – must be long-term and not behavioural / social

1 liver, damage / failure / disease / cirrhosis ; **R** destroys **A** hardens
2 brain damage / loss of brain cells / loss of neurones / loss of memory / AW ;
3 cancer of correct named part of body ;
mouth / pharynx / oesophagus / gut / pancreas / liver / breast
4 stomach ulcers ;
5 heart disease / stroke / AW ;
6 high blood pressure / hypertension ;
7 alcoholism / addiction / dependence / tolerance ;
8 (risk of) damage, to fetus / pregnant woman's baby / fetal alcohol syndrome / AW ;
e.g. low birth weight / poor mental development
9 increased risk of miscarriage ;
10 malnutrition / named deficiency disease(s) ;
11 obesity / weight gain ;
12 loss in weight / wasting ; [max. 2]

(ii) (500 x 2 =) 1000 (cm^3) ; [1]

(b) (i) (nutrients are) large <u>molecules</u> / need to be small <u>molecules</u> ;
A complex / simple, <u>molecules</u>
(some nutrients are) insoluble / need to be soluble ;
must pass through, intestine wall / capillary wall ;
R ref. to absorption unqualified by wall(s) [max. 2]

(ii) small intestine / ileum / villi ; **A** duodenum [1]

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(c) (i) x 9.0 (%) ; [1]

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relevant comment on part of graph ;
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little increase in risk up to, 0.05 / 0.075, g 100 cm^{-3}
greater increase in risk above, 0.05 / 0.075, g 100 cm^{-3}
comparative use of figures – must use figures from both axes [max. 2]

(iii) 1 <u>depressant</u> ;
2 slows down nerve impulses ; **R** 'signals' / 'messages'
3 slows down / increases, reaction / response, time(s) ;
A ref to reflexes **R** reaction time decreases
4 e.g. for stimulus *or* response – traffic lights / braking / swerving / stopping / AW ;
5 blurred / double / impaired / poor, vision AW ;
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[Total: 13]

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external ears / pinna(e) ; **A** ear flaps [max. 1]

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red blood cells without nuclei ;
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seven neck vertebrae ;
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dentary / single bone forming lower jaw / secondary palate ; [max. 1]

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(explanation) narrow / small, pupils ; **A** enlarged iris [2]

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less light enters eyes / prevents too much light entering eyes / AW ;
receptors / retina / rods / cones / light sensitive cells, protected from damage / AW ;
R 'damage to eyes'
*allow ecf if **(b)(i)** incorrect*
more light enters eyes ;
enough light to stimulate, retina / rods / cones ; [2]

(c) ref. to, no cones present / <u>only</u> rods ;
R 'many rods' **R** no, yellow spot / fovea [1]

(d) ref to image (of zebras) on, fovea / retina ; **R** 'picture'
ciliary body / ciliary muscles, relax ; **R** 'cilia muscle'
suspensory ligament(s) becomes taut / AW e.g. 'pulled' ; **R** 'contract', 'stretched'
lens is, made thin(ner) / less convex / flat(ter) / AW ; *ignore* long
less refraction of light ; **A** bending, correct ref to focal length

R if answer implies that the iris is responsible for shape of lens
R change in iris for depth of field (would not change in this bright light) [max. 3]

(e) maintains natural habitat / AW ; e.g. prevent, human interference / development
prevention of extinction ;
less, hunting / poaching / killing / AW ;
tourism / economic reason ;
maintain (bio)diversity ;
maintain, gene, pool / diversity ; **A** ref to source of genes / alleles
maintain, food chains / balanced ecosystems ;
available for scientific study / AW ;
retain for future generations / AW ; e.g. aesthetic value
R any aspect(s) of management of reserves [max. 3]

[Total: 13]

4 (a) (i) chloroplast **;** **R** chlorophyll [1]

(ii) absorbs light / AW **;** e.g. light energy → chemical energy
photosynthesis / equation / described **;** e.g. 'to make glucose'
absorption of carbon dioxide **;**
production of, starch / sucrose **;** **R** 'food' [max. 2]

(b) (i) ref. to enabling leaf to float / buoyancy **;**
ref to diffusion (of gases) **;** **A** movement
access to, carbon dioxide **;**
access to, oxygen **;**
ref. to better access to light **;** [max. 2]

(ii) *accept converse arguments*

stomata allow, carbon dioxide / oxygen / gases, to diffuse into / enter, leaf **;**
water would enter (leaf) through stomata **;**
carbon dioxide less able to enter **;**
leaves would, not float / sink **;**
carbon dioxide diffuses faster through air than through water / AW **;** [max. 2]

(c) roots have access to oxygen **;**
ref. to (aerobic) respiration **;**
to provide, energy / ATP **;**
A 'active uptake uses energy' **R** 'make / create, energy'
needed for active uptake of, minerals / nutrients / salts / ions / AW **;** [max. 3]

[Total: 10]

5 **(a)** *idea that* gene(s) are transferred **;** **A** genetic information / DNA **R** chromosome from one, species / organism, to another, species / organism **;** [2]

(b) DNA / RNA / nucleic acid **;** [1]

(c) **(i)** testosterone **;** **R** spellings with 'oge' [1]

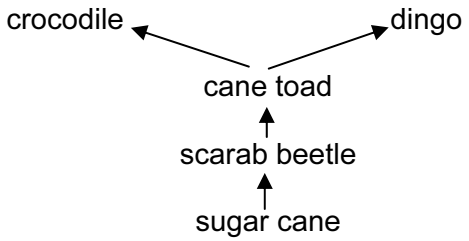
(ii) voice will break / AW **;**
hair on, chest / face / under arms / in pubic area / around sex organs **;**
shoulders broaden **;**
muscle develops **;**
penis enlarges **;**
testes / scrotum, enlarge **;** } **A** genitals, grow / enlarge
produce, sperm / seminal fluid / AW **;**
named behavioural change **;** [max. 2]

(d) **(i)** (x axis) time / years / months **;**
(y axis) number of toads / number of individuals / population / AW **;**
R 'toads' unqualified **A** 'amount of toads'
S shaped curve **;**
exponential / log, phase labelled on straight part of curve (bracket or line) **;** [4]

put ticks and crosses in a column on right hand side of answer

(ii) (lack of) food / prey **;** **A** fewer scarab beetles
ref. to habitat change or damage **;**
change in temperature / global warming **;**
ref. to pollution **;**
(bacterial) disease / parasite **;**
(lack of) breeding places **;**
shortage of water / drought **;** [max. 1]

(e) **(i)** *ignore references to virus*



ignore dingo → crocodile / ora

i. arrows must point from food to feeder (even if incorrect organisms) **;**
ii. all five organisms included in correct order with lines even if no arrows **;**
A if more organisms included [2]

(ii) *no other answers are acceptable*
(carnivore) cane toad + dingo + crocodile **;**
(herbivore) scarab beetle **;**
(producer) sugar cane **;** [3]

[Total: 16]

6 (a) (i) *accept converse argument*
(more) black moths eaten (by, predators / consumers) **;**

(because) black moths, are not camouflaged / do not 'blend in' / AW **;** [max. 1]

(ii) ***either***
more black moths would be caught **;** **A** numerical answer – see Table 5.1

black moths have better camouflage / AW **;**

accept converse argument

or
less of both varieties recaptured **;**

death due to the pollution **;** [max. 2]

(b) (i) (first heading) <u>phenotype</u> **;**
(second heading) <u>genotype</u> **;** [2]

(ii) (dominant wing colour) pale / speckled **;** **A** white [1]

(explanation)

(pale / speckled) appears when,
the dominant allele / **G**, is present **;**
in, heterozygous / **Gg** (moths) **;**

accept black only appears when, homozygous / **gg** / AW **;** [max. 1]

(c) 1 <u>discontinuous</u> variation **;**
2 (wing colour determined by) a, gene / few genes **;** **A** ref to alleles
3 black is recessive / pale is dominant **;**
4 explanation of inheritance **;** *must include ref. to, terms / genotypes*
(black) inherited when parents are, homozygous recessive / **gg**, or heterozygous
(pale) inherited when only one parent has, dominant allele / **G** / AW **;**
5 ref to, sexual reproduction / meiosis **;** **A** mating / breeding / fertilisation [max. 3]

(d)

- *accept other letters*
- *ignore any row headings in candidate answers*
- *answer may be given with a Punnett square*
- *gametes may be accepted in the Punnett square even if not labelled as such*
- *gametes do not have to be circled*
- *accept contents of Punnett square as F_1 genotypes*

- *allow ecf if incorrect parental genotypes but only for gametes and F_1 to max 2*
- *allow ecf if no genotype for parent and gametes are wrong – allow F_1 and phenotype to max 2*

put ticks and crosses in a column on right hand side of answer

genotype of parents Gg x Gg ;

gametes G g x G g ;

F_1 GG Gg Gg gg ;

lines must be correct for F_1 genotype mark

phenotypes pale pale pale black ;

proportion 0.25 / ¼ / 25% / 1 in 4 ;

A 1 black to 3 pale but **(R)** 1 in 3 or 3:1 [5]

(e) (i) <u>mutation</u> ; [1]

(ii) UV light / (ionising) radiation / X rays / (named radioactive) chemical(s) ;
A nuclear fall out [max. 1]

[Total: 17]