

GCSE

**Science:
Biology**

Summer 2009

Mark Schemes

Issued: October 2009

**NORTHERN IRELAND GENERAL CERTIFICATE OF SECONDARY EDUCATION (GCSE)
AND NORTHERN IRELAND GENERAL CERTIFICATE OF EDUCATION (GCE)**

MARK SCHEMES (2009)

Foreword

Introduction

Mark Schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of 16- and 18-year-old students in schools and colleges. The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes therefore are regarded as a part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

The Council hopes that the mark schemes will be viewed and used in a constructive way as a further support to the teaching and learning processes.

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Rewarding Learning

**General Certificate of Secondary Education
2009**

Science: Biology

Paper 1
Foundation Tier

[G0901]

WEDNESDAY 20 MAY, AFTERNOON

**MARK
SCHEME**

			AVAILABLE MARKS	
1	(a)	A – Leaf; B – Stem;	[1] [1]	5
	(b)	Any two from: Anchorage; absorption/uptake of water; absorption/uptake of minerals;	[2]	
	(c)	Flower;	[1]	
2	(a)	A – cell wall; B – cytoplasm;	[1] [1]	5
	(b)	Swim;	[1]	
	(c)	Nucleus drawn inside sperm head; at least half the size of the head;	[2]	
3	(a)	D; C; A; B; (4 × [1])	[4]	5
	(b)	Arthropod/insect;	[1]	
4	(a)	A – Enamel; B – Dentine;	[1] [1]	5
	(b)	Bacteria;	[1]	
	(c)	Any two from: Bacteria feed on sugars; Produce acids; Which decay/eats/erodes/ breaks down;	[2]	
5	(a)	A – photosynthesis B – feeding	[1] [1]	5
	(b)	Respiration/combustion/burning; produces carbon dioxide;	[2]	
	(c)	Carbohydrate (named)/fat/protein;	[1]	
6	(a)	$13 + 8 = 21$; $25 - 21 = 4$;	[2]	5
	(b) (i)	Length of DNA/inherited material/part of a chromosome which codes for one characteristic;	[1]	
	(ii)	Tongue rolling; Scars/hair length;	[2]	

			AVAILABLE MARKS						
7	(a) Freezer/frozen; Food kept at 2–5 °C; Any reasonable answer; Pasteurization; (4 × [1])	[4]	6						
	(b) Water removed; no bacterial growth;	[2]							
8	(a) 70;	[1]	6						
	(b) Increases;	[1]							
	(c) Any two from: Blood to muscles; oxygen/sugar (to muscles); to remove carbon dioxide (from muscles);	[2]							
	(d) Any two from: sweating; hotter/flushed; increased breathing; spending calories/ decreased body mass;	[2]							
9	(a) Coverslip/coverglass;	[1]	5						
	(b) Place/ lower (coverslip/A) on to the slide/over tissue ;	[1]							
	(c) Colour/stain the cells; Make the cells/parts of cells more clearly/easily seen;	[1] [1]							
	(d) Air/bubbles (trapped under the coverslip/coverglass);	[1]							
10	(a) Artery – smaller lumen; thicker wall; no valves; (Any two)	[2]	6						
	(b) Artery more oxygen/glucose/amino acids; vein more carbon dioxide/urea;	[2]							
	(c) Renal artery; pulmonary artery; (2 × [1])	[2]							
11	(a) Normal thumb	[1]	6						
	(b) <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="padding: 2px;">t</td> <td style="padding: 2px;">t;</td> </tr> <tr> <td style="padding: 2px;">Tt</td> <td style="padding: 2px;">Tt;</td> </tr> <tr> <td style="padding: 2px;">tt</td> <td style="padding: 2px;">tt;</td> </tr> </table>	t		t;	Tt	Tt;	tt	tt;	[1]
		t		t;					
		Tt		Tt;					
	tt	tt;							
	[1]								
	[1]								
(c) Half/50%; (Not 1:1) Half/50%; (Not 1:1)	[1] [1]								

			AVAILABLE MARKS
12	(a) A – epidermis; B – pith; C – xylem; D – vascular bundle; (4 × [1])	[4]	6
	(b) Carries food/sugars/products of photosynthesis; from leaves around plant;	[2]	
13	(a) Labelled line X to mouth; Labelled line to large intestine/colon;	[1] [1]	7
	(b) A – Oesophagus; B – Stomach; C – Duodenum;	[1] [1] [1]	
	(c) Any two from: Break down food/molecules/insoluble; to small/simple/soluble; which can be absorbed by blood;	[2]	
14	(a) Phagocytosis;	[1]	
	(b) Engulfs/digests;	[1]	
	(c) Produce antibodies;	[1]	
	(d) Noticed milkmaids with cowpox did not get smallpox; Injected/infected boy with cowpox; Boy given smallpox and recovered;	[3]	
	Quality of written communication	[2]	8
		Total	80



Rewarding Learning

**General Certificate of Secondary Education
2009**

Science: Biology

Paper 2
Foundation Tier

[G0902]

THURSDAY 28 MAY, MORNING

**MARK
SCHEME**

- 1 (a) (i) Peat/lignite/oil/gas; [1]
- (ii) Soot/smoke; [1]
- (iii) Smokeless fuels/alternative fuels; [1]
- (iv) Reduce light penetration/absorption/trapped;
(reduced) photosynthesis/sugar/starch production;
reduced growth;
(Any **two**) [2]
- (v) CO₂; CO; SO₂; NO₂; CH₄; any appropriate gas;
(Any **two**) [2]
- (vi) Causes learning difficulties/mental retardation in children; [1]
- (vii) Reduces/declines/becomes smaller/lower; [1]
- (viii) The greater the distance (from the city)
the higher the number infected by blackspot; [1]
- (b) (i) $1350 \div 3$; 450; [2]
- (ii) Waste food; [1]
- (iii) Warmth/suitable temperature;
Micro-organisms/microbes/fungi/bacteria;
Compactness;
Moisture;
Neutral pH;
(Any **one**) [1]
- (iv) Glass;
Metals;
Cloth;
Paper and card;
(Any **two**) [2]
- (v) Landfill;
Incineration/burning; [2]
- 2 (a) (i) A – lung;
B – bronchus;
C – diaphragm; [3]
- (ii) Arrow out of alveolus/up bronchus/trachea/out of lungs; [1]
- (iii) Correct position; correct size; [2]
- (iv) Increased surface area;
Short distance/easy for gas to pass through;
Maintain diffusion gradient/carry gas away; [3]

			AVAILABLE MARKS		
	(v)	Contract; Moves up/out; Diaphragm;	[3]	22	
	(vi)	Volume increases; pressure decreases;	[2]		
(b)	(i)	Red blood cells;	[1]		
	(ii)	No oxygen transported; respiration stops;	[2]		
	(iii)	Tar; nicotine;	[2]		
	(iv)	Passive smoking;	[1]		
	(v)	(Lung) cancer; bronchitis; emphysema; coronary heart disease; (Any two)	[2]		
3	(a)	(i)	Breasts develop; body hair develops; menstruation;		[2]
		(ii)	Sperm production; testosterone increases; penis enlarges; facial/body hair/voice breaks; (Any two)		[2]
	(b)	(i)	Prevention of fertilization/pregnancy;		[1]
		(ii)	Barrier/stops sperm entering uterus;	[1]	
		(iii)	Chemical; surgical; mechanical; surgical; mechanical;	[5]	
	(c)	(i)	Bars correctly drawn × 2; Labels;	[3]	
		(ii)	Vitamins; minerals; named	[2]	
		(iii)	Growth/repair;	[1]	
		(iv)	Antibodies in milk/defence against disease; Bonding; exact nutrients; (Any two)	[2]	
	(d)	(i)	Increases; then decreases;	[2]	
		(ii)	1994;	[1]	
				22	

4	(a) (i) 14;	[1]
	(ii) 15 000;	[1]
	(iii) Males more muscle ; (allow converse)	[1]
	(iv) Activity; (Not: Age/Gender)	[1]
	(v) Any two from: Below required energy; Starvation; Lose weight/tired;	[2]
	(vi) Respiration;	[1]
	(vii) CO ₂ /water;	[1]
(b)	(i) 24 – 16; 8;	[2]
	(ii) Heat loss; from around the sides of the boiling tube/tin can/to air/ converted to light/any example described; Pasta not burning completely; (Any one)	[1]
(c)	(i) Low fat/low salt/low energy; (Accept values from table) High fibre;	[2]
	(ii) Source/storage of energy /insulation/protection; To make haemoglobin; For red blood cells/O ₂ transport; For bones/teeth;	[1] [2] [1]
	(iii) Contains a full range of food molecules/groups in the required quantities;	[1]
5	(a) (i) Labelled chloroplast;	[1]
	(ii) Draw vacuole; cell wall drawn; Labels – vacuole; cell wall;	[4]
	(iii) Chloroplasts; to trap sunlight;	[2]
	(iv) Similarities: cytoplasm; nucleus; cell membrane; (Any two)	[2]
	Differences: Vacuole; cell wall; chloroplasts; (Any two)	[2]

			AVAILABLE MARKS
(b) (i)	Root hair cell; Large surface area; to absorb water/minerals;	[3]	18
(ii)	Xylem;	[1]	
(iii)	(Moves in) by osmosis; down a concentration gradient; through selectively permeable membrane; (Diffuses) from cell to cell; (Any three)	[3]	
6 (a) (i)	Animal with a backbone;	[1]	22
(ii)	Insulation/warmth; flight;	[2]	
(iii)	Beak/claws/talons; catch/kill/hold/carry/tear prey; Eyes (forward facing); judge distance/pinpoint prey; (not 'see' UQ) Feathers/wings; silent/speedy flight; (any pair) (Any two : Feature + appropriate adaption)	[2]	
(iv)	Internal fertilisation; lay <u>shelled</u> eggs/external development; One pair of wings (and one pair of legs); beak (if not given in (iii)); (Any two)	[2]	
(b) (i)	Arrow; Root vegetables at first trophic level; Owl at third trophic level;	[3]	
(ii)	Grain/leaves/root vegetables;	[1]	
(iii)	Second/primary consumer;	[1]	
(iv)	Order and labels; Size of bars; Bars centred;	[3]	
(c) (i)	Chemical; used to kill/poison pests;	[2]	
(ii)	Small amount of pesticides does not kill rat; Pesticide stays in rats; Pesticides become concentrated in owl; Pesticide reaches lethal level in owl; (Any three)	[3]	
	Quality of written communication	[2]	
Total			120



Rewarding Learning

**General Certificate of Secondary Education
2009**

Science: Biology

Paper 1
Higher Tier

[G0903]

WEDNESDAY 20 MAY, AFTERNOON

**MARK
SCHEME**

			AVAILABLE MARKS							
1	(a)	Coverslip/coverglass;	[1]	5						
	(b)	Place/lower (coverslip/A) on to the slide/over tissue;	[1]							
	(c)	Colour/stain the cells;	[1]							
		Make the cells/parts of cells more clearly/easily seen;	[1]							
	(d)	Air/bubbles (trapped under the coverslip/coverglass);	[1]							
2	(a)	Artery – smaller lumen; thicker wall; no valves; (Any two)	[2]	6						
	(b)	Artery more oxygen/glucose amino acids; vein more carbon dioxide/urea;	[2]							
	(c)	Renal artery; pulmonary artery; (2 × [1])	[2]							
3	(a)	Normal thumb	[1]	6						
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tt	tt;									
			[1]							
			[1]							
	(c)	Half/50%; (Not 1:1)	[1]							
		Half/50%; (Not 1:1)	[1]							
4	(a)	A – epidermis;	[1]	6						
		B – pith;	[1]							
		C – xylem;	[1]							
		D – vascular bundle;	[1]							
	(b)	Carries food/sugars/products of photosynthesis; from leaves around plant;	[2]							
5	(a)	Labelled line X to mouth;	[1]	7						
		Labelled line to large intestine/colon;	[1]							
	(b)	A Oesophagus;	[1]							
		B Stomach;	[1]							
		C Duodenum;	[1]							
	(c)	Any two from Break down food/molecules/insoluble; to small/simple/soluble; which can be absorbed by blood;	[2]							

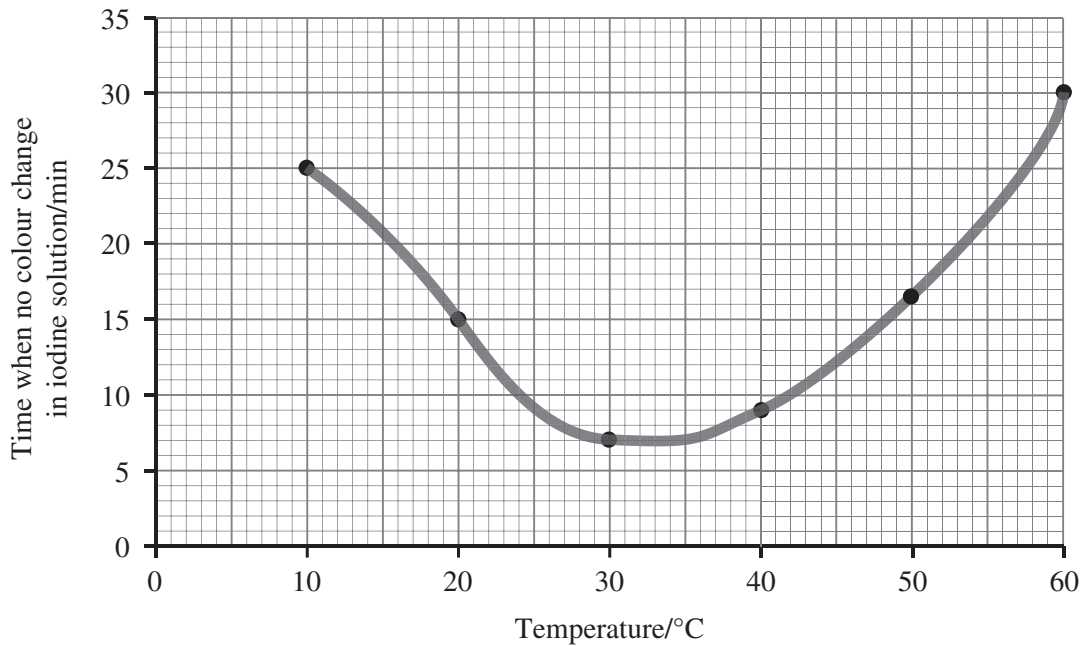
			AVAILABLE MARKS
6	(a) Phagocytosis;	[1]	8
	(b) Engulfs/digests;	[1]	
	(c) Produces antibodies;	[1]	
	(d) Noticed milkmaids with cowpox did not get smallpox; Infected/injected boy with cowpox; Boy given smallpox and recovered;	[3]	
	Quality of written communication	[2]	
7	(a) Taller; bent towards the light;	[2]	5
	(b) (Photo)tropism;	[1]	
	(c) More light; more photosynthesis/growth; ('more' once)	[2]	
8	(a) A – biceps; B – tendon; C – synovial fluid;	[1] [1] [1]	5
	(b) Triceps contracts; biceps relaxes/antagonistics	[2]	
9	(a) Legs	[1]	6
	(b) Don't wear a shirt in the sun/work outdoors without a shirt;	[1]	
	(c) Cover up in sun/stay in shade/apply suncream;	[1]	
	(d) Can be removed before it spreads ;	[1]	
	(e) Any two from: Ozone depleted/holes; more UV rays enter; causes mutations;	[2]	
10	(a) A – Petal; B – Anther/stamen;	[1] [1]	6
	(b) Line down style; Line into an ovule;	[1] [1]	
	(c) After pollination An ovule is not pollinated; Fertilization/described; Seed development/described; (Any two)	[2]	

		AVAILABLE MARKS	
11	(a) Magnesium is required for chlorophyll production; Lack of chlorophyll makes the yellow/chlorophyll is green;	[1] [1]	6
	(b) Nitrogen; Calcium;	[1] [1]	
	(c) Oxygen required for respiration/energy production; Energy used for active uptake/transport/absorption/described;	[1] [1]	
12	(a) Bacterium; Virus;	[1] [1]	6
	(b) Passes through placenta; from mother's blood/into baby's blood;	[2]	
	(c) Any two from: Sexual intercourse; infected syringes; blood-to-blood contact;	[2]	
13	(a) Plasma forced out; through capillary wall;	[2]	7
	(b) A – glucose/amino acid/oxygen; B – CO ₂ /urea;	[1] [1]	
	(c) Too large to pass through capillary wall;	[1]	
	(d) Platelets; Fibrin;	[1] [1]	
14	(a) Fright/stress/excitement;	[1]	7
	(b) Increases rate; Decreased blood flow; Increased blood flow/respiration;	[1] [1] [1]	
	(c) Effect – Dilates bronchioles/deeper breaths/increased rate of breathing/increased blood flow; Advantage – Any two from: More oxygen absorbed/carried in blood; For respiration/energy; For fight/flight/described;	[1] [2]	

15 (a) Bring both to the same temperature (before mixing/reacting); [1]

(b) Yellow brown to blue-black; starch present;
No/little starch digested; [3]

(c)



Line down then up; [1]

Optimum/minimum between 30° < 40°; [1]

(d) 10 °C – Low temperature causes slow rate of starch digestion/all starch digested; [1]

60 °C – Amylase denatured/starch broken down; [1]

8

16 (a) Any **three** from:

Loops/described of foetal blood vessels;

Provide large surface area;

Thin wall of placenta; good blood supply;

Good diffusion gradient; short diffusion distance; [3]

(b) **Similarity:**

water/drugs (named example)/ethanol/nitrogen/blood proteins/antibodies; [1]

Differences: Any **two** from:

Oxygen; carbon dioxide; urea; glucose; amino acids;

minerals (named example); [2]

(c) Any **two** from:

Contraction of uterus;

Dilation of cervix;

Rupture of amniotic membrane;

Mucus plug shed;

Baby turns/head engages; [2]

8

		AVAILABLE MARKS
17 (a)	Cutting down trees;	[1]
(b)	The area of rain forest has reduced;	[1]
(c)	Photosynthesis uses/traps CO ₂ /makes carbon part of the plant; Fewer trees so more CO ₂ in the atmosphere;	[1] [1]
(d)	Combustion of fossil fuels; Produces CO ₂ ;	[1] [1]
(e)	Any three from: CO ₂ forms a layer/builds up; Heat trapped/enters but cannot leave; Greenhouse effect/global warming;	[3]
18 (a)	A – Sensory neurone; B – Motor neurone; C – Association neurone;	[1] [1] [1]
(b)	Any two from: Few/small number neurones/few synapses/short distance; Brain not involved/involuntary; No thinking time;	[2]
(c) (i)	In blood;	[1]
(ii)	Pancreas;	[1]
(iii)	Any two from: Negative feedback pathway; Liver; Converts glucose to glycogen/fat/respites it; When blood sugar is high/to reduce blood sugar	[2]
Total		9
		120



Rewarding Learning

**General Certificate of Secondary Education
2009**

Science: Biology

Paper 2
Higher Tier

[G0904]

THURSDAY 28 MAY, MORNING

**MARK
SCHEME**

1	(a)	(i)	14;	[1]
		(ii)	15 000;	[1]
		(iii)	Males more muscle ; (allow converse)	[1]
		(iv)	Activity; (Not: Age/Gender)	[1]
		(v)	Any two from: Below required energy; Starvation; Lose weight/tired;	[2]
		(vi)	Respiration;	[1]
		(vii)	CO ₂ /water;	[1]
	(b)	(i)	24 – 16; 8;	[2]
		(ii)	Heat loss from around the sides of the boiling tube/tin can/to air/ converted to light/any example described; Pasta not burning completely; (Any one)	[1]
	(c)	(i)	Low fat/low salt/low energy; (Accept values from table) High fibre;	[1] [1]
		(ii)	Source/storage of energy /insulation/protection;	[1]
			To make haemoglobin; For red blood cells/O ₂ transport;	[2]
			For bones/teeth;	[1]
		(iii)	Contains a full range of food molecules/groups in the required quantities;	[1]
2	(a)	(i)	Labelled chloroplast;	[1]
		(ii)	Draw vacuole; cell wall drawn; Labels – vacuole; cell wall;	[4]
		(iii)	Chloroplasts; to trap sunlight;	[2]
		(iv)	Similarities: cytoplasm; nucleus; cell membrane; (Any two)	[2]
			Differences: Vacuole; cell wall; chloroplasts; (Any two)	[2]

AVAILABLE
MARKS

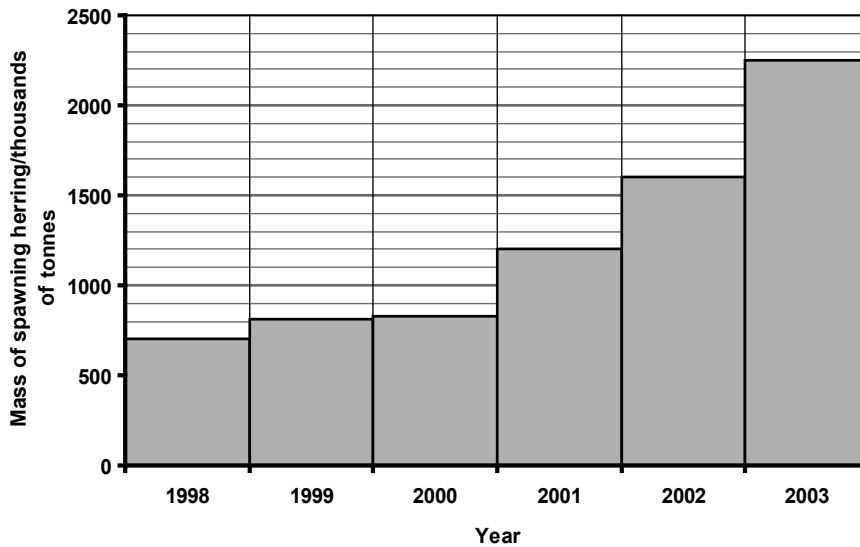
18

			AVAILABLE MARKS	
	(b) (i)	Root hair cell; Large surface area; to absorb water/minerals;	[3]	18
	(ii)	Xylem;	[1]	
	(iii)	(Moves in) by osmosis; down a concentration gradient; (Diffuses) from cell to cell; through a selectively permeable membrane; (Any three)	[3]	
3	(a) (i)	Animal with a backbone;	[1]	22
	(ii)	Insulation/warmth; flight;	[2]	
	(iii)	Beak/claws/talons; catch/kill/hold/carry/tear prey; Eyes (forward facing); judge distance/pinpoint prey; (not 'see' UQ) feathers/wings; silent/speedy flight; (Any two : Feature + appropriate adaption)	[2]	
	(iv)	Internal fertilisation; lay <u>shelled</u> eggs/external development; One pair of wings (and one pair of legs); beak (if not given in (iii)); (Any two)	[2]	
	(b) (i)	Arrow; Root vegetables at first trophic level; Owl at third trophic level;	[3]	
	(ii)	Grain/leaves/root vegetables;	[1]	
	(iii)	Second/primary consumer;	[1]	
	(iv)	Order and labels; Size of bar; Bars centred;	[3]	
	(c) (i)	Chemical; used to kill/poison pests;	[2]	
	(ii)	Small amount of pesticides does not kill rat; Pesticide stays in rats; Pesticide becomes concentrated in owl; Pesticide reaches lethal level in owl; (Any three)	[3]	
		Quality of written communication	[2]	

4	(a) (i) Sunlight;	[1]
	(ii) A – Cuticle; B – (Upper) epidermis; C – Guard cell;	[3]
	(iii) Palisade;	[1]
	(iv) Diffusion; through stoma;	[2]
	(b) Trap as much light as (possible); Thin; Air spaces; to allow gases to circulate Any reasonable adaptation; + function;	[4]
	(c) Stored as starch; transported as sucrose; glucose respired; growth of fruit; (Any three)	[3]
	(d) (i) To remove/absorb carbon dioxide;	[1]
	(ii) Control/comparison;	[1]
	(iii) Starch produced/present in plant B; Photosynthesis requires carbon dioxide;	[2]
5	(a) (i) Sun/light;	[1]
	(ii) A – Decomposer/named example; B – Respiration;	[2]
	(iii) $(1500 \times 100) \div 15\,000$; 10%;	[2]
	(iv) Less energy used/lost/wasted;	[1]
	NL as heat/to maintain body temperature/for movement;	[1]

AVAILABLE MARKS
18

(b) (i)



axis and labels; [2]
scales (app);
accurately plotted;
histogram with bars;

[4]

(ii) Increase;

[1]

Birth rate higher;
than death rate;

[2]

(iii) More fish caught than replaced (by reproduction);

[1]

(iv) Smaller/reduced quantity of **fish** caught;
Species has time to **breed/reproduce**;
Larger **mesh**/hole in nets;

[3]

(c) (i) Lack of sex education/contraception/cultural ref;
Medical advances;
Increased food availability;
Improved housing/sanitation/sewage disposal;
(Any **two**)

[2]

(ii) Career/education/contraception;
Lack of food/starvation/famine/drought;
War;
Disease;
Natural disaster;
(Any **two**)

[2]

AVAILABLE
MARKS

22

			AVAILABLE MARKS	
6	(i)	Nitrification; Nitrogen (gas); Nitrogen (gas); nitrates/nitrites; Decomposition/decay;	[5]	18
	(ii)	To make proteins;	[1]	
	(iii)	Reduce the growth of denitrifying bacteria/increase nitrifying/nitrogen fixing bacteria; Better drainage/less water logging; More/more active uptake; Less spread of disease; (Any two)	[2]	
	(iv)	Slurry/manure; compost;	[2]	
	(v)	Nutrients absorbed by plants; less nutrients enter waterways; Reduce runoff; and leaching;	[2] [2]	
	(vi)	Improve soil texture/slow release/ Cheap/get rid of waste;	[1] [1]	
	(vii)	Easy to store; mineral composition known correct; fast acting/soluble; (Any two)	[2]	
7	(a) (i)	Removal/elimination; of toxic products of (metabolism);	[2]	
	(ii)	Correct size/shape; attached to ureters and urethra;	[2]	
	(iii)	A – kidney; B – aorta/artery; C – urethra; D – ureter;	[4]	
	(iv)	Controls the release of urine;	[1]	
	(b) (i)	Deaminated/separated into ammonia/urea;	[1]	
	(ii)	Liver; Kidney;	[1] [1]	
	(iii)	Respired/energy; Stored;	[2]	
	(iv)	Less sweat; (more) in urine for excretion;	[2]	
	(v)	Osmoregulation;	[1]	
	(c) (i)	Sugar; salt; water; (Any two)	[2]	

		AVAILABLE MARKS
	(ii) Down a concentration gradient/described; by diffusion; through the selectively permeable membrane; (Any two)	[2]
	(iii) Maintain diffusion gradient;	[1]
8	(a) (i) Testes/ovaries; Identical to parent cells/shows no variation; One, two; Two, four;	[4]
	(ii) X on male and/or female gamete production;	[1]
	(iii) A – fertilization; B – mitosis;	[2]
	(iv) Half the number of chromosomes /23 instead of 46 chromosomes / only one from each pair of chromosomes ;	[1]
	(b) (i) Tissue culture;	[1]
	(ii) Storage properties; taste/colour/texture; size; hardness/disease resistance; (Any two)	[2]
	(iii) Genetically; identical;	[2]
	(iv) Quick/large numbers of offspring/only one adult plant required/ produced out of season; disease free;	[1]
	(v) Expensive/difficult to carry out; no variation; susceptible to disease; (Any two)	[2]
	(c) (i) Not killed (by pesticide); (Do not accept ref immunity)	[1]
	(ii) Resistance is genetically inherited; Resistant flies survive ; They reproduce ; Pass resistance trait on to offspring ; (Any three in logical sequence)	[3]
	(iii) Crop damage by pests; Larger amounts/stronger/different pesticide has to be used; Different pesticide must be used/new one developed/new method: (Any two)	[2]
	Total	22
		160

