

GCSE

**Science:
Biology**

Summer 2010

Mark Schemes

Issued: October 2010

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

MARK SCHEMES (2010)

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.

CONTENTS

	Page
Foundation Tier	
Paper 1	1
Paper 2	7
Higher Tier	
Paper 1	13
Paper 2	21



Rewarding Learning

**General Certificate of Secondary Education
2010**

Science: Biology

Paper 1
Foundation Tier

[G0901]

FRIDAY 21 MAY, MORNING

**MARK
SCHEME**

			AVAILABLE MARKS
1	(a) A – Ovary;	[1]	5
	B – Vagina;	[1]	
	(b) X in either oviduct;	[1]	
(c) Nucleus of sperm and ovum;	[1]	5	
	Fuse;		
2	(a) Lung cancer;	[1]	
	Addiction/irregular heart rate;	[1]	
	(b) Binds permanently with haemoglobin/red blood cell;	[1]	
(b) Reduces/stops transport of oxygen/causes death;	[1]	5	
	(c) Inhaling smoke from another person;		[1]
3	(a) A – Kidney;	[1]	5
	B – Ureter;	[1]	
	(b) Bladder labelled correctly;	[1]	
(c) Storage;	[1]	5	
	Of urine;		
4	(a) Oxygen;	[1]	
	(b) Respiration;	[1]	
	(c) Stoma/stomata;	[1]	
(d) (i) Hydrogencarbonate indicator/limewater;	[1]	5	
	(ii) (Hydrogencarbonate) Yellow/(Limewater) cloudy/milky;		[1]
5	(a) Any two from: Fish; Amphibians; Reptiles; Birds;	[1]	5
	(b) Birds and Mammals;	[1]	
	(c) Scales;	[1]	
	(d) Young develop inside mother/young feed on mother's milk/ body covered with hair or fur;	[1]	
	(e) Amphibians: smooth moist skin/eggs laid in water; Reptiles: skin covered with dry scales/eggs laid on land;	[1]	

		AVAILABLE MARKS												
6	(a) Hinge/synovial;	[1]												
	(b) Triceps drawn attached to tendons at shoulder; Attached to lower arm bone;	[1] [1]												
	(c) Biceps – relaxes; Triceps – contracts;	[1] [1]												
7	(a) Height/weight/mass/suitable example; Discontinuous/discrete; Genetic/genes;	[1] [1] [1]												
	(b) Full range of results/intermediates;	[1]												
	(c) Height – A; Tongue rolling – C;	[1] [1]												
8	(a) Uncontrolled/abnormal cell division;	[1]												
	(b) Tumour;	[1]												
	(c) UV light;	[1]												
	(d) Any two from: Use high factor sun lotion; Wear a hat/long-sleeved shirt/clothing/cover up; Stay indoors/out of sun during middle (hottest/warmest part) of the day; Regularly check skin/moles;	[2]												
	(e) Malignant spreads, benign doesn't/stays in one place;	[1]												
9	(a) <table border="1" style="display: inline-table; vertical-align: top;"> <thead> <tr> <th>Change during puberty</th> <th>Boys</th> <th>Girls</th> </tr> </thead> <tbody> <tr> <td>Growth spurt</td> <td>Yes</td> <td>Yes</td> </tr> <tr> <td>Voice deepens/Growth of facial hair/ growth of testes/growth of penis/ broadening of shoulders</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>Menstruation</td> <td>No</td> <td>Yes</td> </tr> </tbody> </table>	Change during puberty	Boys	Girls	Growth spurt	Yes	Yes	Voice deepens/Growth of facial hair/ growth of testes/growth of penis/ broadening of shoulders	Yes	No	Menstruation	No	Yes	[1] [1] [1]
Change during puberty	Boys	Girls												
Growth spurt	Yes	Yes												
Voice deepens/Growth of facial hair/ growth of testes/growth of penis/ broadening of shoulders	Yes	No												
Menstruation	No	Yes												
	(b) Oestrogen; Produced in the ovary;	[2]												
		5												
		6												
		6												
		5												

			AVAILABLE MARKS	
10	(a)	Any two from: Bacteria; Virus; Fungus;	[2]	6
	(b)	Any two from: Use sterile water/agar/wash hands; Flamed wire loop; Lid of Petri dish not completely removed; Work beside Bunsen flame/swab bench;	[2]	
	(c)	Prevent dangerous/pathogenic microorganisms from entering/leaving the dish;	[1]	
	(d)	Prevent growth of pathogenic/harmful microorganisms;	[1]	
11	(a)	(i) Hydrogen; Oxygen;	[2]	6
		(ii) Cellulose; Glucose/sugar;	[1] [1]	
	(b)	(i) 1512;	[1]	
		(ii) Butter;	[1]	
12	(a)	A – Right atrium; B – Aorta;	[1] [1]	6
	(b)	Produce higher pressure; Pump blood greater distance/all around the body;	[1] [1]	
	(c)	Any two from: Lack of exercise; Obesity; Smoking/ excess alcohol; Excess salt/high blood pressure; Excess fat/cholesterol;	[2]	
	(d)	Any two from: Lack of exercise; Obesity; Smoking/ excess alcohol; Excess salt/high blood pressure; Excess fat/cholesterol;	[2]	
13	(a)	SO ₂ /NO _x ; Soot;	[1] [1]	7
	(b)	(i) Manure/slurry; Artificial fertilizer;	[1] [1]	
		(ii) Uses up oxygen; aerobic; Fish cannot respire;	[1] [1]	
		(iii) Eutrophication;	[1]	
		(iv) Eutrophication;	[1]	

14 (a)	A – Respiration;	[1]	AVAILABLE MARKS
	B – Fossilisation;	[1]	
	C – Combustion/burning;	[1]	
	(b) Any three from:		
	Carbon in CO ₂ assimilated/fixed/taken into plants;		
	Photosynthesis;		
	Plants eaten/consumed by animals;		
	Plants/animals die/Animals excrete urine/produce faeces;		
	Microorganisms/bacteria/fungi respire ;		
	Producing/releasing CO ₂ (into the atmosphere);	[3]	
	QWC;	[2]	8
	Total		80



Rewarding Learning

**General Certificate of Secondary Education
2010**

Science: Biology

Paper 2
Foundation Tier

[G0902]

THURSDAY 3 JUNE, MORNING

**MARK
SCHEME**

			AVAILABLE MARKS		
1	(a)	Produce/release energy;	[1]	18	
		Growth;	[1]		
		Nutrition;	[1]		
		Removing wastes;	[1]		
	(b)	(i)	Sperm duct;		[1]
			Labelled line X on penis;		[1]
		(iii)	Labelled line Y on the scrotum;		[1]
		(iv)	To store urine; Sperm production;		[2]
	(c)	(i)	A – Petal;		[4]
			B – Style;		
			C – Ovary;		
			D – Sepal;		
(ii)	Attract insects;	[1]			
(iii)	Pollen from anthers; To stigma; Involves (male & female) gametes/pollen & ovule; Which fuse/fertilization/produce seeds;	[4]			
2	(a)	(i)	A – Eyepiece;	[3]	
			B – Stage;		
			C – Light source/lamp;		
		(ii)	Focus image;	[1]	
		(iii)	10×4 $= 40$;	[2]	
		(iv)	Structures more easily seen;	[1]	
(v)	<u>Coverslip</u> lowered over tissue;	[1]			

			AVAILABLE MARKS		
(b)	(i)	A – Nucleus; B – Cytoplasm; C – Vacuole;	[3]	22	
	(ii)	45;	[1]		
	(iii)	Large surface area; for absorption;	[2]		
	(iv)	Cell wall; Strength/support/shape;	[2]		
(c)	(i)	Tissue; Organ; Circulatory;	[3]		
	(ii)	Pump blood;	[1]		
	(iii)	Different/number of organs ; doing same job/working together;	[2]		
3	(a)	Any two from: Growth/repair; Energy/respiration; Protection against disease; Storage/insulation;	[2]		
	(b)	(i)	Add Benedicts ; Heat water in bath;		[2]
		(ii)	Orange/red;		[1]
		(iii)	Biuret; Blue; Purple/violet	[3]	
	(c)	(i)	A – Flour; B – Yeast;	[2]	
		(ii)	Multiply; Respire/ferment sugar;	[2]	
		(iii)	Carbon dioxide;	[1]	
		(iv)	Bubbles/gas trapped ;	[1]	
		(v)	Killed;	[1]	

			AVAILABLE MARKS	
	(d) (i)	Peas; Water removed; Cornflakes; (Baked) beans; Refrigeration;	[5]	22
	(ii)	Heat to 72°C; Cool quickly ;	[2]	
4	(a) (i)	Sun;	[1]	18
	(ii)	Leaves/grass;	[1]	
	(iii)	Leaves, thrush, hawk; Arrows;	[2]	
	(iv)	Breakdown; Release/recycle nutrients;	[2]	
	(v)	Feeding/energy level;	[1]	
	(vi)	Hawk;	[1]	
	(vii)	Hawk numbers will increase ; more food/rabbits/thrush to eat;	[2]	
	(b) (i)	Net;	[1]	
	(ii)	Bars drawn (×2) Line + Labels;	[3]	
	(c) (i)	Any two from: Gills; Fins; Scaly skin;	[2]	
	(ii)	Reptiles and birds lay eggs with shells ; Fish eggs are jelly-like/could dry out on land; or Gametes (egg/sperm) need water; or External fertilization;	[2]	

			AVAILABLE MARKS		
5	(a)	(i) Water; Oxygen; Glucose/starch;	[3]	18	
		(ii) (Green area) contains chlorophyll; Which absorbs light;	[2]		
		(iii) Any three from: Thin; Large surface area; Stomata (in lower epidermis)/air spaces (in spongy mesophyll); No chloroplasts in epidermis; Chloroplasts (concentrated/broadside) in mesophyll; Palisade cells end on; Xylem/phloem short distance from mesophyll;	[3]		
		(iv) Diffuses through stomata;	[1]		
	(b)	(i) Boil in water; Remove chlorophyll; Test/add iodine solution;	[3]		
		(ii) Leaf dipped in water; To soften it;	[2]		
	(c)	(i) Peripheral area without chlorophyll not shaded; Central part of covered strip not shaded and green area above and below shaded;	[2]		
		(ii) Dark ; For 48 hours;	[2]		
	6	(a)	(i) A – Liver; B – Colon; C – Rectum;		[3]
			(ii) X on anus; Y on stomach;		[2]
(iii) Any two from: Large surface area; Long; Thin lining; Folds; Villi; Microvilli; Permeable membrane; Many capillaries/good blood supply;			[2]		
(iv) Mechanical digestion/crush food/described; increase surface area/for enzyme action;		[2]			

			AVAILABLE MARKS
<p>(b) (i) A – Dentine; B – Pulp (cavity);</p>	[2]		
<p>(ii) Harden enamel/plaque more easily removed;</p>	[1]		
<p>(iii) Contains calcium; Needed for growth of teeth;</p>	[2]		
<p>(iv) Any three from: Sugar forms plaque; Bacteria feed on sugar; Bacteria produce acid; Erodes enamel;</p>	[3] QWC [2]		
<p>(c) (i) Food gets trapped in pocket/more difficult to clean/allows plaque to form;</p>	[1]		
<p>(ii) Bone recedes; Tooth not anchored/becomes wobbly;</p>	[2]		22
Total			120



Rewarding Learning

**General Certificate of Secondary Education
2010**

Science: Biology

Paper 1
Higher Tier

[G0903]

FRIDAY 21 MAY, MORNING

**MARK
SCHEME**

			AVAILABLE MARKS				
1	(a)	Change during puberty	Boys	Girls			
		Growth spurt	Yes	Yes	[1]		
		Voice deepens/Growth of facial hair/ growth of testes/growth of penis/ broadening of shoulders	Yes	No	[1]		
		Menstruation	No	Yes	[1]		
	(b)	Oestrogen;			[1]		
		Produced in the ovary;			[1]	5	
2	(a)	Any two from:					
		Bacteria;					
		Virus;					
		Fungus;			[2]		
	(b)	Any two from:					
		Use sterile water/agar/wash hands;					
		Flamed wire loop;					
		Lid of Petri dish not completely removed;					
		Work beside Bunsen flame/swab bench;			[2]		
	(c)	Prevent dangerous/pathogenic microorganisms from entering/leaving the dish;			[1]		
	(d)	Prevent growth of pathogenic/harmful microorganisms;			[1]	6	
3	(a)	(i) Hydrogen; Oxygen;			[2]		
		(ii) Cellulose;			[1]		
			Glucose/sugar;			[1]	
	(b)	(i) 1512;			[1]		
	(ii) Butter;			[1]	6		

			AVAILABLE MARKS	
4	(a)	A – Right atrium/auricle;	[1]	
		B – Aorta;	[1]	
	(b)	Produce higher pressure;	[1]	
		Pump blood greater distance/all around the body;	[1]	
(c)	Any two from: Lack of exercise; Obesity; Smoking/ excess alcohol; Excess salt/high blood pressure; Excess fat/cholesterol;	[2]	6	
5	(a)	SO ₂ /NO _x ;	[1]	
		Soot;	[1]	
	(b) (i)	Manure/slurry;	[1]	
		artificial fertilizer;	[1]	
	(ii)	Uses up oxygen/aerobic;	[1]	
Fish cannot respire;		[1]		
(iii)	Eutrophication;	[1]	7	
6	(a)	A – Respiration;	[1]	
		B – Fossilisation;	[1]	
		C – Combustion/burning;	[1]	
	(b)	Any three from: Carbon in CO ₂ assimilated/fixed/taken into plants; photosynthesis; Plants eaten/consumed by animals; Plants/animals die/Animals excrete urine/produce faeces; Microorganisms/bacteria/fungi respire ; Producing/releasing CO ₂ (into the atmosphere);	[3]	
	QWC;	[2]	8	
7	(a)	DCPIP;	[1]	
	(b)	Blue to colourless/clear (need both);	[1]	
	(c)	Blackcurrant;	[1]	
	(d)	Any two from: Vit C is broken down; Dissolves/leaches into the water; Damages/denatures cell membranes;	[2]	

			AVAILABLE MARKS
8	(a) A – Bronchiole;	[1]	5
	B – Alveolus;	[1]	
C – (Blood) capillary;	[1]		
(b) Any two from:			
Large surface area;			
Thin;			
Moist;			
Good blood supply/many capillaries/concentration gradient;			
Permeable;	[2]		
9	(a) Transferred from person during sexual intercourse /in sexual fluids;	[1]	
	(b) Gonorrhoea/any other named example;	[1]	
	(c) (HI)Virus;	[1]	
	(d) Acts a (physical) barrier /stops sexual fluids entering (the woman’s vagina);	[1]	
	(e) Any two from:		
	Blood to blood/described;		
	Reusing/sharing hypodermic (syringe) needles;		
	Through placenta/during birth/breast milk;	[2]	
10	(a) 360 000; 3000; 120; 1	[2]	
	(b) Any two from:		
	Respiration; Movement; Excretion/inedible parts;	[2]	
	(c) Any two from:		
	Larger mesh size;		
	Smaller net size;		
	Decommission boats;		
	Quota set;		
	Restricted season/ban;	[2]	
11	(a) Yes, No;	[1]	
	Yes, Yes;	[1]	
	No, Yes;	[1]	
	Yes, Yes;	[1]	
	(b) Cells/muscles;	[1]	
	Transported in the blood to the lungs/and breathed out;	[1]	
			6

- 12 (a) When hormone level rises the % of apple fall reduces/accept converse /inverse relationship; [1]
- (b) To reduce/prevent apple fall /produce larger apples /seedless fruit /synchronise ripening; [1]
- (c) Any **two** from:
rooting powder/cloning;
weed control;
stimulation of flowering;
fruit formation/ any from (b) if not already given; [2]
- (d) Any **two** from:
Insects carry less pollen between the flowers;
/fewer flowers pollinated/reduced/no fertilization/seed development/
less hormones/less yield/fruit; [2]
- 13 (a) **Paul** – Heamophilic male; [1]
Emma – $X^H X^h$; [1]
- (b)
- | | | |
|-------|-----------|---------|
| X^H | $X^H X^H$ | $X^H Y$ |
| X^h | $X^H X^h$ | $X^h Y$ |
- [3]
- (c) All received X^h from their mother/Julie/
Males/Martin only requires **one** X^h /haemophilic allele; [1]
Sisters also receive X^H from father/are carriers/heterozygous /require two X^h ; [1]
- 14 (a) Detect/receive **stimuli**; [1]
- (b) Retina; [1]
- (c) Rods respond to low intensity/dim light; [1]
- (d) Any **two** from:
Detect colours;
High intensity light/bright conditions;
Concentrated in centre of eye/fovea/yellow spot;
Clearly defined/detailed image; [2]
- (e) As a nerve/electric **impulse**; [1]
Through/along optic **nerve**; [1]

AVAILABLE
MARKS

6

7

7

			AVAILABLE MARKS
15	<p>(a) Any two from: Blocked oviducts; Ova not released from ovary; Lining of uterus does not allow implantation; STI/menopause/hysterectomy;</p> <p>(b) Hormones are injected;</p> <p>(c) Any two from: Collected and removed from uterus/via vagina; Sperm added; Fusion of nuclei;</p> <p>(d) (Observed with a) microscope;</p> <p>(e) (Allowed to) implant; In uterus lining;</p>	<p>[2]</p> <p>[1]</p> <p>[2]</p> <p>[1]</p> <p>[1]</p> <p>[1]</p>	8
16	<p>(a) To mix the fungus with nutrients/air;</p> <p>(b) Temperature monitored/measured/sensed (by sensor); Water jacket cools the biodigester when required;</p> <p>(c) High temperatures would kill the fungus;</p> <p>(d) To prevent other microorganisms entering; <i>(NOT contamination as could be chemicals)</i></p> <p>(e) Any three from: Extraction/taken out of the biodigester; Purification/separating out the penicillin; Packaging/making into tablet/storage;</p>	<p>[1]</p> <p>[1]</p> <p>[1]</p> <p>[1]</p> <p>[3]</p>	8
17	<p>(a) Increases (rapidly up to 1987); Increases slowly/levels off;</p> <p>(b) Any two from: (Coolant in) fridge/freezer; (Coolant in) air-conditioner; Aerosol (propellant);</p> <p>(c) More UV light/radiation; (UV) causes mutations;</p> <p>(d) Any three from: Stay in shade/out of midday sun (described); Cover up/ wear clothing/hat; Use sun block/(high factor) cream; Regularly check skin/moles;</p>	<p>[1]</p> <p>[1]</p> <p>[2]</p> <p>[1]</p> <p>[1]</p> <p>[3]</p>	9

18 (a) Pancreas;	[1]	AVAILABLE MARKS
(b) <u>Absorption</u> of digested food/sugar/glucose (in the intestine);	[1]	
(c) Carried/transported in the blood;	[1]	
(d) Any three from: Glucose absorbed from the blood; Converted to glycogen/fat; Stored; Respired;	[3]	
(e) Any two from: Blood sensed/monitored by organ A/pancreas; Continuous/always/constantly; Brings about change in opposite direction/described;	[2]	
(f) Diabetes;	[1]	
Total	9	120



Rewarding Learning

**General Certificate of Secondary Education
2010**

Science: Biology

Paper 2
Higher Tier

[G0904]

THURSDAY 3 JUNE, MORNING

**MARK
SCHEME**

- 1 (a) (i) Sun; [1]
- (ii) Leaves/grass; [1]
- (iii) Leaves, thrush, hawk;
Arrows; [2]
- (iv) Breakdown;
Recycle/release nutrients; [2]
- (v) Feeding/energy level; [1]
- (vi) Hawk; [1]
- (vii) Hawk numbers will **increase**;
More food/rabbits/thrush to eat; [2]
- (b) (i) Net; [1]
- (ii) Bars drawn (×2)
Line + labels; [3]
- (c) (i) Any **two** from:
Gills;
Fins;
Scaley skin; [2]
- (ii) Reptiles and birds lay eggs with **shells**;
Fish eggs are jelly-like need water/could dry out on land;
or Gametes (egg/sperm) need water;
or External fertilization; [2]
- 2 (a) (i) Water;
Oxygen;
Glucose/starch; [3]
- (ii) (Green area) contains chlorophyll;
Which absorbs light; [2]
- (iii) Any **three** from:
Thin;
Large surface area;
Stomata (in lower epidermis)/air spaces (in spongy mesophyll);
No chloroplasts in epidermis;
Chloroplasts (concentrated/broadside) in mesophyll;
Palisade cells end on;
Xylem/phloem **short distance** from mesophyll; [3]
- (iv) Diffuses through stomata; [1]

	(b) (i) Boil in water; Remove chlorophyll; Test/add iodine solution;	[3]	
	(ii) Leaf dipped in water; To soften it;	[2]	
	(c) (i) Peripheral area without chlorophyll not shaded; Central part of covered strip not shaded and green area above/below shaded;	[2]	
	(ii) Dark ; For 48 hours;	[2]	18
3	(a) (i) A – Liver; B – Colon; C – Rectum;	[3]	
	(ii) X on anus; Y on stomach;	[2]	
	(iii) Any two from: Large surface area; Long; Thin lining; Folds; Villi; Microvilli; Permeable membrane; Many capillaries/good blood supply;	[2]	
	(iv) Mechanical digestion/crush food/described; increase surface area/for enzyme action;	[2]	
	(b) (i) A – Dentine; B – Pulp (cavity);	[2]	
	(ii) Harden enamel /plaque more easily removed ;	[1]	
	(iii) Contains calcium; Needed for growth of teeth;	[2]	
	(iv) Any three from: Sugar forms plaque; Bacteria feed on sugar; Bacteria produce acid; Erodes enamel ;	[3]	
		QWC [2]	

			AVAILABLE MARKS	
	(c) (i)	Food gets trapped in pocket/more difficult to clean;	[1]	22
	(ii)	Bone recedes; Tooth not anchored/becomes wobbly;	[2]	
4	(a) (i)	A – Anther/stamen; B – Ovary;	[2]	18
	(ii)	To attract insects; Colourful/large petals ; Nectaries/scent; Insects attracted/covered in pollen; Sticky pollen/stigma;	[3]	
	(iii)	Large surface area; To catch pollen;	[2]	
	(iv)	Any three from: Size of flower/petal; Shape/position or number of stamens; Apple flowers single/grass flowers in groups; Size/amount/shape of pollen;	[3]	
	(b) (i)	Correct position; Pointing downwards within testa;	[2]	
	(ii)	Testa;	[1]	
	(c) (i)	Wind; Explosive/self; Animals;	[3]	
	(ii)	To prevent overcrowding; Colonise new areas;	[2]	
5	(a) (i)	A – Upper epidermis; B – Palisade (mesophyll);	[2]	
	(ii)	Cuticle – waterproof; Prevents evaporation ; Stomata close;	[3]	
	(iii)	Any three from: (Water) evaporates from the cell (surface); Diffuses ; Through/across the (intercellular) space/stomata;	[3]	
	(iv)	Thickened wall/large lumen/described;	[1]	

- (v) Minerals/nitrates/named example; [1]
- (vi) Transport **sugar/products of photosynthesis;**
from the leaves; [2]
- (b) (i) Reset/zero the bubble/move bubble to start of the scale; [1]
- (ii) Bubble would move to the left/towards the plant;
water loss from the leaves/shoot;
Causes shoot to absorb/take up water (from the potometer); [3]
- (iii) Place potometer at varying/different distances from a fan; [1]
- (iv) $27 \div 10$;
 $= 2.7$; mm/minute; [3]
- (v) Correct **humidity** difference/described;
Appropriate effect; [2]
- 6 (a) (i) Virus; [1]
- (ii) Artificial/active/acquired; [1]
- (iii) Still possess **antigens**; [1]
- (iv) **Lymphocyte/white blood cell** recognises antigen;
Starts to make antibodies; [2]
- (v) **More** antibodies in blood;
Faster response;
Longer lasting/remains high for longer;
(Any two) [2]
- (vi) More expensive/may not get second dose/takes longer/
may catch disease between doses; [1]
- (vii) Clumps them/stops them spreading/reproducing; [1]
- (viii) Phagocyte;
Engulfs;
Digests; [2]
- (b) (i) Flemming; [1]
- (ii) Fungus/mould; [1]
- (iii) 11; [1]

			AVAILABLE MARKS	
	(iv)	Antibiotic diffused out; Killed bacteria;	[2]	18
	(v)	Antibiotic A	[1]	
7	(a)	(i) A – Denitrification; B – Ingestion/feeding; C – Nitrification/decomposition;	[3]	22
		(ii) Nitrates;	[1]	
		(iii) Any two from: Nitrogen fixation bacteria (in root nodules); Changes nitrogen gas to nitrates; For growth/protein/amino acids;	[2]	
	(b)	(i) Any two from: Saprophytic; Releases enzymes; External digestion; Products absorbed;	[2]	
		(ii) Points plotted = 2 marks; Label + line;	[3]	
		(iii) 7mm (no units –1); Earthworms and other invertebrates enter the bag; Break down leaf litter faster/quicker;	[3]	
	(c)	(i) Some paper may need ink removed/not suitable for recycling; Presses/flattens/dries paper;	[2]	
		(ii) Reduces deforestation; Less landfill/incineration; Saves energy in paper making process;	[3]	
		(iii) Transport/collection; Sorting/workforce; Bleaching/machinery;	[2]	
		(iv) poor quality;	[1]	
8	(a)	(i) A – Chromosome; B – Protein;	[2]	
		(ii) (Amino acid) 3 incorporated instead of 1 ; Different protein/structure B; Protein does not work;	[2]	

		AVAILABLE MARKS
(iii) CAT and TAT both code for same amino acid ;	[1]	
(iv) Radiation/UV light;	[1]	
(b) (i) Franklin/Wilkins;	[1]	
(ii) Double helix;	[1]	
(iii) Watson and Crick (need both) Model building;	[2]	
(iv) Bases form pairs; A pairs with T; or C; G pairs with T; or C;	[2]	
(c) (i) No change/stayed same; More (fish with) black/larger spots;	[2]	
(ii) Better/improved camouflage/described;	[1]	
(iii) Large-spotted fish suffer less predation ; More (large-spotted) fish survive/reproduce ; To pass genes to next generation; Allow converse for small-spotted fish	[3]	
(iv) Breed large fish together; Repeats the process over a number of generations;	[2]	
(v) Any two from: Food value/meat quality; Hardiness; disease resistance; (Not size/markings/colour)	[2]	22
Total		160

