



GCSE MARKING SCHEME

SCIENCE - BIOLOGY

SUMMER 2012

INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2012 examination in GCSE SCIENCE - BIOLOGY. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

UNIT B1
FOUNDATION TIER

Question	Marking details	Marks Available
1. (a)	Earthworm – invertebrate Fern – non-flowering plant Fox – vertebrate Dandelion – flowering plant Algae – microorganism 4 or 5 = 4 marks;;;; 3 = 3 marks 2 = 2 marks 1 = 1 mark	4
(b)	Presence of {backbone/ spine} in vertebrates (or converse); Must be clear reference to vertebrates/ invertebrates	1
(c)	Bacteria / virus / fungi/ yeast; NOT named species/ plant plankton/ mould	1
(d)	Scientific name is always the same / common names different/ scientific name is the {same all over the world/ universal}/ scientific names are the same in <u>all</u> languages;	1
Question total		[7]

Question	Marking details	Marks Available
2. (a) (i)	Answer <u>120</u> ;; Suitable part calculation (eg 620 – 500) allow 1 mark	2
(ii)	Less food has to be <u>bought</u> / lower labour <u>costs</u> / can keep <u>more</u> chickens in the <u>same</u> space; NOT lower heating costs/ security costs/ cheaper – unqualified/ less food – unqualified	1
(b)	Have less food/ {crushing/ cramped/ squashed/ squeezed together/ crammed} (against cage wall)/ less room so less exercise; Must be clear reference to caged/ uncaged NOT restricted movement/ less space/ cooped up/ squished up/ standing on top of each other/ fighting	1
(c)	Poor feather growth/ less feathers; NOT no feathers	1
(d)	<u>More</u> room to <u>move</u> / stretch legs or wings <u>more</u> / <u>more</u> movement/ <u>more</u> exercise/ movement is <u>less</u> restricted. NOT more ethical/ cruel/ less broken bones	
Question total		[6]

Question	Marking details	Marks Available
3. (a) (i)	I hawk or stoat;	1
	II Any two from: Mice / beetles / moths / rabbits / caterpillars / snails;	1
	III <u>green</u> plants;	1
	(ii) Badger: eats {beetles/ mice/ rabbits} <u>and plants</u> ; No mark if any wrong animal named	1
	(iii) Sun (light); NOT light/ sunshine	1
	(iv) Arrows/ \longrightarrow ;	1
(b) (i)	Decrease;	1
	(ii) More { <u>variety</u> of herbivores/ herbivore species} to <u>feed on</u> ; NOT more food/ more herbivores	1
Question total		[8]

Question	Marking details	Marks Available
4. (a) (i)	26, 48;	1
	(ii) Plots 4 plots all correct (-1 per error) (+/- ½ small square);; Line quality;	2 1
(b) (i)	30 min (from graph) (units must be present);	1
	(ii) Rise <u>and</u> then fall;	1
(c) (i)	Insulin;	1
	(ii) Diabetes/ diabetic;	1
Question total		[8]
5. (a)	Pairs;	1
	DNA;	1
	Genes;	1
	Inherited;	1
(b) (i)	X X and X Y;	1
	(ii) 23;	1
	(iii) Gametes/ sex cells;	1
Question total		[7]

FOUNDATION / HIGHER TIER

Question	Marking details	Marks Available
6/1 (a)	(i) I DD II dd; Allow e.c.f from (a)(i)	1
	(ii) Gametes correct; Cross correct;	1 1

FI	Gametes	D	D
	d	Dd	Dd
	d	Dd	Dd

(b)	(i)	Allow e.c.f from (a)(ii)	
		Gametes correct; Cross correct (mark independently of gametes);	1 1

	Gametes	D	d
	D	DD	Dd
	d	Dd	dd

(ii)	Answer from candidate's Punnett square	
	1 homozygous dominant : 2 heterozygous : 1 recessive; NOT 25:50:25/ 2:4:2/ ¼: ½: ¼	1

Question total [6]

Question	Marking details	Marks Available
7/2 (a)	Variation; NOT {environmental/ genetic} variation/ mutation	1
(b)	Any two from: (Trees in region) A have <u>less</u> water/ <u>further</u> away from {water/ river} ORA; (Trees in region) A have <u>less</u> (sun)light /ORA; Accept south facing slope has <u>more</u> sunlight (Trees in region) A are growing on <u>thinner</u> soils/ ORA; (Trees in region) A are growing higher up the hillside therefore at a <u>lower</u> temp/ ORA; NOT REFERENCES TO DIFFERENCES IN O ₂ OR CO ₂ CONCENTRATIONS <u>Candidates must make it clear which survey points they are referring to in their answer</u>	2
(c)	They are <u>genetically</u> different / <u>genetic</u> differences / <u>genes</u> are different / DNA is different/ genetic variation/ variation in inherited genes; NOT: Chromosomes are different/ They come from seeds from different parents/ mutations/ genetics	1
Question total		[4]

Question	Marking details	Marks Available
8/3 (a)	<u>Erector</u> muscle;	1
(b)	<p>Indicative content:</p> <p>Sweat gland</p> <p>Removes {sweat / water and salts} from blood/ produces sweat</p> <p>Sweat travels up sweat duct</p> <p>Through sweat pore onto surface of skin</p> <p>{ Water in sweat evaporates / accept sweat evaporates Removing heat</p> <p>The order of these two statements can be reversed as shown below:</p> <p>{ Heat is removed from the body to Evaporate the water in sweat / accept to evaporate the sweat</p>	

5 – 6 marks

The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.

3 -4 marks

The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.

1 – 2 marks

The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.

0 marks

The candidate does not make any attempt or give a relevant answer worthy of credit

Question total [7]

Question	Marking details	Marks Available
9/4 (a)	<p>$8400 \div 992 \times 100 = 846.8\text{g}$ (accept 846.77g);;</p> <p>Award 2 marks for correct answer – unit required</p> <p>Award 1 mark for correct answer if no unit indicated.</p> <p>If answer is incorrect award 1 mark for $8400 \div 992 \times 100$</p> <p>NOT 847</p>	2
(b) (i)	<p>White sliced because it has the <u>{lowest/ lower/ less}</u> {fat / saturated fat} content (salt is neutral)</p> <p>NOT low fat</p>	1
(b) (ii)	<p>White sliced because it has the <u>{lowest/ lower/ less}</u> salt content</p> <p>NOT low salt</p>	1
(c) (i)	<p>Any 2 from:</p> <p>Initial temperature (of water);</p> <p>Final temperature (of water);</p> <p>{Rise/ Change} in temperature of water = 2 marks</p> <p>NOT temperature alone</p> <p>Mass (accept weight) of {bread/ food (being burned)}</p> <p>NOT amount</p>	2
(c) (ii)	<p>Much of the heat from the burning {food sample / bread} is {not transferred to the water / lost to the surroundings}/ incomplete burning / apparatus is not insulated.</p>	1
	Question total	[7]
	PAPER TOTAL	[60]

HIGHER TIER

Question	Marking details	Marks Available
5.	<p>(a) (i) {Grown / bent/ curved/ leaning/ turned} towards the {light/ lamp}</p> <p style="padding-left: 20px;">NOT moves towards light</p> <p>(ii) <u>Positive</u> phototropism</p> <p>(iii) Hormones / plant hormones / phytohormones / auxins</p>	<p>1</p> <p>1</p>
(b)	<p>(i) C (straight up)</p> <p>(ii) All <u>{sides/ parts}</u> of the {shoot/ seedlings} receive an equal amount of light/ correct reference to distribution of auxin; In each revolution / every 20 minutes/ as plant {revolves/ rotates/ turns}; All shoots receive an equal amount of light as it is rotating = 1 mark Accept an answer which states: The effect of one sided illumination has been cancelled out by the fact that the shoots are revolving (OWTTE) for 2 marks</p>	<p>1</p> <p>2</p>
Question total		[6]

Question	Marking details	Marks Available
6. (a)	'Eat' marked between 'normal conc of glucose' and bottom of 'glucose conc increases' box;	1
(b)	To keep glucose constant/ too much glucose in the blood/ control glucose level in blood/ lower level (in blood)/ help level return to normal; It = glucose level	1
(c)	'X' on "insulin released" box; Accept 'X' on "glucose changed to glycogen" box.	1
(d)	Negative feedback;	1
	Question total	[4]
7. (a)	D C B A ;;; 3/ 4 correct = 3 marks 2 correct = 2 marks 1 correct = 1 mark	3
(b)	To understand the possible effects on environment / health (safe to eat)/ health problems/ to check there is no transfer of genes to other species; NOT to see if genetic modification is successful	1
	Question total	[4]

Question	Marking details	Marks Available
8.	(a)	1
	On pair 7; Opposite (defective allele)/ at the same locus/ at the same position;	1
	(b)	1
	(i)	
	Could cause disease (leukaemia / cancer); NOT makes you ill/ gives you health problems/ side effects	
	(ii)	1
	New cells / replaced cells / copies would have {cystic fibrosis/ defective} allele/ copy would not have the virus/ gene therapy would have to be repeated;	
	(c)	2
	Profile would show {cystic fibrosis/ defective} gene/ show if parents were carriers (of the disease); would show chances/ risk of having a child with cystic fibrosis / (counsellor could) predict/ determine risk;	
Question total		[6]

Question	Marking details	Marks Available
9. (a)	Any 2: Depth of soil; constant flow of spray/ Ref to rain e.g. rain is not constant; allowance for wind; evaporation; capacity of soil to soak up solution/ soil composition; ref to slope;	Max 2
(b)	Any 2 for 1 mark; Nitrate/ NO_3^- Phosphate/ PO_4^- Potassium/ K Named trace element e.g. Magnesium Allow correct formulae NOT NPK	Max 1

(c)

Indicative content

6

The fertiliser {runs off / leaches into} the water. The fertiliser causes {overgrowth of plants/ algal bloom} in the water. Top layers of plants {stop light reaching the lower layers/ stops photosynthesis underneath} so the lower layers of plants die. They decay by the action of bacteria which use up oxygen for respiration. This causes the fish to die because of lack of oxygen.

5 – 6 marks

The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.

3 – 4 marks

The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.

1 – 2 marks

The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.

0 marks

The candidate does not make any attempt or give a relevant answer worthy of credit

Question total [9]

Question	Marking details	Marks Available
10. (a)	Any 2 Same <u>volume</u> of water; same soil/ pH/ mineral (content); same temperature; NOT heat NOT light	Max 2
(b)	<u>Keep all factors the same</u> but use {pure water / tap water/ distilled water/ unpolluted water/ water without copper} NOT clean/ normal water	1
(c)	Mutation; Variation; Survival value – {some were tolerant to/ not poisoned by/ resistant to copper}; NOT immune to copper Gene passed on.	4
Question total		[7]
PAPER TOTAL		60

UNIT B2
FOUNDATION TIER

Question	Marking details	Marks Available								
1. (a) (i)	3(μm)	1								
	(ii) Algal (cell.)	1								
(b)	<table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 50%;">Feature</th> <th style="width: 50%;">Micro-organism</th> </tr> </thead> <tbody> <tr> <td>Reproduces by budding</td> <td>Yeast</td> </tr> <tr> <td>Reproduces by dividing in two</td> <td>Bacteria/ Algal cell</td> </tr> <tr> <td>Reproduces inside a host cell</td> <td>virus</td> </tr> </tbody> </table>	Feature	Micro-organism	Reproduces by budding	Yeast	Reproduces by dividing in two	Bacteria/ Algal cell	Reproduces inside a host cell	virus	3
Feature	Micro-organism									
Reproduces by budding	Yeast									
Reproduces by dividing in two	Bacteria/ Algal cell									
Reproduces inside a host cell	virus									
(c)	Protein.	1								
Question total		[6]								

Question	Marking details	Marks Available
2. (a)	Unambiguous line pointing at / in nucleus in cell A (must not touch chromosome)	1
(b)	4/ 2 pairs	1
(c)	Both cells must have: 2 long, 2 short lines drawn inside the nucleus.	1
Question total		[3]

Question	Marking details	Marks Available
3. (a) (i)	(Soil) warmer under the sheets/ protects from frost damage; so enzymes work faster/ better.	2
(ii)	I Increases <u>and</u> plateaus/ flattens	1
	II From graph - should be 208	1
	III From graph - should be 100	1
	IV From graph - should be 28	1
(b) (i)	Red (plastic)	1
(ii)	Blue (plastic)	1
(iii)	Comparison idea / control/ to see what it would be like in the open. Reject reference to fair test	1
(c)	To average / smooth out variation in results (due to variable weather/ soil conditions); So more reliable/ increased strength of evidence/ increased confidence in evidence. NOT accuracy/ comparison/ reproducibility/ fair test	2
(d)	Any reasonable suggestion such as: Unsightly / litter / not recycled/ / not biodegradable/ wasteful of resources / harmful if eaten by animals / could trap animals/ is poisonous NOT pollution/ kill or harm unqualified	1
Question total		[12]

Question	Marking details	Marks Available								
4. (a)	Carbon dioxide/ CO ₂ Oxygen/ O ₂	2								
(b)	Absorb/ take in/ capture (sun)light. NOT catch/ trap/ uses	1								
(c) (i)	Kill leaf / stop reactions/ breaks down cells or cell walls. NOT denature/ kill enzyme	1								
(ii)	Decolourise leaf / dissolves or removes chlorophyll/ take the green out.	1								
(iii)	Soften leaf / make leaf permeable.	1								
(iv)	<table border="1"> <thead> <tr> <th>Colour of leaf</th> <th>Tick (✓) correct box</th> </tr> </thead> <tbody> <tr> <td><i>dark blue-black</i></td> <td style="text-align: center;">✓</td> </tr> <tr> <td><i>dark brown</i></td> <td></td> </tr> <tr> <td><i>Pale yellow</i></td> <td></td> </tr> </tbody> </table>	Colour of leaf	Tick (✓) correct box	<i>dark blue-black</i>	✓	<i>dark brown</i>		<i>Pale yellow</i>		1
Colour of leaf	Tick (✓) correct box									
<i>dark blue-black</i>	✓									
<i>dark brown</i>										
<i>Pale yellow</i>										
Question total		[7]								

Question	Marking details	Marks Available
5. (a)	(i) A Rib Accept rib cage B Trachea/ windpipe C Bronchus/ bronchi	3
	(ii) Diaphragm/ intercostal <u>muscle</u> ; (allow even if label arrow incorrect) Feature identified (mark independently of label)	2
(b)	(i) Diffusion.	1
	(ii) Any two from: Large surface area; thin; Moist / damp; NOT wet/ water Close to / rich or good blood supply. Accept no gap between alveolus and blood supply	3
Question total		[8]

FOUNDATION / HIGHER TIER

Question	Marking details	Marks Available
6/1 (a)	Respiration/ respire. NOT anaerobic respiration	1
(b) (i)	To kill or destroy bacteria / fungi / micro-organisms/ microbes/ to sterilise. NOT get rid of bacteria/ denature	1
(ii)	Weak disinfectant didn't kill <u>all</u> bacteria / fungi/ micro-organisms; Bacteria/ fungi/ micro-organisms grew/ reproduced/ multiplied; Respired producing heat	3
Question total		[5]

Question	Marking details	Marks Available
7/2 (a)	A Oesophagus/ gullet B Gall bladder	1 1
(b)	Indicative content: Food enters small intestine. Mixes with bile from gall bladder/ liver. Fat emulsified or description/ large globules to small globules (not molecules). Lipase from pancreas Lipase in small intestine. Breaks down/ digests/ hydrolyses fats. To fatty acids. And glycerol.	6

5-6 marks

The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.

3-4 marks

The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.

1-2 marks

The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.

0 marks

The candidate does not make any attempt or give a relevant answer worthy of credit

Question total [8]

Question	Marking details	Marks Available
8/3	(a) (i) Breathing is <u>faster</u> so <u>more smoke</u> will be taken in (OWTTE); Lungs are smaller so easily/ quickly fill with smoke (OWTTE); Lungs are still developing/ growing therefore easily damaged. Accept Lungs are smaller and still developing = 1 Accept Therefore they fill quickly with smoke or easily damaged =1	3
	(ii) Any two from: Some parents think that smoking in cars has no effect on children; How smoking in cars (greatly) concentrates cigarette smoke (OWTTE); Levels of smoke in cars can be 27 times greater than in the home.	2
	(b) Any two from: (Particles or soot in smoke) it clog up the mucus (making harder to move); (Heat from smoke)/ it dries up mucus (and cleaning mechanism fails) or it stops the airways being moist; (Chemicals in smoke) it paralysing/ anaesthetises/ stops cilia/ hair like structures so they stop working.	2
Question total		[7]

Question	Marking details	Marks Available
9/4 (a)	When the predatory mite reaches 500/ 1 week after introduction/ at week 5/ between weeks 5 and 6 ; It kills off/ causes a decline in the red spider mite.	2
(b)	Biological control accept biocontrol	1
(c)	It may start eating other (harmless/ non pest species/) insects/ species/ non target species (not enough to say it may become a pest itself). NOT start eating the fruit	1
	Question total	[4]
	TOTAL FOUNDATION TIER	[60]

HIGHER TIER

Question	Marking details	Marks Available
5. (a)	Diagram B (no mark) Any two from: Diaphragm has flattened/ contracted; Rib cage has moved up/ out/ up and out OR sternum has moved up/ out/ up and out; Thoracic volume (or description of) increased/ chest cavity expands; (Accept reverse argument.)	2
(b) (i)	Oxygen; <u>Diffusing</u> into <u>blood / capillary</u> . NOT moving or going in	2
(ii)	Any two from: Large surface area relating to <u>increased</u> gaseous exchange; Moist lining relating to gases <u>dissolving</u> and diffusing in solution; Rich blood supply relating to <u>more/ faster</u> gaseous exchange/ speed at which CO ₂ can be removed and/ or O ₂ can be supplied; Thin wall relating to ease at which gases can diffuse/ easier for gas exchange. NOT thin cell walls	2
	Question total	[6]

Question	Marking details	Marks Available
6. (a)	Any two from: No embryos used/ own stem cells; No animal use in experiments/ only tested on humans/ no animal rights issues; Not cruel (neutral) No Genetic Modification.	2
(b)	Mitosis. (Spelling must be correct)	1
(c) (i)	(Growing) TIP of stem / shoot/ root or meristem	1
(ii)	20	
Question total		[5]
7. (a) (i)	Any number between 5 and 10	1
(ii)	Any number between 15 and 20	1
(b)	30-33 minutes	1
(c)	More energy released/ More ATP produced (per glucose molecule) / Glucose <u>completely</u> used / oxidised. NOT more glucose is oxidised	1
(d)	Yeast produces ethanol / alcohol; Yeast produces carbon dioxide It = muscle	2
Question total		[6]

Question	Marking details	Marks Available
8.	(a) Bases.	1
	(b) Amino acids.	1
	(c) 7	2
	(d) Double helix.	1
	(e) Enzymes / hormones	1
	Question total	[5]
9.	(a) 25%	1
	(b) Osmosis; Water passes out; from a high water concentration to low concentration outside /down a gradient / from a low solute concentration to a high solute concentration (must indicate correct direction of movement); through SPM (selective / partial / semi).	4
	(c) (i) Active transport/ uptake.	1
	(ii) Oxygen; Glucose	2
	Question total	[8]

Question	Marking details	Marks Available
10.	<p data-bbox="400 360 1270 622">Indicative content</p> <p data-bbox="400 360 1270 622">A 1m² quadrat is thrown randomly and the number of living dandelions in the quadrat is counted. This is repeated at least twice (until the number in the quadrat is constant/ not increasing or a stated number of times). An average is calculated of the numbers counted. The number is multiplied to calculate the total number in the whole lawn. This is done before treatment and 1 week/ stated time after treatment</p> <p data-bbox="400 674 539 701">5-6 marks</p> <p data-bbox="400 712 1254 936">The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.</p> <p data-bbox="400 987 539 1014">3-4 marks</p> <p data-bbox="400 1025 1238 1249">The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.</p> <p data-bbox="400 1301 539 1328">1-2 marks</p> <p data-bbox="400 1339 1254 1518">The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.</p> <p data-bbox="400 1570 512 1597">0 marks</p> <p data-bbox="400 1608 1190 1675">The candidate does not make any attempt or give a relevant answer worthy of credit</p>	[6]
Question total		60
TOTAL HIGHER TIER		60



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