



GCSE MARKING SCHEME

SCIENCE - BIOLOGY

JANUARY 2014

INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2014 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.

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B1

Question	Marking details	Marks Available
1 (a)	Backbone/vertebrae/bones/spine (NOT spinal cord);	1
(b) (i)	<u>Genus</u> ;	1
(b) (ii)	<u>Species</u> ;	1
(c)	Eats plants/vegetation; (NOT - does not eat meat/they are vegetarians) neutral – eats {grass/ vegetables/ veg}	1
(d) (i) I	{percentage/ %} <u>dark</u> sheep;	1
(d) (i) II	correct plotting +/- $\frac{1}{2}$ small square;;	2
(d) (i) III	<u>straight</u> line joining the plots;	1
(d) (ii) I	as temperature rises the {%/ proportion} <u>dark</u> sheep falls; (NOT {number/ amount} of sheep/reverse argument)	1
(d) (ii) II	Any two from: (differential) predation/camouflage; disease; food; water; correct genetic reason; NOT different genes (NOT hunting)	max 2
Question 1 Total		[11]

Question	Marking details	Marks Available
2 (a)	{Badgers/ they} {spread/pass on/transmit} {TB/it} (to cattle)/ORA	1
(b)	Public disquiet/animal rights issues/protests/people might try to stop it;	1
(c)	Badgers from {outside the area/nearby} move in;	1
(d)	(if) not all badgers killed/some (infected) badgers would {escape spread TB to other farms};	1
(e)	Any two from vaccination (reject injection/jab) of cattle; vaccination (reject injection/jab) of badgers; Accept vaccination (cattle/badgers not specified)= 1 mark fencing/ prevention of badgers entering {cattle housing/ troughs} keep badgers away from farm/keep cattle in sheds (idea of separation); control of cattle movement; testing of {cattle/badgers}; kill {infected/diseased} cattle;	max 2
Question 2 Total		[6]

Question	Marking details	Marks Available
3 (a)	Heart disease/circulatory disease/stroke/clogged arteries/mobility issues/diabetes; NOT heart attack/failure	1
(b)	{Burns/ uses up} {fat/ <u>stored</u> energy}; NOT burns {calories/energy}/ lose weight	1
Question 3 Total		[2]

Question	Marking details	Marks Available	
4	(a) (i) <u>bronchioles;</u>	1	
	(ii) <u>production of thick mucus;</u>	1	
	(iii) <u>an inhaler;</u>	1	
	(b) (i) C/from his father and his mother;	1	
	(ii) A/heterozygous for cystic fibrosis;	1	
	(iii) C/homozygous recessive for cystic fibrosis;	1	
	(iv) A/25%;	1	
	(v) C/males and females;	1	
	Question 4 Total		[8]

Question	Marking details	Marks Available
5 (a)	Bacteria/ fungi;	1
(b)	{The <u>leaves/they</u> } have { <u>decayed/rotted/decomposed</u> }; { <u>More/faster</u> } at { <u>15 °C / the high temperature/highest temperature</u> }; ORA	2
(c)	(i) Any two from: same type of leaves/from same tree; NOT same leaves same size of leaf; equal volumes of soil; NOT amount/ type/moisture content same {length amount} of time/both one month;	max 2
	(ii) To make a (<i>qualified</i>) conclusion (e.g. meaningful/valid)/to make a comparison/to avoid invalid results/to determine that the temperature causes the difference; NOT to make more {reliable/accurate}/ avoid bias	1
(d)	Carbon dioxide/CO ₂ ; NOT CO ² /Co	1
(e)	(Nitrates) released/produced by/come from the <u>leaves</u> ; during <u>decay</u> ;	2
Question 5 Total		[9]

Question	Marking details	Marks Available
6/1 (a)	Rat-tailed maggots; Sludgeworms; NOT maggots/worms	2
(b)	Water lice ; NOT lice	1
(c)	(i) Increases/gets higher/goes up; (ii) {Uses atmospheric oxygen/comes to the surface} to breathe/ description of adaptation-they {have a breathing tube/use their tail to breathe}/ takes oxygen out of the air/can breathe out of water ; NOT lift their heads to breathe	1 1
Question 6/1 Total		[5]

Question	Marking details	Marks Available
7/2 (a)	(i) Midday meal; smallest/ lowest {dose/ amount} of insulin (injected); NOT lowest level of glucose/ sugar/ carbohydrate in the meal	2
	(ii) She underestimated the amount of glucose/sugar/carbohydrate in the meal/more glucose than she {thought/estimated/ calculated} there would be; {Injected/dose/gave} too little insulin;	2
(b)	{Converts/ changes} glucose to glycogen (correct spelling); Stored/in the liver; NOT insulin stores glucose as glycogen 2 nd mark only credited if reference to glycogen	2
Question 7/2 Total		[6]

Question	Marking details	Marks Available
8/3 (a)	(i) A;	1
	(ii) Hairs {lying flat/lying down/hairs not stood up/lower}/ {erector muscle/ X} is relaxed; Sweat on the surface of the skin/A {shows/ is} sweating/more sweat; NOT sweat produced/sweat in the sweat duct/sweat is produced	2
(b)	Reduced blood flow (in the skin)/less blood in the capillaries; NOT less blood flowing through <u>the body</u> {Reduces/less} heat loss (reject no heat loss); ORA (Must state letter A)	2
(c)	It <u>contracts</u> ; NOT tenses/gets shorter	1
	Question 8/3 Total	[6]

Question	Marking details	Marks Available
9/4 (a)	As a fertilizer for <u>growth</u> /to make crops <u>grow</u> /to increase <u>growth</u> (rate)/to increase the {crop/ yield};	1
(b)	<p data-bbox="413 461 668 492">Indicative content</p> <p data-bbox="413 510 1219 645">Nitrate pellets dissolve. Nitrate runs off into pond. Increased growth of aquatic plants/algal bloom. Sunlight blocked. Plants die. Decay. Decay microbes/ bacteria use oxygen in water for respiration. Aquatic animals/insects/fish die.</p> <p data-bbox="413 678 576 710">5 – 6 marks</p> <p data-bbox="413 714 1241 913">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="413 947 576 978">3 – 4 marks</p> <p data-bbox="413 983 1241 1182">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="413 1216 576 1247">1 – 2 marks</p> <p data-bbox="413 1252 1219 1451">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="413 1485 528 1516">0 marks</p> <p data-bbox="413 1520 1203 1585">The candidate does not make any attempt or give a relevant answer worthy of credit.</p>	6
Question 9/4 Total		[7]

Question	Marking details	Marks Available
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5 (a)	<p>{the <u>genes</u>/all the alleles} in {an <u>organism/dog/it</u>}/ the {set/pair/two/both} <u>alleles</u> that {determine/control} {a characteristic/colour} of the dog/ the genetic make-up of {an organism/dog};</p>	1
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(b)	<p>(i) {Cross/mate/breed} {the (black) Labrador/ it} with {a yellow Labrador/bb}/do a test cross; If all the {puppies/litter} are black then {the (black) Labrador/ it} is {homozygous/BB}; If there are yellow puppies in the litter then {the (black) Labrador/ it} is {heterozygous/Bb};</p>	3
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(ii)	1 mark for each correct Punnett square;;	2
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Gametes	B	B
b	B	Bb
	b	
b	B	Bb
	b	

Gametes	B	b
b	Bb	b
		b
b	Bb	b
		b

Alternative marking option

(b)	<p>(i) Cross/mate/breed} the black Labrador with another Black Labrador which is known to be {heterozygous/Bb}; If all the puppies are black then the black Labrador is {homozygous/BB}; If there are some yellow puppies in the litter then the black Labrador is {heterozygous/Bb};</p>	3
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Question	Marking details	Marks Available
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(ii)	1 mark for each correct Punnett square;	2
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Gametes	B	B	Gametes	B	b
B	BB	BB	B	BB	BB
b	Bb	Bb	b	Bb	bb

If bi not completed then first marking option must be used for marking punnett squares

[6]

Question 5 Total

Question	Marking details	Marks Available
6 (a)	(i) Continuous;	1
	(ii) {heights/lengths/shells/they} are bigger; NOT population bigger	1
	(iii) 4mm and 17mm (units required);	1
	(iv) $(29-17) = 12\text{mm}$ (units required);	1
(b)	(i) Any three from: food; temperature NOT climate/weather/heat (can be neutral); pH; NOT PH/Ph oxygen; parasites; disease; predation; pollution; NOT space/size of {pond/habitat} (not neutral)	Max 3
Question 6 Total		[7]

Question	Marking details	Marks Available
7	(a) They are <u>genetically</u> identical/same {genotypes/DNA/genes};	1
	(b) (i) {Genetic composition/DNA/genes} of { <u>gametes/sex cells</u> } is {not identical/varies}; They inherit <u>different</u> {genes/DNA/chromosomes} from {both <u>parents/at fertilisation</u> };	2
	(ii) Evolution/ natural selection/adaptation to environment/survival value/survival of the fittest/ref to disease resistance;	1
	Question 7 Total	[4]

Question	Marking details	Marks Available
9	<p>Collect the blood from the {<u>gut/digestive system/stomach</u>} of leeches/collect the ingested blood;</p> <p>Compare {<u>genetic/DNA</u>} profiles with the {known/stored} {genetic/DNA} profiles;</p> <p>{A correct match/if they are <u>the same</u>} shows the endangered species exist;</p> <p>3rd point is linked to 2nd point</p>	3
Question 9 Total		[3]

Question	Marking details	Marks Available
10 (a)	(Radiation) causes mutation/ {damages/changes} the{genes/DNA/ chromosomes}; NOT mutation of cells or organs	1
(b)	Any three from: insecticides bioaccumulate/increases in concentration through a food chain; NOT passed along food chain can destroy {useful/other/all} insects is not selective; can affect fertility of animals at top of food chains; insects can develop{resistance/ immunity} to insecticides;	max 3
(c)	Any two from: size of population on mainland is larger than island population/ ORA; more insect predators on mainland than on island/ORA; fertile males (from mainland) cannot get to island; fewer sterile flies are needed (because the island is small);	max 2
Question 10 Total		[6]

Question	Marking details	Marks Available
11	<p data-bbox="411 309 668 342">Indicative content</p> <p data-bbox="411 360 1241 528">Soya has increased rate of photosynthesis because of inserted bacterial gene. Therefore increased growth. Yield is increased. Soya withstands/ resistant to herbicide because of inserted bacterial gene. Weeds are killed. Reduces competition for resources (minerals/light/space/water/CO₂).</p> <p data-bbox="411 577 555 611">5-6 marks</p> <p data-bbox="411 616 1241 846">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="411 884 555 918">3-4 marks</p> <p data-bbox="411 922 1241 1120">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="411 1158 555 1191">1-2 marks</p> <p data-bbox="411 1196 1241 1350">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="411 1388 528 1422">0 marks</p> <p data-bbox="411 1426 1241 1485">The candidate does not make any attempt or give a relevant answer worthy of credit</p> <p data-bbox="411 1523 663 1556">Question 11 Total</p>	[6]

B2

Question	Marking details	Marks Available
1	(a)	
	(i) Any two from Bacteria(l); Yeast; Alga(l);	max 2
	(ii) 1235; can be in any order 2345; can be in any order 1;	3
	(b)	
	(i) <u>Protein</u> (coat);	1
	(ii) By multiplying inside a host cell;	1
	Question 1 total	[7]

Question	Marking details	Marks Available
2 (a)	X - gall bladder; Y - stomach;	2
(b)	(i) Bile; Lipase; Glycerol;	3
	(ii) carries bile (into small intestine)/bile {travels/passes/flows/transported} through/bile flows through; NOT releases bile/this is the bile duct/connects gall bladder to intestine/carries bile to pancreas	1
Question 2 total		[6]

Question	Marking details	Marks Available	
3	(a) (i) Carbon dioxide CO ₂ ; NOT Co Water/H ₂ O;	2	
	(ii) Chlorophyll;	1	
	(b) (i)	I suitable scale;	1
		II all plots correct; (tolerance +/- 0.5 small square) 1 error = 1 mark, 2 errors = 0 mark	2
		III line quality;	1
		(ii) I rises/increases;	1
			II 22-25
	(iii) Same plant/same time; NOT – ref to repeating/reliability	1	
	(c)	Respiration/{release/ for}energy/cellulose/cell wall/(storage as) starch/ protein; NOT {create/produce/make} energy NOT food/growth (this could be neutral)	1
	Question 3 Total		[11]

Question	Marking details	Marks Available
4 (a)	Nucleus;	1
(b)	(i) Sugar and phosphate;	1
	(ii) A with T and G with C;	1
	(iii) Double helix;	1
(c)	Amino acids + Proteins;	1
	Question 4 Total	[5]

Question	Marking details	Marks Available
5 (a)	Biological (control); Accept bio control	1
(b)	(i) <i>No mites present</i> July 380; (reject 380cm ²) <i>With mites present</i> June 200; (reject 200cm ²)	2
	(ii) Reduces/decreases;	1
	(iii) August – <u>greatest</u> difference in number/OWTTE;	1
(c)	(i) Check whether it {affects/causes} {disease/damage} to { <u>other organisms/ tomatoes</u> } / does not become a pest itself; NOT disease unqualified/causes disease to humans	1
	(ii) Further work – need for repetition/check for repeatability/do it {again/ multiple times/three times}; NOT reproducibility Q <i>refers to same scientists</i>	1
	Question 5 Total	[7]

Question	Marking details	Marks Available
6/1 (a)	Meiosis (correct spelling required);	1
(b)	STAGE 2 - 23, 23, 46, 46;	1
	STAGE 3 – 4 cells each containing 23;	1
(c)	Gametes/sex cells/sperm/eggs/ova; NOT daughter cells	1
(d)	Different;	1
(e)	Growth/cell replacement/repair (of damaged) { <u>tissues/cells</u> }; NOT asexual reproduction/mitosis/bacterial reproduction/ replication/ cloning	1
Question 6/1 Total		[6]

Question	Marking details	Marks Available
7/2 (a)	4 3 1 2 3 or 4 correct = 3 marks 2 correct = 2 marks 1 correct = 1 mark	3
(b)	Make reference to {avoiding bias/validity}; NOT {fair test/reliability} (could be neutral)/ not to favour an area/give a true result	1
Question 7 Total		[4]

Question	Marking details	Marks Available
8/3 (a)	<ul style="list-style-type: none"> • Amylase digested/ broke down/hydrolysed; NOT turn/change • Starch to glucose; • which {diffused/ passed/ small enough to go} through the {visking tubing/membrane} (into the water); * <p>*Only accessed if second marking point awarded</p>	1 1 1
(b)	Starch <u>molecule too big</u> to pass through {visking tubing/ <u>membrane</u> };	1
(c)	Blood/blood stream;	1
(d)	1 mark for each correct row	2

Substance tested for	Reagent used	Colour of reagent	Colour with positive result
Starch	Iodine	Yellow-brown/ Orange/orange- brown/ yellow- orange NOT red/ yellow	blue- black
Glucose	Benedict's	blue	green/yellow/ orange/ /brown/brick red NOT red

Question 8/3 Total

[7]

Question	Marking details	Marks Available
9/4 (a)	Bronchiole	1
(b)	<p data-bbox="413 360 676 387">Indicative content:</p> <p data-bbox="413 412 1238 645">Air breathed in contains more oxygen than blood arriving at the alveolus. Oxygen dissolves in moisture (accept water) lining alveolus. Oxygen diffuses into blood through the thin alveolus wall. Blood in capillary arriving at alveolus contains more carbon dioxide than air in alveolus. Carbon dioxide diffuses into alveolus. Large surface area of alveolus means increased gas exchange.</p> <p data-bbox="413 696 576 723">5 – 6 marks</p> <p data-bbox="413 730 1238 931">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="413 965 576 992">3 – 4 marks</p> <p data-bbox="413 999 1238 1200">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="413 1234 576 1261">1 – 2 marks</p> <p data-bbox="413 1267 1238 1469">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="413 1503 528 1529">0 marks</p> <p data-bbox="413 1536 1203 1603">The candidate does not make any attempt or give a relevant answer worthy of credit.</p>	6
Question 9/4 Total		[7]

Question	Marking details	Marks Available
5	(a) (i) Liver – arrow & name;	1
	(ii) Gall bladder – arrow & name;	1
	(b) (i) Bile breaks {down/ up} large {lipid/fat/oil} drop(let)s <u>into</u> small drop(let)s; Accept bile emulsifies lipid/fat/oil NOT large molecules into small molecules Ref to pH is neutral for <u>increased/bigger/larger surface area</u> for enzyme/lipase action;	2
	(ii) All {lipid/ olive oil} digested/enzyme working flat out;	1
	(iii) Glycerol;	1
	Question 5 total	[6]

Question	Marking details	Marks Available
6	(a) <u>Enzyme –substrate complex;</u>	1
	(b) <u>Active site</u> is {changed/distorted/alterd}/bonds in active site are broken; {Substrate/amino acid} cannot {fit/join/lock }; NOT match	2
	(c) Temperature; pH; NOT PH/Ph Concentration of substrate; Concentration of enzyme; Reject amount/volume/mass	Max 2
Question 6 total		[5]

Question	Marking details	Marks Available
7	(a) Carbon dioxide/CO ₂	1
	(b) As temperature increases salt concentration increases; as water is evaporated; (only awarded if 1 st mark awarded)	2
	(c) <ul style="list-style-type: none"> • Osmosis; (reject if salt water or salt or solutions are moving) • (When salt concentration is high) – water is lost; • Correct statement about water potential/water moves {from where it is in high concentration to where it is in low concentration/ down a concentration gradient} (related to animals/surrounding solution); • Correct mention of selectively permeable membrane/ other correct form of words; 	1
		1
		1
		1
	Question 7 total	[7]

Question	Marking details	Marks Available
8	<ul style="list-style-type: none"> • Active transport/uptake; • Requires <u>both</u> oxygen and glucose; • For respiration/release of energy; • Rate of uptake of glucose follows rate of uptake of cadmium/Rate of uptake of cadmium follows rate of uptake of glucose/the more the rate of uptake the more glucose is used; 	<p>1</p> <p>1</p> <p>1</p> <p>1</p>
Question 8 Total		[4]

Question	Marking details	Marks Available
9 (a)	$\frac{200 \times 200}{20};$ <p>Answer = 2000; 2 marks for correct answer</p>	2
(b)	20/ number recaptured;	1
(c)	<p>Sample {size/area} may be too small/sample from only one part of lake; Sampling needs to be repeated (and averaged); Immigration; Predation may have reduced numbers marked/differential predation due to dye/dye makes fish more visible to predators; The dye adds bias to recapture/ dye makes fish easier to see to recapture; (ignore ref to time given to sampling)</p>	Max 3
(d)	<p>Line rises <u>from February</u>, peaks in {March/April} + then drops; one mark for 12 month scale; (accept letters/numbers for names of months)</p>	1 1
Question 9 Total		[8]

Question	Marking details	Marks Available
10	<p data-bbox="399 280 670 324">Indicative content</p> <p data-bbox="399 347 1173 392">Similarities: both break down glucose and <u>release</u> energy.</p> <p data-bbox="399 414 1228 593">Differences: muscle cells produce lactic acid and no carbon dioxide during anaerobic respiration. Aerobic respiration produces water and carbon dioxide. Aerobic uses oxygen and anaerobic does not. Anaerobic creates oxygen debt, aerobic does not.</p> <p data-bbox="399 616 1236 728">Aerobic is more efficient because it releases more energy per glucose molecule than anaerobic because it completely breaks down glucose.</p> <p data-bbox="399 750 558 795">5-6 marks</p> <p data-bbox="399 795 1244 1041">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="399 1052 558 1097">3-4 marks</p> <p data-bbox="399 1097 1228 1310">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="399 1321 558 1366">1-2 marks</p> <p data-bbox="399 1366 1220 1545">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="399 1556 534 1601">0 marks</p> <p data-bbox="399 1601 1204 1680">The candidate does not make any attempt or give a relevant answer worthy of credit</p> <p data-bbox="399 1691 670 1736">Question 10 Total</p>	[6]



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