GCSE MARKING SCHEME

SCIENCE B

SUMMER 2013

INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2013 examination in GCSE SCIENCE B. 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.

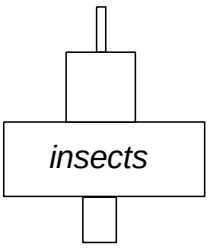
WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

GCSE SCIENCE B

SUMMER 2013 - MARKSCHEME

UNIT 1 - FOUNDATION TIER

SECTION A

Question	Answer	Marks
1.	**One** mark for **each** correct answer. **Advantages** / **Disadvantages** The farmer no longer uses insecticide to kill insects. ✓ (Advantages) No build- up of insecticides to toxic levels in food chains. ✓ (Advantages) The insects can become resistant to the poison. ✓ (Disadvantages) Other insects are at risk of being killed. ✓ (Disadvantages)	1 1 1 1
2. (i)	Plates.	1
(ii)	Volcanoes, plates.	2
(iii)	Earthquakes / tsunamis (accept tidal wave)	1
3. (a) (i)	Insects.	1
(ii)	Willow or white spruce.	1
(iii)	Red tailed hawk / lynx / red fox / shrew.	1
(iv)	One mark for each correct label.  1. red tailed hawk/ lynx/red fox 2. shrew 3. white spruce	3
(b)	Any three of: Disease (Competition for) light Number of grazing animals (Amount of) nutrients or water (in soil)	3
(c) (i)	Camouflage/ blend in.	1
(ii)	I. More food / hare (not hair) / prey available. II. Food / prey supply is decreasing / less hare.	1 1

Question			Answer	Marks
4.	(a)	(i)	Subs: time (h) = 310 / 0.161 (1), answer 1925.46 (h) - accept 1925 or 1925.5. (Allow use of data for **C** and **D**) 1925.4 - No workings but incorrect rounding give 1 mark	1+1
		(ii)	Power = 230 x 0.78 (1) 179.4 - accept 179 (W) conversion to 0.179 (kW). (allow ecf)	1+1 1
		(iii)	Total cost = 12p x 305 <u>3660p</u> or <u>(£)36.60</u>	1 1
	(b)		Save more (than £5) in running costs in first year / more than £5 cheaper to run (Do not accept just 'cheaper')	1
5.	(a)	(i)	Production of carbon dioxide. Adds to greenhouse effect/global warming. Two points must be coherently and correctly linked for 2 marks	1 1
		(ii)	Less trees / forest. to absorb carbon dioxide/less photosynthesis. Two points must be coherently and correctly linked for 2 marks	1 1
	(b)		• Rising sea levels / melting ice caps • Climate change / extreme weather conditions/rising temperature.	
6.	(a)		Number of extinctions increases over time (1) at an increasing rate / speeds up / gets faster (or wte) (1)	2
	(b)	(i)	Any two from: More land for housing / building / room to live. More land for food production. More land for energy crops (Allow: more land for waste disposal).	2
		(ii)	Less habitat therefore less food Two points must be coherently and correctly linked for 2 marks	2
		(iii)	(Captive) breeding programmes / protected areas / protected species / no hunting (or however expressed).	1
7.	(a)	(i)	Sun more active in picture 2 / more flares in 2	1
		(ii)	(Solar) flare.	1
		(iii)	Less interference from atmosphere / atmosphere not blocking signals / no light pollution / better image	1
	(b)	(i)	D	1
		(ii)	C	1

SECTION B

Question			Answer	Marks
8.	(a)		Different shape surfaces / one side is more curved / flatter which causes difference in air pressure. Two points must be coherently and correctly linked for 2 marks.	1 1
	(b)	(i)	6 – 25 (m/s).	1
		(ii)	1520 (m^2).	1
		(iii)I	900 (kW).	1
		II	Subs of 900 / 1500 %Efficiency = 60.	1 1
	(c)	(i)	Calculation of radius 40 m.	1
			Answer = 5027.2 m^2 / accept 5027. Use of π in calculator gives 5024 Accept range 5024-5027 Use of πr^2 to give 20096 Accept range 20096- 20109	1
		(ii)	Extraction of air density value 1.173. Subs ½ x 1.173 x 5027 (allow ecf) x 1300. Answer of 3 832 836 shown gets both marks.	1 1
	(d)	(i) I	Plots (tolerance +/- 0.5 square) All correct (2), 4 correct (1) Line of best fit (not point to point)	2 1
		II	Power output of a wind turbine depends on wind speed <u>and</u> air density. Both vary with altitude. Points must be correctly and coherently connected for 2 marks.	1 1
		(ii)	Power output varies with air density. which depends on temperature. Points must be correctly and coherently connected for two marks	1 1

Question	Answer	Marks
(e)	**Indicative content:** **Benefits** include references to no fuel costs, renewable resource, no air pollution, no effect on climate. **Drawbacks** include references to variable wind speed, low power outputs, noise pollution, visual pollution. Benefits or drawbacks only max of 3. **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.	6

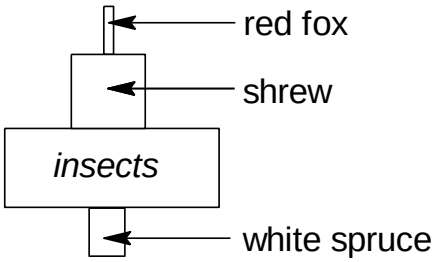
UNIT 1 - HIGHER TIER

SECTION A

Question			Answer	Marks
1.	(a)		Different shape surfaces / one side is more curved / flatter. which causes difference in air pressure. Two points must be coherently and correctly linked for 2 marks.	1 1
	(b)	(i)	6 – 25 (m/s).	1
		(ii)	1520 (m^2).	1
		(iii)I	900 (kW).	1
		II	Subs of 900 / 1500 %Efficiency = 60.	1 1
	(c)	(i)	Calculation of radius 40 m. Answer = 5027.2 m^2 / accept 5027. Use of π in calculator gives 5024 Accept range 5024-5027 Use of πr^2 to give 20096 Accept range 20096- 20109	1 1
		(ii)	Extraction of air density value 1.173. Subs ½ x 1.173 x 5027 (allow ecf) x 1300. Answer of 3 832 836 shown gets both marks.	1 1
	(d)	(i) I	Plots (tolerance +/- 0.5 square) All correct (2), 4 correct (1) Line of best fit (not point to point)	2 1
		II	Power output of a wind turbine depends on wind speed <u>and</u> air density. Both vary with altitude. Points must be correctly and coherently connected for 2 marks.	1 1
		(ii)	Power output varies with air density. which depends on temperature. Points must be correctly and coherently connected for two marks	1 1

Question	Answer	Marks
(e)	**Indicative content:** **Benefits** include references to no fuel costs, renewable resource, no air pollution, no effect on climate. **Drawbacks** include references to variable wind speed, low power outputs, noise pollution, visual pollution. Benefits or drawbacks only max of 3. **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 an 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.	6

SECTION B

Question	Answer	Marks
2. (a) (i)	Sun(light)	1
(ii)	Pyramid shape for top three layers Narrow box at bottom Correctly labelled	1 1 1
		
(b)	**Any 3 of:** Disease (Competition for) light Number of grazing animals (Amount of) nutrients or water (in soil)	3
(c) (i)	Camouflage/blend in	1
(ii)	If the population of prey increases, there will be more food so predator population will increase. As the population of predators increases more food is needed so eventually the population of prey will decrease. Less food for the predators so their population falls again Three from above. Must be correctly and coherently connected points to get 3 marks.	3

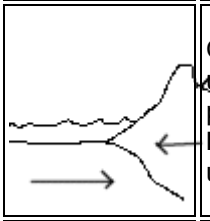
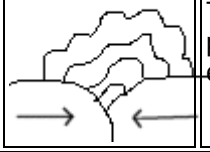
<table>
<tr><th colspan="2">Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>3. (a) (i)</td><td></td><td>Subs time (h) = 310/0.161,
Ans 01925.46(h) - accept 1925 or 1925.5 (Allow for data for C and D)
1925.4 – No workings but incorrect rounding give 1 m</td><td>1
1</td></tr>
<tr><td></td><td>(ii)</td><td>
<table>
<tr><th>Model</th><th>Voltage (V)</th><th>Current (A)</th><th>Power (W)</th><th>Power (kW)</th><th>Units used in one year (kWh)</th><th>Annual Cost (£)</th></tr>
<tr><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2</td><td></td><td></td><td>179 (2)</td><td>0.179 (1)</td><td></td><td></td></tr>
<tr><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>4</td><td></td><td></td><td></td><td></td><td>320 (1)</td><td></td></tr>
<tr><td>5</td><td></td><td>0.69 (1)</td><td></td><td></td><td></td><td>36.60 (1)</td></tr>
</table>
</td><td>6</td></tr>
<tr><td></td><td>(b) (i)</td><td>Model C has lower running costs (1)
Thereby saving the homeowner <u>more than £5</u> in the first year (1)
Two statements must be coherently and correctly connected for 2 marks</td><td>2</td></tr>
<tr><td></td><td>(ii)</td><td>Environmental benefit due to less electricity used / less electricity needs to be produced / less pollution caused / less effect on climate
(Not: help the environment)</td><td>1</td></tr>
</table>

Question	Answer	Marks
4.	**Indicative content:** **Carbon capture** involves trapping the carbon dioxide at its emission source, transporting it to a storage location (usually deep underground) and isolating it. The pressure found deep underground causes CO_2 to behave more like a liquid than a gas. Because it can seep into the spaces in porous rocks, a great amount of CO_2 can be stored in a relatively small area. The focus is all wrong. They argue that we should be coming up with ways to wean ourselves off fossil fuels instead of spending time and money on ways to continue using fossil fuels. Current CC technologies actually require a lot of energy to implement and run. What happens if the carbon dioxide leaks out in the ocean? Excess CO_2 in the water increases acidity. **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, 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.	6

<table>
<tr><th colspan="2">Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>5.</td><td>(i)</td><td>The farmer no longer has to use insecticide / pesticide on insects
so the surrounding environment is no longer exposed to large amounts of harmful insecticide
therefore no build-up of insecticides to toxic levels in food chains
Statements must be coherently and correctly connected for 3 marks</td><td>1
1

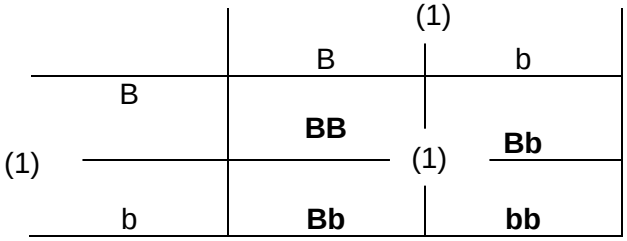
1</td></tr>
<tr><td></td><td>(ii)</td><td>This type of genetically modified corn will poison the insects over a longer period than the farmer who would spray the crops once or twice.
In this way the insects can become accustomed (or resistant) to the poison.
A variety of insects are at risk of being killed / It might be predatory insects that eat the harmful ones or, perhaps attractive insects such as butterflies.
Statements must be coherently and correctly connected for 3 marks</td><td>1

1

1</td></tr>
<tr><td>6.</td><td>(a)</td><td>
<table>
<tr><th>Type of Plate Boundary</th><th>Diagram</th><th>Description</th></tr>
<tr><td>Destructive</td><td>  </td><td>Oceanic plate(1) forced under (1) continental plate (1)
If: one plate forced under another (2)</td></tr>
<tr><td>Constructive</td><td>  </td><td>Two plates move apart (1)</td></tr>
<tr><td>Collision</td><td>  </td><td>Two continental plates (1) move towards each other (1)</td></tr>
</table>
</td><td>6</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>Destructive <u>and</u> collision boundaries</td><td>1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>All</td><td>1</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>Destructive <u>and</u> constructive boundaries</td><td>1</td></tr>
<tr><td></td><td>(c)</td><td></td><td>Any three of: weathering, erosion, meteorite impact, volcanic eruptions</td><td>3</td></tr>
</table>

GCSE SCIENCE B

UNIT 2 - FOUNDATION TIER

QUESTION			Answer	MARK
1.	(a)	(i)	Nucleus	1
		(ii)	46	1
		(iii)	Pairs	1
		(iv)	DNA	1
	(b)		Body cell - chromosomes in pairs / sperm cells not paired	1
			Different numbers in each / 46 present in body cells <u>and</u> 23 in sperm cell	1
2.		(i)		3
		(ii)	bb	1
		(iii)	25%	1
		(iv)	Mutation	1
3.	(a)		Copper, Al	2
	(b)	(i)	Copper (1) <u>best</u> <u>electrical</u> conductivity / high<u>est</u> <u>electrical</u> conductivity (1) (Not: 'good' electrical conductor)	2
		(ii)	Aluminium (1) low<u>est</u> density (1) (Also accept titanium (1) – strong<u>est(1)</u>)	2
		(iii)	Copper(1) high<u>est</u> <u>thermal</u> conductivity (1)	2
	(c)		Weakest iron aluminium copper Strongest titanium *All in correct order for mark*	1

QUESTION			Answer	MARK
4.	(a)		High, sound	2
	(b)	(i)	Does not use (ionising) radiation, so will not cause cancer / cause mutations (Also accept: x-rays go straight through (1) but sound wave bounce off layers of different density (1)) *One mark for making a valid point* *Two marks can be only awarded for correctly and coherently connecting points*	2
		(ii)	Examine the heart / blood vessels / shatter gall / kidney stones / to find cancerous growths (Not: 'brain scan')	1
5.	(a)		Corrosive	1
	(b)	(i)	Sodium chloride + water	2
		(ii)	Green	1
	(c)	(i)	All points correct (2) four points correct (1) join points with line correctly (1)	3
		(ii)	25 cm^3	1
	(d)		Repeat test without indicator stop adding sodium hydroxide at pH 7 / add only 25 cm^3 sodium hydroxide evaporate off (excess) water	3
6.	(a)		B (given) A, E, C, D all correct (3), two or three correct (2), one correct (1)	3
	(b)	(i)	Time taken for 50%/½ (1) of activity / radioactive substance / mass / atoms to decay (1) (Not: radiation)	2
		(ii)	^{99}Tc (is most suitable), since it has a half-life that is just long enough to be monitored. *one mark for making a valid point* *2 marks can be only awarded for correctly and coherently connecting points*	2
	(c)	(i)	Inject / ingest radioisotope / (accept radiotherapy taken inside the body) (1) radiotherapy / radioisotope kills cancer cells (1)	2
		(ii)	Correct workings (1) (Accept 3 (half-lives))(1) Correct answer 1/8^{th} (1)	2

QUESTION			Answer	MARK
7.	(a)	(i)	Allows a common standard/fair comparison/test (1) so making it easier to compare different foods (1) *one mark for making a valid point* *Two marks can be only awarded for correctly and coherently connecting points*	2
		(ii)	34.0, 0.3	2
	(b)		0.5 ×100/4.0 (1) 12.5% (1)	2
	(c)		**Indicative content** • Fat content reduced / monounsaturated reduced most • Less salt and fat in 'healthy' crisps • Less salt / blood pressure and strokes • Reduce obesity / cardiovascular disease / chance of diabetes • Reduced use of NHS resources **Marking Bands** **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.	**6**

GCSE SCIENCE B

UNIT 2 - HIGHER TIER

QUESTION			ANSWER	MARK
1.	(a)	(i)	All points correct (2) two or three points correct (1) join points with line correctly (1)	3
		(ii)	25 cm^3	1
	(b)		NaCl	1
	(c)		Repeat test without indicator stop adding sodium hydroxide at pH 7 / add only 25 cm^3 sodium hydroxide evaporate off (excess) water	3
2.	(a)		Radio-isotope attached to drug, injected into patient, target an organ	3
	(b)	(i)	Time taken for 50% / ½ (1) of activity/radioactive substance / mass / atoms to decay (Not: radiation) (1)	2
		(ii)	^{99}Tc (is most suitable), since it has a half-life that is just long enough to be monitored. *one mark for making a valid point* *Two marks can be only awarded for correctly and coherently connecting points*	2
	(c)	(i)	Inject/ingest radioisotope / (accept radiotherapy taken inside the body) (1) radiotherapy / radioisotope kills cancer cells (1)	2
		(ii)	Correct workings (1) Correct answer $1/8^{th}$ (1)	2

QUESTION			ANSWER	MARK
3.	(a)	(i)	Allows a common standard / fair comparison/test (1) so making it easier to compare different foods (1) *one mark for making a valid point* *Two marks can be only awarded for correctly and coherently connecting points*	2
		(ii)	34.0, 0.3	2
	(b)		0.5 × 100/4 (1) 12.5% (1)	2
	(c)		**Indicative content** • Fat content reduced / Monounsaturated reduced most • Less salt and fat in 'healthy' crisps • Less salt / blood pressure and strokes • Reduce obesity / cardiovascular disease / chance of diabetes • Reduced use of NHS resources **Marking bands** **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.	6QWC

QUESTION			ANSWER	MARK
4.	(a)		Both lower case e.g. hh	1
	(b)		Correctly drawn Punnett square or cross diagram Use letters from (a) Parents (1) Cross (allow ecf) (1) 75% (1)	3
	(c)		50% chance of being a carrier / 25% chance having child with sickle cell (1) so should consider adoption / ivf from non-carrier *one mark for making a valid point* *Two marks can be only awarded for correctly and coherently connecting points*	2
5.	(a)		Lead positively charged (ions) attracted to opposite charge cathode where they gain electrons/form atoms *one mark for making each valid point* *Three marks can be only awarded for correctly and coherently connecting points*	3
	(b)		$PbBr_2 \rightarrow Pb + Br_2$ (Allow max of 2 if one correct half equation is given)	3
	(c)		bromine gas <u>plus</u> formed/given off/which is toxic / corrosive use a fume cupboard	2

	H	h
H	HH	Hh
h	Hh	hh

QUESTION			Answer	MARK
6.			**Indicative content** • Ultrasound / high frequency sound waves • Sound wave bouncing / reflecting • Two structures of different density • Ionising radiation not used • Safer to unborn/less chance of cancer **Marking bands** **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.	**6**

QUESTION			ANSWER	MARK
7.	(a)		Total = 2 000 000 tonnes difference = 2 000 000 – 333 000 = 1 667 000 % increase = 500.6 (accept 500%)	1 1 1
	(b)		Require less energy to manufacture take less time to break down compared to traditional plastics therefore, cause less harm to environment. *Three marks can be only awarded for correctly and coherently connecting points*	3
	(c)		**Any three from:** • Land use no longer available for growing crops • Price food may rise/ shortage food • Make contribution to deforestation (making room for growing crops) • More expensive • Release methane when they compost	3

WJEC
245 Western Avenue
Cardiff CF5 2YX
Tel No 029 2026 5000
Fax 029 2057 5994
E-mail: exams@wjec.co.uk
website: www.wjec.co.uk