



GCSE MARKING SCHEME

JANUARY 2016

**SCIENCE B
UNIT 1 - HIGHER TIER
4781/02**

INTRODUCTION

This marking scheme was used by WJEC for the 2016 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was 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 conference was to ensure that the marking scheme was 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' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

GCSE SCIENCE B
UNIT 1 HIGHER TIER
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Section A

Question	Marking point	Marks																				
1 (a)	Reduction from 29 to 3 (1) = 26 (GW) (1) or 31 – 5 (1) = 26 (GW) (1)	2																				
(b) (i)	I. Area = (60 000/15) = 4000 (km ²) (1) II. Energy content = (60 000 x 20) = 1 200 000 (units) (1)	2																				
(ii)	CO ₂ released during burning (1) = CO ₂ absorbed during growing / photosynthesis (1) so carbon neutral (1) <i>Any two points</i> <i>The points must be correctly and coherently connected to be awarded two marks</i>	2																				
(c)	1 mark for each correct point <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">Steady wind speed (m/s)</th> <th style="text-align: center;">Zero power output</th> <th style="text-align: center;">Maximum power output</th> <th style="text-align: center;">Between zero and maximum power output</th> </tr> </thead> <tbody> <tr style="background-color: #cccccc;"> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">27.2</td> <td style="text-align: center;">✓</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">19.6</td> <td></td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td style="text-align: center;">12.2</td> <td></td> <td></td> <td style="text-align: center;">✓</td> </tr> </tbody> </table>	Steady wind speed (m/s)	Zero power output	Maximum power output	Between zero and maximum power output					27.2	✓			19.6		✓		12.2			✓	3
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27.2	✓																					
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(d)	smaller, larger power output, more reliable, less of an eyesore	3																				

Question	Marking point	Marks
2	<p>Indicative content</p> <ul style="list-style-type: none"> • power output one nuclear power station is equivalent to 900 wind turbines • nuclear power stations last 3 times longer / in the lifetime of one nuclear power station equivalent 2 700 wind turbines. • cost wind turbines more than double the cost of a nuclear power station / nuclear option cheaper per unit produced • wind power is less reliable • radioactive waste more detrimental to the environment since it has to be stored safely for long periods of time / danger of leakage into the ecosystem. <p>Marking bands</p> <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.</p> <p>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.</p> <p>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.</p> <p>0 marks The candidate does not make any attempt or give a relevant answer worthy of credit.</p>	6
3	<p>(i) $200/1\ 000 (1) \times 100 = 20 (1)$</p> <p>(ii) $\text{Current} = 200/230 (1) = 0.87 / 0.9 (A) (1)$</p> <p>(iii) $5 \times 200 \times 6 (1) = 6\ 000 (Wh) (1)$</p>	2 2 2

Section B

Question	Marking point	Marks																														
4 (a)	(i) Any three of: <ul style="list-style-type: none"> • disease • competition for nutrients with willow • competition for light • number of insects/snowshoe hares • deforestation 	3																														
	(ii) sunlight (accept Sun)	1																														
	(iii) relative proportions All correct (2), Three correct (1)	2																														
(b)	as supply of food (shrew) increases so will lynx (1). This causes the number of shrew to decrease (1) and so will the lynx (1) <i>The points must be correctly and coherently connected to be awarded three marks.</i>	3																														
5 (a)	(i) time = $270/2.7$ (1) = 100 (h) (1)	2																														
	(ii) Note: Answers: 35.2, 210. 1 mark will be awarded if candidate as shown correct workings for calculation but given incorrect answer.	6																														
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(b)	A & B cost more to buy and run than D so it wouldn't be one of those (1) C costs £216 and D costs £168 to run over 5 years (1) The saving in running costs of £48 is more than the extra cost to buy £20 so chose C (1) <i>The points must be correctly and coherently connected to be awarded three marks.</i>	3																														

Question	Marking point	Marks
6 (a) (i)	<p>Any two of:</p> <ul style="list-style-type: none"> • increase in the number of bacteria • decreases the oxygen content of the water • plants / animals need oxygen to survive <p>One mark for:</p> <ul style="list-style-type: none"> • decreases biodiversity / decreases range/diversity of the river animals / plants 	3
(ii)	<p>Any three of:</p> <ul style="list-style-type: none"> • waste broken down by the action of decay micro-organisms • which need lots of oxygen because: • anaerobic respiration (by bacteria) only partly breaks down the waste • plentiful oxygen means that the bacteria use aerobic respiration • aerobic respiration makes the breaking down process complete <p><i>The points must be correctly and coherently connected to be awarded three marks.</i></p>	3
(b)	<p>Wales has always had more ‘very good’ river quality (1). The river quality in England improved (1) but worsened in Wales (1) In 2000, there is no bad river quality in Wales but there is in England (1)</p>	4

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7	<p>(i) 1 mark each label</p> <table border="1" data-bbox="592 309 802 741"> <tr><td>Region</td></tr> <tr><td></td></tr> <tr><td></td></tr> <tr><td>infra-red</td></tr> <tr><td></td></tr> <tr><td>ultra violet</td></tr> <tr><td></td></tr> <tr><td></td></tr> </table> <p>(ii) speed = 1×10^{-1} (1) $\times 3 \times 10^9$ (1) or use of another pair of values = 3×10^8 (m/s) (1)</p> <p>(iii) minimum value at top (1) maximum value at bottom (1) correct order in between (1)</p> <table border="1" data-bbox="435 1050 987 1424"> <thead> <tr> <th>Region</th> <th>Energy (J)</th> </tr> </thead> <tbody> <tr> <td>radio</td> <td>$< 2 \times 10^{-24}$</td> </tr> <tr> <td>microwave</td> <td>$2 \times 10^{-24} - 2 \times 10^{-22}$</td> </tr> <tr> <td>visible</td> <td>$3 \times 10^{-19} - 5 \times 10^{-19}$</td> </tr> <tr> <td>X-ray</td> <td>$2 \times 10^{-17} - 2 \times 10^{-14}$</td> </tr> <tr> <td>gamma-ray</td> <td>$> 2 \times 10^{-14}$</td> </tr> </tbody> </table>	Region			infra-red		ultra violet			Region	Energy (J)	radio	$< 2 \times 10^{-24}$	microwave	$2 \times 10^{-24} - 2 \times 10^{-22}$	visible	$3 \times 10^{-19} - 5 \times 10^{-19}$	X-ray	$2 \times 10^{-17} - 2 \times 10^{-14}$	gamma-ray	$> 2 \times 10^{-14}$	<p>2</p> <p>2</p> <p>3</p>
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8 (a)	matter swirling around an emerging star forms small pellets (1) which collide and make larger bodies (1)	2
8 (b)	<p>Indicative content</p> <p>Three of the following need to be discussed.</p> <ul style="list-style-type: none"> • <i>The Fission Theory:</i> The Moon was once part of the Earth and somehow separated from the Earth early in the history of the Solar System. • <i>The Capture Theory:</i> The Moon was formed somewhere else, and was later captured by the gravitational field of the Earth. • <i>The Co-formation Theory:</i> The Moon and the Earth condensed together from the original cloud that formed the Solar System. • <i>The Impact Theory:</i> A body the size of Mars struck the earth, ejecting large volumes of matter. A disk of orbiting material was formed, and this matter eventually condensed to form the Moon in orbit around the Earth. <p>Marking bands:</p> <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.</p> <p>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.</p> <p>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.</p> <p>0 marks The candidate does not make any attempt or give a relevant answer worthy of credit.</p>	6