

GCSE

Science B

Unit **B711/01**: Modules B1, C1, P1 (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 2016

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All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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Annotations used in scoris

Annotation	Meaning
	correct response
	incorrect response
BOD	benefit of the doubt
NBOD	benefit of the doubt not given
ECF	error carried forward
	information omitted
I	ignore
R	reject
CON	contradiction

Abbreviations, annotations and conventions used in the detailed Mark Scheme.

- / = alternative and acceptable answers for the same marking point
- (1)** = separates marking points
- allow** = answers that can be accepted
- not** = answers which are not worthy of credit
- reject** = answers which are not worthy of credit
- ignore** = statements which are irrelevant
- () = words which are not essential to gain credit
- = underlined words must be present in answer to score a mark (although not correctly spelt unless otherwise stated)
- ecf = error carried forward
- AW = alternative wording
- ora = or reverse argument

MARK SCHEME

Question	Answer	Marks	Guidance
1 a	depressants (1) hallucinogens (1)	2	
b	7 (units) (2) but if answer incorrect 21 (units drunk) (1)	2	
c	<p>20 -29 year olds reduce the risk of an accident by 30 if they ... <input checked="" type="checkbox"/></p> <p>Only those aged 108 – 19 will have an accident with a blood ... <input type="checkbox"/></p> <p>People over 30 are 20 times better drivers than people in other age groups. <input type="checkbox"/></p> <p>People with a blood alcohol level of 150 mg/100ml are at least 200 <input checked="" type="checkbox"/></p> <p>The lower the blood alcohol level the more likely you are to have an accident. <input type="checkbox"/></p>	2	<p>each correct tick = 1 mark</p> <p>three ticks but one correct and two wrong = 1 mark</p> <p>three ticks but two correct and one wrong = 1 mark</p> <p>more than three ticks = 0 marks</p>
Total		6	

Question	Answer	Marks	Guidance
2 a	pancreas (1)	1	allow phonetic spelling (1)
b	in the blood (1)	1	allow veins / arteries / capillaries / blood vessels / blood system (1) not (red) blood cells / haemoglobin
c	idea that carbohydrates are sugar / glucose or made of sugar / glucose (molecules) (1) idea of insulin controls / lowers / regulates (blood) sugar or glucose levels / AW (1)	2	allow he will be eating more sugar / glucose (1) allow his (blood) sugar / glucose level will go up (1) ignore other named sugars e.g. sucrose ignore references to energy / fat not protein allow idea of need to control / lower / regulate (blood) sugar or glucose levels by injecting insulin (1) ignore just 'needs to inject insulin' not insulin increases blood sugar levels allow Type 1 is insulin dependent (1)
d i	nucleus (1)	1	allow chromosomes / DNA (1)
d ii	intelligence (1)	1	more than 1 answer circled scores 0
	Total	6	

Question	Answer	Marks	Guidance
3 a	<p>[Level 3] Describes two patterns including data AND relates patterns to reason(s) why numbers have gone down or are different. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Describes two patterns OR Describes a pattern including data OR Describes a pattern and suggest a simple reason why numbers have gone down or are different. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Describes a pattern OR Suggests a simple reason why numbers have gone down. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to E</p> <p>Indicative scientific points may include:</p> <p>Reasons</p> <ul style="list-style-type: none"> • vaccination program is working (ignore just they have been vaccinated) • countries are poorer • countries have less medical treatment • people live in remote places / Africa is remote so difficult to vaccinate whole population • Africa / EMR have not vaccinated all the population • Europe has more money so can vaccinate more people • SEA must have vaccinated all the population • Africa /SEA had the highest numbers to start because they have larger population / less developed • ideas about cleaner water in areas where there are less cases <p>Patterns including data</p> <ul style="list-style-type: none"> • Quotes data e.g. Eastern Mediterranean has 532 cases in 1996 and 297 cases in 2011 or e.g. Africa drops by 1552 <p>Patterns</p> <ul style="list-style-type: none"> • less polio cases in 2011 • more cases in Africa than America • less cases in Europe <p>Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.</p>

Question	Answer	Marks	Guidance
b	engulf / digest (virus or pathogen) (1) (make) antibodies (1)	2	allow surround / wrap around / consume (virus) (1) allow phagocytosis (1) ignore eat / kill / destroy / fight / cover / absorb allow higher level answers e.g. antibodies lock onto antigens (2)
Total		8	

Question	Answer	Marks	Guidance
4 a	too slow (1) idea that he thinks about action / not automatic (1)	2	allow ora ie reflex is too fast, if clearly stated (1) allow idea that his brain is controlling the action (1) allow may hold on long enough to burn hand (1) allow if it was a reflex he would have dropped plate / ora (1)
b	any two from: idea that receptors detect stimulus (1) idea of generate (nerve) impulse (1) which travels along axon / nerve fibre / sensory neurone (1)	2	allow (peripheral / sensory) nerve ending (detects stimulus) (1) not idea of electrical impulse sent to receptor allow idea of generate electrical signal (1) ignore travels along the nervous system ignore sensor neurone / motor neurone
c	cell body (1)	1	allow dendrites / dendron (1) allow phonetic spelling
	Total	5	

Question	Answer	Marks	Guidance
5 a	B (1)	1	allow correct answer ticked, circled or underlined in list if answer line is blank (1)
b	C (1) because it contains oxygen / does not contain carbon and hydrogen only (1)	2	second marking point is dependent on the first allow has O in the formula (1) allow C and H for carbon and hydrogen (1) not contains an oxygen molecule (in the formula) not is not a mixture of carbon and hydrogen only not does not contain carbon and hydrogen molecules or compounds only not does not contain carbon and hydro only
c	propene (1)	1	not propane
d	C ₂ H ₆ O (1)	1	allow elements in any order allow C ₂ H ₆ O ₁ / C ₂ H ₅ OH (1) not C ₂ H ₆ O / C ² H ⁶ O not C ₂ +H ₆ +O
Total		5	

Question	Answer	Marks	Guidance
6 a i	fractional distillation (1)	1	distillation is insufficient allow fractionation / fractionating (1) ignore fractioning
a ii	any two from: LPG (1) petrol (1) paraffin (1) heating oil (1) fuel oil / kerosene (1) bitumen (1)	2	allow tar allow naphtha (1) allow lubricating oil (1) ignore diesel (stem of question) ignore gas / oil
b i	poisonous / toxic (1)	1	allow carbon monoxide can kill you (1) allow idea of reducing ability to transport oxygen (1) ignore harmful / dangerous / pollution / references to global warming
b ii	catalytic converter (1)	1	allow correct answer ticked, circled or underlined in list if answer line is blank (1) allow converter (1)
c	any two from: idea of kills or harms (sea) birds (1) idea of kills or harms fish or marine life or aquatic life (1) damage to beaches (1) idea of destruction of habitats (1) environmental problems are caused by detergents used in clean up of oil (1)	2	allow idea of kills or harms wildlife / animals (1) allow idea that it sends tourists away (1) allow detergents are poisonous to animals (1) ignore idea of cost of cleaning up oil
	Total	7	

Question	Answer	Marks	Guidance
7 a	butane + oxygen → carbon dioxide + water (1)	1	allow = instead of → not and / & , instead of + allow correct formulae but equation does not need to balance e.g. $C_4H_{10} + O_2 \rightarrow CO_2 + H_2O$ (1) allow mix of correct formulae and words (1)
b	heat (1)	1	allow correct answer ticked, circled or underlined in list if answer line is blank

Question	Answer	Marks	Guidance
c	<p>[Level 3] Answer analyses information to describe advantages and disadvantages of methane AND States two other factors that need to be considered when choosing a fuel. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Answer analyses information to describe an advantage and a disadvantage of methane AND States two other factors that need to be considered when choosing a fuel. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Answer analyses information to describe an advantage or a disadvantage of methane OR States two other factors that need to be considered when choosing a fuel. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to C</p> <p>Indicative scientific points may include:</p> <p>Advantages of methane:</p> <ul style="list-style-type: none"> • good availability • (reasonably) low cost • second highest / high energy value • gas if qualified, e.g. easier to deliver <p>Disadvantages of methane:</p> <ul style="list-style-type: none"> • makes CO₂ • less energy produced than hydrogen • more expensive than coal / ethanol <p>For advantages & disadvantages answer must clearly refer to methane. Ignore advantages & disadvantages of other fuels.</p> <p>Other factors that need to be considered when choosing fuel:</p> <ul style="list-style-type: none"> • idea of storage • toxicity of fuel • ease of use • idea of renewable • idea of other pollution products other than CO₂ / does it have a clean flame / is it smelly • idea of volatility • viscosity of fuel • ease of transport <p>Two factors that need to be considered when choosing a fuel, on its own, gains credit at Level 1 only.</p> <p>Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.</p>
Total		8	

Question	Answer	Marks	Guidance
8 a	<p>B and C (1)</p> <p>(because)</p> <p>a new substance is made in B / a gas is given off in B / there is a temperature change in B / fall in temperature in B (1)</p> <p>an energy change takes place in C / there is a temperature change in C / rise in temperature in C (1)</p>	3	<p>both required for mark</p> <p>explanation marks are dependent on correct identification of B and C</p> <p>allow ora e.g. A is not a chemical change as there is no new substance made or no temperature or energy change AND D is not a chemical change as there is no new substance made or no temperature or energy change scores 2 marks</p> <p>If B and C correctly identified (1), allow both have a temperature change (2)</p>
b	sodium, hydrogen, carbon and oxygen	2	<p>all 4 correct scores 2 2 or 3 correct scores 1 1 correct scores 0</p> <p>ignore Na / H / C / O</p>
Total		5	

Question	Answer	Marks	Guidance
9 a i	microwave (1)	1	more than one answer scores 0
	ii infrared (1)	1	allow IR (1) more than one answer scores 0
	iii ultraviolet (1)	1	allow UV [(1) more than one answer scores 0
b	<div data-bbox="320 555 922 616" style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">Waves with a high frequency travel faster than waves with a low frequency</div> <div data-bbox="958 555 1021 616" style="border: 1px solid black; width: 28px; height: 38px; display: inline-block; vertical-align: middle;"></div> <div data-bbox="320 651 922 711" style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">Waves with a long wavelength travel faster than waves with a short wavelength</div> <div data-bbox="958 651 1021 711" style="border: 1px solid black; width: 28px; height: 38px; display: inline-block; vertical-align: middle;"></div> <div data-bbox="320 746 922 807" style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">Waves all travel at the same speed in a vacuum</div> <div data-bbox="958 746 1021 807" style="border: 1px solid black; width: 28px; height: 38px; display: inline-block; vertical-align: middle; text-align: center;">✓</div> <div data-bbox="320 842 922 903" style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">Waves in a vacuum have the same speed as waves in glass and air</div> <div data-bbox="958 842 1021 903" style="border: 1px solid black; width: 28px; height: 38px; display: inline-block; vertical-align: middle;"></div>	1	more than one tick scores 0
	Total	4	

Question	Answer	Marks	Guidance
10	<p>[Level 3] Names signal A and signal B AND describes how the signals change when noise is added AND explains why it is easier to remove noise from signal A. Quality of written communication does not impede communication of the science at this level (5 – 6 marks)</p> <p>[Level 2] Names signal A and signal B <u>and</u> describes how the signals change when noise is added OR Describes how the signals change when noise is added <u>and</u> attempts to explain why it is easier to remove noise from signal A. Quality of written communication partly impedes communication of the science at this level (3 – 4 marks)</p> <p>[Level 1] Describes the appearance of signals A and B OR Describes the appearance of noise Quality of written communication impedes communication of the science at this level (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to C.</p> <p>Why it is easier to remove noise from signal A may include:</p> <ul style="list-style-type: none"> • noise adds extra random information • noise is similar to signal B so difficult to tell which is noise and which is the signal • noise is amplified when signal is amplified • (idea that) signal is read as 0 and 1 so easier to remove noise to see 1 and 0 again rather than any intermediate value <p>Appearance of signals with noise may include:</p> <ul style="list-style-type: none"> • noise is an analogue signal • noise is continually changing • noise adds to both signals • noise makes the original signal B difficult to see clearly • idea that amplitude of noise much smaller than amplitude of signal A • easy to recognise signal A even when noise added • signals become ‘fuzzy’ or ‘less clear’ <p>Name of signals</p> <ul style="list-style-type: none"> • signal A is digital and signal B is analogue <p>Descriptions of signal A and signal B may include:</p> <ul style="list-style-type: none"> • signal A is either 0 or 1 / on and off / two states but signal B has a continuously variable value / AW <p>Ignore noise is easier to remove from signal A (in stem of question)</p> <p>Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.</p>
Total		6	

Question	Answer	Marks	Guidance
11 a i	no (no mark) idea that the general trend of the graph is downwards (1) OR yes (no mark) idea that there are no lower recorded readings / general trend of graph since 1997 is upwards (1)	1	allow graph goes up and down over the years so may still go down again (1) allow because we have banned CFCs / idea of rules relating to disposal of CFCs (1) allow 1997 or 295 is the lowest reading (on the graph) (1)
ii	take readings after 2005 / idea of take more readings or do more tests / idea of re-analyse previous readings (1)	1	allow compare their results with those from other years (1) allow share their results / compare with other scientists (1) allow repeat readings / tests allow 'extend the x axes of the graph' (1) allow use a computer model (1)
b i	1972 (1)	1	more than one answer scores 0
ii	any two from: skin cancer / melanoma (1) skin aging (1) cataracts (1)	2	allow damage to (skin) cells / (idea of) mutation (1) not just 'cancer' ignore just 'skin damage' allow causes lens or eyes to go cloudy (1) allow causes damage to the retina (1) ignore just 'eye damage' ignore causes blindness ignore heat stroke
	Total	5	

Question	Answer	Marks	Guidance
12 a	idea that it allows different houses to be compared / can see if any changes made to the house have changed the efficiency (1)	1	<p>allow idea of fair test (1)</p> <p>ignore idea of more reliable</p>
b	<p>any two from:</p> <p>the amount of useful energy for the house / AW (1)</p> <p>the amount of energy put into the house / AW (1)</p> <p>wasted energy / AW (1)</p>	2	<p>allow correct efficiency equation e.g.</p> <p><u>useful energy</u> (x 100) / energy input (2)</p> <p>allow heat loss (1)</p>
c i	<p>payback time is 3.5 years (2)</p> <p>or</p> <p>payback time = $\frac{1400}{400}$ (1)</p> <p>or</p> <p>payback time is less than 5 years / or state a value less than 5 (1)</p>	2	<p>check calculations next to and in table</p> <p>allow (5 x (£)400) = (£)2000 or (you save) (£)2000 (1)</p> <p>allow idea that (£)2000 is more than (£)1400 (2)</p> <p>allow (in 5 years) you save (£)600 (2)</p>

Question	Answer	Marks	Guidance
ii	cavity wall insulation and cavity wall insulation saves (£)2000 (1) low energy bulbs and a thermostat saves (£)550 (1) BUT cavity wall insulation saves (£)1450 more (2)	2	low energy light bulbs / thermostat given = 0 marks check calculations next to and in table ignore incorrect subtraction ignore idea that cavity wall saves more per year than low energy light bulbs and a thermostat allow overall cavity wall saves (£)600 (2) allow low energy light bulbs and a thermostat saves (£)495 (2)
Total		7	

Question	Answer	Marks	Guidance
13	<p>any two from:</p> <p>in shape B (the ray of) light is reflected at X (1)</p> <p>in shape B (the ray of) light is reflected at Y (1)</p> <p>in shape C (the ray) of light is reflected at X (1)</p> <p>in shape C (the ray) of light is refracted at X (1)</p> <p>AND</p> <p>idea that shape B sparkles the most as has most light leaving the top of the diamond (into the eye) (1)</p>	3	<p>allow shape B shows (only) total internal reflection (2)</p> <p>allow idea that shape B sparkles the most because all the light is reflected (and enters the eye) (1)</p>
Total		3	

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