OCR
Oxford Cambridge and RSA

GCSE

Science B

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

General Certificate of Secondary Education

Mark Scheme for June 2016

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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	20 -29 year olds reduce the risk of an accident by 30 if they ... ✓ Only those aged 1O8 – 19 will have an accident with a blood ... People over 30 are 20 times better drivers than people in other age groups. People with a blood alcohol level of 150 mg/100ml are at least 200 ..... ✓ The lower the blood alcohol level the more likely you are to have an accident.	2	each correct tick = 1 mark three ticks but one correct and two wrong = 1 mark three ticks but two correct and one wrong = 1 mark more than three ticks = 0 marks
	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	**[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) **[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) **[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) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to E** **Indicative scientific points may include:** **Reasons** • 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 **Patterns including data** • Quotes data e.g. Eastern Mediterranean has 532 cases in 1996 and 297 cases in 2011 or e.g. Africa drops by 1552 **Patterns** • less polio cases in 2011 • more cases in Africa than America • less cases in Europe **Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.**

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_2H_6O (1)	1	**allow** elements in any order **allow** $C_2H_6O_1$ / C_2H_5OH (1) **not** C2H6O / C^2H^6O **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	**[Level 3]** **Answer analyses information to describe advantages <u>and</u> 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) **[Level 2]** **Answer analyses information to describe an advantage <u>and</u> 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) **[Level 1]** **Answer analyses information to describe an advantage <u>or</u> 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) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to C** **Indicative scientific points may include:** **Advantages of methane:** • good availability • (reasonably) low cost • second highest / high energy value • gas if qualified, e.g. easier to deliver **Disadvantages of methane:** • makes CO_2 • less energy produced than hydrogen • more expensive than coal / ethanol For advantages & disadvantages answer must clearly refer to methane. Ignore advantages & disadvantages of other fuels. **Other factors that need to be considered when choosing fuel:** • idea of storage • toxicity of fuel • ease of use • idea of renewable • idea of other pollution products other than CO_2 / does it have a clean flame / is it smelly • idea of volatility • viscosity of fuel • ease of transport **Two factors that need to be considered when choosing a fuel, on its own, gains credit at Level 1 only.** **Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.**
	Total	**8**	

Question	Answer	Marks	Guidance
8 a	B **and** C (1) (because) 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) an energy change takes place in C / there is a temperature change in C / rise in temperature in C (1)	3	**both required for mark** explanation marks are dependent on correct identification of B and C **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** If B **and** C correctly identified (1), **allow** both have a temperature change (2)
b	sodium, hydrogen, carbon and oxygen	2	all 4 correct scores 2 2 or 3 correct scores 1 1 correct scores 0 **ignore** Na / H / C / O
	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	Waves with a high frequency travel faster than waves with a low frequency ☐ Waves with a long wavelength travel faster than waves with a short wavelength ☐ Waves all travel at the same speed in a vacuum ✓ Waves in a vacuum have the same speed as waves in glass and air ☐	1	more than one tick scores 0
	Total	**4**	

Question	Answer	Marks	Guidance
10	**[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) **[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) **[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) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to C.** **Why it is easier to remove noise from signal A may include:** • 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 **Appearance of signals with noise may include:** • 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' **Name of signals** • signal **A** is digital and signal **B** is analogue **Descriptions of signal A and signal B may include:** • signal **A** is either 0 or 1 / on and off / two states but signal **B** has a continuously variable value / AW **Ignore** noise is easier to remove from signal A (in stem of question) **Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.**
	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	**allow** idea of fair test (1) **ignore** idea of more reliable
b	**any two from:** the amount of **useful** energy for the house / AW (1) the amount of energy put into the house / AW (1) wasted energy / AW (1)	2	**allow** correct efficiency equation e.g. $\frac{\text{useful energy}}{\text{energy input}}$ (x 100) (2) **allow** heat loss (1)
c i	payback time is 3.5 years (2) **or** payback time = $\frac{1400}{400}$ (1) **or** payback time is less than 5 years / or state a value less than 5 (1)	2	**check calculations next to and in table** **allow** (5 x (£)400) = (£)2000 or (you save) (£)2000 (1) **allow** idea that (£)2000 is more than (£)1400 (2) **allow** (in 5 years) you save (£)600 (2)

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

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553