OCR
Oxford Cambridge and RSA

GCSE

Chemistry B

Unit **B741/01**: Modules C1, C2, C3 (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 2017

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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

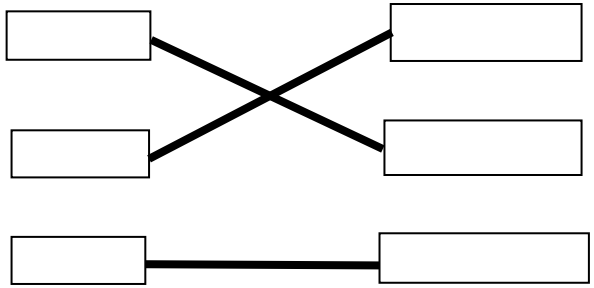
Annotation	Meaning
	correct response
	incorrect response
	benefit of the doubt
	benefit of the doubt **not** given
	error carried forward
	information omitted
	ignore
	reject
	contradiction

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

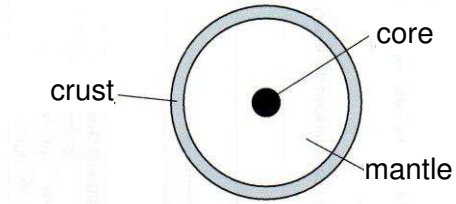
MARK SCHEME

Question	Answer	Marks	Guidance
1 a i	**B** / purple (1) colour fades in both light and temperature (1)	2	award 0 marks for the question with **incorrect** choice
ii	**C** / pink (1) changes colour as the temperature changes (1)	2	award 0 marks for the question with **incorrect** choice but second mark can be given if no choice given
b	solvent – thins the paint (1) binding medium – sticks the pigment to the surface (1)	2	**allow** solvent dissolves other constituents / makes the paint easier to run / so it is easier to spread (1) **allow** sticks the paint to the surface (1) **not** binds the pigment together / binds pigment to solvent
	Total	**6**	

Question	Answer	Marks	Guidance
2 a	acid + **alcohol** → ester + water (1)	1	**allow** a named alcohol e.g. ethanol (1) **allow** phonetic spelling
b	perfumes (1)	1	**allow** pear drops / food flavours / air freshener / deodorants (1) food additive it **not** sufficient
c	 (2)	2	**all** correct **(2)** **one** or **two** correct **(1)**
d	**any two from:** to check they are not poisonous or toxic (1) to check they do not irritate skin (1) to check they do not stain (1) to check they are safe (1)	2	 **allow** to check if they are harmful (1) **allow** to see if there is a reaction with skin (1) **allow** to check if they are dangerous (1) **allow** to check for 'side-effects' / to check to see if there is a reaction (1) **ignore** testing the smell or odour
	Total	**6**	

Question	Answer	Marks	Guidance
3 a	**B** (1)	1	**allow** ethene / C_2H_4 (1) but letter takes precedence
b	**A** (1)	1	**allow** methane / CH_4 (1) but letter takes precedence
c	**B** (1)	1	**allow** ethene / C_2H_4 (1) but letter takes precedence
d	**C** (1)	1	**allow** poly(bromoethene) / $(C_2H_3Br)_n$ (1) but letter takes precedence (1)
e	land fill (1) burning / incinerating (1) recycling (1)	3	**allow** put on tip / bury underground (1) **ignore** reuse them **allow** cracked (to make new monomers) (1) **ignore** put in the bin **ignore** turn it into a gas **not** broken down into smaller polymers
	Total	**7**	

Question	Answer	Marks	Guidance
4	**Level 3** **States two other factors to be considered** **AND** **chooses A or B with at least two reasons** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **Level 2** **States two other factors to be considered** **OR** **States one other factor and chooses A or B with a reason** **OR** **chooses A or B with at least two reasons** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **Level 1** **States one other factor to be considered** **OR** **chooses A or B with a reason** 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 grade C.** **Indicative scientific points may include:** **Other factors** • availability • storage • toxicity • ease of use • amount of ash or smoke produced • physical state of fuel • renewability • flammability / does it explode easily • how long to make the fuel **ignore** general references to pollution **Choice and reasons** • **A** because it has a high energy value, only makes carbon dioxide and is reasonably cheap • **B** because it is cheap and has many years supply **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
		6	

Question	Answer	Marks	Guidance
5 a	 (2)	2	all **three** labels correct (2) **one** or **two** labels correct (1) **allow** inner core for core but not outer core **allow** inner or outer crust for crust
b	**any two from:** soil is (very) fertile / crops grow better / aw (1) provide geothermal energy / used to heat water / cheap source of heat (1) idea of taking advantage of tourists (1) idea that people may want to study the volcano (1)	2	 **allow** soil has many nutrients present (1) **ignore** soil is good unless qualified, e.g. can grow bigger crops or soil good for crops would be sufficient to gain a mark **ignore** for warmth views and attractiveness is **not** sufficient **allow** want to live in same place (as rest of family) (1) **allow** housing may be cheap / land may be cheap (1) **ignore** because there is nowhere else to go

Question	Answer	Marks	Guidance
5 c	**any one from:** (scientific) conference / lecture (1) (scientific) paper / journal / magazine (1) internet / blog / Twitter / Facebook (1) email (1) book (1) newspaper (1) television (1) **AND** **any one from:** work can be checked (1) to see if work can be replicated / so work does not need to be duplicated (1) so that further evidence can be collected (1) to provide information to other scientists or public or other organisations / AW (1) so they can get recognition for their work (1) for education (1)	2	send it to a scientist is **not** sufficient **allow** media or write up his work or writing down his work if no other marks scored from this section (1) **allow** peer-review / work can be evaluated (1) **allow** work can be developed further (1) **allow** so other scientists cannot take credit (1) **allow** to help predict other eruptions (1) **allow** so others know what they have done (1)
	Total	**6**	

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>6 a</td><td>ammonia + sulfuric (acid) → ammonium sulfate (1)</td><td>1</td><td>allow = or ⇌ instead of →
not ‘and’ or ‘&’ instead of ‘+’

allow $NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$
balancing not required

allow mix of correct names and correct formulae
if mix of names and formulae, name takes precedence

ignore + water as a product</td></tr>
<tr><td>b</td><td>potassium nitrate (1)</td><td>1</td><td>allow KNO_3 but name takes precedence (1)</td></tr>
<tr><td>c</td><td>burette (1)</td><td>1</td><td>allow correct answer ticked, circled or underlined in list if answer line is blank</td></tr>
<tr><td>d</td><td><table><tr><th>Atom</th><th>Number</th></tr><tr><td>N</td><td>1</td></tr><tr><td>H</td><td>6</td></tr><tr><td>P</td><td>1</td></tr><tr><td>O</td><td>4</td></tr></table></td><td>2</td><td>all four correct (2)

two or three correct (1)</td></tr>
<tr><td></td><td>Total</td><td>5</td><td></td></tr>
</table>

Question	Answer	Marks	Guidance
7 a	nitrogen obtained from air (1) hydrogen obtained from natural gas / hydrogen obtained by cracking oil fractions (1)	2	
b	reaction that goes both ways / AW (1)	1	**allow** returns to original reactants / goes back to where it started (1) **allow** idea that you can get the reactants back, this may be in the form of a word equation (1) **allow** the reaction can go backwards and forwards / reaction can be undone **ignore** 'a reaction that can be reversed' **ignore** can get elements back **ignore** physical processes mentioned
c	manufacture of nitric acid / manufacture of explosives / use in cleaning fluids / manufacture of dyes / manufacture of plastics / manufacture of drugs (1)	1	**ignore** to make beach
d	(pressure) 400 (atmospheres) **and** (temperature) 100 (°C) (1)	1	**both required** **allow** any pressure above 400 and any temperature below 100
	Total	**5**	

Question	Answer	Marks	Guidance
8 a	**E** (1)	1	
b	(yes because) idea that this alloy is a good conductor (of electricity) (1) and has good ductility / can easily be pulled into wires (1)	2	**marks are for explanation BUT** just quoting numbers is insufficient just 'conducts (electricity)' is **not** sufficient **not** it has the highest (electrical) conductivity just 'it is ductile' / 'it is quite ductile' / 'it is fairly ductile' is **not** sufficient **ignore** comments about strength **ignore** comments about other brasses **BUT** **allow** no use **A** because it is the best conductor (of electricity) (1)

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>8 c</td><td>Level 3
Identifies and explains at least one relevant property needed in making helicopters

AND

Explains which metal (aluminium, steel or both) is suited to make helicopters
Quality of written communication does not impede communication of the science at this level.
(5–6 marks)
Level 2
Identifies and explains at least one relevant property needed in making helicopters

OR

Explains which metal (aluminium, steel or both) is suited to make helicopters
Quality of written communication partly impedes communication of the science at this level.
(3–4 marks)
Level 1
Identifies at least one relevant property of metals needed to make a helicopter.
Quality of written communication impedes communication of the science at this level.
(1–2 marks)
Level 0
Insufficient or irrelevant science such as repeating the question. Answer not worthy of credit.
(0 marks)</td><td>6</td><td>This question is targeted at grades up to C

Relevant scientific points at level 3 may include:

<table><tr><th>Property for making helicopter</th><th>Explanation</th></tr><tr><td>low density / lightweight</td><td>so less fuel needed / travels faster</td></tr><tr><td>does not corrode</td><td>will last longer / no need to pay for rust treatment</td></tr><tr><td>malleable</td><td>can be easily shaped</td></tr><tr><td>strong</td><td>less damage (in a crash)</td></tr><tr><td>hard</td><td>not scratched</td></tr></table>
ignore strong so lasts a long time

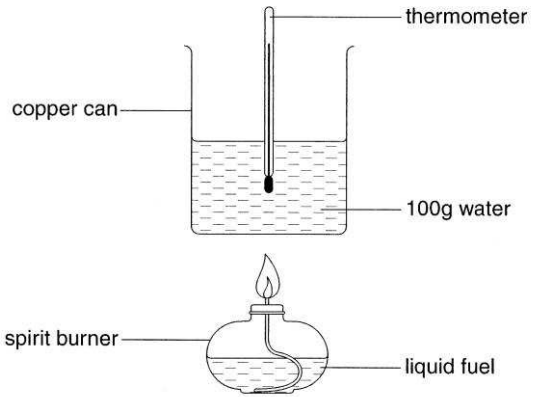
Relevant scientific point at all levels may include:

Aluminium is used to make helicopters because it is
• lower density / lightweight
• does not corrode
• malleable.

Steel is used to make helicopters because it is
• stronger
• malleable
• cheaper

Use the L1, L2, L3 annotations in scoris. Do not use ticks.</td></tr>
<tr><td></td><td>Total</td><td>9</td><td></td></tr>
</table>

Question	Answer	Marks	Guidance
9 a	151 (1)	1	
b	method **D** (1) high**est** atom economy **and** high**est** percentage yield (1)	2	 explanation mark is dependent on mentioning **both** atom economy and percentage yield
c	**any two from**: labour / salaries / workers (1) energy / electricity / gas (1) research and testing / quality control (1) time taken for development (1) marketing (1) rent / rates / taxes / insurance (1) plant / buildings / machinery / equipment (1) maintenance / repair / health & safety (1) pollution controls (1)	2	**allow** mark for an explanation of the cost e.g. needs specialist workers so costs a lot of money **allow** cost of temperature **ignore** transport / packaging / storage
d	idea that impurities might give side effects (1)	1	**allow** idea that cannot give correct dosage with impure drug (1) **allow** impurities may be toxic / may have (allergic) reaction to the impurities safe to use is **not** sufficient
	Total	**6**	

Question	Answer	Marks	Guidance
10 a	 **any three from:** suitable container for fuel (1) suitable container of water above burning flame (1) use of thermometer in the water (1) fair test – same mass or volume or amount of water in copper can / same distance between burner and copper can / use same burner each time / same copper can / same size flame or wick (1)	3	**if experiment is unsafe, or incorrect experiment, max 1** marks can be awarded from a labelled diagram or written answer **allow** paraffin burner / crucible with fuel **not** Bunsen burner **ignore** same mass of fuel
b	(yes because) fuel **B** gave same temperature rise as other fuels (1) for **least** mass of fuel burned (1)	2	**marks are for explanation** **allow** temperature rise was 20°C **for all fuels** **allow only** 0.6g of fuel burned i.e. answers must be comparative

Question	Answer	Marks	Guidance
10 c	energy given out or heat given out (1)	1	**allow** temperature (of surroundings) increase **allow** heat or energy produced / made / exits / released **allow** energy or heat is lost (limit of acceptability) **ignore** gives more energy **not** energy or heat is created
d	<table><tr><th>atom</th><th>number</th></tr><tr><td>C</td><td>4</td></tr><tr><td>H</td><td>10</td></tr><tr><td>O</td><td>1</td></tr></table> (2)	2	all **three** correct (2) **one** or **two** correct (1)
	Total	**8**	

Question	Answer	Marks	Guidance
11 a	calcium carbonate + hydrochloric acid → calcium chloride + carbon dioxide + water (1)	1	order of substances on either side of arrow is unimportant **allow** marble for calcium carbonate **allow** mixture of correct formulae and names but names take precedence **allow** correct formulae, i.e. (1) $CaCO_3 + HCl \rightarrow CaCl_2 + CO_2 + H_2O$ balancing is **not** required

			allow = or ⇌ for arrow **not** 'and' or & for +
b i	0.49 / 0.5 (g) (1)	1	
b ii	2.9 / 3.0 (minutes) (1)	1	**allow** just **'**3' (minutes)
b iii	curve for small chips is **steeper** / ora (1)	1	**assume unqualified answer refers to small marble chips** **allow** for a given time more gas with smaller chips (1) **allow** reaction finishes in shorter time / reaction finishes before the large chips / curve ends first / reaction stops sooner (1) **ignore** references to reaction finishes in a faster / quicker time **allow** numbers quoted from the graph but they must be correct to within ±½ square
c	idea that powders are very flammable / idea that powders can lead to explosions (1)	1	**allow** reference to choking hazard **allow** respiratory or breathing problems

Question	Answer	Marks	Guidance
d	**Level 3** **Answer applies understanding of the reacting particle model (with collisions) to explain how increasing the temperature AND increasing the concentration of the acid will increase the rate of reaction**. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **Level 2** **Answer applies understanding of the reacting particle model (collisions) to explain how increasing the temperature increases the rate of**	6	**This question is targeted at grades up to C** **Indicative scientific points may include:** • more collisions between particles result in faster reaction **temperature increase:** increasing the temperature of the increases the rate of reaction because • idea that particles move faster / particles have more energy / more (successful) collisions / collisions are more energetic • idea of increased collisions (frequency)

	reaction OR increasing the concentration of the acid increases the rate of reaction. **OR** **Answer applies understanding of the reacting particle model (no collisions) to explain how increasing the temperature increases the rate of reaction AND increasing the concentration of the acid increases the rate of reaction** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **Level 1** **Answer describes that increasing the temperature and increasing the concentration will increase the rate of reaction** **OR** **describes that more collisions will increase the rate of reaction.** 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).		**concentration increase:** increasing the concentration of a reactant increases the rate of reaction because • idea of more crowded particles / more particles in same volume • idea of increased collisions (frequency) **ignore** references to 'more particles' **allow** increase in pressure / shaking / swirling as another method of increasing the rate of reaction **pressure increase:** increasing the pressure of a (gaseous) reactant increases the rate of reaction because • idea of more crowded particles / more particles in same volume • idea of increased collisions (frequency) **ignore** references to 'more particles' **allow** reference to ions / atoms / molecules instead of particles **Use the L1, L2, L3 annotations in Scoris. Do not use ticks.**
	Total	**11**	

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

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Head office
Telephone: 01223 552552
Facsimile: 01223 552553