

GCSE

Chemistry B

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

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

- / = 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

Question	Answer	Marks	Guidance
1 a	A (1)	1	allow ethanoic acid
b	E (1)	1	allow ethene / C ₂ H ₄
c	C and F (1)	1	allow butane and methylpropane
d	poly(tetrafluoroethene) (1)	1	allow name without brackets allow Teflon / ptfe
	Total	4	

Question	Answer	Marks	Guidance
2 a	do not contain carbon and hydrogen only / contain more elements than just hydrogen and carbon (1)	1	<p>allow C and H for carbon and hydrogen (1)</p> <p>allow it contains oxygen / has three elements / has the symbol O in the formula (1)</p> <p>not contains an oxygen molecule (in the formula)</p> <p>not reference to a mixture</p> <p>not does not contain carbon and hydrogen molecules or compounds only</p> <p>not does not contain carbon and hydro only</p>
b	C ₇ H ₁₄ O ₂ (1)	1	<p>allow any order of atoms</p> <p>credit correct answer if written in box in table but answer line takes precedence</p>
c	ethyl ethanoate (1)	3	<p>incorrect ester = 0 mark for question</p> <p>allow dissolves easily / (very) soluble in water</p> <p>ignore reference to melting point</p>
	Total	5	

Question	Answer	Marks	Guidance
3 	<p>Level 3 States the correct percentage of both of the gases AND Describes the effect of two of these processes on the percentage of oxygen and carbon dioxide. Quality of communication does not impede communication of science at this level. (5-6 marks)</p> <p>Level 2 States the correct percentage of both of the gases OR Describes the effect of two of the processes on the percentage of oxygen and carbon dioxide OR States the correct percentage of one of the gases And describes the effect of one of the processes on the percentage of oxygen and carbon dioxide. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>Level 1 States the correct percentage of one of the gases OR Describes the effect of one of the processes on the percentage of oxygen and carbon dioxide. Quality of 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>	<p>6</p>	<p>This question is targeted at grades up to C</p> <p>Indicative scientific points may include:</p> <ul style="list-style-type: none"> • Percentage of oxygen is any value between 20 and 22% • Percentage of carbon dioxide is any value between 0.03 and 0.04% • Respiration and combustion decrease percentage of oxygen and increase percentage of carbon dioxide • Photosynthesis increases percentage of oxygen and decreases percentage of carbon dioxide <p>Use the L1, L2, L3 annotations in Scoris, do not use ticks</p>
	<p>Total</p>	<p>6</p>	

Question	Answer	Marks	Guidance
4 a	any three from: amount of pollution / type of pollution (1) cost (1) availability (1) toxicity / is it safe / is it harmful / is it dangerous (1) ease of use (1) storage (1) flammability (1) is it finite source / is it a fossil fuel (1)	3	ignore colour of flame allow the gases produced (during combustion) eco-friendly is not sufficient
b	any two from: lack of oxygen (1) incomplete combustion (1) forms soot / forms carbon (1)	2	allow ora if specified just 'amount of oxygen' is insufficient allow flame not hot enough (1) allow sodium (ions) injected into flame (1)
Total		5	

Question	Answer	Marks	Guidance
5 a	pie-chart (1)	1	allow any other way of indicating the correct answer such as a tick or a circle but answer line takes precedence
b	bar chart (1)	1	allow any other way of indicating the correct answer such as a tick or a circle but answer line takes precedence
c	C because it has most solvent (1)	1	answer must be comparative
d	thermochromic paint changes colour with temperature (1) phosphorescent pigment glows in the dark (1)	2	allow thermochromic pigment changes colour when it gets hot or cold allow references to heat instead of temperature allow phosphorescent paint releases light in the dark not phosphorescent pigment changes colour
	Total	5	

Question	Answer	Marks	Guidance								
6 a	<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>Alloy</th> <th>Metallic element</th> </tr> </thead> <tbody> <tr> <td>amalgam</td> <td>(copper)</td> </tr> <tr> <td>bronze</td> <td>mercury</td> </tr> <tr> <td>solder</td> <td></td> </tr> </tbody> </table> <p style="text-align: right;">(2)</p>	Alloy	Metallic element	amalgam	(copper)	bronze	mercury	solder		2	<p>All four correct (2)</p> <p>Two or three correct (1)</p> <p>Ignore any extra metals or alloys included in the table</p>
Alloy	Metallic element										
amalgam	(copper)										
bronze	mercury										
solder											
b	(copper oxide has had) oxygen removed (1)	1	<p>allow copper is made (1)</p> <p>allow (copper ions have) gained electrons (1)</p> <p>allow hydrogen gains oxygen (1)</p>								
c	duralumin (no mark) low density (1) high strength / strong (1)	2	<p>allow steel because it has the highest strength / steel because it is strong for one mark</p>								
	Total	5									

Question	Answer	Marks	Guidance
7 a i	does not rust in boiled water / no rusting in tube A (1) does not rust in dry air / no rusting in tube D (1)	2	allow tube with no air no rusting allow tube with no water no rusting A and D rust slower is not sufficient
ii	salt (water) (1)	1	allow sea water not sodium
b	$4Al + 3O_2 \rightarrow 2Al_2O_3$ formulae (1) balancing - conditional on correct formulae (1)	2	allow any correct multiple e.g. $2Al + \frac{3}{2}O_2 \rightarrow Al_2O_3$ allow = or \Rightarrow for arrow not 'and' or & for + allow one mark for correct balanced equation with minor errors of case, subscript and superscript e.g. $4AL + 3O^2 \rightarrow 2Al_2O_3(1)$
Total		5	

Question	Answer	Marks	Guidance
8 a i	air (1)	1	allow other ways of indicating answer e.g. tick or circle but the answer on the answer line takes precedence
ii	recycled (1)	1	allow sent round again / it is reacted together (again)
b	<p>[Level 3] Extracts the correct conditions from the graph AND states at least two costs of making ammonia. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Extracts one correct condition from the graph and states at one cost of making ammonia. OR Extracts the correct conditions from the graph OR States at least two costs of making ammonia. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Extracts one correct condition from the graph OR States one cost of making ammonia. 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. (0marks)</p>	6	<p>This question is targeted at grades up to C.</p> <p>Costs</p> <ul style="list-style-type: none"> • cost of starting materials • labour costs • cost of the plant / apparatus or equipment • cost of catalyst • rent or rates • health and safety • pollution control <p>ignore references to advertising / environment / transport / storage / packaging / energy / temperature and pressure</p> <p>Conditions</p> <ul style="list-style-type: none"> • any temperature from 350°C or below • any pressure from 400 atmospheres or above <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
Total		8	

Question	Answer	Marks	Guidance
9 a	idea of increased crop yield / faster growth (1)	1	<p>allow to get bigger crops</p> <p>ignore vague answers e.g. to get better crops</p> <p>ignore reference to nutrients</p> <p>ignore speeds up crop yield</p>
b	nitrogen (1) phosphorus (1)	2	<p>allow N</p> <p>allow P</p> <p>not O / oxygen</p> <p>not H / hydrogen</p> <p>i.e. nitrogen, phosphorus and oxygen = 1 mark phosphorus, oxygen and hydrogen = 0 mark</p>
c i	<p style="text-align: center;">potassium nitric → potassium + water hydroxide + acid nitrate</p> <p>one correct product: potassium nitrate / water (1)</p> <p>remainder of word equation correct(1)</p>	2	<p>equation must be totally correct for 2 marks</p> <p>allow correct formulae or mix of names and formulae i.e. $\text{KOH} + \text{HNO}_3 \rightarrow \text{KNO}_3 + \text{H}_2\text{O}$</p> <p>allow hydrogen oxide</p>
ii	add a few drops of universal indicator to solution (1)	2	<p>allow use pH paper / pH indicator</p> <p>not litmus</p> <p>allow specific reference to colour and pH e.g. green is pH 7</p> <p>allow second marking point even if incorrect indicator is used</p>
	Total	7	

Question	Answer	Marks	Guidance
10 a	$(2 \times 23) + 12 + (3 \times 16)$ (1)	1	mark is for the working out and not for the final answer allow $23 + 23 + 12 + 16 + 16 + 16$ etc.
b i	gas produced / gas escapes / carbon dioxide made / steam made (1)	1	not name or formula of incorrect gas ignore references to evaporation unless linked with water
ii	5.3	1	unit not needed
iii	any two from reaction not complete / AW did not heat for long enough / temperature not high enough (1) some solid spits out of the test-tube (1)	2	allow not all the water escapes (1) allow a mistake in the mass reading (1)
	Total	5	

Question	Answer	Marks	Guidance
11 a	<p>Level 3 Describes two stages of extracting drug from plant material AND Explains why the drug is impure using both melting point and chromatography data. Quality of communication does not impede communication of science at this level. (5-6 marks)</p> <p>Level 2 Answer describes one stage of extracting drug from plant material AND explains why the drug is impure using <u>either</u> melting point <u>or</u> chromatography data OR Answer describes two stages of extracting drug from plant material. OR Explains why the drug is impure using <u>both</u> melting point and chromatography data. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>Level 1 Describes one stage of extracting drug from plant material OR Explains why the drug is impure using <u>either</u> melting point <u>or</u> chromatography data. Quality of 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 for extraction may include:</p> <ul style="list-style-type: none"> • Crushing (plant material) • Boiling (with a solvent) • Dissolving (with a solvent) / solvent extraction • Chromatography • Crystallisation • Evaporation • Filtration <p>Indicative scientific points for analysis may include:</p> <ul style="list-style-type: none"> • Drug is impure • Chromatography shows that there are (at least) two substances (so not pure) • Melting point is below that of the pure sample so not pure • Melting point is a range so not pure <p>Use the L1, L2, L3 annotations in Scoris, do not use ticks</p>

Question	Answer	Marks	Guidance
b	any two from idea that the drug must be as pure as possible (1) idea that the drug must have no side effects / needs to be safe to use / not addictive (1) idea that the drug must have been extensively trialled / idea that the drug does what it is supposed to do (1)	2	
	Total	8	

Question	Answer	Marks	Guidance										
12 a	thermometer (1)	1	allow temperature probe										
b	fair test / easier to compare results (1)	1	ignore to make the results reliable										
c	<table border="1"> <thead> <tr> <th>Fuel</th> <th>Temperature change of water in °C</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>23</td> </tr> <tr> <td>B</td> <td>26</td> </tr> <tr> <td>C</td> <td>27</td> </tr> <tr> <td>D</td> <td>30</td> </tr> </tbody> </table> <p>Correct temperature changes (1)</p> <p>Fuel D (1)</p>	Fuel	Temperature change of water in °C	A	23	B	26	C	27	D	30	2	allow ecf from incorrect temperature changes
Fuel	Temperature change of water in °C												
A	23												
B	26												
C	27												
D	30												
d	exothermic (1)	1											
	Total	5											

Question	Answer	Marks	Guidance
13 a	$\text{zinc} + \begin{array}{c} \text{(dilute)} \\ \text{hydrochloric} \\ \text{(acid)} \end{array} \rightarrow \begin{array}{c} \text{zinc} \\ \text{chloride} \end{array} + \text{hydrogen}$	1	any order for reactants any order for products allow unbalanced symbol equation e.g. $\text{Zn} + \text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$ allow mix of name and correct formula
b i	zinc has a greater gradient / iron has a smaller gradient (1) less gas is made with zinc / more gas is made with iron (1)	2	allow reaction with zinc is faster / reaction with iron is slower / takes less time to react
ii	Powder has more surface area / more collisions (per second) / more exposed particles (1)	1	assume answers refer to powder unless lump is specified allow or a lump has less surface area / less collisions (per second) / less exposed particles
iii	any three from: higher temperature / heat (1) greater concentration (1) add a catalyst (1) use a finer powder (1) shake or stir (1)	3	ignore increase pressure
	Total	7	

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