

GCSE

Chemistry B

Unit **B742/01**: Modules C4, C5, C6 (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 2017

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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
L1	Level 1
L2	Level 2
L3	Level 3

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

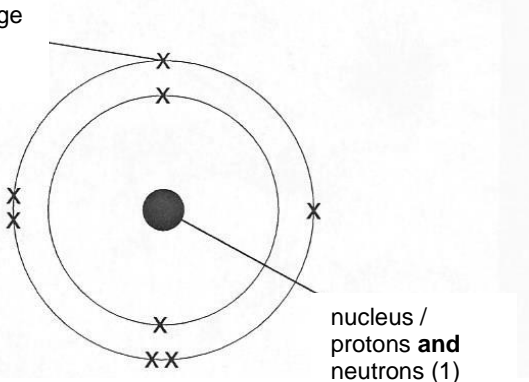
/	= alternative and acceptable answers for the same marking point
(1)	= separates marking points
allow	= answers that can be accepted
not	= answers which are not worthy of credit
reject	= answers which are not worthy of credit
ignore	= statements which are irrelevant
()	= words which are not essential 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	CO ₂ (1)	1	
b	Mg ²⁺ (1)	1	
c	Na (1)	1	
d	MgF ₂ (1)	1	allow F ₂ Mg allow Mg ²⁺ (F ⁻) ₂ not Mg ²⁺ F ₂ ⁻
e	solid sodium chloride does not conduct (1) solution of sodium chloride does conduct (1)	2	allow liquid sodium chloride conducts (1)
Total		6	

Question	Answer	Marks	Guidance
2	<p>any three from:</p> <p>hard (1)</p> <p>high density (1)</p> <p>high tensile strength / strong (1)</p> <p>(good) conductors of electricity (1)</p> <p>(good) conductors of heat (1)</p> <p>malleable (1)</p> <p>ductile / can be made into wires (1)</p> <p>sonorous / when hit makes ringing sound (1)</p> <p>lustrous / shiny (1)</p> <p>high boiling point (1)</p>	3	<p>allow good conductors (1) if no marks awarded for conductors of heat and electricity</p> <p>allow can be hammered into shape (1)</p> <p>ignore bendy / flexible</p> <p>ignore durable / tough / hardwearing / long lasting</p> <p>ignore high melting point (stem of question)</p>
	Total	3	

Question	Answer	Marks	Guidance
3 a	toilet flushing and baths and taps (1)	1	both required
b	21 (%) (1)	1	
c	idea of having fewer baths and/or more showers (1) baths use more water than showers / ora (1)	2	allow collect more rainwater (1) allow put bricks in cistern to reduce toilet flushing (1) allow use water from washing to flush toilet (1) allow idea of flushing toilet less frequently (1) allow other suitable ideas ignore install a water meter
d	lakes (1) rivers (1)	2	allow sea (1) allow streams (1)
	Total	6	

Question	Answer	Marks	Guidance
4 a	<p>electron / charge cloud (1)</p>  <p>nucleus / protons and neutrons (1)</p>	2	<p>allow phonetic spelling of nucleus</p>
b	<p>carbon and tin (1)</p> <p>idea of same vertical arrangement (1)</p>	2	<p>both required</p> <p>allow same number of electrons in outer shell (1) allow they are both in Group 4 (1)</p>
Total		4	

Question	Answer	Marks	Guidance
5	<p>Level 3 Interprets data to identify the correct order of reactivity AND fully explains the reasoning AND writes a correct word equation. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>Level 2 Interprets data to identify the correct order of reactivity AND either gives a simple explanation or attempts a word equation. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>Level 1 Interprets data to identify at least two halogens in correct order of reactivity OR attempts a word equation 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 grade C.</p> <p>allow correct name of halogen or halide instead of Y and X except in order of reactivity</p> <p>Indicative scientific points may include:</p> <p>order of reactivity</p> <ul style="list-style-type: none"> • chlorine > Y > X <p>Explanation</p> <ul style="list-style-type: none"> • idea that chlorine displaces bromine from sodium bromide so more reactive than both X and Y • idea that chlorine displaces iodine from sodium iodide • X displaces nothing so must be least reactive • Y displaces iodine from sodium iodide so more reactive than X • idea that Cl₂ reacts or displaces with two solutions • idea that Y₂ only reacts or displaces with halide containing X / reacts or displaces with one solution • idea that X₂ does not react / no displacement happens <p>Word equation chlorine + sodium bromide → sodium chloride + bromine</p> <p>allow symbol equation which does not need to be balanced</p> <p>Cl₂ + 2NaBr → 2NaCl + Br₂</p> <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>

		6	
Question	Answer	Marks	Guidance
6 a	pipette (1)	1	
b i	15 (cm ³) (1)	1	
ii	20 (cm ³) (1)	1	
c	(starts) red or pink (1) changes to blue or purple (1)	2	
Total		5	

Question	Answer	Marks	Guidance
7 a	cm ³ and dm ³ (1)	1	both required
b	g/dm ³ and mol/dm ³ (1)	1	both required
c	add water (1) but 1 part sugar solution and 3 parts water (2)	2	allow specific quantities e.g. 10 cm ³ of sugar solution added to 30 cm ³ of water (2)
Total		4	

Question	Answer	Marks	Guidance
8 a	0.67 (1)	1	
b	<p>mass is conserved in the reactions / mass of magnesium + mass of oxygen = mass of magnesium oxide (1)</p> <p>as mass of magnesium increases so does the mass of oxygen / mass of magnesium increases so does the mass of magnesium oxide / mass of oxygen increases so does the mass of magnesium oxide (1)</p>	2	<p>allow correct ideas about direct proportionality (2) for example</p> <ul style="list-style-type: none"> • if you double (or any other multiple) the mass of magnesium you double (or the appropriate multiple) the mass of magnesium oxide made (1) • if you double (or any other multiple) the mass of magnesium you double (or the appropriate multiple) the mass of oxygen used (1)
c	<p>any answer between 59.7 and 60.6 (%) (2)</p> <p>but if answer is incorrect then</p> $\frac{0.2 \times 100}{0.33} / \frac{0.4 \times 100}{0.67} / \frac{0.6 \times 100}{1.00} / \frac{1.0 \times 100}{1.67} \quad (1)$	2	
Total		5	

Question	Answer	Marks	Guidance
9 a	Pete is correct (no mark) because reaction faster (at start) / more gas is made (1) Sue is correct (no mark) because half as much gas made (at end) / half the volume is made (at end) (1)	2	not if Pete is incorrect allow ora not if Sue incorrect but allow Sue is not correct since the result at three or four minutes is not half allow ora
b	5 (minutes) (1)	1	allow any value above 4 and up to 5 minutes
c	D (1) (because) idea of greatest volume of gas in first minute (1)	2	
	Total	5	

Question	Answer	Marks	Guidance
10	<p>Level 3 Candidate describes how to prepare and purify a sample of lead iodide AND writes a correct symbol equation. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>Level 2 Candidate mixes solutions together, filters the mixture and EITHER washes or dries the precipitate OR writes a correct symbol equation. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>Level 1 Candidate mixes lead nitrate and sodium iodide solutions OR attempts a symbol equation. 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 grade C. Marks can be awarded from a labelled diagram.</p> <p>Indicative scientific points at level 3 may include in addition:</p> <ul style="list-style-type: none"> • mixing or reacting of solutions • filters off lead iodide / precipitate • washes with water • dries in an oven or on window sill <p>Indicative scientific points at level 2 may include in addition:</p> <ul style="list-style-type: none"> • mixing or reacting of solutions • filters off lead iodide / precipitate • washes with water OR dries in oven or on window sill <p>Indicative scientific points at level 1 may include:</p> <ul style="list-style-type: none"> • mixing or reacting of solutions <p>Symbol equation $\text{Pb}(\text{NO}_3)_2 + 2\text{NaI} \rightarrow \text{PbI}_2 + 2\text{NaNO}_3$</p> <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
		6	

Question	Answer	Marks	Guidance
11 a i	B (1)	1	
ii	A (1)	1	
b	magnesium / Mg ²⁺ (1)	1	allow correct answer ticked, circled or underlined in list if answer line is blank
	Total	3	

Question	Answer	Marks	Guidance
12 a	8 (1)	1	
b	alkanes (1) hydrocarbons (1)	2	allow correct answers ticked, circled or underlined in list if answer lines are blank
c	any two from: (increased risk of) sunburn (1) accelerated ageing of skin (1) skin cancer (1) (increased risk of eye) cataracts (1)	2	allow damage to skin cells (1) ignore just 'skin damage' allow (idea of) mutation in skin (1) ignore just cancer allow cause lens or eyes to go cloudy (1) allow causes damage to the retina (1) ignore just 'eye damage' ignore causes blindness
d	idea that Julie is correct because the ozone hole area is increasing and decreasing even though the world use of CFCs has (generally) declined (1) idea that Phil is incorrect because the (graph shows that) the hole in the ozone layer is bigger in 2015 than in 1989 / ora (1)	2	allow idea that Julie is correct because the ozone hole area increases after the world use of CFCs has (generally) declined (1)
	Total	7	

Question	Answer	Marks	Guidance
13 a	(to provide) electrical power (1)	1	allow idea of providing power for heating / lighting (1) allow to provide water that can be used by astronauts (1)
b	2Zn + O ₂ → 2ZnO formulae (1) balancing - conditional on correct formulae (1)	2	allow any correct multiple, including multiples e.g. 4Zn + 2O ₂ → 4ZnO allow = or ⇒ for arrow not 'and' or & for + allow one mark for correct balanced equation with incorrect use of case, subscript or superscript e.g. 2ZN + O2 → 2znO
Total		3	

Question	Answer	Marks	Guidance
14 a	correct order (1) magnesium zinc iron (Tin)	1	allow correct symbols, i.e. Mg, Zn, Fe
b	copper is deposited on the magnesium strip (1) (because) magnesium is more reactive than copper / copper is less reactive than magnesium / magnesium is higher in the reactivity series (than copper) / copper is lower in the reactivity series (than magnesium) (1)	2	allow solution goes colourless / magnesium turns orange or brown (1) allow magnesium displaces copper / magnesium sulfate formed (1)
c	oxygen and water (1)	1	both required for mark allow correct formulae allow air and water / moist air / damp air (1) allow salty water for water

	Total	4	
Question	Answer	Marks	Guidance
15 a	<p>Level 3 Gives three reasons why washing powder C is the best AND gives at least two advantages of washing clothes at low temperatures Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>Level 2 Gives two reasons why washing powder C is the best AND gives one advantage of washing clothes at low temperatures Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>Level 1 Gives one reason why washing powder C is the best OR gives one advantage of washing clothes at low temperatures 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>Explanations for C Pete is correct because</p> <ul style="list-style-type: none"> • best or excellent stain removal • best or excellent whiteness • best or good for preventing fading <p>ignore just quoting data</p> <p>Advantages of washing clothes at low temperatures:</p> <ul style="list-style-type: none"> • idea that energy is saved • idea that less greenhouse gases are produced • idea that (delicate) fabrics aren't damaged • idea that colours won't run • idea of preventing enzymes (in detergents) denaturing <p>ignore costs less</p> <p>Use the L1, L2, L3 annotations in Scoris. Do not use ticks.</p>
b	<p>(dry cleaning) does not involve water / solvent is not water / washed in organic solvent (1)</p> <p>stain will not dissolve in water / stain will only dissolve in organic solvent (1)</p>	2	<p>ignore references to washing machine</p> <p>allow idea that water will damage fabric (1)</p> <p>ignore references to temperature of wash</p>

	Total	8	
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Question	Answer	Marks	Guidance
16 a i	40 (°C) (1)	1	
ii	solubility decreases as temperature increases / or a (1)	1	assume unqualified answer refers to temperature increasing
iii	yes (no marks) idea that 1 kg can dissolve 2.5 g (1) so 3 kg can dissolve 3 x 2.5 (g) (1)	2	if no = 0 marks for the question no marks for 7.5 kg on its own – marks are for the working out
b	quoting a solubility for carbon dioxide from any temperature (1) and show it is less than the solubility of sulfur dioxide at the same temperature (1)	2	allow much larger y-axis scale (1) allow the (solubility) values for sulfur dioxide are greater than the values for carbon dioxide at all temperatures (2)
c i	as pH (of ocean) goes down the percentage of carbon dioxide (in air) goes up (1)	1	ignore just quoting data

Question	Answer	Marks	Guidance
16 c ii	<p>any two from:</p> <p>as pH (of ocean) goes down the mass of carbon dioxide dissolved (per kg of sea water) goes up (1)</p> <p>as percentage of carbon dioxide (in air) goes up the mass of carbon dioxide dissolved (per kg of sea water) goes up (1)</p> <p>as years increase the pH (of ocean) goes down (1)</p> <p>as years increase the as percentage of carbon dioxide (in air) goes up (1)</p> <p>as years increase the mass of carbon dioxide dissolved (per kg of sea water) goes up (1)</p>	2	<p>allow ora</p>
iii	<p>the mass of carbon dioxide dissolved (per kg of sea water) changes with temperature /</p> <p>solubility of carbon dioxide (in sea water) changes with temperature (1)</p>	1	<p>allow to have a fair test / to control all the variables</p> <p>allow a more general statement about the solubility of gases e.g. solubility of gases change with temperature</p> <p>allow change in temperature changes pH</p> <p>temperature is an important factor is not sufficient</p> <p>not temperature depends on the mass of carbon dioxide</p>
Total		10	

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

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Facsimile: 01223 552553

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