



GCSE

Chemistry B

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

General Certificate of Secondary Education

Mark Scheme for June 2015

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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.




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Annotations

Mark Scheme

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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

ADDITIONAL OBJECTS: You **must** assess and annotate the additional objects for each script you mark. Where credit is awarded, appropriate annotation must be used. If no credit is to be awarded for the additional object, please use annotation as agreed at the SSU.

When you open the script if the message appears that there are additional objects you must check these additional objects.

The additional objects are normally additional sheets of answers that must be marked. You should immediately link each extra answer with the appropriate question using the paper clip icon.

PLEASE ASK YOUR TEAM LEADER IF YOU DO NOT KNOW HOW TO DO THIS.

It is vitally important that all parts of the candidate's answer are marked.

Subject-specific Marking Instructions

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

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Mark Scheme

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Question	Answer	Marks	Guidance
1 a i	3 (1)	1	
ii	5 (1)	1	
b i	copper carbonate → copper oxide + carbon dioxide (1)	1	allow = instead of → not and or & for + allow symbol equation but does not need to be balanced allow mix of correct formulae and words e.g. $\text{CuCO}_3 \rightarrow \text{copper oxide} + \text{CO}_2$ (1) not copper carbonate + heat → copper oxide + carbon dioxide
ii	break down (of a substance) (using heat) (1)	1	allow a reaction which produces two or more substances from one substance (by heating) (1) allow (substance) decomposes (with heat) / break up (of a substance)(with heat) (1) allow cracking at high temperature (1) allow molecules break down / ion molecules break down (1) ignore breaks up bonds not heat particles broken down not breakdown of heat not elements or atoms break down ignore decay / dissolve
c	any two from: high melting point (1) high boiling point (1) conducts electricity (1) ductile / can be drawn into wires (1) malleable / can be worked into shape (1) sonorous / make a ringing noise when hit (1) lustrous / shiny (1) hard (1) high density (1) high tensile strength / strong (1)	2	allow can be hammered into shape (1) ignore bendy / flexible allow dense (1) ignore durable / tough / hardwearing / long lasting
Total		6	

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Question	Answer	Marks	Guidance
2 a i	H ₂ O (1)	1	
ii	Na ⁺ (1)	1	not NA ⁺ not Na
b	12 (1)	1	
c	number of protons + number of neutrons (in an atom) (1)	1	allow number of particles in the nucleus (1)
d	idea of just one symbol (1)	1	allow it is on the periodic table (1) allow it can't be split into two different atoms (1) allow idea that it only has one capital letter (1) allow idea that it is not bonded with another atom (1) allow formula doesn't contain other elements (1)
e	any two from: Dobereiner (1) Newlands (1) Mendeleev (1)	2	
	Total	7	

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Question	Answer	Marks	Guidance
3	<p>Level 3 Candidate applies knowledge to predict more than one correct observation AND names <u>both</u> of the products AND predicts a correct reaction time for rubidium. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>Level 2 Candidate applies knowledge to predict more than one correct observation AND EITHER names one of the products OR predicts a correct reaction time for rubidium. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>Level 1 Candidate applies knowledge to predict <u>one</u> observation OR the name of one product OR predicts a correct reaction time for rubidium. 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>Indicative scientific points may include:</p> <p>Observations</p> <ul style="list-style-type: none"> • melts • moves across the surface (of the water) • catches fire or explodes or sparks • gas given off • alkaline solution made <p>Names of Products</p> <ul style="list-style-type: none"> • hydrogen • rubidium hydroxide <p>Reaction Time</p> <ul style="list-style-type: none"> • any time less than 7 seconds <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
		6	

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Question	Answer	Marks	Guidance
4 a	insoluble materials – filtration and/or sedimentation (1) microbes – chlorination (1)	2	answer must be linked to insoluble solids and microbes allow sieve for insoluble materials (1) allow add chlorine (1) If no marks scored allow filter it or chlorination (1)
b	Pete is right about A but wrong about B (no mark) A contains copper (ions) because it gives a blue (ppt) with sodium hydroxide (1) A contains sulfate (ions) because it gives a white (ppt) with barium chloride (1) B contains iron(III) (ions) because it gives a brown (ppt) with sodium hydroxide (1) B does not contain sulfate (ions) as it does not give a white (ppt) with barium chloride (1)	4	allow Pete is wrong not Pete is wrong about A for marks about A not Peter is correct for B for marks about B copper sulfate goes blue with sodium hydroxide is not sufficient copper sulfate goes white with barium chloride is not sufficient iron(III) sulfate goes brown with sodium hydroxide is not sufficient B is not iron(III) sulfate because it does not go white with barium chloride is not sufficient allow B does not contain sulfate as it does not give a ppt allow A and B both cannot be sulfates since they do not both go white with barium chloride (2)
Total		6	

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Question	Answer	Marks	Guidance
5 a	198 (1)	1	ignore any unit given
b i	0.33 (1)	1	
ii	33 (1)	1	allow ecf from (i) allow 32.32 or 32.3 (1)
c	C ₂ H ₅ (1)	1	allow any order of symbols not C ² H ⁵ / C2H5 / or use of lower case H
Total		4	

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Question	Answer	Marks	Guidance
6 a	carbon dioxide (1)	1	<p>allow CO₂(1)</p> <p>allow correct answer circled, underlined or ticked in list if answer line is blank</p>
b i	<p>any two from:</p> <p>correct piece of apparatus to collect and measure gas e.g. (gas) syringe, upturned measuring cylinder with water or upturned burette with water (1)</p> <p>workable and gas tight (1)</p>	2	<div data-bbox="1288 399 1848 654" data-label="Diagram"> <p>The diagram shows a conical flask containing a reaction mixture, stoppered with a two-hole stopper. A delivery tube is inserted into the stopper and is connected to a gas syringe. The gas syringe is labeled 'gas syringe' and the flask is labeled 'flask'.</p> </div> <p>The measuring apparatus must be graduated and does not need to be assembled. The apparatus does not need to be named if there is no ambiguity from the diagram</p> <p>allow even if the syringe / measuring cylinder is not graduated</p> <p>allow the tube can be a single line</p> <p>ignore if tube does not appear to go through the stopper</p> <p>not the delivery tube must not go in the reaction mixture</p>

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Question	Answer	Marks	Guidance
6 b ii	<p>Level 3 Explains why the volume of gas produced is the same AND Explains the different shapes of the graph in terms of simple reacting particle model Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>Level 2 Explains why the volume of gas produced is the same AND explains that nitric acid is faster than propanoic acid OR Explains why the volume of gas produced is the same AND recognises that nitric acid is a strong acid and/or propanoic acid is a weak acid OR explains that nitric acid is faster than propanoic acid AND recognises that nitric acid is a strong acid and/or propanoic acid is a weak acid OR Explains the different shapes of the graph in terms of simple reacting particle model Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>Level 1 Explains why the volume of gas produced is the same OR Explains that nitric acid is faster than propanoic acid OR recognises that nitric acid is a strong acid and/or propanoic acid is a weak acid 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>Indicative scientific points may include:</p> <p>Volume of gas</p> <ul style="list-style-type: none"> • both use same amount of calcium carbonate • both use same amount of acid • both use same amount of reactants • acid and/or calcium carbonate are the limiting reactants <p>Shapes of graph</p> <ul style="list-style-type: none"> • nitric acid faster than propanoic acid • nitric acid is strong acid and propanoic acid is a weak acid <p>Reacting particle model</p> <ul style="list-style-type: none"> • nitric acid has more hydrogen ions / greater concentration of hydrogen ions • nitric acid has more collisions (per second) • nitric acid has particles closer together <p>ignore nitric acid is more reactive (than propanoic acid)</p> <p>allow ora for propanoic acid</p> <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p> <p>To access level 3 answer must include a particle model explanation?</p>
Total		9	

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Question	Answer	Marks	Guidance
7 a	gas (1)	1	
b	reversible reaction (1)	1	allow reaction that goes both ways / reaction that goes backwards and forwards (1)
c	No idea that graph shows that percentage yield goes up with increasing pressure (1) idea that graph shows that percentage yield goes down as temperature increases (1)	2	No marks for no on its own. allow yes for pressure graph and no for temperature graph – but no marks allow graph shows a positive correlation (1) allow graph shows a negative correlation (1)
Total		4	

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Question	Answer	Marks	Guidance																
8 a	(litmus changes) from blue or purple (1) to red (1)	2	<p>allow one mark if the colours are reversed</p> <p>allow pink for red (1)</p> <p>allow changes from blue to green to red (1)</p> <p>allow sudden change of colour of litmus for one mark if no other mark awarded</p>																
b i	<p>suitable table for all three titrations but no units or titres or numbers (1)</p> <p>BUT</p> <p>table for all three titrations including data, units and titres (2)</p>	2	<table border="1"> <thead> <tr> <th>(Titration number)</th> <th>Rough / 1</th> <th>2</th> <th>3</th> </tr> </thead> <tbody> <tr> <td>final reading / cm³</td> <td>20.1</td> <td>24.1</td> <td>43.1</td> </tr> <tr> <td>Starting reading / cm³</td> <td>0.0</td> <td>5.2</td> <td>24.2</td> </tr> <tr> <td>titre / cm³</td> <td>20.1</td> <td>18.9</td> <td>18.9</td> </tr> </tbody> </table> <p>allow volume of acid instead of titre</p> <p>allow first instead or reading 1 instead of starting</p> <p>allow second or reading 2 instead of final</p> <p>allow the final and starting rows to be reversed.</p> <p>allow similar table with the rows and columns reversed</p>	(Titration number)	Rough / 1	2	3	final reading / cm ³	20.1	24.1	43.1	Starting reading / cm ³	0.0	5.2	24.2	titre / cm ³	20.1	18.9	18.9
(Titration number)	Rough / 1	2	3																
final reading / cm ³	20.1	24.1	43.1																
Starting reading / cm ³	0.0	5.2	24.2																
titre / cm ³	20.1	18.9	18.9																
ii	<p>use titrations 2 and 3 / use the last two titrations (1)</p> <p>titre = 18.9 (1)</p>	2	<p>allow do not use the rough value (1)</p> <p>allow ecf from wrong titres in (b)(i) or from wrong choice of titrations but answer must be to one decimal place e.g if all three readings used then 19.3 (1) and e.g. if rough and 1 taken or rough and 2 taken then 19.5 (1)</p>																
Total		6																	

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Question	Answer	Marks	Guidance
9	<p>any two from:</p> <p>must dilute baby milk because harmful if too concentrated (1)</p> <p>dilute medicines to avoid giving overdoses or avoid harm (1)</p> <p>dilute concentrated fruit squashes to make sure the taste is not too strong (1)</p>	2	<p>ignore can have too many chemicals or preservatives</p> <p>allow idea that doses are weaker or could be harmful if left undiluted (1)</p> <p>ignore progressively dilute heroin to wean addicts off the drug</p> <p>allow if not are highly acidic (1)</p>
	Total	2	

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Question	Answer	Marks	Guidance
10 a	remove food or blood stains (1)	1	<p>allow remove biological stains / remove named foods/ remove protein stains (1)</p> <p>allow digest or break down food or blood stains (1)</p> <p>ignore remove dirt</p> <p>ignore just 'remove stains'</p>
b	<p>any two from:</p> <p>idea of less energy used / cheaper energy costs (1)</p> <p>idea of able to wash more fragile clothes (1)</p> <p>does not shrink or damage clothes (1)</p>	2	<p>not just 'cheaper'</p> <p>allow less carbon dioxide produced (1)</p> <p>allow prevent dye from running (1)</p> <p>allow enzymes only work effectively at low temperatures or enzymes do not denature (1)</p>
Total		3	

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Question	Answer	Marks	Guidance
11 a	hydrogen (1)	1	allow H or H ₂ (1) not hydrogen and oxygen or hydrogen / oxygen
b	2H ₂ + O ₂ → 2H ₂ O correct formulae (1) balancing (1) balancing mark is conditional on correct formulae	2	allow any correct multiple e.g. 4H ₂ + 2O ₂ → 4H ₂ O (2) allow = or ⇒ for arrow not 'and' or & for + allow one mark for correct balanced equation with minor errors in case, subscript and superscript e.g. 2h ₂ + O ² → 2H ₂ o
c	idea that water is the only product (and is non polluting) (1)	1	allow does not make carbon dioxide / does not make greenhouse gases (1) allow water and unused hydrogen and oxygen (1)
d	provides water that astronauts can use / light / lightweight / low density / compact / no moving parts (1)	1	allow idea that makes a usable product i.e. water (for astronauts) / can be used as drinking water ignore efficient / reliable
Total		5	

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Question	Answer	Marks	Guidance
12 a	Y (1) Idea that uses most soap (before boiling to get a lather) (1)	2	If not Y then scores 0
b	Y (1) idea that boiling does not remove any of the hardness / volume of soap does not change after boiling (1)	2	If not Y then scores 0 allow it doesn't take less soap after boiling (1) allow (volume of) soap doesn't change (1)
c	soapless detergents form a lather with hard water / ora (1)	1	allow soapless detergents do not form a scum (1) allow soapless detergents form more lather (with hard water) (1) but ignore more lather is made
d	add washing soda / add sodium carbonate / use an ion exchange resin (1)	1	allow add calgon (1) allow distillation (1)
	Total	6	

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Question	Answer	Marks	Guidance
13 a	as a control / for comparison (1)	1	allow to see if the treatments have an effect (1) allow to see if the treatments made a difference (1) allow to see the difference between treating and not treating (1) allow to see if it would rust if there was no treatment (1)

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Question	Answer	Marks	Guidance
b	<p>Level 3 Identifies the correct order for the effectiveness of the methods of rust prevention AND explains their decision AND describes how painting protects iron from rusting to include the idea of a barrier to both water and oxygen or air. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>Level 2 Identifies the correct order for the effectiveness of the methods of rust prevention with one error or list is in reverse order AND attempts to explain their decision AND gives a simple reason why painting protects iron from rusting. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>Level 1 Identifies the least effective OR identifies most effective method of rust prevention OR gives a simple reason why painting protects iron from rusting. 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 E.</p> <p>Indicative scientific points may include:</p> <p>correct order</p> <ul style="list-style-type: none"> • iron mixed with chromium > iron coated in zinc > painted iron > iron covered in oil <p>Explanation</p> <ul style="list-style-type: none"> • idea that the longer the time before rusting appears the better the treatment <p>How painting protects iron from rusting</p> <ul style="list-style-type: none"> • provides a barrier • stops oxygen or air reaching the surface of the iron • stops water reaching the surface of the iron <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
		7	

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Mark Scheme

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Question	Answer	Marks	Guidance
14 a	formula C (1) because it contains (a) carbon to carbon double bond(s) (1)	2	allow contains C=C (double bonds) (1) must be clear it is a carbon-carbon double bond and not a carbon-oxygen double bond ignore carbon double bond / double carbon bond
b	mixture of two liquids (1) that (normally) do not mix or are immiscible (1)	2	allow a colloid (1) allow oil and water (1)
Total		4	

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Mark Scheme

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Question	Answer	Marks	Guidance
15 a i	2000 (1)	1	
ii	decreases / gets smaller / gets less (1) better pollution controls / introduction of limits to amount of pollution (1)	2	allow use of catalytic converters on cars / less cars (on the road) (1) allow new machinery producing less pollution (1) allow less industrial output / reduction in population / change in fuels used (1) allow more renewable energy sources used (1) allow factories have moved elsewhere allow greater public awareness (1) allow government initiatives (1)
b i	Germany (1) 2320 tonnes (is the greatest) (1)	2	allow when all added together Germany is the most (1) allow Germany has the largest population / Germany is the most industrialised (1)
ii	No any two from: In Germany NH ₃ bigger than SO ₂ (1) In Sweden NH ₃ bigger than SO ₂ (1) In Estonia SO ₂ is the highest value / SO ₂ is higher than NO _x (1) In Poland SO ₂ bigger than NO _x (1)	2	No marks for no on its own. Marks are for the explanations allow only Slovakia and UK show this pattern (1)
iii	$\frac{52}{3600} \times 100$ (1) 1.44 (%) (1)	2	FIRST LOOK AT ANSWER IF ANSWER = 1.44 or 1.4 AWARD 2 MARKS do not allow 1 / 1.45

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Question	Answer	Marks	Guidance
iv	Other countries make more than their share (of ammonia) / Sweden makes less (ammonia) than expected / Sweden makes less (ammonia) per million of population (1)	1	<p>allow Sweden has better anti-pollution laws</p> <p>ignore values are roughly the same</p> <p>allow Sweden makes less than average</p> <p>allow ecf from percentage above 1.9% in (b)(i)</p>
	Total	10	

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