OCR
Oxford Cambridge and RSA

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.

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

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
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

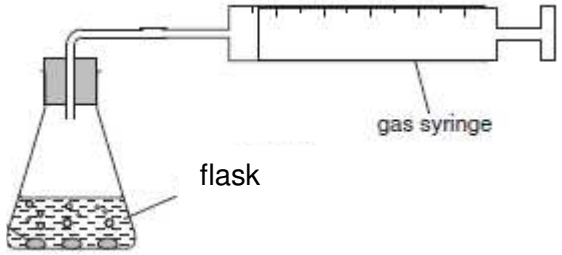
Question	Answer	Marks	Guidance
1 a i	3 (1)	1	
ii	5 (1)	1	
b i	copper carbonate → copper oxide + carbon dioxide (1)	1	**allow** = instead of → **not** and or & for + **allow** symbol equation but does not need to be balanced **allow** mix of correct formulae and words e.g. $CuCO_3$ → copper oxide + CO_2 (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**	

Question	Answer	Marks	Guidance
2 a i	H_2O (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**	

Question	Answer	Marks	Guidance
3	**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) **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) **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) **Level 0** Insufficient or irrelevant science. Answer not worthy of credit. (0marks)	6	**This question is targeted at grades up to C.** **Indicative scientific points may include:** **Observations** • melts • moves across the surface (of the water) • catches fire or explodes or sparks • gas given off • alkaline solution made **Names of Products** • hydrogen • rubidium hydroxide **Reaction Time** • any time less than 7 seconds **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
		6	

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**	

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_2H_5 (1)	1	**allow** any order of symbols **not** C^2H^5 / C2H5 / or use of lower case H
	Total	**4**	

Question	Answer	Marks	Guidance
6 a	carbon dioxide (1)	1	**allow** CO_2 (1) **allow** correct answer circled, underlined or ticked in list if answer line is blank
b i	**any two from:** correct piece of apparatus to collect and measure gas e.g. (gas) syringe, upturned measuring cylinder with water or upturned burette with water (1) workable and gas tight (1)	2	 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 **allow** even if the syringe / measuring cylinder is not graduated **allow** the tube can be a single line **ignore** if tube does not appear to go through the stopper **not** the delivery tube must not go in the reaction mixture

Question	Answer	Marks	Guidance
6 b ii	**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) **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) **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) **Level 0** Insufficient or irrelevant science. Answer not worthy of credit. (0marks)	6	**This question is targeted at grades up to C.** **Indicative scientific points may include:** **Volume of gas** • 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 **Shapes of graph** • nitric acid faster than propanoic acid • nitric acid is strong acid and propanoic acid is a weak acid **Reacting particle model** • nitric acid has more hydrogen ions / greater concentration of hydrogen ions • nitric acid has more collisions (per second) • nitric acid has particles closer together **ignore** nitric acid is more reactive (than propanoic acid) **allow** ora for propanoic acid **Use the L1, L2, L3 annotations in Scoris; do not use ticks.** **To access level 3 answer must include a particle model explanation?**
	Total	**9**	

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**	

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>8 a</td><td>(litmus changes) from blue or purple (1) to red (1)</td><td>2</td><td>allow one mark if the colours are reversed
allow pink for red (1)
allow changes from blue to green to red (1)

allow sudden change of colour of litmus for one mark if no other mark awarded</td></tr>
<tr><td>b i</td><td>suitable table for all three titrations but no units or titres or numbers (1)
BUT
table for all three titrations including data, units and titres (2)</td><td>2</td><td>
<table>
<tr><th>(Titration number)</th><th>Rough / 1</th><th>2</th><th>3</th></tr>
<tr><td>final reading / cm^3</td><td>20.1</td><td>24.1</td><td>43.1</td></tr>
<tr><td>Starting reading / cm^3</td><td>0.0</td><td>5.2</td><td>24.2</td></tr>
<tr><td>titre / cm^3</td><td>20.1</td><td>18.9</td><td>18.9</td></tr>
</table>
allow volume of acid instead of titre
allow first instead or reading 1 instead of starting
allow second or reading 2 instead of final
allow the final and starting rows to be reversed.
allow similar table with the rows and columns reversed</td></tr>
<tr><td>ii</td><td>use titrations 2 and 3 / use the last two titrations (1)

titre = 18.9 (1)</td><td>2</td><td>allow do not use the rough value (1)

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)</td></tr>
<tr><td></td><td>Total</td><td>6</td><td></td></tr>
</table>

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

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

Question	Answer	Marks	Guidance
11 a	hydrogen (1)	1	**allow** H or H_2 (1) **not** hydrogen and oxygen or hydrogen / oxygen
b	$2H_2 + O_2 \rightarrow 2H_2O$ correct formulae (1) balancing (1) balancing mark is conditional on correct formulae	2	**allow** any correct multiple e.g. $4H_2 + 2O_2 \rightarrow 4H_2O$ (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. $2h_2 + O^2 \rightarrow 2H_2o$
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**	

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**	

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)

Question	Answer	Marks	Guidance
b	**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) **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) **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) **Level 0** Insufficient or irrelevant science. Answer not worthy of credit. (0marks)	6	**This question is targeted at grades up to E.** **Indicative scientific points may include:** **correct order** • iron mixed with chromium > iron coated in zinc > painted iron > iron covered in oil **Explanation** • idea that the longer the time before rusting appears the better the treatment **How painting protects iron from rusting** • provides a barrier • stops oxygen or air reaching the surface of the iron • stops water reaching the surface of the iron **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
		7	

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**	

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

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	**allow** Sweden has better anti-pollution laws **ignore** values are roughly the same **allow** Sweden makes less than average **allow** ecf from percentage above 1.9% in (b)(i)
	Total	**10**	

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