OCR
RECOGNISING ACHIEVEMENT

GCSE

Chemistry B

General Certificate of Secondary Education

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

Mark Scheme for June 2013

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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.

1. **Annotations**

Annotation	Meaning
	correct response
	incorrect response
	benefit of the doubt
	benefit of the doubt **not** given
	error carried forward
	information omitted
	ignore
	reject
	contradiction
	Level 1
	Level 2
	Level 3

2. **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.

3. **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)		17 (1)	1	
	(b)		12 (1)	1	
	(c)		Mg **and** Ca / He and Ne(1)	1	both needed **allow** MG and CA / HE and NE **allow** magnesium and calcium / helium and neon answer must be in table
	(d)		O **and** Ne / Mg **and** C*l* (1)	1	both needed **allow** NE / MG and CL / Cl_2 **allow** oxygen / O_2 and neon / magnesium and chlorine answer must be in table
			Total	**4**	

Question			Answer	Marks	Guidance
2	(a)		**any two from:** so results can be replicated (1) so further evidence can be collected (1) idea of peer review (1) idea of gaining credit for (1)	2	 **allow** so the theory can be tested **allow** so the theory can be developed **allow** idea that theory can be proved right or wrong if no other mark awarded award 1 mark for idea of telling others (scientists) what they have found out (1)
	(b)		**any one from:** in Rutherford's theory the atom can be split / Rutherford's theory does not have solid atoms / Rutherford's theory has atoms of mostly space (1) in Dalton's theory atoms could not be split (1)	1	 **allow** presence of nucleus or electrons in Rutherford's theory / smaller particles present **allow** Dalton was unaware that electrons / nucleus exist
	(c)		negative (1)	1	**allow** minus / -1
			Total	**4**	

Question			Answer	Marks	Guidance
3	(a)		**any two from:** because it reacts with water (1) because it reacts with oxygen / because it reacts with air (1) because it is a reactive metal (1)	2	 **allow** so that it does not react / prevent contact with oxygen / air and water (2) **allow** it reacts with moist air or damp air (2) **ignore** prevents corrosion / rusting
	(b)		**Level 3 (5–6 marks)** Candidates recall word equation or an unbalanced symbol equation for the reaction between either caesium or lithium and water. Candidate applies knowledge of the reaction of alkali metals to predict observations and names of products formed in the reaction between caesium and water, including the idea that the reaction with caesium is faster. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Candidate applies knowledge of the reaction of alkali metals to predict an observation **and** gives the name or formulae of a product formed in the reaction between caesium and water. Quality of written communication partly impedes communication of the science at this level. **OR** Candidates recall word equation or an unbalanced symbol equation for the reaction between either caesium or lithium and water. **Level 1 (1–2 marks)** Candidate applies knowledge of the reaction of alkali metals to make a simple observation **OR** names a product formed in the reaction of caesium with water. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to C** **Indicative Scientific points may include** **Word equations** • caesium + water → caesium hydroxide + hydrogen • $Cs + H_2O \rightarrow CsOH + H_2$ (need not be balanced) • lithium + water → lithium hydroxide + hydrogen • $Li + H_2O \rightarrow LiOH + H_2$ (need not be balanced). **Relevant points** • hydrogen made • caesium hydroxide made • bubbles • floats and moves on the surface • gives a flame • gets smaller and forms a colourless solution • faster reaction than with lithium / extremely rapid reaction • caesium is more reactive than lithium • reaction is more explosive.
			Total	**8**	

Question			Answer	Marks	Guidance
4	(a)		yes as the temperature increases the mass decreases / no because from 500 the mass no longer decreases (1) idea that the lower the mass the more carbon dioxide is made / correct link between decrease in mass and the mass of carbon dioxide being made (1)	2	**no mark** for yes or no on its own
	(b)		lime water / calcium hydroxide (solution) (1) goes milky / gives a white precipitate (1)	2	**allow** $Ca(OH)_2$ **allow** goes white / misty / cloudy / creamy
			Total	**4**	

Question			Answer	Marks	Guidance
5	(a)		Ti / V / Cr (1) have melting points above melting point of iron (1)	2	**allow** titanium / vanadium / chromium **allow** vanadium has the highest melting point (2)
	(b)		K (1)	1	**allow** potassium
	(c)		**any two from:** high boiling point (1) (good) thermal conductor (1) (good) electrical conductor (1) high density (1) malleable / flexible (1) ductile (1) lustrous (1) hard (1) high tensile strength (1) sonorous (1) have basic oxides (1) form positive ions (1) form ionic compounds (1)	2	 **ignore** just a good conductor **ignore** just dense **allow** shiny **allow** strong **allow** often react with acids to give hydrogen
			Total	**5**	

Question			Answer	Marks	Guidance
6	(a)		suitable method of collecting gas – graduated gas syringe, measuring cylinder, burette (2)	2	**allow** one mark for collection using apparatus that was not graduated but the method must work
	(b)	(i)	38 – 41 (seconds) (1)	1	
		(ii)	acid or magnesium runs out (1)	1	**allow** reactant(s) run out / used up **ignore** magnesium dissolved
			Total	**4**	

Question			Answer	Marks	Guidance
7	(a)		3rd row – 0.51 (1) 4th row – 0.28 (1)	2	<table><tr><th>mass of magnesium in g</th><th>mass of oxygen used in g</th><th>mass of magnesium oxide made in g</th></tr><tr><td>0.10</td><td>0.07</td><td>0.17</td></tr><tr><td>0.20</td><td>0.14</td><td>0.34</td></tr><tr><td>0.30</td><td>0.21</td><td>0.51</td></tr><tr><td>0.40</td><td>0.28</td><td>0.68</td></tr></table>
	(b)		1.0 (g) (1) 1.7g magnesium is 10x 0.17 so amount of Mg is 0.1 x 10 (1)	2	**allow** 1g explanation must be given for two marks
	(c)		40 (g/mol) (1)	1	**ignore** any unit given
			Total	**5**	

Question			Answer	Marks	Guidance
8	(a)		red / pink (1)	1	
	(b)		add alkali / sodium hydroxide (from the burette) to acid (1) (sodium hydroxide is added) until end point is reached (1) add indicator or named indicator (1)	3	**allow** or until a colour change is seen
	(c)	(i)	$\frac{22.1+22.3+22.2}{3}$ (1) **or** 22.2 (1)	1	
		(ii)	titration 1 is not consistent / only consistently close readings should be included / all the other volumes are close to one another / all the other volumes are within 0.2 cm^3 (1)	1	**allow** titration 1 is a rough titration / titration 1 is inaccurate / it is a practice titration **allow** titration 1 is an outlier or anomaly **allow** it is a very different from the other values e.g. it is (at least) 0.5 cm^3 different **ignore** it does not follow the pattern
			Total	**6**	

Question			Answer	Marks	Guidance
9			**Level 3 (5–6 marks)** Includes an explanation of both a reversible reaction **and** an equilibrium and correctly describes the effect of pressure and temperature on the position of equilibrium. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Includes an explanation of either a reversible reaction **or** an equilibrium and correctly describes the effect of pressure **or** temperature on the position of equilibrium **OR** includes an explanation of both a reversible reaction **and** an equilibrium **OR** correctly describes the effect of pressure and temperature on the position of equilibrium Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Explains what is meant by either a reversible reaction **or** an equilibrium **OR** includes one correct description of the effect of either pressure **or** temperature on the position of equilibrium. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to grade C.** **Relevant points include:** • idea that reversible reactions can proceed in both directions / go forwards and backwards • idea that, at equilibrium, rate of forward reaction equals the rate of the backward reaction • idea that, at equilibrium, concentrations of reactants and products do not change • as the pressure increases the position of equilibrium moves to the right or concentration of products increases or vice versa • as the temperature increases the position of equilibrium moves to the left or the concentration of reactants increases or vice versa. • increase temperature less ammonia • increase pressure more ammonia
			Total	**6**	

Question			Answer	Marks	Guidance
10	(a)		**LOOK FOR ANSWER FIRST OF ALL** **IF concentration = 27.4 (%) OR 27(%) AWARD 2 MARKS** $\frac{19.2}{70} \times 100$ (1)	2	
	(b)		fish (1) **then any one from:** least energy (1) least fat (1) least sodium (1) least carbohydrate (1)	2	**allow** curry because it contains most / a lot of protein (1) **allow** low for least **allow** calories for energy
			Total	**4**	

Question			Answer	Marks	Guidance
11	(a)	(i)	chlorine (1) potassium (1)	2	**allow** Cl_2 / C*l* / CL **not** chloride **allow** K
		(ii)	solid sodium chloride has ions in fixed positions / ions do not move in a solid (1) liquid sodium chloride has ions that move (1)	2	**Ignore** electrons cannot move in a solid **allow** solid has no free ions **allow** liquid sodium chloride has free ions **NOT** electrons can move in a liquid if no other mark scored 1 mark for particles cannot move in a solid but can move in a liquid / liquid has mobile charge carriers but solid does not for one mark

Question			Answer	Marks	Guidance
	(b)		experiments **1** and **3** show that as time doubles mass (of copper made) doubles (1) experiments **3** and **4** show that as the current quadruples, the mass also quadruples (1) **OR** experiments **1** and **2** show that as current doubles mass (of copper made) doubles (1)	2	**allow** reference to the correct data in the table to identify which experiments they are using **allow** when the time doubles and the current stays the same the mass doubles **allow** when the current doubles and the time stays the same the mass doubles **allow** if no other marks awarded then as time and current increase the mass (of copper) increases for one mark
			Total	**6**	

Question			Answer	Marks	Guidance
12	(a)		**any one from:** contains oxygen (1) has other elements other than hydrogen or carbon / has atoms besides hydrogen and carbon (1) does not contain just carbon and hydrogen (1)	1	 **allow** has O in the formula **allow** hydrocarbons contain hydrogen and carbon **only**
	(b)		hydration (1)	1	**allow** other ways of indicating correct response eg ringing or ticking the correct answer but answer line takes precedence
	(c)		**Level 3 (5–6 marks)** Describes how ethanol is made from glucose including how ethanol is separated from the reaction mixture. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** States that fermentation needs yeast or enzymes **and** describe a condition needed for fermentation **OR** describe partly how ethanol is made from glucose including mention of use of yeast and distillation Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** States that fermentation needs yeast or enzymes or catalyst. **OR** gives one condition Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to C** **Indicative scientific points at Level 3 should include:** • use of distillation to obtain pure alcohol. **Indicative scientific points at Levels 1 and 2 may include:** • water required • temperature 25 – 50^{o}C / warm / body temperature • absence of oxygen • reaction catalysed by (enzymes) in yeast. **Indicative scientific points at Level 1 may include:** • yeast needed • enzyme such as zymase needed. • any condition from the list above • distillation to get pure alcohol
			Total	**8**	

Question			Answer	Marks	Guidance
13	(a)		zinc + copper sulfate → copper + zinc sulfate (1)	1	**allow** = instead of → order of reactants and products does not matter **not** and or & in equation **ignore** roman numerals in formula **allow** correct symbol equation even if not balanced $Zn + CuSO_4 \rightarrow Cu + ZnSO_4$
	(b)		correct order (1) (magnesium) zinc iron copper	1	**allow** correct symbols Zn Fe Cu
	(c)		silver is deposited on the copper (strip) (1) because copper is more reactive than silver / silver is less reactive than copper / copper is higher in the reactivity series / silver is lower in reactivity series (1)	2	**allow** solution goes blue / copper turns black **allow** copper displaces silver / copper nitrate formed
			Total	**4**	

Question			Answer	Marks	Guidance
14	(a)	(i)	**B** (1)	1	**allow** other ways of indicating correct response eg ringing or ticking the correct answer
		(ii)	water sample **A** has lots of lather / no scum (1)	1	
	(b)		**any two from** distilling water (1) use of ion exchange (column) (1) adding washing soda / Calgon (1) boiling (1)	2	**ignore** heat the water but **allow** heat water to decompose calcium / magnesium hydrogen carbonate **allow** removing the (soluble) calcium / magnesium ions **ignore** use of water softener / brita or other named filter
			Total	**4**	

Question			Answer	Marks	Guidance
15	(a)		**any two from** (increased) risk of (sun)burn (1) accelerated ageing of skin (1) skin cancer (1) (increased) risk of cataracts (1)	2	 **Ignore** just cancer **allow** damage to eye, **ignore** blindness
	(b)		CCl_3F has 5 atoms and C_2HF_5 has 8 atoms (1)	1	**allow** C_2HF_5 has three more atoms / ora
			Total	**3**	

Question			Answer	Marks	Guidance
16	(a)		(concentration) increases (1) reaches a maximum / later on it decreases (1)	2	
	(b)		any year in the range 1990–1994 (1) because this is the maximum / this is where the concentration stops increasing / this is where the concentration starts decreasing (1)	2	**allow** a year before 1990 if the explanation refers to the idea of a time-lag between the ban and when it has an effect give credit for correct response to second marking point if year range extends just beyond 1994, eg 1995 / 1996
	(c)		**LOOK FOR ANSWER FIRST OF ALL** **IF age = 43 years AWARD 2 MARKS** 1970 is the year having 2.0 (1) so age is 43 years (1)	2	 **allow** ecf from wrong year from graph ie 2013 – year
	(d)		**LOOK FOR ANSWER FIRST OF ALL** **IF year = 2078 AWARD 2 MARKS** in 2003 it is 8.0 so at 50% it will be 4.0 (1) 2078 (1)	2	look for working out on the graph **allow** ecf from incorrect 50% value
	(e)		Concentration of CFC12 is (always) smaller than CFC11 (1)	1	assume unqualified answers refer to CFC12 **allow** ora if specified
	(f)		as ozone decreases CFC increases / ora (1)	1	**allow** when CFC concentration is high ozone is low / ora **allow** when one goes up the other goes down
			Total	**10**	

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