AQA Style

GCSE

COMBINED SCIENCE: TRILOGY

H

Higher Tier Chemistry Paper 1

Mark Scheme

BEYOND SCIENCE

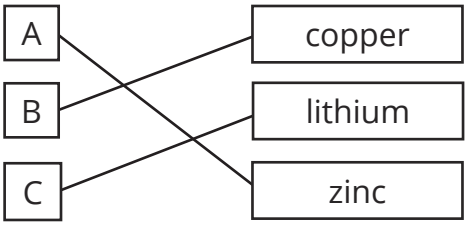
Question 1

Question	Answers	Extra information	Mark
01.1	gas		**1**
01.2	reactivity decreases as you go down the group	Allow converse argument throughout.	**1**
	the outer electrons are farther from the nucleus	Allow more energy levels/ shells.	**1**
	less attraction between the outer electrons and the nucleus	Allow more shielding.	**1**
	(so) the electron is gained less easily		**1**
01.3	potassium chloride	Answers in either order.	**1**
	bromine		**1**
01.4	displacement (reaction)		**1**
01.5	no reaction		**1**
	because iodine is less reactive than bromine	Allow converse.	**1**
Total			**10**

Question 2

Question	Answers	Extra information	Mark
02.1	**Level 3:** There is a clear description of the difference between the two atomic models which is linked to an explanation of the evidence that caused the change in model.		**5-6**
	Level 2: There is a description of **both** atomic models **or** there is a description of one model **and** a description of the evidence from the alpha particle experiment.		**3-4**
	Level 1: There are simple statements that describe a model or the evidence from the alpha particle scattering experiment. Two marks can be given for two valid statements.		**1-2**
	No relevant content.		**0**
	Indicative content: **Plum Pudding Model** • a ball of positive charge • negative electrons embedded in it **Evidence** • alpha particle scattering experiment • mass of the atom is concentrated at the centre • the centre was charged **Nuclear Model** • positively charged nucleus • negatively charged electrons orbiting the outside		
02.2	6		**1**
02.3	same number of protons **or** same number of electrons different numbers of neutrons	If numbers are quoted, they must be correct.	**1** **1**
02.4	$\frac{(20 \times 10) + (80 \times 11)}{100}$ 10.8		**1** **1**
Total			**11**

Question 3

Question	Answers	Extra information	Mark
03.1		Award **2** marks for three correct lines. Award **1** mark for one or two correct lines. If more than one line is drawn from one box, award no marks for that box.	**2**
03.2	$\frac{100}{1000}$ = 0.1 (dm^3) 0.1 × 300 30 (g)	Allow $\frac{300}{1000}$ = 0.3 (g per cm^3). Allow 100 × 0.3. If no other mark awarded, allow 30 000 for **1** mark.	**1** **1** **1**
03.3	(the concentration) increases or (the solution) becomes more concentrated	Allow concentration is higher than 300 grams per dm^3.	**1**
03.4	chlorine		**1**
03.5	$2H^+ + 2e^- \longrightarrow H_2$		**1**
03.6	aluminium oxide must be molten so that the ions can move to the electrodes the melting point of aluminium oxide is high so melting requires a lot of energy it is mixed with cryolite which reduces the temperature/energy required for the process/electrolysis		**1** **1** **1** **1**
Total			**12**

Question 4

Question	Answers	Extra information	Mark
04.1	a shared pair of electrons in the overlap **or** on the intersection between each of the hydrogen atoms and the carbon atom	Electrons can be dots, crosses or e^- in any combination. Ignore any inner shell electrons on the carbon atom. Do **not** allow inner shell electrons on the hydrogen atoms. Do **not** accept if electrons are added to outer shells outside the overlap.	**1**
04.2	$M_r = 16$ $\frac{4}{16}$ (× 100) 25%	 Allow 6.25% for **2** marks.	**1** **1** **1**
04.3	small molecule with weak intermolecular forces that require little energy to overcome	Allow simple/small molecular structure. Allow weak forces between molecules. Allow **1** mark for low boiling point if no other marks awarded.	**1** **1** **1**
04.4	in graphite one electron from each carbon atom is delocalised electrons can move through the structure (and carry the current/charge/electricity) diamond has no delocalised electrons so it cannot conduct electricity	Allow graphite has delocalised/free electrons. Allow each carbon atom forms (covalent) bonds with four other carbon atoms.	**1** **1** **1** **1**
Total			**11**

Question 5

Question	Answers	Extra information	Mark
05.1	ionic (bonding)		**1**
05.2	number of moles of Fe = $\frac{112}{56}$ = 2		**1**
	number of moles of HCl = $\frac{182.5}{36.5}$ = 5		**1**
	6 moles of hydrochloric acid would be needed to react with 2 moles of iron	Allow correct reasoning showing insufficient HCl is available. Allow error carried forward from incorrect calculation of number of moles.	**1**
	(so) hydrochloric acid is the limiting reactant	Allow HCl.	**1**
05.3	iron has been oxidised because the iron atoms have lost electrons	If more than one box is ticked award no marks.	**1**
Total			**6**

Question 6

Question	Answers	Extra information	Mark
06.1	number of moles of $MgCO_3 = \frac{210}{84} = 2.5$ number of moles of HCl $= 2.5 \times 2 = 5$ mass of HCl = 5 × 36.5 = 182.5 (g)	An answer of 182.5 (g) with no working shown scores **4** marks.	**1** **1** **1** **1**
06.2	the gas/carbon dioxide is lost so the measurement/mass does not include all of the products/atoms		**1** **1**
Total			**6**

Question 7

Question	Answers	Extra information	Mark
07.1	(polystyrene is a) good thermal insulator (so) it reduces heat loss to the surroundings	Allow polystyrene is a poor conductor of heat.	**1** **1**
07.2	Any **one** from: • add a lid • use more than one polystyrene cup/nested polystyrene cups • add insulation inside the beaker/between the cup and the beaker • use a temperature probe and data logger to measure the temperature		**1**
07.3	there is a curved line starting at the reactants line which goes up and then down the line for the products is lower than the line for the reactants	Allow curve to start/finish anywhere along reactant/ product lines. The products energy level does not need to be labelled, but if it is then the label must be correct.	**1** **1**
07.4	Na_2SO_4 correct balancing 2NaOH and $2H_2O$		**1** **1**

07.5	(bonds broken) (3 × 522) + (2 × 460) = 2486 (bonds made) (2 × 522) + (2 × 265) + (2 × 460) = 2494 (energy change = bonds broken – bonds made) 2486 – 2494 = (-) 8 (kJ/mol)	Allow calculation of difference between their calculations of energy for bonds broken and bonds made. Ignore energy change sign. An answer of 8 or -8 (kJ/mol) with no working shown scores **3** marks. An incorrect answer for one step does not prevent allocation of marks for subsequent steps.	**1** **1** **1**
07.6	strong acids ionise completely in (aqueous) solution weak acids only partially ionise in (aqueous) solution	Allow all H^+ ions are released into the solution. Allow there are fewer H^+ ions in the solution.	**1** **1**
07.7	dilution by a factor of 100 (pH =) 3	Allow pH changes by 1 when solution is diluted by a factor of 10. Allow pH changes by 2. An answer of 3 scores **2** marks.	**1** **1**
Total			**14**