

Answer scheme

Paper 1

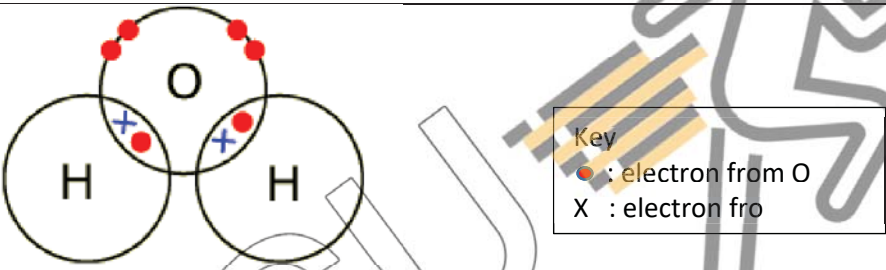
1	2	3	4	5	6	7	8	9	10
B	A	D	C	D	D	C	D	C	B
11	12	13	14	15	16	17	18	19	20
A	D	C	A	B	A	C	A	D	B

Paper 3

Section A

Qn	Answers												
1	<table border="1"> <thead> <tr> <th>substance</th> <th>classification (element, compound or mixture)</th> <th>atoms found within the substance</th> </tr> </thead> <tbody> <tr> <td>hydrogen sulfide</td> <td>compound</td> <td>hydrogen, sulfur</td> </tr> <tr> <td>brass</td> <td>mixture</td> <td>copper, zinc</td> </tr> <tr> <td>limestone</td> <td>compound</td> <td>calcium, carbon, oxygen</td> </tr> </tbody> </table>	substance	classification (element, compound or mixture)	atoms found within the substance	hydrogen sulfide	compound	hydrogen, sulfur	brass	mixture	copper, zinc	limestone	compound	calcium, carbon, oxygen
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brass	mixture	copper, zinc											
limestone	compound	calcium, carbon, oxygen											
2a	$\text{Fe}(\text{CO})_5$												
2b(i)	Iron(II) oxide conducts electricity only in molten form. OR Iron(II) oxide does not conduct electricity as a solid.												
2b(ii)	<table border="1"> <thead> <tr> <th></th> <th>number of protons</th> <th>number of neutrons</th> <th>number of electrons</th> </tr> </thead> <tbody> <tr> <td>${}^{56}_{26}\text{Fe}^{2+}$</td> <td>26</td> <td>30</td> <td>24</td> </tr> <tr> <td>${}^{16}_8\text{O}^{2-}$</td> <td>8</td> <td>8</td> <td>10</td> </tr> </tbody> </table>		number of protons	number of neutrons	number of electrons	${}^{56}_{26}\text{Fe}^{2+}$	26	30	24	${}^{16}_8\text{O}^{2-}$	8	8	10
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2c(i)	Isotopes are <u>atoms of the same element</u> with the <u>same number of protons</u> but <u>different number of neutrons</u> .												
2c(ii)	As the isotopes have <u>the same number of valence electrons</u> , they possess the same chemical properties.												
3a	oxidation state of copper in CuCl = +1 oxidation state of copper in CuCl_2 = +2												
3b	CuCl is oxidised to CuCl_2 as the oxidation state of Cu increases from +1 in CuCl to +2 in CuCl_2 . CuCl is reduced to Cu as the oxidation state of Cu decreases from +1 in CuCl to 0 in Cu.												

3c	The colourless solution turns blue OR A pink/ brown/ reddish-brown solid is formed.
4a(i)	filter funnel
4a(ii)	burette
4a(iii)	electronic balance
4a(iv)	delivery tube/ teat pipette
4b	When the solvent particles become a vapour, they are moving at <u>high speeds</u> in <u>all directions</u> and spaced <u>far</u> apart.
5a	Concentration of HNO ₃ in mol/dm ³ = $0.15 \div \frac{100}{1000} = \underline{1.5 \text{ mol/dm}^3}$ Concentration of HNO ₃ in g/dm ³ = $1.5 \times 63 = \underline{94.5 \text{ g/dm}^3}$
5bi	Number of moles of HNO ₃ = $\frac{100}{1000} \times 0.5 = \underline{0.05 \text{ mol}}$
5bii	Potassium carbonate / K ₂ CO ₃
5biii	<u>Mole ratio</u> K ₂ CO ₃ : KNO ₃ = 1 : 2 Number of moles of KNO ₃ = $0.02 \times 2 = \underline{0.04 \text{ mol}}$
6a	P: copper(II) oxide / CuO Q: hydrochloric acid / HCl R: copper(II) chloride / CuCl ₂ S: copper(II) hydroxide / Cu(OH) ₂
6b	$\text{Ag}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \rightarrow \text{AgCl}(\text{s})$
7ai	The reactivity of Group I metals increases down the group. Down the group, there are <u>more filled electron shells</u> between the nucleus and the valence electron. Hence, there is a <u>greater tendency to lose the valence electron</u> to attain the noble gas electronic configuration.
7aii	It reacts explosively.
7aiii	Hydrogen gas
7bi	Noble gases are/ have <ul style="list-style-type: none"> • colourless • odourless • gases at room temperature and pressure OR have low melting and boiling points • insoluble in water • poor conductors of electricity • low densities (any one)

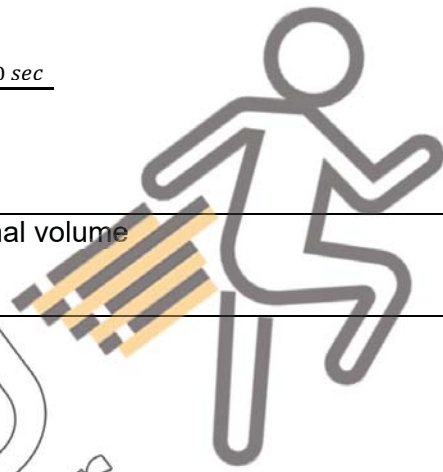
7bii	They have <u>fully-filled valence electron shells</u> and already achieved a stable noble gas electronic configuration.
8a	nitrogen/ N ₂
8b	Carbon dioxide is a greenhouse gas / causes climate change / causes global warming. This results in ice caps melting (or rise in sea levels) / increased flooding / desertification / increased death of corals.
8c	It is formed due to incomplete combustion.
8d	
8ei	A reaction/ a change in which heat is given out to the surroundings.
8eii	Rusting, respiration, neutralisation or any acceptable answer.

Section B

Qn	Answers
9a	M: magnesium N: sulfuric acid
9b	$\text{Mg} + \text{H}_2\text{SO}_4 \rightarrow \text{MgSO}_4 + \text{H}_2$
9c	Steps for making crystals: 1. Add <u>excess</u> magnesium metal to a test tube containing sulfuric acid and stir. 2. <u>Filter</u> to obtain the filtrate, which is magnesium sulfate solution, and remove the excess magnesium metal residue. 3. <u>Heat</u> the filtrate till it is <u>saturated</u> . 4. Allow the saturated solution to <u>cool</u> so that the salt can crystallise. 5. Filter to collect the crystals. Wash the crystals with a little cold distilled water to remove impurities and dry between sheets of filter paper.
9d	Magnesium oxide / magnesium carbonate/ magnesium hydroxide
9ei	Add a few drops of universal indicator solution into each solution. OR Dip a piece of red and blue litmus paper into each solution.
9eii	The solution will turn from green to red. OR The red litmus paper will remain red and the blue litmus paper will turn red.
10a	Limestone is first <u>decomposed by heat</u> to produce carbon dioxide and calcium oxide. $\text{CaCO}_3 (\text{s}) \rightarrow \text{CaO} (\text{s}) + \text{CO}_2 (\text{g})$

	<p>Calcium oxide reacts with the impurities from iron, which is sand, to form <u>molten slag</u>.</p> $\text{CaO (s)} + \text{SiO}_2 \text{ (s)} \rightarrow \text{CaSiO}_3 \text{ (l)}$
10bi	Paint serves as a protective layer that prevents iron from coming into contact with <u>water and oxygen</u> .
10bii	Zinc is more reactive than iron, hence zinc will react with water and oxygen first.
10biii	The ship will rust.
10biv	The presence of sodium chloride in seawater results in the increase of the speed of rusting.
10c	<ul style="list-style-type: none"> ✓ Recycling helps to conserve finite/ non-renewable metal ores. ✓ Recycling helps to save energy, hence less fossil fuels are burnt for energy production. ✓ Recycling helps to save cost of extracting metals. ✓ Recycling reduces pollution as recycling metals creates less pollutants than extracting metals from its ores. ✓ Recycling reduces the need of landfills for metal extraction wastes <p>(any two)</p>
11a	The gas (carbon dioxide) is slightly soluble/ insoluble in water.
11b	a labelled gas syringe
11c(i)	
11c(ii)	All the egg shell (calcium carbonate) had been used up.
11c(iii)	Based on students' graph, Acceptable range of 41 – 43 cm ³

11c(iv)	Based on students' graph $\text{average speed} = \frac{\text{volume at 10 sec} - \text{volume at 0 sec}}{10 \text{ sec}}$
11c(v)	a graph with a higher gradient but same final volume



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