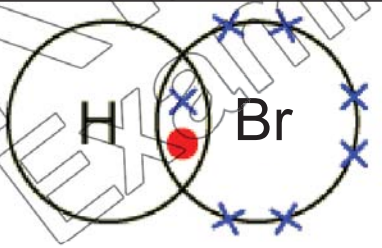
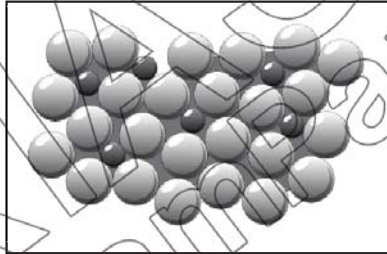


Section A: Structured Questions [45 marks]

1	(a)	description words			[3]
		1 solid 2 ions 3 compound	Students incorrectly state mixture due to the different charges.		
		1 liquid 2 element 3 atom	Students incorrectly state solid due to the connecting atoms or molecule		
		1 gas 2 compound 3 molecule	Students incorrectly state mixture due to the different coloured shapes failing to appreciate the line or as atoms .		
		Any order			
				1 mark for every 3 correct answers	
	(b)	(i)	Presence of mobile ions to act as charge carriers to enable conduction of electricity	Missing key terms of mobile ions act as charge carriers. Students state free electrons which is reserved for metals.	[1]
		(ii)	Heating A till it melts / A is in molten state.	Students state electrolysis and electroplating it as a method.	[1]
			[Total: 5 marks]		
2	(a)	Different solubilities of components in solvent		Many students wrote solubility as a one-word response. Failing to state solubility of the dyes.	[1]
	(b)	Contains blue, purple and orange		Most who got wrong failed to indicate blue as well as they felt it wasn't perfectly in line.	[1]
	(c)	Graphite/Carbon in the pencil is insoluble in the solvent and would not affect the results.		Students failed to answer question of why pencil was used by only stating why ink is not used. Some used 'lead' as a term to explain about the carbon from pencil.	[1]
			[Total: 3 Marks]		
3	(a)			Most could not recall how to draw the bromine electrons properly. Left blank. Legend stated only as hydrogen/bromine	[2]

	(b)				
		(i)	H ⁺	Students wrote equations of HBr or H ⁺ .	[1]
		(ii)	Colourless solutions starts to turn reddish - brown	Students described the displacement reaction itself rather than colour observations. Some stated yellow instead of reddish brown.	[1]
		(iii)	$\text{Cl}_2(\text{g}) + 2\text{Br}^-(\text{aq}) \rightarrow 2\text{Cl}^-(\text{aq}) + \text{Br}_2(\text{aq})$ <p>[1] – correct chemical formula/ions [1] – correct state symbols (2nd mark is only awarded if the 1st mark is given)</p>	Very poorly done. 98% could not do this question and could not balance equation. Need to revisit this topic.	[2]
				[Total: 6 marks]	
4	(a)		<p>Substance reduced: ZnO has been reduced [1] Reason: ZnO has lost an oxygen atom to form Zn / oxidation number of Zn has decreased from +2 in ZnO to 0 in Zn. [1]</p>	<p>substance reduced: most incorrectly state as just Zn. Reason: students are able to explain the loss of oxygen to identify the substance reduced. However, their phrasing is wrong using <i>oxygen has been reduced from zinc oxide</i>.</p>	[2]
	(b)	(i)		<p>most students who made mistakes drew orderly arranged atoms or did not differentiate the size of the atoms enough. the size of the atoms enough. Labelling might help.</p>	[1]
		(ii)	<p>The <u>different sized atoms disrupts the orderly arrangement</u> [1] of pure metal. This makes it <u>harder for the layers to slide over one another</u> [1] thereby making it harder.</p>	<p>Most fail to get the full marks by either omitting <i>different size disrupts orderly arrangement</i>.</p>	[2]
				[Total: 5 marks]	
5	(a)	(i)	<p>Mr of CuO = 64 + 16 = 80</p> <p>No. of moles of CuO = $\frac{0.40}{80}$ = 0.0050 moles</p>		[1]

		(ii)	Mole ratio, CuO:H ₂ is 1:1, hence <u>0.0050 moles of H₂ is required</u>	Students fail to state why the value is same as a(i).	[1]
	(b)	(i)	No. of moles of hydrogen gas used = $\frac{165}{24000}$ = <u>0.006875moles</u> [1] Mole ratio, CuO:H ₂ is 1:1 <u>0.005mole of CuO requires only 0.005 moles of H₂. However, 0.006875moles of H₂ is used. Hence H₂ is in excess.</u> [1] <u>CuO is the limiting reagent.</u> [1]	Quite a large number of students had not done this part as they forgot to change cm ³ to dm ³ . They also had forgotten the formula. Lastly, they incorrectly associate CuO and H ₂ mole directly by looking which is more rather than by looking at amount of H ₂ available vs needed.	[3]
		(ii)	Mr of water vapour = 2 + 16 = 18 Mole ratio of CuO:H ₂ O is 1:1. <u>Hence 0.005mols of water vapour is formed.</u> [1] Mass of water vapour = 0.005 x 18 = <u>0.09g</u> [1]	Quite a fair number of students erroneously used the amount of hydrogen used in a(i). to calculate the number of moles. 1m was given for method mark.	[2]
				[Total: 7 marks]	
6	(a)		True; <u>In the same Period, metallic character of elements decreases from left to right of PT</u> so W is more metallic than Z.	Most students were able to do this question. However the explanation needs improvement as they only say the Z is a halogen rather than showing less character of a metal.	[1]
	(b)		True; <u>On moving down Group I elements, the reactivity increases</u> so V is less reactive than W.	Most students could do this well.	[1]
	(c)		False; <u>On moving down Group I elements, the melting point of the element decreases</u> so V should have a higher melting point than W.	Quite a fair number of students had forgotten trends of Grp 1	[1]
	(d)		False, <u>On moving down any group, the number of electron shells in the atoms of the element increases</u> so X should have less electron shells than Y.	Almost all students were able to answer this question well.	[1]

		(No mark for reason if 'true/false' is incorrect.)																						
				[Total: 4 marks]																				
7	(a)	<p>A: barium chloride</p> <p>B: hydrochloric acid</p> <p>C: barium sulfate</p> <p>D: hydrogen gas</p> <p>E: zinc chloride</p> <p>F: silver chloride</p>	<p>A students could not identify the acid.</p> <p>B students could not identify the acid as HCl. Most placed Barium sulfate in this option.</p> <p>C most left this blank</p> <p>D all students could identify this</p> <p>E some students were able to identify this but was not able to work backwards.</p> <p>F as above</p>	[6]																				
	(b)	$2\text{AgNO}_3(\text{aq}) + \text{ZnCl}_2(\text{aq}) \rightarrow 2\text{AgCl}(\text{s}) + \text{Zn}(\text{NO}_3)_2(\text{aq})$ $\text{BaCl}_2(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + 2\text{HCl}(\text{aq})$ $2\text{HCl}(\text{aq}) + \text{Zn}(\text{s}) \rightarrow \text{ZnCl}_2(\text{aq}) + \text{H}_2(\text{g})$	Most students who could not do the above could not write a balanced equation. Some also wrote nonsensical response as the reaction cannot go through.	[2]																				
				[Total: 8 marks]																				
8	(a)	<table border="1"> <thead> <tr> <th>name of salt</th> <th>formula of salt</th> <th>name of acid used to make salt</th> <th>name of the other compound used to make salt</th> </tr> </thead> <tbody> <tr> <td>sodium sulfate</td> <td>Na_2SO_4</td> <td>sulfuric acid</td> <td>sodium oxide/hydroxide/carbonate</td> </tr> <tr> <td>potassium phosphate</td> <td>K_3PO_4</td> <td>phosphoric acid</td> <td>potassium oxide/hydroxide/carbonate</td> </tr> <tr> <td>silver chloride</td> <td>AgCl</td> <td>hydrochloric acid</td> <td>silver nitrate</td> </tr> <tr> <td>calcium phosphate</td> <td>$\text{Ca}_3(\text{PO}_4)_2$ Few recalled the charge for phosphoric acid</td> <td>phosphoric acid</td> <td>calcium hydroxide</td> </tr> </tbody> </table>	name of salt	formula of salt	name of acid used to make salt	name of the other compound used to make salt	sodium sulfate	Na_2SO_4	sulfuric acid	sodium oxide/hydroxide/carbonate	potassium phosphate	K_3PO_4	phosphoric acid	potassium oxide/hydroxide/carbonate	silver chloride	AgCl	hydrochloric acid	silver nitrate	calcium phosphate	$\text{Ca}_3(\text{PO}_4)_2$ Few recalled the charge for phosphoric acid	phosphoric acid	calcium hydroxide		[3]
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	(b)	The paint and plastic coating acts as a barrier [1] to	Most students could identify why the paint can be used to prevent rusting but quite a large number did not state how it acts as a protective layer/ barrier from the reactants.	[2]																				

		Prevent / minimize oxygen and water from coming into contact with iron directly [1]																	
	(c)	Nitrogen dioxide – motor vehicles Sulfur dioxide – factories / coal/ volcanic eruptions	Most correctly stated the gases SO ₂ but CO was another incorrect response.	[2]															
			[Total: 7 marks]																
	Section B – Free Response Questions [20 marks]			For Examiner's Use															
9	(a)	Solution of sodium chloride and seawater	Many stated swimming pool, tap but the water was only inferred not mentioned.	[1]															
	(b)	Both have same number of protons, 17. They have different number of neutrons, <u>Cl-35 has 18 neutrons while Cl-17 has 20 neutrons.</u>	Many students correctly stated the the same number in proton but did not elaborate on the difference in the number of neutron through calculation to show how they knew the neutron was different.	[1] [1]															
	(c)	(i)	Table 8.1																
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		(ii)	<p>charges [1], electrons [1]</p> <p>Most failed to draw the proper charges and wrongly indicated the outermost shell for magnesium with 2 electrons.</p>																

	(d)	(i)	Hydrogen and chlorine <u>share a pair of electrons</u> between them.	Most wrongly stated by just stating it has covalent bonds without describing further.	[1]
		(ii)	Magnesium chloride is a solid at room temperature as <u>a large amount of energy</u> is required to overcome the <u>strong electrostatic forces of attraction between oppositely charged ions</u> . Hydrogen chloride is a gas at room temperature as only a <u>small amount of energy</u> is required to overcome the <u>weak intermolecular forces of attraction between molecules</u> .	Most students failed to state everything to get full marks. Many confused between structure and bonding. Structure describes how the particles are packed and its movement and arrangement.	[1] [1]
				[Total : 10 marks]	
10	(a)	(i)	Universal indicator in hydrochloric acid is red while it is purple in sodium hydroxide. Reject orange/yellow for hydrochloric acid and blue for sodium hydroxide	Orange and blue are synonymous for weak acid and alkalis	[2]
		(ii)	There are more H ⁺ ions than OH ⁻ ions in acid. [1] There are more OH ⁻ than H ⁺ ions in alkaline solutions. [1]	Acids have both types of ions only that there are more of one type than the other. The converse is true.	[2]
		(iii)	<u>Add magnesium/carbonate/oxide in excess to acid</u> [1] <u>Filter the mixture to obtain magnesium as residue</u> and keep the filtrate [1] <u>Heat the filtrate to saturate the solution and allow it to cool</u> to allow crystals to form [1] Dry the crystals between sheets of filter paper [1]	By drawing out the reaction, students can visualise better and not omit the steps.	[4]
	(b)		No. of moles of NaOH = 0.02x1.5 = 0.03 [1] Concentration of HCl = 0.03 / 0.0250 [1] = 1.20 mol/dm ³		[2]
				[Total: 10 marks]	
11	(a)	(i)	Experiment 1 has a faster rate of reaction than experiment 2. / Experiment 1 took a faster time to complete than experiment 2.	Steeper gradient indicates a faster rate of reaction.	[1]
		(ii)	<u>Powdered</u> calcium carbonate has a <u>larger surface area</u> to volume	Most omitted to state which particle was the smaller one and assumed the reader to	[2]

		ratio / larger total surface area <u>exposed to collisions</u> . [1] Results in <u>higher frequency of effective collisions</u> [1], thus greater speed of reaction.	know. Many used higher probability instead of frequency.	
	(iii)	$\text{CaCO}_3(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{CaCl}_2(\text{aq}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$	Most could not recall reactions between acid and carbonates and the product obtained.	[2]
	(b)	<p>Volume of carbon dioxide released/ (cm³)</p> <p>Time (sec)</p> <p>Experiment 1</p> <p>Experiment 2</p> <p>Experiment 3</p>	Sizeable number of students failed to label the correct term. Students failed to appreciate the half volume compared to first graph. Students did not follow the reaction speed of the first graph.	[1]
	(c) (i)	Exothermic reactions.	Heat increase is exothermic reaction	[1]
	(ii)	<u>Greater energy is given off when bonds of products are formed</u> [1] <u>then energy taken in from surrounding in breaking bonds</u> [1] of reactants. Hence there is a net increase in temperature.	Students failed to appreciate how bonds of existing compounds need to be broken in order to form new bonds. Breaking of bonds require energy which is taken in (endo) from surroundings. Forming of bonds require the energy to be given out to surroundings (exo). Since final is exo it means that more energy is given off than taken in.	[2]
	(iii)	Using a pH meter.	accurately = use instrument to measure	[1]
				[Total: 10 marks]

End of Paper