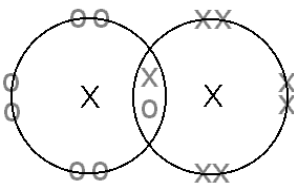
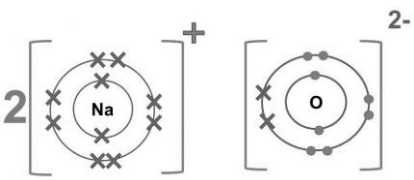




Annual Examinations for Secondary Schools 2022

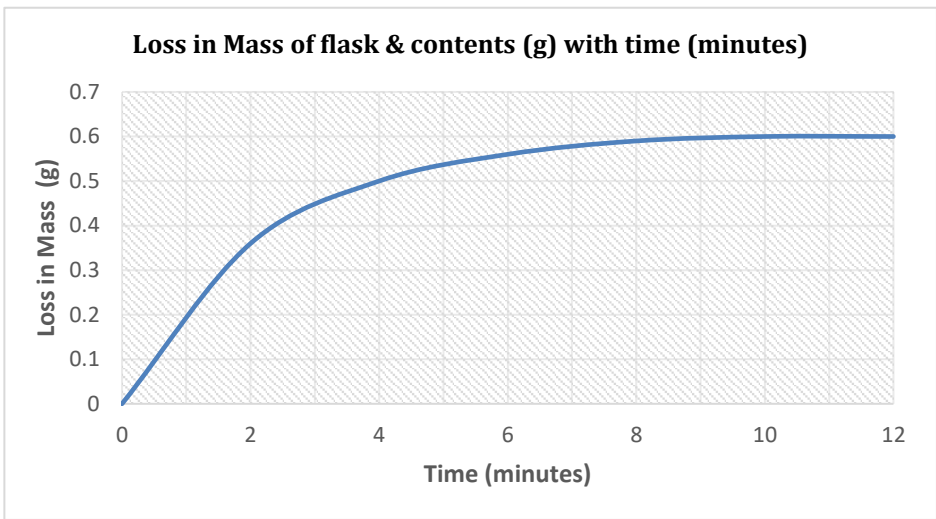
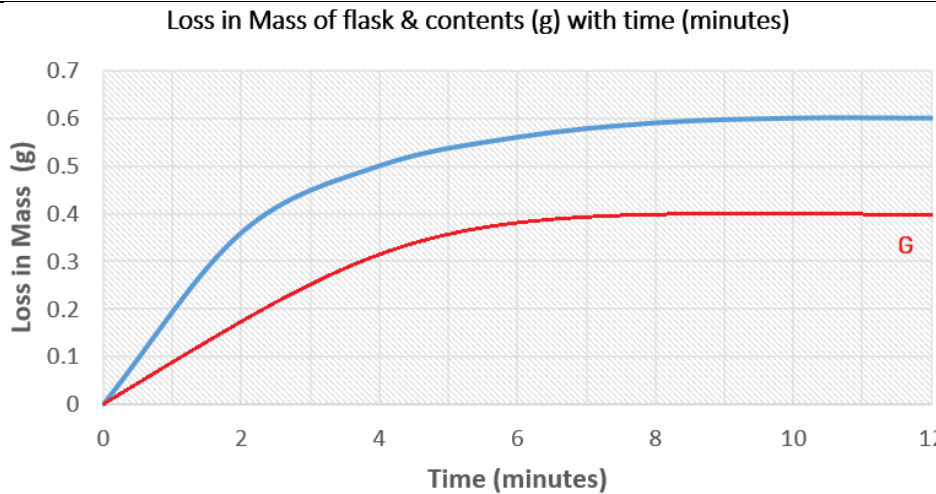
YEAR 11 CHEMISTRY MARKING SCHEME

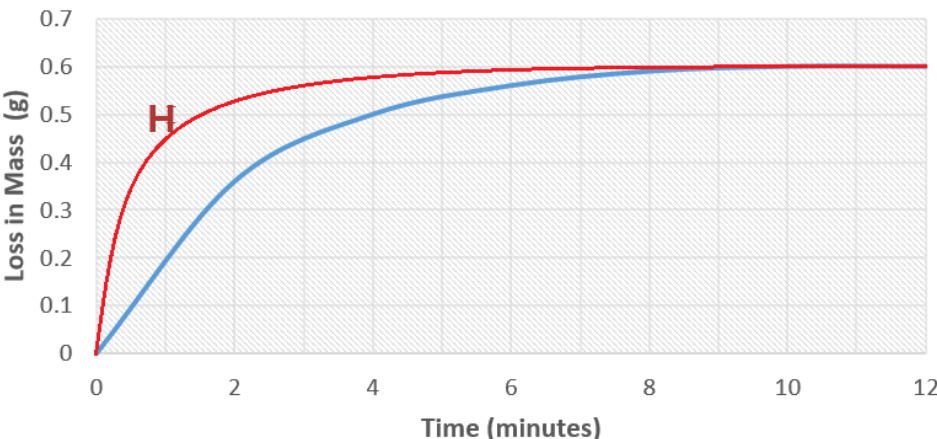
Item		Answer and guidelines	Marks
Section A			
1	a	17 – shows the atomic number (or number of protons) 35 or 37 – shows the atomic mass number (or number of protons + neutrons)	1 1
1	b	Different atoms of the same element with the same atomic number (or same number of protons) but different mass number (or different number of neutrons).	1 1
1	c	X-35 has 18 neutrons while X-37 has 20 neutrons. OR X-37 has 2 more neutrons than X-35.	1
1	d	The chemical behaviour of elements depends on their electron arrangement. Both isotopes have the same electron configuration (2, 8, 7).	1 1
1	e	$(75 \times 35) + (25 \times 37) = 3550$ $3550/100 = 35.5$	1 1
1	f	 <p>1 mark for drawing 2 overlapped atoms of X. 1 mark for showing shared electrons. 1 mark for correct number of unshared electrons. Accept touching atoms of X. Do not accept separated atoms of X joined with a circle.</p>	3
Total			12
2	a	i Fluorine	1
		ii Si	1
		iii Iron	1
<i>Accept other suitable answers.</i>			
2	b	 <p>1 mark for correct symbol of elements. 1 mark for showing charge for O. 1 mark for showing charge for Na. Accept if two ions of Na are correctly drawn instead of only one with a number '2' in front of it as shown.</p>	3
Total			6
3	a	Ba, Sr, Ca, Mg, Be	1

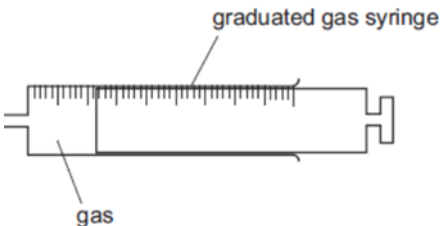
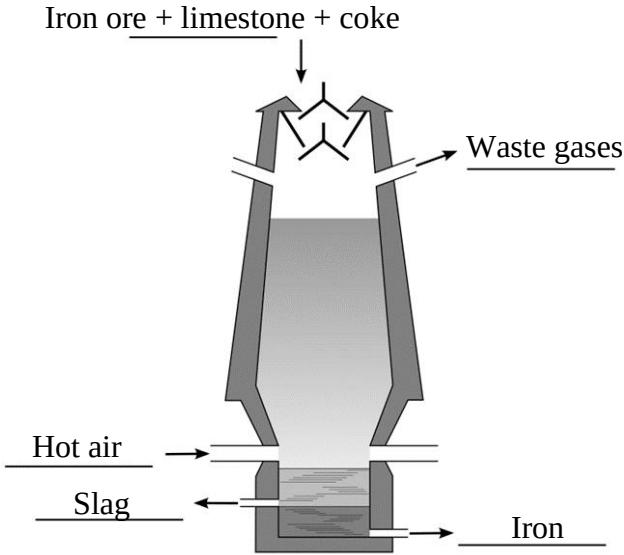
Item			Answer and guidelines	Marks								
3	b		As more electron shells are added and atoms get bigger in size , outer shell electrons experience a decreased attraction pull by the positively charged nucleus and so are more easily lost when the metal reacts.	1								
3	c		$\text{Ca} + 2\text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{H}_2$ <i>1 mark for formulae, 1 mark for balancing.</i>	2								
3	d		Potassium is more reactive with water than calcium.	1								
			Total	6								
4	a		<table><tr><td>Solid A</td><td>iodine</td></tr><tr><td>Solid B</td><td>zinc nitrate</td></tr><tr><td>Solid C</td><td>ammonium chloride</td></tr><tr><td>Solid D</td><td>copper(II) hydroxide</td></tr></table>	Solid A	iodine	Solid B	zinc nitrate	Solid C	ammonium chloride	Solid D	copper(II) hydroxide	1
		Solid A	iodine									
		Solid B	zinc nitrate									
		Solid C	ammonium chloride									
Solid D	copper(II) hydroxide											
				1								
				1								
				1								
4	b		$\text{Ca(HCO}_3)_2 \rightarrow \text{CaCO}_3 + \text{CO}_2 + \text{H}_2\text{O}$ <i>1 mark for formulae, 1 mark for balancing.</i>	2								
			Total	6								
5	a	i	Any hydrogen chloride gas fumes present in the gaseous mixture dissolve in water and are trapped there.	1								
		ii	Concentrated sulfuric acid is a drying agent and absorbs any water vapour present in the gaseous mixture.	1								
		iii	Chlorine is denser than air.	1								
5	b	i	$2\text{Br}^- + \text{Cl}_2 \rightarrow 2\text{Cl}^- + \text{Br}_2$ <i>1 mark for formulae, 1 mark for balancing.</i>	2								
		ii	Chlorine is the most reactive, followed by bromine. Iodine is the least reactive.	1								
			Total	6								
6	a		$\text{Ag} \rightarrow \text{Ag}^+ + \text{e}^-$ <i>1 mark for formulae, 1 mark for balancing.</i>	2								
6	b		$\text{Ag}^+ + \text{e}^- \rightarrow \text{Ag}$ <i>1 mark for formulae, 1 mark for balancing.</i>	2								
6	c		Oxygen	1								
6	d		Purification of copper.	1								
			Total	6								
7	a		Hydrocarbons are compounds which are made up of carbon and hydrogen atoms only.	1								
7	b		Propene is an alkene because it has a double bond between two of its carbon atoms.	1								

Item			Answer and guidelines	Marks
7	c		$ \begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}=\text{C} \\ \quad \quad \\ \text{H} \quad \quad \text{H} \end{array} $ Propene	1
			$ \begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{C}\equiv\text{C}-\text{H} \\ \\ \text{H} \end{array} $ Propyne	1
7	d		$\text{C}_3\text{H}_8 + 5\text{O}_2 \rightarrow 3\text{CO}_2 + 4\text{H}_2\text{O}$ <i>1 mark for formulae, 1 mark for balancing</i>	2
			Total	6
8	a		In a dynamic equilibrium the rate of the forward reaction is equal to the rate of the backward reaction.	1
8	b		The reaction must occur in a closed container.	1
8	c	i	Decrease	1
8		ii	Increase	1
8	d		A catalyst does not affect the equilibrium position. / No change.	1
8	e		Ammonium sulfate or ammonium nitrate. <i>Accept other valid ammonium salts.</i>	1
			Total	6
9	a	i	White, hydrated.	1
		ii	White, soluble, (aluminium / zinc), yellow.	2
		iii	Yellow, lilac.	1
9	b		$\text{Ag}^+ + \text{Br}^- \rightarrow \text{AgBr}$ <i>1 mark for formulae, 1 mark for balancing.</i>	2
			Total	6

Please turn over.

Item			Answer and guidelines	Marks
			Section B	
10	a		 <p>1 mark for correct axis, 1 mark for correct use of scale, 3 marks for points plotted, 1 mark for correct drawing of graph.</p>	6
	b		$2\text{H}_2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{O}_2$ 1 mark for formulae, 1 mark for balancing.	2
	c		$102.00 - 101.40 = \underline{0.60 \text{ g}}$	1
	d		10 minutes	1
	e		From the graph: <u>1.6 minutes</u> . Accept answers 1.6 ± 0.1 minutes.	2
	f		This happens because at the start there is the maximum number of peroxide particles present so the number of successful collisions with the catalyst is very high . With time, as the amount of products increases, the amount of peroxide particles decreases, and so does the number of collisions with the catalyst . Hence, the rate of reaction also decreases with time.	1 1
	g	i	 <p>Accept any sketch that shows a lower rate and lower amount of product.</p>	2
		ii	Since the concentration of the peroxide solution used is less than that used in the original experiment, then less amount of O_2 will be produced. The rate of reaction would also be slower since there are half the number of peroxide particles colliding with the catalyst particles. Accept any explanation that correctly explains lower rate of reaction.	1

Item			Answer and guidelines	Marks
	h		<p>Loss in Mass of flask & contents (g) with time (minutes)</p>  <p>Accept any sketch that shows a higher rate and same amount of product.</p>	2
	i		More surface area increases the frequency of collisions between the reactant particles and the catalyst.	1
			Total	20
11	a		$\underline{1}\text{H}_2\text{SO}_4(\underline{\text{aq}}) + \underline{2}\text{KOH}(\underline{\text{aq}}) \rightarrow \underline{2}\text{H}_2\text{O}(\underline{\text{l}}) + \underline{1}\text{K}_2\text{SO}_4(\underline{\text{aq}})$ 1 mark for state symbols, 1 mark for balancing	2
	b		3, 1, 5, (4), 6, 2. 1 mark each.	5
	c			1
	d		Moles of KOH: 2 moles in 1000 cm ³ ? in 30 cm ³ (2 × 30)/1000 = 0.06 moles of KOH	1 1
	e		Ratio H ₂ SO ₄ : KOH = 1:2 therefore 0.06/2 = 0.03 moles of acid	1 1
	f		Concentration of acid: 0.03 moles in 25 cm ³ ? in 1000 cm ³ (0.03 × 1000)/25 = 1.2 mol dm⁻³	1 1
	g		Sulfuric acid is a strong acid because it ionises completely in solution.	1 1

Item			Answer and guidelines	Marks
	h	i	Gas syringe 	1
		ii	Hydrogen gas is produced. It can be identified as it burns with a squeaky 'pop'.	1
			Total	20
12	a		They form coloured compounds, they and their compounds are good catalysts, and they can occur in more than one oxidation state. <i>Accept any two.</i>	1
	b		Haematite	1
	c		 <i>1 mark each</i>	5
	d		$\underline{1}\text{Fe}_2\text{O}_3 + \underline{3}\text{CO} \rightarrow \underline{2}\text{Fe} + \underline{3}\text{CO}_2$ <i>½ mark each. Accept if instead of 1, no number is written.</i>	2
	e		Carbon monoxide gains an oxygen atom to form carbon dioxide. <i>Accept other interpretations of oxidation.</i>	1
	f		Water and oxygen.	1
	g		Plastic coating. Galvanising. <i>Accept other methods of rust prevention.</i>	1
	h	i	Green	1
		ii	Fe^{2+} loses an electron.	1
		iii	$\text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + \text{e}$ <i>1 mark for formulae, 1 mark for balancing.</i>	2
			Total	20