PEPERIKSAAN PERCUBAAN SPM PERLIS 2020

CHEMISTRY 4541/2
Paper 2

Question Number			Answer	Mark
1	(a)	(i)	Water	1
		(ii)	Sodium Chloride	1
	(b)	(i)	Liquid	1
		(ii)	To achieve duplet electrons arrangement	1
	(c)	(i)	Ionic bond	1
		(ii)	Ion	1
	(d)	(i)	2.8.7	1
		(ii)	HCl	1
		(iii)	Low melting point // exist as gas in room temperature // low boiling point // dissolve in water // dissolve in organic solvent	1
			TOTAL	**9**

2. (a) Atoms of same element that have same number of protons
but different number of neutrons — 1

(b) To detect the leakage of underground pipe//
To detect the blood clot in blood capillary — 1

(c)

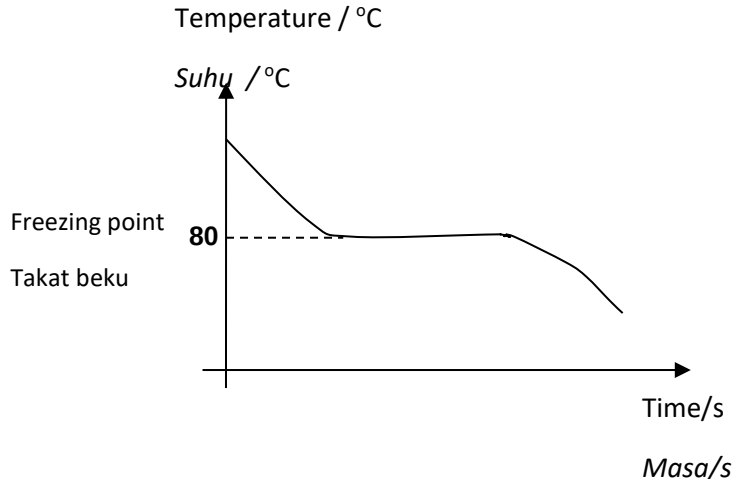
Isotope *Isotop*	Number of elcctron *Bilangan elektron*	Number of neutron *Bilangan neutron*
Sodium-23 *Natrium-23*	**11**	**12**
Sodium-24 *Natrium -24*	**11**	**13**

1

1

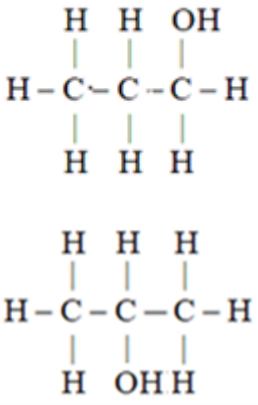
(d) (i) The heat energy absorbed by particles is — 1
use to overcome the forces attraction between particles — 1

(ii)



Corect title and unit — 1
Correct shape of curve — 1
mark freezing ponit — 1

TOTAL — **9**

Question number			Answer	Mark
3	(a)	(i)	Ester	1
		(ii)	Propyl butanoate	1
	(b)	(i)	Esterification	1
		(ii)	Butanoic acid	1
		(iii)	$C_3H_7OH + C_3H_7COOH \rightarrow C_3H_7COOC_3H_7 + H_2O$ correct chemical formulae for reactant and product [1m] balanced equation [1m]	2
	(c)		$C_3H_7OH + \frac{9}{2}O_2 \rightarrow 3CO_2 + 4H_2O$ // $2C_3H_7OH + 9O_2 \rightarrow 6CO_2 + 8H_2O$ correct chemical formulae for reactant and product [1m] balanced equation [1m]	2
	(d)			1 1
			Total	**10**

Question Number			Answer	Mark
4	(a)	(i)	period 2	1
		(ii)	alkali metal	1
		(iii)	T^+	1
	(b)	(i)	more reactive	1
		(ii)	atomic size for Q is bigger// force of attraction between nucleus and electron for atom Q is weaker	1
	(c)	(i)	$4Na + O_2 \rightarrow 2Na_2O$ correct chemical formulae for reactant and product [1m] balanced equation [1m]	2
		(ii)	mol Na 2.3/23= 0.1 [1 m] from the equation 4 mol Na : 1 mol O_2 if 0.1 mol Na : 0.025 mol O_2 [1 m] mass O_2 = 0.025 x 32 =0.8 g [1 m]	3
			TOTAL	10

Question Number			Answer	Mark
5	(a)		positively charged ion	1
	(b)	(i)	Lead (II) iodide / Plumbum (II) iodida	1
		(ii)	yellow precipitate will dissolve when heated yellow precipitate will form again when it is cooled	1 1
		(iii)	$Pb^{2+} + 2\ I^- \rightarrow PbI_2$ correct chemical formulae for reactant and product [1m] balanced equation [1m]	2
		(iv)	from the equation 2 mol I^- : 1 mol PbI_2 if 0.0002 mol I^- : 0.0001 mol PbI_2 [1 m] mass PbI_2 = 0.0001 x 461 = 0.0461g [1 m]	2
	(c)		zinc ion / Zn^{2+}	1
	(d)		1. add excess sodium hydroxide solution into the industrial waste water 2. blue precipitate formed OR 1. add excess ammonia solution into the industrial waste water 2. dark blue solution formed	1 1
			TOTAL	11

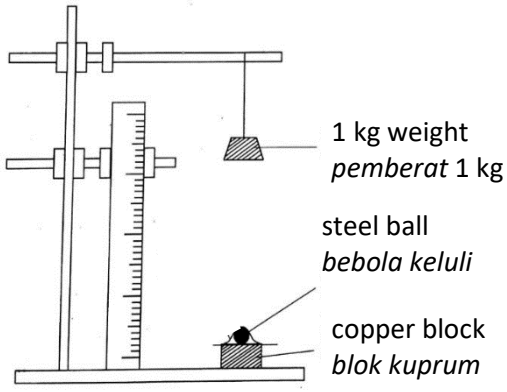
6.	(a)	To reduce heat lost to surrounding// Polystyrene is a good insulator of heat		1
	(b)	$Pb^{2+} + SO_4^{2-} \rightarrow PbSO_4$		1
	(c)	(i)	(50+50) x 4.2 x (32.0 – 28.0) J // 1680 J // 1.68 kJ **(r: without unit)**	1
		(ii)	Number of mole of lead(II) ion n = $\frac{0.5 \times 50}{1000}$ // 0.025 mol **OR** Number of mole of sulphate ion n = $\frac{0.5 \times 50}{1000}$ // 0.025 mol	1
			0.025 mol $PbSO_4$ precipitate produce → 1680 J 1.0 mol $PbSO_4$ precipitate produce → 67200 J **OR** $\frac{1680}{0.025}$ // $-\frac{1.68}{0.025}$	1
			= - 67200 J mol^{-1} // - 67.2 kJ mol^{-1} Heat of precipitation = ΔH = -67.2 kJ mol^{-1} **(r: without unit)**	1
	(d)	(i)	Heat of combustion is heat released when 1 mol of alcohol/fuel is burnt in excess oxygen	1
		(ii)	Range between 3320-3340 kJ	1
		(ii)	1.number of carbon atom increases 2. more carbon dioxide and water are formed 3. more heat released during bond formation	1 1 1
				TOTAL **11**

Question number			Answer	Mark
7	(a)		**Set I:** In dry state, hydroxide ions in solid sodium hydroxide are arranged orderly at fixed position. Dry solid sodium hydroxide does not show alkaline properties. **Set II**: When moist red litmus paper is used/ water is present, sodium hydroxide ionises in water to produce free moving hydroxide ions. Sodium hydroxide shows alkaline properties.	1 1 1 1
	(b)		Sodium hydroxide is strong alkali but ammonia is weak alkali. Sodium hydroxide ionises completely in water but ammonia ionises partially in water. Sodium hydroxide produces high concentration of hydroxide ions but ammonia produces low concentration of hydroxide ions. The higher the concentration of hydroxide ions, the higher the pH value.	1 1 1 1
	(c)	(i)	Dilution $0.1 \times V = 0.02 \times 250$ Volume = 50 cm^3	1 1 1
		(ii)	pH value is lower than 13 Concentration of hydroxide ions decreases. The lower the concentration of hydroxide ions, the lower the pH value.	1 1 1
		(iii)	Neutralisation $H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$ correct chemical formulae for reactant and product [1m] balanced equation [1m] Calculation: Number of mole of NaOH = $\frac{0.02 \times 25}{1000}$ // 0.0005 mol 2 mol of NaOH reacts with 1 mol of H_2SO_4 // 0.0005 mol of NaOH reacts with 0.00025 mol of H_2SO_4 Concentration of H_2SO_4 = $\frac{0.00025 \times 1000}{25}$ mol dm^{-3} // 0.01 mol dm^{-3} **OR** $\frac{M_a \times 25}{0.02 \times 25} = \frac{1}{2}$ M_a = 0.01 mol dm^{-3}	1 1 1 1 1 1 **OR** 1+1 1
				Total **20**

Question number			Answer	Mark
8	(a)	(i)	1. oxidation number for magnesium is +2 2. oxidation number for ferum is +3	1 1
		(ii)	1. $MgCl_2$ is magnesium chloride / magnesium klorida 2. Fe_2O_3 is iron(II) oxide / ferum (II) oksida	1 1
	(b)	(i)	redox//oxidation and reduction	1
		(ii)	1. metal Y is copper 2. metal Z is zinc 3. Mg, Z, Y 4. $2Mg + O_2 \rightarrow 2MgO$ correct chemical formulae reactant & product [1m] balanced equation[1m]	1 1 1 2
	(c)	(i)	1. metal R is Sn // Pb // Cu//Ag 2. metal S is Mg//Al//Zn **Set 1** 3. Iron rusts/corrode 4. Iron is more electropositive than R 5. Fe^{2+} is formed 6. $Fe \rightarrow Fe^{2+} + 2e$ 7. Iron is oxidized **Set II** 8. Iron does not rust 9. Iron is less electropositive than S 10. Presence of OH^- 11. $O_2 + H_2O + 4e \rightarrow 4OH^-$ 12. Metal S is oxidized	1 1 1 1 1 1 1 1 1 1 1 1 max 8
			TOTAL	20

Question Number			Answer	Mark
9	(a)	(i)	▪ Y: (Name of any metal situated above Cu in the electrochemical series) ▪ Z: (Name of any acid) Sample answer: **Y:** Magnesium // Zinc // Aluminium [**Reject**: Sodium // Potassium] **Z:** Hydrochloric acid // Sulphuric acid // Nitric acid [**Accept:** weak acid] ▪ Chemical equation: Correct formula of reactants and products Balanced Sample answer: $Mg + 2HCl \rightarrow MgCl_2 + H_2$	1 1 1 1 4
		(ii)	Experiment I Average Rate of Reaction = 30/10 = 3.0 cm^3s^{-1} Experiment II Average Rate of Reaction = 30/20 = 1.5 cm^3s^{-1} [With correct unit]	1 1 ...2
		(iii)	▪ Rate of reaction in Experiment I is higher than Experiment II ▪ The size of metal Y in Experiment I is smaller than Experiment II // The total surface area of metal Y in Experiment I larger than Experiment II ▪ Frequency of collision between hydrogen ions and atoms of **Y** in Experiment I is higher than in Experiment II ▪ Frequency of effective collision (between the particles) in Experiment I is higher than in Experiment II	1 1 1 1 4

	(b)		Temperature: 1. (20 – 100) cm^3 of (0.1 – 1.0) mol dm^{-3} sodium thiosulphate solution is measured 2. Sodium thiopsulphate solution is then poured into a conical flask 3. The initial temperature of sodium thiosulphate is recorded 4. The conical flask is placed on the top of a piece of white paper marked with "X" 5. 5.0 cm^3 of (0.1 – 1.0) mol dm^{-3} hydrochloric acid is measured 6. The hydrochloric acid is poured quickly into the conical flask. 7. A stopwatch is started immediately 8. The conical flask is swirled throughout the experiment 9. The time taken for the mark "X" to disappear from sight is recorded 10.The experiment is repeated using sodium thiosulphate solution solution at 35°C, 40°C,45°C and 50°C. **OR** Presence of catalyst: 1. (25-50) cm^3 of (0.1-1.0) mol dm^{-3} of hydrochloric acid is measured and poured into a conical flask. 2 About 5.0 g of zinc granules is weigh. 3. A burette is filled with water and inverted into a basin containing water 4 The water level in the burette is adjusted to 50 cm^3 mark. 5. The granulated zinc is added into the conical flask. 6. Immediately the conical flask is closed and connect it using delivery tube to the burette 7. The stopwatch is started. 8. The conical flask is shaken steadily. 9. Record volume of hydrogen gas every 30 seconds interval. 10.The experiment is repeated by adding 5 cm^3 of copper(II) sulphate solution into the reactants mixture.	1 1 1 1 1 1 1 1 1 1 ...10 **OR** 1 1 1 1 1 1 1 1 1 1 ...10
			TOTAL	**20**

10.	(a)		-Cleaning agent Y is more effective than cleaning agent X	1
			-Cleaning agent Y do not form scum in hard water , so it can remove oily stain	1
			-Cleaning agent X form scum in hard water and cannot remove oily stain	1
			-Calcium ions and magnesium ions in hard water react with cleaning agent X to form scum/white precipitate	1
	(b)	(i)	P=bronze **OR** P=brass Q= brass Q=bronze	1 1
			• [Bronze / alloy P] // [Brass / alloy Q /] is harder than it cooper / pure metal • The presence of different sizes of stanum/zinc atoms disrupts the ordely arrangement of atoms in cooper / pure metal • These make the atomic layers of atoms in alloys is harder to slide over one another • The layer of atoms in copper/ pure metal easily slide one another because it contain same size of atoms	1 1 1 1
		(ii)	 Functional diagram labelled diagram Procedure: 1. A steel ball is attached to the surface of the copper block using cellophane tape. 2. A weight with a mass of 1 kg is hung at a height of 50 cm above the steel ball. 3. The weight is then dropped on the steel ball. 4. The diameter of the dent on the surface of the copper block is measured and recorded. 5. Steps 1 to 4 are repeated for two times at different places on the copper block 6. The experiment is repeated by using a [bronze/brass/P/Q] block to replace the copper block.	1 1 1 1 1 1 1 1 1

Type of material *Jenis bahan*	Diameter of dent (cm)			Average diameter of dent (cm)	
	1	2	3		
Copper	a_1	a_2	a_3	$\frac{a1 + a2 + a3}{3}$ // a	1
Bronze/Brass	b_1	b_2	b_3	$\frac{b1 + b2 + b3}{3}$ // b	1

Conclusion

[Bronze / alloy P] // [brass / alloy Q] is harder than coppery — 1

max=10

	TOTAL	**20**