PERCUBAAN SPM PERLIS

ANSWER PAPER 1
TRIAL
SPM 2020

1	A	21	D	41	A
2	C	22	B	42	B
3	C	23	D	43	D
4	D	24	B	44	A
5	D	25	C	45	C
6	A	26	B	46	C
7	A	27	B	47	A
8	A	28	C	48	C
9	C	29	A	49	D
10	A	30	B	50	C
11	B	31	B		
12	C	32	D		
13	D	33	B		
14	D	34	B		
15	B	35	C		
16	A	36	C		
17	D	37	D		
18	B	38	D		
19	B	39	A		
20	C	40	A		

ANALISIS

A : 11
B : 12
C : 14
D : 13

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	1
Sodium-24 *Natrium -24*	11	13	1

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

Temperature / °C

Suhu / °C

Freezing point
Takat beku

80

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Time/s

Masa/s

			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)		$C_3H_7OH + \dfrac{9}{2}O_2 \rightarrow 3CO_2 + 4H_2O$ // $2C_3H_7OH + 9O_2 \rightarrow 6CO_2 + 8H_2O$ 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^+ Telegram @soalanpercubaanspm	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**

4

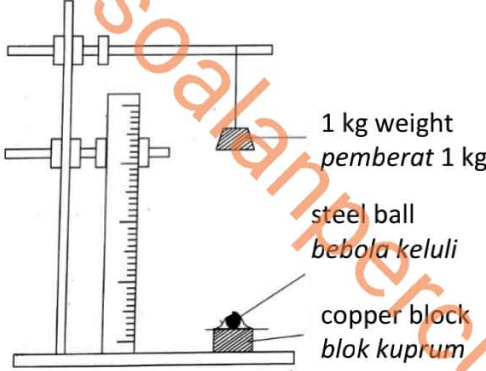|	Question Number		Answer	Mark
5	(a)		positively charged ion	1
	(b)	(i)	Lead (II) iodide / Plumbum (II) iodida	1
		(ii)	yellow precipitate will dissolve when heated	1
			yellow precipitate will form again when it is cooled	1
		(iii)	$Pb^{2+} + 2I^- \rightarrow PbI_2$ Telegram @soalanpercubaanspm correct 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//	1
			Polystyrene is a good insulator of heat	
	(b)		$Pb^{2+} + SO_4^{2-} \rightarrow PbSO_4$	1
	(c)	(i)	$(50+50) \times 4.2 \times (32.0 - 28.0)$ J // 1680 J // 1.68 kJ	
			(r: without unit)	1
		(ii)	Number of mole of lead(II) ion	
			$n = \dfrac{0.5 \times 50}{1000}$ // 0.025 mol	
			OR	1
			Number of mole of sulphate ion	
			$n = \dfrac{0.5 \times 50}{1000}$ // 0.025 mol	
			0.025 mol PbSO4 precipitate produce $\rightarrow$ 1680 J	
			1.0 mol PbSO4 precipitate produce $\rightarrow$ 67200 J	
			OR	1
			$\dfrac{1680}{0.025}$ // $\dfrac{-1.68}{0.025}$	
			$= -67200$ J mol^{-1} // -67.2 kJ mol^{-1}	
			Heat of precipitation $= \Delta H = -67.2$ kJ mol^{-1}	1
			(r: without unit)	
	(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	1
			2. more carbon dioxide and water are formed	1
			3. more heat released during bond formation	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.	1
			Dry solid sodium hydroxide does not show alkaline properties.	1
			Set II: When moist red litmus paper is used/ water is present, sodium hydroxide ionises in water to produce free moving hydroxide ions.	1
			Sodium hydroxide shows alkaline properties.	1
	(b)		Sodium hydroxide is strong alkali but ammonia is weak alkali.	1
			Sodium hydroxide ionises completely in water but ammonia ionises partially in water.	1
			Sodium hydroxide produces high concentration of hydroxide ions but ammonia produces low concentration of hydroxide ions.	1
			The higher the concentration of hydroxide ions, the higher the pH value.	1
	(c)	(i)	Dilution	1
			$0.1 \times V = 0.02 \times 250$	1
			Volume = 50 cm^3	1
		(ii)	pH value is lower than 13	1
			Concentration of hydroxide ions decreases.	1
			The lower the concentration of hydroxide ions, the lower the pH value.	1
		(iii)	Neutralisation	1
			$H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$	
			correct chemical formulae for reactant and product [1m]	1
			balanced equation [1m]	1
			Calculation:	
			Number of mole of NaOH = $\dfrac{0.02 \times 25}{1000}$ // 0.0005 mol	1
			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	1
			Concentration of H_2SO_4 = $\dfrac{0.00025 \times 1000}{25}$ mol dm^{-3} // 0.01 mol dm^{-3}	1
			OR Telegram @soalanpercubaanspm	**OR**
			$\dfrac{M_a \times 25}{0.02 \times 25} = \dfrac{1}{2}$	1+1
			M_a = 0.01 mol dm^{-3}	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)	1
			▪ Z: (Name of any acid)	1
			Sample answer: **Y:** Magnesium // Zinc // Aluminium [**Reject**: Sodium // Potassium] **Z:** Hydrochloric acid // Sulphuric acid // Nitric acid [**Accept:** weak acid] Telegram @soalanpercubaanspm	
			▪ Chemical equation: Correct formula of reactants and products Balanced	1 1
			Sample answer: $Mg + 2HCl \rightarrow MgCl_2 + H_2$	4
		(ii)	Experiment I Average Rate of Reaction $= 30/10 = 3.0 \ cm^3s^{-1}$	1
			Experiment II Average Rate of Reaction $= 30/20 = 1.5 \ cm^3s^{-1}$	1
			[With correct unit]	...2
		(iii)	▪ Rate of reaction in Experiment I is higher than Experiment II	1
			▪ 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	1
			▪ Frequency of collision between hydrogen ions and atoms of **Y** in Experiment I is higher than in Experiment II	1
			▪ Frequency of effective collision (between the particles) in Experiment I is higher than in Experiment II	1
				4

	(b)		Temperature:	
			1. $(20 - 100)$ cm^3 of $(0.1 - 1.0)$ mol dm^{-3} sodium thiosulphate solution is measured	1
			2. Sodium thiopsulphate solution is then poured into a conical flask	1
			3. The initial temperature of sodium thiosulphate is recorded	1
			4. The conical flask is placed on the top of a piece of white paper marked with "X"	1
			5. 5.0 cm^3 of $(0.1 - 1.0)$ mol dm^{-3} hydrochloric acid is measured	1
			6. The hydrochloric acid is poured quickly into the conical flask.	1
			7. A stopwatch is started immediately	1
			8. The conical flask is swirled throughout the experiment	1
			9. The time taken for the mark "X" to disappear from sight is recorded	1
			10. The experiment is repeated using sodium thiosulphate solution solution at 35°C, 40°C, 45°C and 50°C.	1
				...10
			OR	**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.	1
			2 About 5.0 g of zinc granules is weigh.	1
			3. A burette is filled with water and inverted into a basin containing water	1
			4 The water level in the burette is adjusted to 50 cm^3 mark.	
			5. The granulated zinc is added into the conical flask.	1
			6. Immediately the conical flask is closed and connect it using delivery tube to the burette	1
			7. The stopwatch is started.	1
			8. The conical flask is shaken steadily.	1
			9. Record volume of hydrogen gas every 30 seconds interval.	1
			10. The experiment is repeated by adding 5 cm^3 of copper(II) sulphate solution into the reactants mixture.	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	1
			• The presence of different sizes of stanum/zinc atoms disrupts the ordely arrangement of atoms in cooper / pure metal	1
			• These make the atomic layers of atoms in alloys is harder to slide over one another	1
			• The layer of atoms in copper/ pure metal easily slide one another because it contain same size of atoms	1
		(ii)	 1 kg weight *pemberat* 1 kg steel ball *bebola keluli* copper block *blok kuprum*	
				Functional diagram 1 labelled diagram 1
			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

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

Conclusion

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

1

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max=10

	TOTAL	20

Question number	Rubric	Score
1 (a)	[Able to record **all** readings accurately with unit.] **Sample answer :** Set I : 0.7 V Set II : 1.6 V Set III : 2.4 V	3
	[Able to record **all** readings accurately without unit, or able to record **any two** readings correctly with unit, or able to record **all** readings accurately in two decimal places without unit.] **Sample answer :** Set I : 0.7 / 0.70 Set II : 1.6 / 1.60 Set III : 2.4 / 2.40	2
	[Able to record at least **one** reading correctly.]	1
	No response or wrong response	0

Question number	Rubric	Score
1 (b)	[Able to state the **three** variables correctly.] **Sample answer :** Manipulated variable : Pairs of metals//Tin, zinc, magnesium Responding variable : Potential difference//Voltmeter reading Fixed variable : Type of electrolyte//Metal X	3
	[Able to state any **two** variables correctly.]	2
	[Able to state any **one** variable correctly.]	1
	No response or wrong response	0

Question number	Rubric	Score
1 (c)	[Able to state the relationship between the manipulated variable and the responding variable and state the direction correctly.] **Sample answer :** The further the distance between two metals in electrochemical series, the voltmeter reading becomes higher.	3
	[Able to state the relationship between the manipulated variable and the responding variable without stating the direction.] **Sample answer :** The distance between two metals in electrochemical series influences changes the voltmeter reading.	2
	[Able to give an idea of hypothesis.] **Sample answer :** Different metal has a different voltage.	1
	No response or wrong response	0

Question number	Rubric	Score
1 (d)	[Able to give the operational definition for the construction of electrochemical series correctly with the following aspects : **(I)** What should be done **(II)** What should be observed **Sample answer :** Telegram @soalanpercubaanspm When two different metals are dipped into an electrolyte, the voltmeter gives a higher reading shows that the further the distance between two metals.	3
	[Able to give the operational definition for the construction of electrochemical series incompletely with **any** (**one**) aspects either **(I)** or **(II)**] **Sample answer :** Two different metals are dipped into an electrolyte// the voltmeter gives a higher reading shows that the further the distance between two metals.	2
	[Able to give an idea of operational definition for the construction of electrochemical series.] **Sample answer :** The voltmeter gives a reading.	1
	No response or wrong response	0

Question number	Rubric	Score
1 (e)	[Able to arrange the **four** metals correctly.] (accept symbol) **Sample answer :** X, tin, zinc, magnesium.	3
	[Able to arrange **any three** metals in sequence correctly.] (accept symbol) **Sample answer :** X, tin, zinc//Tin, zinc, magnesium	2
	[Able to arrange **any two** metals in sequence correctly.] (accept symbol) **Sample answer :** X, tin // tin, zinc // zinc, magnesium.	1
	No response or wrong response	0

Question number	Rubric	Score
1 (f)(i)	[Able to state the size change of metal X correctly.] **Sample answer :** The size of metal X increases//thicker.	3
	[Able to state the size change of metal X less correctly.] **Sample answer :** The size of metal X changes.	2
	[Able to give an idea of any observation.] **Sample answer :** Magnesium electrode become thinner.	1
	No response or wrong response	0

Question number	Rubric	Score
1 (f)(ii)	[Able to make inference correctly.] **Sample answer :** Copper(II) ion receive electron/discharge to form copper atom.	3
	[Able to make inference less correctly.] **Sample answer :** Copper(II) ion discharge//copper atom formed.	2
	[Able to give an idea of inference based on observation given in f(i).] **Sample answer :** Magnesium dissolved.	1
	No response or wrong response	0

Question number	Rubric	Score
1 (f)(iii)	[Able to state the relationship between the change in the size of X electrode with time correctly.] Telegram @soalanpercubaanspm **Sample answer :** The size of X electrode increases with time.	3
	[Able to state the relationship between the change in the size of X electrode with time less correctly.] **Sample answer :** Telegram @soalanpercubaanspm The size of X electrode directly proportional with time.	2
	[Able to give an idea of size of X electrode.] **Sample answer :** The size of X electrode changes.	1
	No response or wrong response	0

Question number	Rubric	Score
1 (g)	[Able to predict the voltage produced accurately.] Telegram @soalanpercubaanspm **Answer :** 2.0 V//2.0	3
	[Able to predict the voltage produced less accurately.] **Sample answer :** 1.8 [Any value between 1.6 and 2.4]	2
	[Able to give an idea of the voltmeter reading.] **Answer :** Less than 2.4	1
	No response or wrong response	0

Question number	Rubric	Score
1 (h)	[Able to achieve **all** the following aspects correctly : (i) Balance the half equation at zinc electrode. (ii) Balance the half equation at metal X electrode. (iii) Write the overall ionic equation.] **Answer :** At zinc electrode : $Zn \rightarrow Zn^{2+} + \mathbf{2e}$ At metal X electrode : $X^{2+} + \mathbf{2e} \rightarrow X$ Overall ionic equation : $\mathbf{Zn + X^{2+} \rightarrow Zn^{2+} + X}$	3
	[Able to achieve any **two** aspects correctly.]	2
	[Able to achieve any **one** aspect correctly.]	1
	No response or wrong response	0

Question number	Rubric	Score
1 (i)	[Able to classify **all** the four metals correctly.] **Answer :** <table><tr><td>Metal which are more electropositive than copper</td><td>Metal which are less electropositive than copper</td></tr><tr><td>Iron Tin</td><td>Silver Gold</td></tr></table>	3
	[Able to classify any **three** metals correctly.]	2
	[Able to classify any **two** metals correctly.]//Classify inversely	1
	No response or wrong response	0

Question number	Rubric	Score
2 (a)	[Able to give the problem statement correctly.] **Sample answer :** Telegram @soalanpercubaanspm How does when iron in contact with magnesium, rusting of iron inhibit? // How does when iron in contact with copper, rusting of iron increase? // What is the effect of other metal on the rusting of iron?	3
	[Able to give the problem statement less correctly.] **Sample answer :** To investigate the effect of rusting of iron when in contact with more electropositive metal. // To investigate the effect of rusting of iron when in contact with less electropositive metal.	2
	[Able to give an idea of the problem statement.] **Sample answer :** Does rusting occurs when iron in contact with other metal?	1
	No response or wrong response	0

Question number	Rubric	Score
2 (b)	[Able to state **all** the variables correctly.] **Sample answer :** Manipulated variable : Magnesium and copper // Type of metals in contact with iron. Responding variable : Rusting of iron // formation of blue spot/colouration. Fixed variable : Iron nails // jelly/agar-agar solution // electrolyte // temperature // potassium hexacyanoferrate(III) solution.	3
	[Able to state any **two** variables correctly.]	2
	[Able to state any **one** variable correctly.]	1
	No response or wrong response	0

Question number	Rubric	Score
2 (c)	[Able to state the relationship between the manipulated variable and the responding variable correctly and with direction.] **Sample answer :** When iron in contact with magnesium, rusting of iron inhibit // When iron in contact with copper, rusting of iron increase	3
	[Able to state the relationship between the manipulated variable and the responding variable correctly and without direction.] **Sample answer :** When iron in contact with metal, iron does not rust. // When iron in contact with metal, rusting occurs.	2
	[Able to give an idea of the hypothesis.] **Sample answer :** The presence of metal effect rusting.	1
	No response or wrong response	0

Question number	Rubric	Score
2 (d)	[Able to list **all** the materials and apparatus correctly.] **Sample answer :** Materials : Iron nail, magnesium ribbon, copper strip, jelly//agar-agar solution, potassium hexacyanoferrate(III) and phenolphthalein indicator, sand paper. Apparatus : Test-tubes//boiling tubes, test tube rack.	3
	[Able to give a list the following materials and apparatus.] **Sample answer :** Materials : Iron nail, magnesium, copper, jelly solution, potassium hexacyanoferrate (III). Apparatus : Test-tubes//boiling tubes, test tube rack.	2
	[Able to give an idea of materials and apparatus.] **Sample answer :** Materials : Iron nail, magnesium/copper. Apparatus : Boiling tube / beaker / any suitable container.	1
	No response or wrong response	0

Question number	Rubric	Score
2 (e)	[Able to state **all** steps in the procedure correctly.] **Sample answer :** 1. Iron nails, magnesium ribbon and copper strip are cleaned with sand paper. 2. Both iron nails is coiled with different metal. 3. The iron nails are put into two different test tubes. 4. The mixture of jelly solutions, potassium hexacyanoferrate (III) and phenolphthalein indicator is poured into the test tubes. 5. The test tube left aside for one day. 6. Any observation are recorded.	3
	[Able to state the steps 2, 3, 4 and 6]	2
	[Able to state steps 2 and 4]	1
	No response or wrong response	0

Question number	Rubric	Score
2 (f)	[Able to tabulate the data with the following aspects :] 1. Correct titles 2. Complete list of metals **Sample answer :** | Pairs of metal	Observation
---	---
Iron + magnesium	
Iron + copper	Telegram @soalanpercubaanspm		2
	[Able to tabulate the data but incomplete.] **Sample answer :** |	
---	---
Iron + magnesium	
Iron + copper			1
	No response or wrong response	0