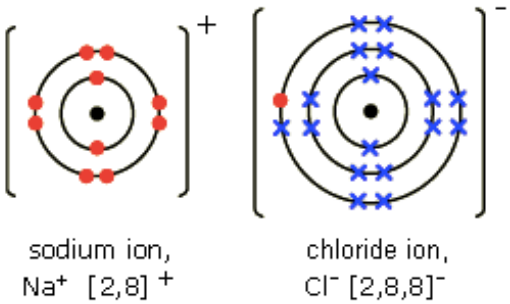
MODUL ULANGKAJI KECEMERLANGAN BERFOKUS SPM 2019

MARKING SCHEME PAPER 2 SET 2 2019

QUESTION	MARK SCHEME	MARKS
1a		
i)	Diffusion of a gas	1
ii)	Discrete molecules of Br_2	1
iii)	The colour moves from left to right. This indicates that the tiny discrete particles have diffused. The particles are constantly moving randomly and diffuse to the whole container.	1 1 1
iv)	The time taken will be shorter // less than 10 minutes	1
b		
i)	1 mole of Ne = 1 x 20 = 20 g 0.5 mole Ne = 0.5 (1 x 20) = 10 g	1
ii)	1 mole of any gas (Avogadro's Law), including NH_3 will occupy 24 dm^3 at room temperature and pressure. There 0.5 mole of NH_3 = 0.5 x 24 = 12 dm^3	1
iii)	All the gases will have the same number of moleculer particles Because all the gas have the same mass of 0.5 mol. 1 mole is always equal to 6.02 x 10^{23} particles at STP (Avogadro's Law)	 1 1
	TOTAL	10

2a		
i)	Y / Chlorine	1
ii)	R / Argon	1
iii)	X / Aluminium	1
iv)	Q, R, Y, X / C, Ar, Cl, Al	1
v)	2.4	1
vi)	Y^-	1
vii)	Has the same number of electron shells filled with electrons	1
viii)	Red litmus paper turns blue	1
b)		E1 SL1
	TOTAL	10

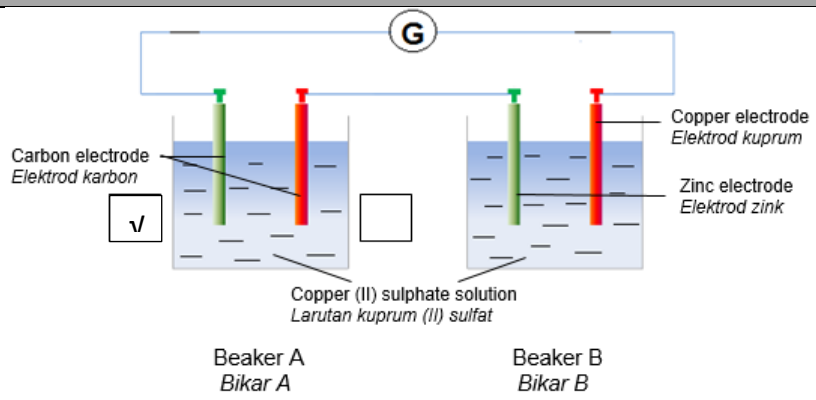
<table>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>3</td><td>(a)</td><td>(i)</td><td colspan="2">Stainless steel</td><td>1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td colspan="2">Strong // shiny // does not rust</td><td>1</td></tr>
<tr><td></td><td>(b)</td><td></td><td colspan="2"><table><tr><td>Type of glass
Jenis kaca</td><td>Composition
Komposisi</td><td>Uses
Kegunaan</td></tr><tr><td>Fused glass
Kaca silika terlakur</td><td>Silicone dioxide / silica</td><td>Laboratory glassware, telescope mirrors, optical fibres and lenses
Peralatan kaca makmal, cermin teleskop, fiber optik, lensa</td></tr><tr><td>Soda lime glass</td><td>Silicone dioxide
Sodium oxide
Calcium oxide
Silikon dioksida
Natrium oksida
Kalsium oksida</td><td>Light bulbs, window glass, drinking glass, mirrors
Mentol lampu, kaca tingkap, gelas minuman, cermin</td></tr></table></td><td>1

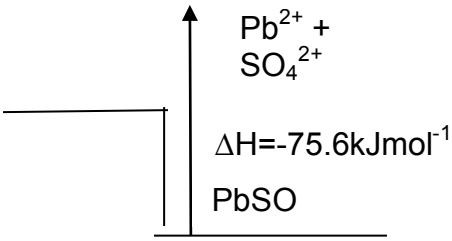
1

1</td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td colspan="2">Used in high- rise buildings // bridges // oil platforms // highway</td><td>1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td colspan="2">Cheap // can be moulded into any shape // stronger // able to withstand tensile forces</td><td>1</td></tr>
<tr><td></td><td>(d)</td><td></td><td colspan="2">Function : to heal wound and skin diseases // as a laxative // to treat diabetes / asthma / epilepsy / ostheoarthritis / sunburn
How it is used : the leaf is used to produce juice and taken orally / rubbed on body</td><td>1

1</td></tr>
<tr><td></td><td>(e)</td><td></td><td colspan="2">Penicillin
Taken under doctor’s prescription // should be finished to make sure all the bacteria are killed // work together with the doctor to find a way to reduce the side effects</td><td>1
1</td></tr>
<tr><td></td><td></td><td></td><td colspan="2">TOTAL</td><td>10</td></tr>
</table>

4	a	(i)	Beaker A : Water	1
			Beaker B : Metylbenzene	1
		(ii)	-the pH of ethanoic acid in Beaker A is 4.0, showing that it is a weak acid -the ethanoic acid molecules in Beaker A dissociates partially in water -the H^+ ions concentration is low	1 1 1
		(iii)	-The ethanoic acid in beaker B consists of ethanoic acid molecules which is neutral -the ethanoic acid molecules are not dissociated to form the H^+ ion	1 1
	b	(i)	-T -Solution T is strong alkali -T dissociates completely in water to produce high concentration of OH^- ions	1 1 1
			TOTAL	10

5	(a)	(i)		1
		(ii)	The left carbon electrode in beaker A is conneted to positive terminal of beaker B	1
		(iii)	Blue solution becomes lighter / pale blue / light blue. Copper(II) ions receive electrons becomes copper atoms	1 1
		(iv)	Oxygen gas Bring / place / put a glowing wooden splinter into a test tube that contain the gas, and it ignites / relights/ rekindles	1 1
	(b)	(i)	Negative terminal : $Zn \rightarrow Zn^{2+} + 2e$ Positive terminal : $Cu^{2+} + 2e \rightarrow Cu$	1 1
		(ii)	Hydrogen gas Hydrogen ion is chosen to discharged at copper electrode to form hydrogen gas	1 1
			TOTAL	10

6(a)	Heat release when 1 mol of lead(II) sulphate is formed from its ion in aqueous	1	
(b)	$Pb^{2+} + SO_4^{2+} \rightarrow PbSO_4$	1	
(c)	(i)lead(II) Ion n=MV/1000 =0.5(25)/1000 =0.0125	1	
	(ii)Sulphate ion n=MV/1000 =0.5(25)/1000 =0.0125	1	
(d)	H=mc□ =50(4.2)(4.5) =945J	1 1	
(e)	0.0125 mol $PbSO_4$ →945J 1mol $PbSO_4$ →75600J Heat of precipitation is -75.6kJmol^{-1}	1 1	
	Energ  Energy level with label reactant and product Correct ΔH with negative sign	1 1	10

No			Mark scheme	Sub mark	Total mark
7	a	i			

			P1: Ice cube has low melting and point// molecules in ice cube are held by weak intermolecular force of attraction. P2: Less heat energy needed to overcome the weak force of attraction. P3: Salts has high melting point// ions in salt are attracted by a strong electrostatic force of attraction. P4: Lots of heat energy needed to overcome the strong force of attraction.	1 1 1 1	4
	b	ii	P1: Ice cube: covalent bond P2: Salt: ionic bond P3: Electron arrangement of hydrogen atom is 1, P4: Electron arrangement of oxygen atom is 2.6 P5: Two hydrogen atoms share a pair of electron with one oxygen atom// one oxygen atom shares two pairs of electron with two hydrogen atoms P6: to achieve stable duplet// octet electron arrangement P7: Sodium atom has the electron arrangement of 2.8.1. P8: Electron arrangement of chlorine atom is 2.8.7 P9: Sodium atom releases one electron to form sodium ion/ Na+. P10: Chlorine atom receives one electron to form chloride ion/ Cl-. P11: to achieve stable octet electron arrangement P12: Sodium ion/ Na+ and chloride ion/ Cl- are attracted by a strong electrostatic force of attraction.	1 1 1 1 1 1 1 1 1 1 1 1	Max 10
	c	i	Solvent W: water Solvent X: tetrachloromethane/ methylbenzene/ diethyl eter/ cyclohexane [a: suitable organic solvent]	 1 1	2
		ii	PI: Table salt/ sodium chloride can conduct electricity in solvent W P2: Table salt/ sodium chloride in solvent W exists as free moving ions P3: Table salt/ sodium chloride in solvent X cannot conduct electric. P4: Table salt/ sodium chloride in solvent X has no free moving ions/ ions in a fix position/Table salt cannot dissolve in solvent X	1 1 1 1	4
				TOTAL	**20**

8	(a)	(i)		
			Set I	Set II

<table>
<tr><td></td><td></td><td>
<table>
<tr><td>Similarity</td><td>It involves heating</td><td>It involves heating</td></tr>
<tr><td></td><td>The reaction is between a gas and a solid.</td><td>The reaction is between a gas and a solid.</td></tr>
<tr><td>Difference</td><td>Metal oxide is formed.</td><td>Metal is formed.</td></tr>
<tr><td></td><td>Metal is reacted with oxygen gas.</td><td>Metal is reacted with hydrogen gas.</td></tr>
<tr><td></td><td>The mass of the solid increases.</td><td>The mass of the solid decrease.</td></tr>
</table>
</td><td>1
1

1
1

1
1

1
1</td><td>max 6</td></tr>
<tr><td></td><td></td><td>(ii)
1 mol of CuO produced 1 mol of Cu
0.1 mol CuO produced 0.1(1) / 1= 0.1 mol Cu

Mass of Cu = 0.1 x 64 = 6.4g</td><td>1
1

1</td><td>3</td></tr>
<tr><td></td><td></td><td>(iii)
Hydrogen</td><td>1</td><td>1</td></tr>
<tr><td></td><td>(b)</td><td>(I) Formula that show the actual number of atoms of each element in a compound</td><td>1</td><td>1</td></tr>
<tr><td></td><td></td><td>(ii) $C_6 H_{12} 0_6$</td><td>1</td><td>1</td></tr>
<tr><td></td><td>I</td><td>(i)
<table>
<tr><td>Element</td><td>C</td><td>H</td></tr>
<tr><td>Mass (g)</td><td>14.5-2.5= 12.0</td><td>2.5</td></tr>
<tr><td>Numbers pf moles</td><td>12/12</td><td>2.5/1</td></tr>
<tr><td>Mole ratio</td><td>2</td><td>5</td></tr>
</table>
Empirical Formula is C_2H_5</td><td>1

1
1</td><td></td></tr>
<tr><td></td><td></td><td>(ii) 1.12 dm^3 of gas Y has mass of 2.9 g

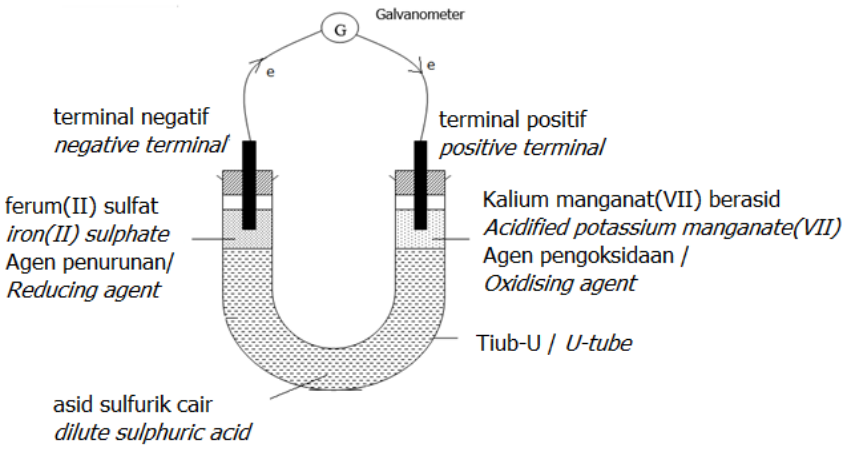
1 mole of gas will have
22.2/1.12 x 2.9 g = 58 g</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(iii) ($C_2 H_5$)n = 58
[2 (12) + 5 (1)]n = 58
29n = 58
n=2
Molecular formula is C_4H_{10}</td><td>1

1
1</td><td>8</td></tr>
<tr><td></td><td></td><td>TOTAL</td><td></td><td>20</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
</table>

<table>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>9</td><td>(a)</td><td>Effect : Corrodes buildings made from limestone or metal // Increase acidity of soil // increase acidity of rivers and lakes
Kesan: mengkakis bangunan yang diperbuat daripada batu kapur atau</td><td>1</td></tr>
</table>

		logam // meningkatkan keasidan tanah // meningkatkan keasidan sungai dan tasik Raw material: Limestone *Bahan mentah: Batu kapur* Chemical equation: $CaCO_3 + SO_2 \rightarrow CaSO_3 + CO_2$	1 1+1
	(b)	Solid P : Copper(II) carbonate *Pepejal P: kuprum(II) karbonat* Solid Q: Copper(II) oxide *Pepejal Q: kuprum(II) oksida* Solution R: Copper(II) sulphate *Larutan R: kuprum(II) sulfat* Gas Y: Carbon dioxide *Karbon dioksida* Reaction I: Displacement of metal *Tindak balas I: penyesaran logam* Colour of solid T: Brown *Warna pepejal T= Perang*	1 1 1 1 1 1
	(c)	Solid X: Magnesium powder // magnesium oxide *Pepejal X: serbuk magnesium // magnesium oksida* Procedure: *Prosedur:* 1. Tuangkan 150 cm^3 larutan asid hidroklorik cair ke dalam sebuah bikar dan panaskan larutan perlahan-lahan. *Pour 150 cm^3 of dilute hydrochloric acid into a beaker and heat the solution gently.* 2. Tambahkan serbuk magnesium oksida sedikit demi sedikit sehingga berlebihan dan kacaukan campuran menggunakan rod kaca. *Add magnesium oxide powder little by little until in excess and stir the mixture using glass rod.* 3. Turaskan campuran. Hasil turasan adalah larutan magnesium klorida. *Filter the mixture. The filtrate formed is magnesium chloride solution.* 4. Persamaan kimia: / *chemical equation:* $MgO + 2HCl \rightarrow MgCl_2 + H_2O$ 5. Tuangkan 50 cm^3 hasil turasan/magnesium klorida ke dalam sebuah bikar. *Pour 50 cm^3 of the filtrate/magnesium chloride into a beaker.* 6. Tuangkan 50 cm^3 larutan kalium karbonat ke dalam bikar yang sama. *Pour 50 cm^3 of potassium carbonate solution into into the same beaker.* 7. Kacaukan campuran menggunakan rod kaca dan turaskan campuran *Stir the mixture using glass rod and filter the mixture.* 8. Bilaskan mendakan magnesium karbonat menggunakan air suling. *Rinse the magnesium carbonate precipitate using distilled water* 9. Keringkan mendakan magnesium karbonat menggunakan dua kertas turas. *Press the magnesium carbonate precipitate between two filter papers.* 10. Persamaan kimia: / *Chemical equation:* $MgCl_2 + K_2CO_3 \rightarrow MgCO_3 + 2KCl$	1 Max 9
		Total	20

10	(a)	Example: Displacement of iodine from potassium iodide solution by chlorine *Contoh: Penyesaran iodin daripada larutan kalium iodida oleh klorin*	
		Chemical equation: $Cl_2 + 2KI \rightarrow 2KCl + I_2$ *Persamaan kimia:*	1
		Chlorine, Cl_2 accept electron and is reduced to chloride ion, Cl^- *Klorin, Cl_2 menerima elektron dan diturunkan kepada ion klorida, Cl^-*	1
		Iodide ion, I^- release electron and is oxidised to iodine, I_2 *Ion iodida, I^- mendermakan elektron dan dioksidakan kepada iodin, I_2*	1
		Oxidation and reduction occur simultaneously. Therefore, displacement of halogen is a redox reaction. *Pengoksidaan dan penurunan berlaku serentak. Maka, penyesaran halogen adalah tindak balas redoks.*	1
	(b)	Changing of Fe^{2+} ions to Fe^{3+} ions *Pertukaran ion Fe^{2+} kepada ion Fe^{3+}* • Add oxidising agent: Bromine water *Tambahkan agen pengoksidaan: Air bromin*	1
		• Oxidation half equation: $Fe^{2+} \rightarrow Fe^{3+} + e$ *Persamaan setengah pengoksidaan:*	1
		Oxidation number of iron increases from +2 to +3. Oxidation occurs. *Nombor pengoksidaan ferum bertambah daripada +2 kepada +3. Pengoksidaan berlaku.*	1 1
		• Reduction half equation: $Br_2 + 2e \rightarrow 2Br^-$ *Persamaan setengah penurunan:*	1
		Oxidation number of bromine decreases from 0 to -1. Reduction occurs. *Nombor pengoksidaan bromin berkurang daripada 0 kepada -1.*	1
		• Oxidation and reduction occur simultaneously. *Pengoksidaan dan penurunan berlaku serentak.*	1
		OR / *ATAU* Changing of Fe^{3+} ions to Fe^{2+} ions *Pertukaran ion Fe^{3+} kepada ion Fe^{2+}* • Add reducing agent: Zinc powder *Tambahkan agen penurunan: Serbuk zink*	
		• Reduction half equation: $Fe^{3+} + e \rightarrow Fe^{2+}$ *Persamaan setengah penurunan:*	
		Oxidation number of iron decreases from +3 to +2. Reduction occurs. *Nombor pengoksidaan ferum berkurang daripada +3 kepada +2. Penurunan berlaku.*	
		• Oxidation half equation: $Zn \rightarrow Zn^{2+} + 2e$ *Persamaan setengah pengoksidaan:*	
		Oxidation number of zinc increases from 0 to +2. Oxidation occurs. *Nombor pengoksidaan zink bertambah daripada 0 kepada +2.*	
		• Oxidation and reduction occur simultaneously. *Pengoksidaan dan penurunan berlaku serentak.*	

	(c)	Agen pengoksidaan: Kalium manganat(VII) berasid *Oxidising agent: Acidified potassium manganat(VII)* Rajah: / *Diagram:*  Prosedur: / *Procedure :* 1. Apitkan tiub-U kepada sebuah kaki retort. *Clamp a U-tube to a retort stand.* 2. Tuangkan asid sulfurik cair ke dalam tiub-U sehingga parasnya 6 cm daripada mulut tiub-U. *Pour dilute sulphuric acid into the U-tube until its levels are 6 cm away from the mouths of the U-tube.* 3. Masukkan larutan ferum(II) sulfat 0.5 mol dm^{-3} berhati-hati ke dalam lengan kiri tiub-U menggunakan penitis sehingga mencapai ketinggian 3 cm. *Add 0.5 mol dm^{-3} iron(II) sulphate solution carefully into the left arm of the U-tube using dropper until it reaches the height of 3 cm.* 4. Masukkan larutan kalium manganat(VII) berasid berhati-hati ke dalam lengan kanan tiub-U menggunakan penitis sehingga mencapai ketinggian 3 cm. *Add acidified potassium manganate(VII) solution carefully into the right arm of the U-tube using dropper until it reaches the height of 3 cm.* 5. Celupkan elektrod karbon ke dalam setiap lengan tiub-U. *Dip carbon electrode into each arm of the U-tube.* 6. Sambungkan kedua-dua elektrod kepada galvanometer menggunakan wayar penyambung. *Connect both electrodes to a galvanometer using connecting wire.* 7. Biarkan susunan radas selama 30 minit dan rekod pemerhatian. *Left the set up aside for 30 minutes and record the observation.* | Terminal	Pemerhatian *Observation*
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Terminal negatif *Negative terminal*	Larutan hijau bertukar ke perang *Green solution turns brown*		1 1+1 1 1 1 1 1 1 1 Max 5 1

		Terminal positif *Positive terminal*	Larutan ungu bertukar ke tak berwarna. *Purple solution turns colourless.*	1
		Total		20