

4541/1 (PP)
Chemistry
Kertas 1
Peraturan
Pemarkahan
November
2021



MAKTAB RENDAH SAINS MARA

PEPERIKSAAN AKHIR SIJIL PENDIDIKAN MRSM 2021

CHEMISTRY

Kertas 1

Peraturan Pemarkahan

Untuk kegunaan pemeriksa sahaja

Peraturan pemarkahan ini mengandungi 3 halaman bercetak

Table of Specification SPMRSM 2021

No.	Construct	Topic	Type Of Item	Key
1	Remembering	F 4 LA2	M. Choice	D
2	Remembering	F 4 LA3	M. Choice	C
3	Remembering	F 4 LA4	M. Choice	C
4	Remembering	F 4 LA5	M. Choice	A
5	Remembering	F 4 LA6	M. Choice	D
6	Remembering	F 4 LA6	M. Choice	B
7	Remembering	F 4 LA7	M. Choice	D
8	Remembering	F 4 LA8	M. Choice	A
9	Remembering	F 5 LA9	M. Choice	A
10	Remembering	F 5 LA9	M. Choice	D
11	Remembering	F 5 LA10	M. Choice	B
12	Remembering	F 5 LA10	M. Choice	A
13	Remembering	F 5 LA11	M. Choice	D
14	Remembering	F 5 LA12	M. Choice	A
15	Remembering	F 5 LA13	M. Choice	B
16	Understanding	F 4 LA2	M. Choice	C
17	Understanding	F 4 LA2	M. Choice	B
18	Understanding	F 4 LA3	M. Choice	A
19	Understanding	F 4 LA4	M. Choice	A
20	Understanding	F 4 LA4	M. Choice	B
21	Understanding	F 4 LA5	M. Choice	C
22	Understanding	F 4 LA6	M. Choice	A
23	Understanding	F 4 LA7	M. Choice	A
24	Understanding	F 4 LA7	M. Choice	D
25	Understanding	F 4 LA8	M. Choice	B
26	Understanding	F 5 LA9	M. Choice	D
27	Understanding	F 5 LA10	M. Completion	C
28	Understanding	F 5 LA11	M. Choice	C
29	Understanding	F 5 LA12	M. Choice	D
30	Understanding	F 5 LA13	M. Choice	B
31	Applying	F 4 LA3	M. Choice	B
32	Applying	F 4 LA5	M. Choice	C
33	Applying	F 4 LA6	M. Choice	C
34	Applying	F 4 LA7	M. Choice	B
35	Applying	F 5 LA9	M. Choice	D
36	Applying	F5 LA9	M. Completion	A
37	Applying	F 5 LA11	M. Choice	C
38	Applying	F 5 LA10	M. Choice	B
39	Analyzing	F 4 LA6	M. Choice	C
40	Analyzing	F 5 LA9	M. Completion	D

4541/2 (PP)
Chemistry
Kertas 2
November
2021



MAKTAB RENDAH SAINS MARA

PEPERIKSAAN AKHIR SIJIL PENDIDIKAN MRSM 2021

CHEMISTRY

Kertas 2

Peraturan Pemarkahan

Untuk Kegunaan Pemeriksa Sahaja

Peraturan Pemarkahan ini mengandungi 21 halaman bercetak

SECTION A

No.			Mark Scheme	Sub Mark	Total Mark
1	(a)	(i)	[Able to state the name of positively charged subatomic particle in the atom correctly] Answer: Proton [r: symbol]	1	1
		(ii)	[Able to state the number of neutrons found in the nucleus of carbon-12 atom correctly] Answer: 6	1	1
		(iii)	[Able to state the difference between carbon-14 and carbon-12 correctly] <i>8n vs 6n</i> Answer: Number of neutrons <i>Nucleon no</i>	1	1
	(b)	(i)	[Able to write the standard representation of atom Z correctly] Answer: <i>${}^9_4\text{Z} \rightarrow {}^9_4\text{Be}$</i>	1	1
		(ii)	[Able to write the electron arrangement of Z ion correctly] Answer: 2	1	1
Total				5	5

[Lihat halaman sebelah
SULIT

No.		Mark Scheme	Sub Mark	Total Mark												
2	(a)	[Able to name the component in substance A and B correctly] Answer: Clay // Kaolin <i>Tandh liaf</i>	1	1												
	(b)	[Able to state two basic properties of A and B correctly] Sample answer: <i>↑ temp & brittle</i> <u>High thermal resistant</u> // Breaks easily // Chemically inert // Electrical insulator // <u>Hard and strong</u> // Heat insulator / <i>Brittle</i> . Choose any two properties	1 1	2												
	(c)	[Able to state one difference for both A and B correctly] Sample answer: <table border="1"><thead><tr><th>A</th><th>B</th></tr></thead><tbody><tr><td>Traditional ceramic</td><td>Advanced ceramic</td></tr><tr><td>Made by clay/kaolin</td><td>Contain oxides/carbides/nitrides</td></tr><tr><td>Lower resistant to heat compared to B</td><td>Higher resistant to heat compared to A</td></tr><tr><td>Less chemically inert</td><td>More chemically inert</td></tr><tr><td>No superconductivity properties</td><td>Has superconductivity properties</td></tr></tbody></table> Choose any one comparison	A	B	Traditional ceramic	Advanced ceramic	Made by clay/kaolin	Contain oxides/carbides/nitrides	Lower resistant to heat compared to B	Higher resistant to heat compared to A	Less chemically inert	More chemically inert	No superconductivity properties	Has superconductivity properties	1	1
	A	B														
Traditional ceramic	Advanced ceramic															
Made by clay/kaolin	Contain oxides/carbides/nitrides															
Lower resistant to heat compared to B	Higher resistant to heat compared to A															
Less chemically inert	More chemically inert															
No superconductivity properties	Has superconductivity properties															
(d)	[Able to state another usage of substance A correctly] Sample answer: Cookware/ tiles Accept any suitable answer	1	1													
Total				5												

No.			Mark Scheme	Sub Mark	Total Mark
3	(a)		[Able to state the meaning of cosmetics correctly] Answer: Cosmetics are materials or products that are used externally to cleanse, protect or enhance one's appearances	1	1
	(b)		[Able to state one example of the harmful chemical in cosmetic that can cause redness and peeling skin correctly] Answer: Tretinoin	1	1
	(c)	(i)	[Able to give one example of traditional medicine can be used and describe briefly how it is used correctly] Sample answer: P1. Aloe vera <i>turneri C</i> P2. (Apply) the gel/juice/liquid and rub onto affected skin // Rub the aloe vera gel/juice/liquid onto the affected skin	1	2
			<i>how it is used</i>	1	
		(ii)	[Able to explain the different of efficacy level between modern and traditional medicine correctly] Sample answer: P1. Traditional medicine may not undergo clinical trials // may not have data to authenticate the effectiveness P2. Hard to determine the correct dosage / amount OR Any correct statements about modern medicine	1	2
Total				6	

[Lihat halaman sebelah

No.			Mark Scheme	Sub Mark	Total Mark
4	(a)	(i)	<p>[Able to state the colour of chlorine gas correctly]</p> <p>Answer:</p> <p><u>Greenish yellow</u></p>	1	1
		(ii)	<p>[Able to write a chemical equation for the reaction between chlorine gas and iron wool correctly]</p> <p>P1. Correct formulae of reactants and product P2. Balanced equation</p> <p>Answer:</p> <p>$2\text{Fe} + 3\text{Cl}_2 \rightarrow 2\text{FeCl}_3$</p>	1 1	2
		(iii)	<p>[Able to calculate the mass of the product formed correctly]</p> <p><i>ecf a ci)</i></p> <p>P1. Mole ratio P2. Mass of FeCl_3 with correct unit</p> <p>Sample answer:</p> <p>P1. 2 mole of Fe produces 2 mol of FeCl_3 0.1 mole of Fe produces 0.1 mol of FeCl_3</p> <p>P2. Mass of $\text{FeCl}_3 = 0.1 \times [56 + (3 \times 35.5)] = 16.25\text{g}$</p>	1 1	2
	(b)		<p>[Able to explain why bromine is less reactive than chlorine towards hot iron wool correctly]</p> <p>Sample answer:</p> <p>P1. <u>Atomic size</u> of bromine is bigger than chlorine // the distance between nucleus and the valence shell in bromine atom is further than chlorine atom</p> <p>P2. Forces of attraction between nucleus and valence electron is weaker in bromine <u>atom</u> than chlorine <u>atom</u>. // Nuclear attraction force is weaker in bromine <u>atom</u> than chlorine <u>atom</u>.</p> <p>P3. Harder for bromine <u>atom</u> to receive/attract electrons.</p>	1 1 1 Max 2	2
Total					7

No.			Mark Scheme	Sub Mark	Total Mark
5	(a)	(i)	<p>[Able to state the meaning of hydrogen bond correctly]</p> <p>Answer:</p> <p>Attraction forces between hydrogen atom, H that has bonded with an atom of high electronegativity (such as F, O, N) with N, O or F atom in another molecule.</p>	1	1
		(ii)	<p>[Able to state the name of the element in cellulose that can form hydrogen bond with water molecules correctly]</p> <p>Answer:</p> <p>Oxygen // hydrogen in hydroxyl group/-OH</p>	1	1
	(b)		<p>[Able to state to explain why cotton clothes take longer time to dry compared to synthetic clothes correctly]</p> <p>Sample answer:</p> <p>P1. Cotton clothes absorb water more readily than synthetic fibre clothes</p> <p>P2. Hydrogen bond will hold the water to cellulose in cotton</p> <p style="text-align: center;">OR</p> <p>P1. Synthetic fibre clothes allow water to evaporate easily.</p> <p>P2. No formation of hydrogen bond</p>	<p>1</p> <p>1</p>	2

[Lihat halaman sebelah

- m - intermolecular forces)	(c)	<p>[Able to explain the difference of boiling point between ethanol and ethane correctly]</p> <p>Answer:</p> <p>P1. Ethanol has higher boiling point compared to ethane.</p> <p>P2. Hydrogen bonds formed between ethanol molecules</p> <p>P3. Require more heat to overcome the forces of attraction</p> <p>Vice versa</p>	<p>1</p> <p>1</p> <p>1</p> <p>Max 2</p>	2
	(d)	<p>[Able to draw the dative bond in the ammonium ion correctly]</p> <p>P1. Correct diagram with correct charge</p> <p>P2. Lone pair of electrons shared with H atom</p> <p>Answer:</p> <div style="text-align: center;"> $\left[\begin{array}{c} \text{H} \\ \cdot \times \\ \text{H} \cdot \quad \text{N} \cdot \times \quad \text{H} \\ \cdot \times \\ \text{H} \end{array} \right]^+$ </div>	<p>1</p> <p>1</p>	2
Total				8

No.			Mark Scheme	Sub Mark	Total Mark
6	(a)	(i)	[Able to state the conditions for the effective collision to happen correctly] Answer: P1: Reactant molecules/particles collide in a correct orientation P2: Achieved/overcome activation energy	1 1	2
		(b)	(i)	[Able to write a chemical equation for the reaction between magnesium carbonate and hydrochloric acid correctly] P1. Correct formulae of reactants and products P2. Balanced equation Answer: $\text{MgCO}_3 + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$	1 1
		(ii)	[Able to explain which set of experiment used the highest concentration of hydrochloric acid correctly] Answer: P1. Set I P2. Has the steepest curve/gradient <i>highest volume of CO₂ gas</i>	1 1	2
			[Able to calculate the maximum volume of carbon dioxide gas released at room condition correctly] P1. Number of mole of HCl P2. Mole ratio P3. Volume of CO ₂ with correct unit Sample answer: P1: Number of mole of HCl: $(0.5 \times 50) / 1000 = 0.025 \text{ mol}$ P2: 2 mol of HCl produce 1 mol of CO ₂ 0.025 mol of HCl produce 0.0125 mol of CO ₂ P3: Volume of CO ₂ = $0.0125 \times 24 = 0.3 \text{ dm}^3/300 \text{ cm}^3$	1 1 1	3
Total					9

[Lihat halaman sebelah
SULIT

No.			Mark Scheme	Sub Mark	Total Mark
7	(a)		<p>[Able to state the meaning of redox reaction correctly]</p> <p>Answer:</p> <p>Chemical reaction where oxidation and reduction occur simultaneously/ at the same time</p>	1	1
	(b)	(i)	<p>[Able to state the strongest reducing agent correctly]</p> <p>Answer:</p> <p>Mg // Magnesium</p>	1	1
		(ii)	<p>[Able to calculate the oxidation number for chromium in $\text{Cr}_2\text{O}_7^{2-}$ correctly]</p> <p>Answer:</p> <p>$2x + 7(-2) = -2$</p> <p>$x = +6$</p>	1	1
	(c)	(i)	<p>[Able to state the observation in Beaker A after 30 minutes correctly]</p> <p>Answer: <i>* blue to pale blue</i> <i>* blue become paler.</i></p> <p>Intensity of blue colour decreases //</p> <p>Electrode becomes thicker.</p>	1	1
		(ii)	<p>[Able to state and explain which electrode will undergo oxidation in terms of standard electrode potential correctly]</p> <p>Answer:</p> <p>P1. Sn/Tin</p> <p>P2. Standard electrode potential value for Sn/tin is more negative/less positive than Cu/copper</p> <p>// Standard electrode potential value for Cu/copper is more positive/less negative than Sn/tin</p> <p><i>Note : P1 - wrong</i> <i>P2 - no mark</i></p>	1 1	2

		(iii) [Able to write the cell notation for the voltaic cell in Diagram 7 and calculate the cell voltage correctly] Answer: P1. $\text{Sn(s)} \mid \text{Sn}^{2+}(\text{aq}) \parallel \text{Cu}^{2+}(\text{aq}) \mid \text{Cu(s)}$ P2. $E^{\circ}_{\text{cell}} = E_{\text{cathode}} - E_{\text{anode}}$ $= (+0.34) - (-0.14) = +0.48 \text{ V}$	1	
		(iv) [Able to describe how to increase the cell voltage of the two half-cells based on answer in 7(c)(iii) correctly] Sample answer: P1. Replace Sn with Mg P2. Replace tin(II) nitrate solution with magnesium nitrate solution. <div style="text-align: center;">OR</div> P1. Replace Cu with Ag P2. Replace copper(II) nitrate solution with silver nitrate solution.	1 1	2
Total			10	

[Lihat halaman sebelah
SULIT

No.			Mark Scheme	Sub Mark	Total Mark
8	(a)	(i)	[Able to suggest metal Q correctly] Answer: Zn/Zinc	1	1
		(ii)	[Able to calculate the change in temperature correctly] P1. Number of mole of Pb^{2+}/Pb displaced P2. Ratio of the heat release P3. Temperature with correct unit Sample answer: P1. Number of moles of Pb^{2+}/Pb displaced = $MV/1000$ = $0.5 \times 100/1000$ = 0.05 mol P2. 1 mol of Pb displaced releases 112000 J of heat 0.05 mol of Pb displaced releases 5600 J of heat // $Q = n \times \Delta H$ = $0.05 \text{ mol} \times 112000 \text{ J mol}^{-1}$ = 5600 J P3. Heat given out = $mc\Theta$ $5600 \text{ J} = (100)(4.2)(\Theta)$ $\Theta = 13.3^\circ\text{C}$	1 1 1	3
	(b)	(i)	[Able to identify acid R and acid S correctly] Answer: R : Ethanoic acid // any weak acids S : Hydrochloric acid // any strong acids Accept formula of acids	1 1	2

		<p>(ii) [Able to write the thermochemical equation for the reaction between acid R and potassium hydroxide solution correctly] <i>p1 (ect from b(i))</i></p> <p>P1. Correct formulae of reactants and products 1</p> <p>P2. ΔH with correct value and unit 1</p> <p>Answer:</p> <p><i>KOH Ka</i></p> <p>$\text{CH}_3\text{COOH} + \text{NaOH} \rightarrow \text{CH}_3\text{COONa} + \text{H}_2\text{O} \quad \Delta H = -55 \text{ kJ mol}^{-1}$</p> <p>Penalty P2 if no equation/P1 given</p> <p><i>ect A. from previous question</i></p>		2
		<p>(iii) [Able to explain the difference in heat of neutralisation for both reactions correctly]</p> <p>Sample answer:</p> <p>P1. Ethanoic acid/ acid R ionizes partially in water and some remain as molecules (to produce low concentration of H^+ ions) while hydrochloric acid/ acid S ionized completely in water (to produce high concentration of H^+ ions)</p> <p>// Ethanoic acid/ acid R is a weak acid while hydrochloric acid/ acid S is a strong acid</p> <p>P2. Some of the heat released during neutralisation is absorbed by ethanoic acid/ acid R molecules and used to completely ionises the weak acid</p> <p>Note: mention <u>molecules</u> at least once</p>	<p>1</p> <p>1</p>	2
Total				10

SECTION B

No.	Mark Scheme	Sub Mark	Total Mark
9	<p>(a)</p> <p>[Able to suggest substances that can be used to prepare the salt correctly]</p> <p>Answer:</p> <p>P1. Lead(II) oxide // Lead(II) carbonate P2. Nitric acid <i>Lead</i> [a: formula]</p> <p>[Able to write the chemical equation for the decomposition of the salt correctly]</p> <p>P3. Correct formulae of reactants and products P4. Balanced equation</p> <p>Answer:</p> <p>$2\text{Pb}(\text{NO}_3)_2 \rightarrow 2\text{PbO} + 4\text{NO}_2 + \text{O}_2$</p>	<p>1 1</p> <p>1 1</p>	<p>2</p> <p>2</p>
	<p>(b)</p> <p>[Able to state the name of green solid P and aqueous solution R correctly]</p> <p>Answer:</p> <p>P1. Green solid P = Copper(II) carbonate P2. Aqueous solution R = Copper(II) chloride <i>r: formula</i></p> <p>[Able to describe briefly how to confirm the presence of anion in aqueous solution R correctly]</p> <p>Sample answer:</p> <p>P3. Add (dilute) nitric acid/ HNO_3 / sulphuric acid/ H_2SO_4 P4. Add silver nitrate/ AgNO_3 <u>solution</u> P5. White precipitate produced <i>r: HCl for P3</i></p>	<p>1 1</p> <p>1 1 1</p>	<p>2</p> <p>3</p>

Reagent X
obs X

	(c)	<p>[Able to name the chemical reaction to produce compound J correctly]</p> <p>Answer:</p> <p>P1. Precipitation // Double decomposition</p>	1	1
		<p>[Able to identify compound L and gas M correctly]</p> <p>Answer:</p> <p>P2. Compound L = Calcium chloride // CaCl_2</p> <p>P3. Gas M = Carbon dioxide // CO_2</p>	1 1	2
	(d)	<p>[Able to calculate the value of X correctly with the correct unit]</p> <p>P1. Number of mole of NaOH</p> <p>P2. Mass of NaOH with the correct unit</p> <p>Sample answer:</p> <p>P1: Mol NaOH = $\text{MV}/1000$ $= (0.5 \times 50) / 1000$ $= 0.025 \text{ mol}$</p> <p>P2: Mass NaOH = $\text{mol} \times \text{molar mass}$ $= 0.025 \times 40$ $= 1 \text{ g}$</p>	1 1	2
		<p>[Able to calculate the volume of distilled water needed to form 0.1 mol dm^{-3} sodium hydroxide correctly]</p> <p>P3. Final volume of solution with correct unit</p> <p>P4. Volume of distilled water needed with correct unit</p> <p>Sample answer:</p> <p>P3. $M_1V_1 = M_2V_2$ $V_2 = (0.5)(50) / 0.1$ $= 250 \text{ cm}^3$</p> <p>P4. Volume distilled water = $250 - 50$ $= 200 \text{ cm}^3$</p>	1 1	2

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		<p>[Able to calculate the pH value of the diluted sodium hydroxide solution correctly]</p> <p>P5. Value of pOH P6. pH value of solution</p> <p>Sample answer:</p> <p>P5. $\text{pOH} = -\log [0.1]$ = 1</p> <p>P6. $\text{pH} = 14 - 1$ = 13</p>	1 1	2
		<p>[Able to explain why does diluted sodium hydroxide has different pH value than the standard solution correctly]</p> <p>Answer:</p> <p>P7. Concentration of hydroxide ion, OH^- in diluted solution is lower than that in the standard solution.</p> <p>P8. The lower the concentration of OH^- ion, the lower the pH value.</p>	1 1	2
Total				20

No.		Mark Scheme	Sub Mark	Total Mark												
10	(a)	<p>[Able to compare the observation for synthetic polymer A and synthetic polymer B correctly]</p> <p>Answer:</p> <table><tr><th>Synthetic polymer A</th><th>Synthetic polymer B</th></tr><tr><td>Melt and solidify when they are cooled</td><td>Disintegrate / burn upon heating</td></tr></table> <p>[Able to explain the difference in the observation for synthetic polymer A and synthetic polymer B correctly]</p> <p>Answer:</p> <table><tr><th>Synthetic polymer A</th><th>Synthetic polymer B</th></tr><tr><td>Thermoplastic polymers</td><td>Thermosetting polymers</td></tr><tr><td>Can be repeatedly remoulded upon heating</td><td>Cannot be <u>remoulded</u> after heating <i>reshaped</i></td></tr><tr><td>Can be recycled</td><td>Cannot be recycled</td></tr></table>	Synthetic polymer A	Synthetic polymer B	Melt and solidify when they are cooled	Disintegrate / burn upon heating	Synthetic polymer A	Synthetic polymer B	Thermoplastic polymers	Thermosetting polymers	Can be repeatedly remoulded upon heating	Cannot be <u>remoulded</u> after heating <i>reshaped</i>	Can be recycled	Cannot be recycled	1 + 1	
Synthetic polymer A	Synthetic polymer B															
Melt and solidify when they are cooled	Disintegrate / burn upon heating															
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Can be repeatedly remoulded upon heating	Cannot be <u>remoulded</u> after heating <i>reshaped</i>															
Can be recycled	Cannot be recycled															
(b)		<p>[Able to state the meaning of polymer correctly]</p> <p>Answer:</p> <p>P1. Long chain molecule that is made from a combination of many repeating units/ monomer.</p> <p>[Able to compare both polymerisation reaction correctly]</p> <p>Sample answer:</p> <table><tr><th>Terylene</th><th>Vinyl chloride</th></tr><tr><td>Condensation polymerisation</td><td>Addition polymerisation</td></tr><tr><td>Made up from two different monomers</td><td>Made up from same monomers</td></tr><tr><td>Monomers consist of at least two functional groups</td><td>Monomers must have double bond between C atoms</td></tr><tr><td>Produce polymer and simple molecule</td><td>Produce polymer only</td></tr></table> <p>Choose any two comparisons for P2 & P3</p>	Terylene	Vinyl chloride	Condensation polymerisation	Addition polymerisation	Made up from two different monomers	Made up from same monomers	Monomers consist of at least two functional groups	Monomers must have double bond between C atoms	Produce polymer and simple molecule	Produce polymer only	1	5		
Terylene	Vinyl chloride															
Condensation polymerisation	Addition polymerisation															
Made up from two different monomers	Made up from same monomers															
Monomers consist of at least two functional groups	Monomers must have double bond between C atoms															
Produce polymer and simple molecule	Produce polymer only															

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SULIT

		<p>[Able to suggest other polymer that can be produced for each type of polymerisation correctly]</p> <p>Sample answer:</p> <p>P4. Example of condensation polymer: Nylon// Cellulose// Starch</p> <p>P5. Example of addition polymer: Polyethene// Polypropene// Polystyrene</p>	1 1	5
(c)	(i)	<p>[Able to suggest the name of suitable coagulant to speed up the coagulation of latex and able to describe briefly the process involved correctly]</p> <p>Sample answer:</p> <p>P1. Any named acid</p> <p>P2. Hydrogen ions, H^+ in acid neutralise the negatively charged protein membrane of the rubber particles.</p> <p>P3. The (neutral) rubber particles collide with one another and break the protein membrane.</p> <p>P4. The rubber polymers combine/clump with one another.</p>	1 1 1 1	4
	(ii)	<p>[Able to suggest and justify the most suitable situation to be used for the delivery of the latex correctly]</p> <p>Sample answer:</p> <p>P1. Situation B</p> <p>P2. Anticoagulant contains hydroxide ions, OH^-</p> <p>P3. Hydroxide ions neutralise the hydrogen ions from lactic acid produced by the bacteria.</p> <p>P4. The protein membrane of rubber particles remains negatively-charged</p> <p>P5. Rubber particles repel one another</p> <p>P6. Latex remains in liquid form</p> <p>Note : accept any justification for P2 to P6 on rejection on Situation A</p>	1 1 1 1 1 1	6
Total				20

SECTION C

No.		Mark Scheme	Sub Mark	Total Mark
11	(a)	<p>[Able to state the homologous series of hydrocarbon A correctly]</p> <p>Answer:</p> <p>P1. Alkane</p> <p>[Able to draw and name two isomers of butane correctly]</p> <p>Answer:</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>P2.</p> <pre> H H H H H - C - C - C - C - H H H H H </pre> </div> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>P3. Butane</p> </div> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>P4.</p> <pre> H H-C-H H C H H - C - C - C - H H H H </pre> </div> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>P5. 2-methylpropane</p> </div>	1	
	(ii)	<p>[Able to compare and contrast compound B and compound C correctly]</p> <p>Sample answer:</p> <p><u>Similarities:</u></p> <ul style="list-style-type: none"> Non-hydrocarbon (organic compound) Miscible in water <i>a: soluble</i> Low boiling point than their corresponding alkene <p>Accept any two answers for P1 & P2</p>	1 1	5

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SULIT

Differences			
Compound B	Compound C		
Cannot react with base // no reaction	Can react with base to produce salt and water		
Cannot react with metal/metal carbonate // no reaction	Can react with metal/ metal carbonate		
Lower boiling point (compared to C)	Higher boiling point (compared to B)	1	
pH neutral // pH = 7	pH below 7		
Purple colour of acidified potassium manganate(VII) solution turns colourless	No changes on purple colour of acidified potassium manganate(VII) solution	1	
Functional group: -OH/hydroxyl group	Functional group: -COOH/carboxyl group	1	5
<i>General formulae</i> Accept any three relevant answers for P3, P4 & P5 <i>reject</i>			
(b)	<p>[Able to describe the preparation of pentyl ethanoate by using named materials correctly]</p> <p>Answer:</p> <p>P1. Pentan-1-ol P2. Ethanoic acid</p> <p><i>accept condensed formulae</i></p> <p>Note: P1 & P2 can be deduce from procedure r: pentanol</p> <p>Sample answer:</p> <p><u>Procedure:</u></p> <p>P3. Pour [2-4] cm³ of glacial/pure ethanoic acid and [2-4] cm³ of pure pentan-1-ol into boiling tube and mix well.</p> <p>P4. Add slowly/a few drops of concentrated sulphuric acid into the mixture.</p> <p>P5. Heat gently/warm the mixture.</p> <p>P6. Pour the mixture into a beaker containing water.</p> <p>OR</p>	1 1 <	

		<p>[reflux method]</p> <p>P3. Pour [25-50] cm³ of glacial/pure ethanoic acid and [25-50] cm³ of pure pentan-1-ol into the round bottom flask</p> <p>P4. Add [3-5] cm³ of concentrated sulphuric acid into the mixture.</p> <p>P5. Heat under reflux.</p> <p>P6. Collect the product formed by using distillation method</p> <p>P7. $\text{CH}_3\text{COOH} + \text{C}_5\text{H}_{11}\text{OH} \rightarrow \text{CH}_3\text{COOC}_5\text{H}_{11} + \text{H}_2\text{O}$</p>	1	7
(c)		<p>[Able to choose the hand sanitiser and able to justify correctly]</p> <p>Sample answer:</p> <p>P1. Sanitiser M</p> <p>P2. Percentage of alcohol is higher</p> <p>P3. Can kill germs/bacteria better</p> <p style="text-align: center;">OR</p> <p>P1. Sanitiser N</p> <p>P2. Percentage of alcohol is lower</p> <p>P3. Less irritate the skin // less harm to skin</p> <p style="text-align: center;">OR</p> <p>P1. Sanitiser M</p> <p>P2. Percentage of alcohol in N is lower</p> <p>P3. Sanitiser N has less irritation on skin// less harm to skin</p> <p style="text-align: center;">OR</p> <p>P1. Sanitiser N</p> <p>P2. Percentage of alcohol in M is higher</p> <p>P3. Sanitiser M can kill germs/bacteria better</p>	<p>1</p> <p>1</p> <p>1</p>	3
Total				20

END OF MARK SCHEME