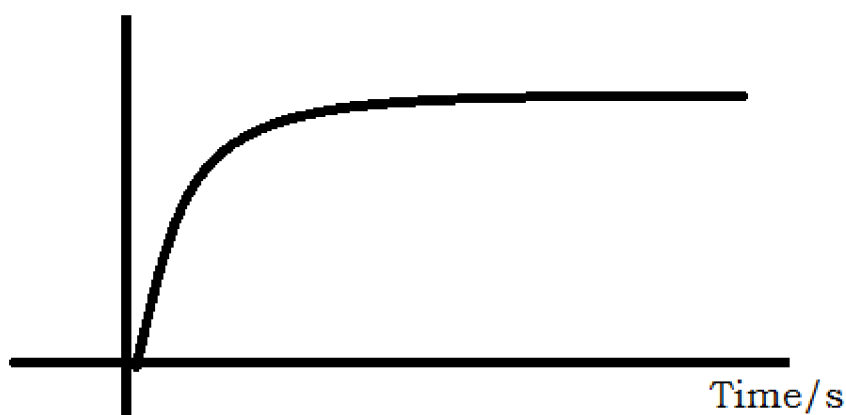


Structure {Paper03}

[SPM10-02]

- (a) (i) The manipulated variable : water and methylbenzene // solvent
 (ii) The responding variable : acidic properties of ethanoic acid
 (iii) The constant variable : concentration of acid // type of metal (Magnesium)

(b)

Volume of hydrogen gas/cm³

(c)

Strong acids	Weak acids
Nitric acid Sulphuric acid Hydrochloric acid	Ethanoic acid

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[SBPtrial08-01]

(a)

Rubric	Score
<i>[Able to write all the volumes with units accurately]</i>	3
Initial burette readings: 0.80 cm ³ , 13.40 cm ³ , 25.90 cm ³ Final burette readings : 13.40 cm ³ , 25.90 cm ³ , 38.40 cm ³	
<i>[Able to record all the volumes accurately but without units / one decimal place]</i>	2
Initial burette readings: 0.8, 13.4, 25.9 Final burette readings : 13.4, 25.9, 38.4	
<i>[Able to write at least four readings of the volumes accurately]</i>	1

(b)

Rubric	Score																
<p><i>[Able to construct a table correctly containing three labeled columns with correct units and record all the burette readings and volume of acids used accurately]</i></p> <p>Suggested answer:</p> <table border="1"> <thead> <tr> <th>Titration No.</th> <th>I</th> <th>II</th> <th>II</th> </tr> </thead> <tbody> <tr> <td>Initial burette reading/cm³</td> <td>0.80</td> <td>13.40</td> <td>25.90</td> </tr> <tr> <td>Final burette reading/cm³</td> <td>13.40</td> <td>25.90</td> <td>38.40</td> </tr> <tr> <td>Volume of acid used/cm³</td> <td>12.60</td> <td>12.50</td> <td>12.50</td> </tr> </tbody> </table>	Titration No.	I	II	II	Initial burette reading/cm ³	0.80	13.40	25.90	Final burette reading/cm ³	13.40	25.90	38.40	Volume of acid used/cm ³	12.60	12.50	12.50	3
Titration No.	I	II	II														
Initial burette reading/cm ³	0.80	13.40	25.90														
Final burette reading/cm ³	13.40	25.90	38.40														
Volume of acid used/cm ³	12.60	12.50	12.50														
<i>[Able to construct a table correctly containing three labeled columns without units/one decimal place and record all the volumes accurately]</i>	2																
<i>[Able to construct a table with at least three labels and four correct readings]</i>	1																

(c)

Rubric	Score
<p><i>[Able to calculate the average volume of acid used correctly and with unit]</i></p> <p>Suggested answer:</p> $\text{Volume of acid used} = \frac{12.60 + 12.50 + 12.50}{3}$ $= 12.53 // 12.5 // 12.533 \text{ cm}^3$	3
<i>[Able to calculate the average volume correctly but without unit.]</i>	2
<i>[Able to show the calculation of average volume of acid used but incorrect answer]</i>	1

(d)

Rubric	Score
<p><i>[Able to state the volume correctly]</i></p> <p>6.27 cm³</p>	3
<p><i>[Able to state the volume but to one decimal place]</i></p> <p>6.3 cm³// [6.0 – 7.0] cm³</p>	2
<p><i>[Able to state the volume but inaccurately]</i></p> <p>12.5 cm³//25.0 cm³</p>	1

(e)

Rubric	Score
<p><i>[Able to classify the strong acids and the weak acids into their group the correctly]</i></p> <p>Strong acids: hydrochloric acid, nitric acid Weak acids: ethanoic acid, carbonic acid, phosphoric acid</p>	3
<p><i>[Able to calssify the strong acids and the weak acids correctly but in opposite group]</i></p> <p>Strong acids: ethanoic acid, carbonic acid Weak acids: hydrochloric acid, phosphoric acid, nitric acid</p>	2
<i>[Able to classify at least three acids into the correct group]</i>	1

[SBPtrial06-01]

(a)(i)

Rubric	Score
[Dapat memberikan warna penunjuk fenolftalein dengan tepat] Contoh jawapan: Merah jambu kepada tanpa warna / hampir tanpa warna	3
[Dapat memberikan warna penunjuk fenolftalein dengan kurang tepat] Contoh jawapan: Berubah kepada tanpa warna / hampir tanpa warna	2
[Dapat menyatakan idea tentang warna penunjuk fenolftalein] Contoh jawapan: Warna larutan berubah	1
Tidak memberi respons atau respons salah.	0

(a)(ii)

Rubric	Score
[Dapat menyatakan inferens yang lengkap berdasarkan pemerhatian] Contoh jawapan: semua ion hidroksida/NaOH telah dineutralkan oleh ion hidrogen/HCl // Tindak balas penutralan telah lengkap berlaku	3
[Dapat menyatakan inferens yang kurang lengkap berdasarkan pemerhatian] Contoh jawapan: Alkali dineutralkan oleh asid // Penutralan telah berlaku // Tiada ion OH ⁻ dalam kelalang kon.	2
[Dapat menyatakan idea tentang perubahan warna] Contoh jawapan: Garam/natrium klorida dan air terhasil // tindak balas penutralan	1
Respon salah / Tiada respon	0

(a)(iii)

Rubric	Score
[Dapat menyatakan maksud takat akhir yang lengkap berdasarkan pemerhatian] Contoh jawapan: Takat proses penutralan di mana penunjuk fenolftalein bertukar warna daripada merah jambu kepada tanpa warna	3

[Dapat menyatakan maksud takat akhir yang kurang tepat berdasarkan pemerhatian] Contoh jawapan: Takat proses peneutralan di mana penunjuk bertukar warna // Takat di mana asid yang ditambah adalah secukupnya untuk meneutralkan semua alkali.	2
[Dapat menyatakan idea tentang maksud takat akhir] Contoh jawapan: Takat di mana penunjuk bertukar warna // takat peneutralan	1
Respon salah / Tiada respon	0

(b)

Rubric	Score																
[Dapat membina jadual dan mengisi jadual dengan tepat] Contoh jawapan:	3																
<table border="1"> <thead> <tr> <th>Titrat</th> <th>I</th> <th>II</th> <th>III</th> </tr> </thead> <tbody> <tr> <td>Bacaan akhir buret /cm³</td> <td>28.10</td> <td>40.40</td> <td>47.40</td> </tr> <tr> <td>Bacaan awal buret /cm³</td> <td>3.30</td> <td>15.70</td> <td>23.10</td> </tr> <tr> <td>Isipadu asid /cm³</td> <td>24.80</td> <td>24.70</td> <td>24.30</td> </tr> </tbody> </table>	Titrat	I	II	III	Bacaan akhir buret /cm ³	28.10	40.40	47.40	Bacaan awal buret /cm ³	3.30	15.70	23.10	Isipadu asid /cm ³	24.80	24.70	24.30	
Titrat	I	II	III														
Bacaan akhir buret /cm ³	28.10	40.40	47.40														
Bacaan awal buret /cm ³	3.30	15.70	23.10														
Isipadu asid /cm ³	24.80	24.70	24.30														
Bacaan dicatat dengan 2 titik perpuluhan dan berunit																	
[Dapat membina jadual dan mengisi jadual dengan bacaan kurang tepat] Bacaan dicatat 1 titik perpuluhan/tidak berunit	2																
[Dapat menunjukkan idea tentang membina dan mencatat bacaan]	1																
Tidak memberi respons atau respons salah.	0																

(c)

Rubric	Score
[Dapat menuliskan persamaan tindak balas dan menunjukkan langkah-langkah penghitungan dengan betul] Contoh jawapan: Langkah 1 : menulis persamaan terlibat $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$ Langkah 2 : Menghitung bilangan mol NaOH $\text{Bilangan mol NaOH} = \frac{25 \times 0.1}{1000} = 0.0025 \text{ mol}$ Langkah 3 : Menghitung kemolaran HCl $\text{Bil mol NaOH} = \text{Bil mol HCl}$ $\text{Isi padu purata HCl} = \frac{24.80 + 24.70 + 24.30}{3} // 24.60 \text{ cm}^3$ $\text{Kemolaran HCl} = \frac{1000 \times 0.0025}{24.60} // 0.10 \text{ mol dm}^{-3}$	3

Atau menggunakan rumus (Langkah 2 dan Langkah 3) $\frac{M_a V_a}{M_b V_b} = 1$ $M_a = \frac{0.10 \times 25.0}{24.60} // 0.10 \text{ mol dm}^{-3}$	
Dapat menunjukkan langkah-langkah penghitungan dengan kurang lengkap Contoh jawapan Menunjukkan langkah 2 dan langkah 3 // menggunakan rumus	2
Dapat menyatakan mana-mana satu langkah dengan betul	1
Tidak memberi respons atau respons salah.	0

(d)

Rubric	Score
[Dapat meramal dan menyatakan sebab dengan tepat] Contoh jawapan: <ul style="list-style-type: none"> $\frac{24.60}{2} \text{ cm}^3 // 12.30 \text{ cm}^3 // \frac{1}{2}$ drp nilai isi padu asid HCl Asid sulfurik adalah asid dwibes sementara asid hidroklorik adalah monobes. // pengionan 1 mol asid sulfurik menghasilkan 2 mol ion H⁺ tetapi pengionan 1 mol HCl menghasilkan 1 mol ion H⁺ // menunjukkan pengiraan 	3
[Dapat meramal dengan betul dengan alasan yang kurang tepat] Contoh alasan kurang tepat <ul style="list-style-type: none"> Pengionan asid sulfurik menghasilkan ion H⁺ lebih banyak 	2
[Dapat meramal dengan betul tanpa alasan]	1
Respon salah / Tiada respon	0

(e)

Rubric	Score						
Dapat membuat pengelasan dengan lengkap dan betul Cadangan jawapan: <table border="1" style="margin-left: 20px;"> <tr> <th>Ion Positif</th> <th>Ion negatif</th> </tr> <tr> <td>Na⁺</td> <td>OH⁻</td> </tr> <tr> <td>H⁺</td> <td>Cl⁻</td> </tr> </table>	Ion Positif	Ion negatif	Na ⁺	OH ⁻	H ⁺	Cl ⁻	3
Ion Positif	Ion negatif						
Na ⁺	OH ⁻						
H ⁺	Cl ⁻						
Dapat membuat pengelasan dengan kurang lengkap Cadangan jawapan: <table border="1" style="margin-left: 20px;"> <tr> <th>Ion Positif</th> <th>Ion negatif</th> </tr> <tr> <td>Na⁺ / H⁺</td> <td>OH⁻ / Cl⁻</td> </tr> </table>	Ion Positif	Ion negatif	Na ⁺ / H ⁺	OH ⁻ / Cl ⁻	2		
Ion Positif	Ion negatif						
Na ⁺ / H ⁺	OH ⁻ / Cl ⁻						
Dapat menunjukkan idea membuat pengelasan tetapi salah Cadangan jawapan : <table border="1" style="margin-left: 20px;"> <tr> <th>Ion Positif</th> <th>Ion negatif</th> </tr> <tr> <td>OH⁻ / Cl⁻</td> <td>Na⁺ / H⁺</td> </tr> </table>	Ion Positif	Ion negatif	OH ⁻ / Cl ⁻	Na ⁺ / H ⁺	1		
Ion Positif	Ion negatif						
OH ⁻ / Cl ⁻	Na ⁺ / H ⁺						
Tidak memberi respons/ respons salah	0						

[SBP07F5midyear-02]

(a)

Rubric	Score
[Able to give 3 correct and complete variables]	3
Suggested answer : Manipulated variable : The concentration of ammonia solution. Respond variable : pH value Fixed variable : Volume of ammonia solution	
Able to give 2 correct and complete variables // 3 incomplete variables	2
Able to give one correct and complete variable // 2 incomplete variables	1
No response or wrong response	0

(b)

Rubric	Score
[Able to give correct and complete relationship] Suggested answer : The higher the concentration of hydroxide ions, the higher the pH value.	3
[Able to give incomplete relationship] Suggested answer : The concentration of hydroxide ions is directly proportionally to the pH value.	2
[Able to give an idea] Suggested answer : The concentration of hydroxide ions affect the pH value	1
No response or wrong response	0

(c)

Rubric	Score
[Able to give correct and complete operational definition] Suggested answer : Ammonia solution has a low concentration of hydroxide ions // Sodium hydroxide has a high concentration of hydroxide ions.	3
[Able to give incomplete relationship] Suggested answer : Ammonia solution partially ionises in water to produce low concentration of hydroxide ions // Sodium hydroxide completely ionises in water to produce high concentration of hydroxide ion.	2

[Able to give an idea] Suggested answer : Ammonia solution / Sodium hydroxide has pH value more than 7.	1
No response or wrong response	0

(d)

Rubric	Score
[Able to predict accurate pH value]. Suggested answer : Range $7.5 < \text{pH} < 8.0$	3
[Able to predict but inaccurate pH value] Suggested answer : Range $7.0 < \text{pH} < 7.5$	2
[Able to give an idea.] Suggested answer : Range 1.0 – 14.0	1
No response or wrong response	0

(e)

Rubric	Score
[Able to give accurate ionisation equation.] Suggested answer : $\text{NH}_4\text{OH} \rightarrow \text{NH}_4^+ + \text{OH}^-$	3
[Able to give inaccurate ionisation equation.] Suggested answer : $\text{NH}_3 + \text{H}_2\text{O} \rightarrow \text{NH}_4^{++} \text{OH}^-$	2
[Able to give an idea]. Suggested answer : $\text{NH}_3 \rightarrow \text{NH}_4^{++} \text{OH}^-$	1
No response or wrong response	0

(f)

Rubric	Score
[Able to give correct and complete statement.] Suggested answer : The higher the concentration of acid, the lower the pH value.	3
[Able to give incomplete statement.] Suggested answer : The concentration of acid is directly proportional to the pH value.	2
[Able to give an idea] Suggested answer : The higher the concentration of acid, the higher the pH value.	1
No response or wrong response	0

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[MRSMtrial09-02]

(a) Based on Experiment I, complete Table 2.1

Name of variable	Action to be taken
(i) Concentration of alkaline solution (sodium hydroxide and ammonia)	(i) Used different concentration of alkaline solution when repeat the experiment.
(ii) pH value	(ii) measured and record pH value
(iii) Type of alkali//	(iii) used the same type of solution

(b)

Experiment	Solution	Concentration (mol dm ⁻³)		
		0.1	0.01	0.001
I	Sodium hydroxide	13	12	11
II	Ammonia	11	10	9

(c) The higher the concentration of hydroxide ions, OH⁻ in the alkaline solution used, the higher pH value

(d) Ammonia is weak alkali that ionise partially in the water and produce low concentration of hydroxide ions, OH⁻
Sodium hydroxide is strong alkali that ionise completely in the water and produce high concentration of hydroxide ions, OH⁻

(e) The solution is strong alkali when pH value measured in 0.1 mol dm⁻³ is 13 and
The solution is weak alkali when pH value measured in 0.1 mol dm⁻³ is 11

(f) 0.00001 mol dm⁻³ sodium hydroxide solution

[MRSMTrial07-01]

(a) State **two** observations that you could obtain during the experiment.

1. pink colour of phenolphthalein change to colourless
2. conical flask feel hot

(b)

Titration Set	1	2	3
Initial Burette Reading/cm ³	0.00 cm ³	0.50 cm ³	5.00 cm ³
Final Burette Reading/cm ³	26.00 cm ³	24.50 cm ³	30.00 cm ³

(c)

Titration Set	1	2	3
Initial Burette Reading/cm ³	0.00	0.50	5.00
Final Burette Reading/cm ³	26.00	24.50	30.00
Volume of HCl/cm ³	26.00	24.00	25.00

(d)(i) Average volume of hydrochloric acid = $(26.00 + 24.00 + 25.00)/3$
= 25.00 cm³

(ii) Mol KOH = $MV/1000 = 0.1 \times 50/1000 = 0.005$ mol

Ratio between KOH to HCl

1 : 1

0.005 : 0.005

Molarity of HCl = $\text{mol} \times 1000/V = 0.005 \times 1000/25$
= 0.2 mol dm⁻³

(e) Sulphuric acid is diprotic acid, that 1 mol of sulphuric acid will produce 2 mol H⁺ ions// double the concentration H⁺ ions

(f)

Soluble	Insoluble
Sodium sulphate	Lead (II) iodide
Magnesium nitrate	Barium sulphate
	Zinc carbonate
	Silver chloride

(g) (i) The pH value of alkali is the measuring of the concentration of the potassium hydroxide solution. The higher pH value, the concentration of potassium hydroxide solution

(ii) pH value is 9

(iii) The concentration of potassium hydroxide increases, the number of hydroxide ions also increases. Then pH value also increases

(iv) Manipulated variable : the concentration of potassium hydroxide

Responding variable : pH value

Controlled variable : type of alkali

(v) The higher the concentration of potassium hydroxide used, the higher pH value

[MRSMTrial06-02]

(a)

	Experiment 1	Experiment 2	Experiment 3
Initial readings of burette	1.35 cm ³	2.30 cm ³	11.45 cm ³
End point readings	26.15 cm ³	27.40 cm ³	36.55 cm ³

(b)

	Experiment 1	Experiment 2	Experiment 3
Initial readings of burette/ cm ³	1.35	2.30	11.45
End point readings/ cm ³	26.15	27.40	36.55
Volume of hydrochloric acid/cm ³	24.80	25.10	25.10

(c) The total volume of hydrochloric acid needed to neutralise the 20 cm³ of potassium hydroxide and the change colour of pink phenolphthalein to colourless

(d) (i) Average of hydrochloric acid = $(24.80 + 25.10 + 25.10)/3 = 25.00 \text{ cm}^3$

(ii) Mol HCl = $MV/1000 = 0.5 \times 25/1000 = 0.0125 \text{ mol}$

Ratio between HCl to NaOH

1 : 1

0.0125 : 0.0125

Molarity of NaOH = $\text{mol} \times 1000/V = 0.0125 \times 1000/20$
 $= 0.625 \text{ mol dm}^{-3}$

(e) Double // 50 cm³

(f)

Weak acid	Strong acid
Oxalic acid	Nitric acid
Methanoic acid	sulphuric acid

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[MRSMTrial04-01]

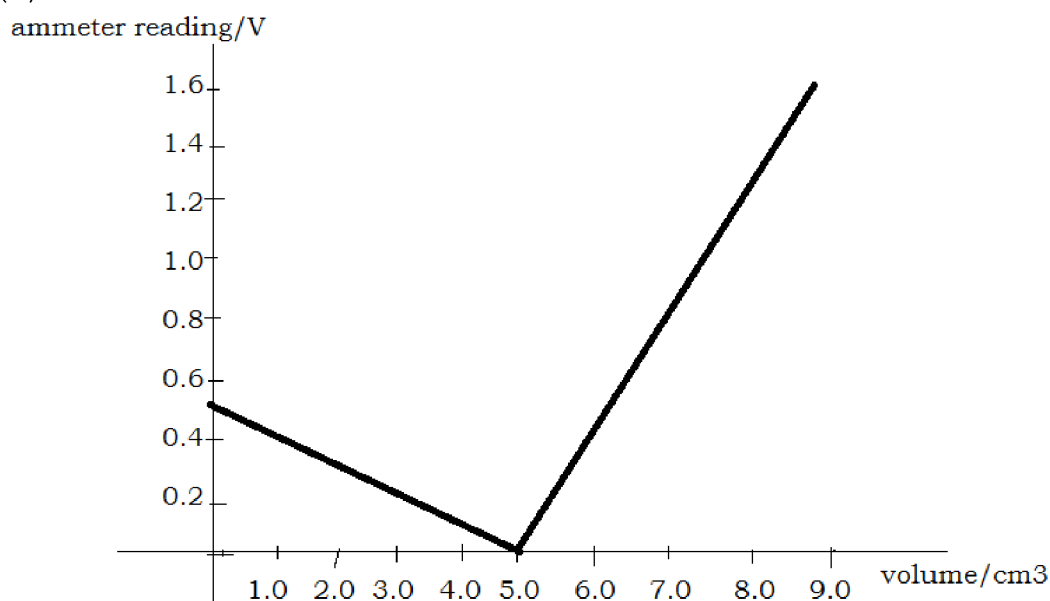
(a)

	Reading voltage/V
Ammeter reading after 5.0 cm ³ added of sulphuric acid added	0.0
Ammeter reading after 6.0 cm ³ of sulphuric acid added	0.4
Ammeter reading after 7.0 cm ³ of sulphuric acid added	0.8

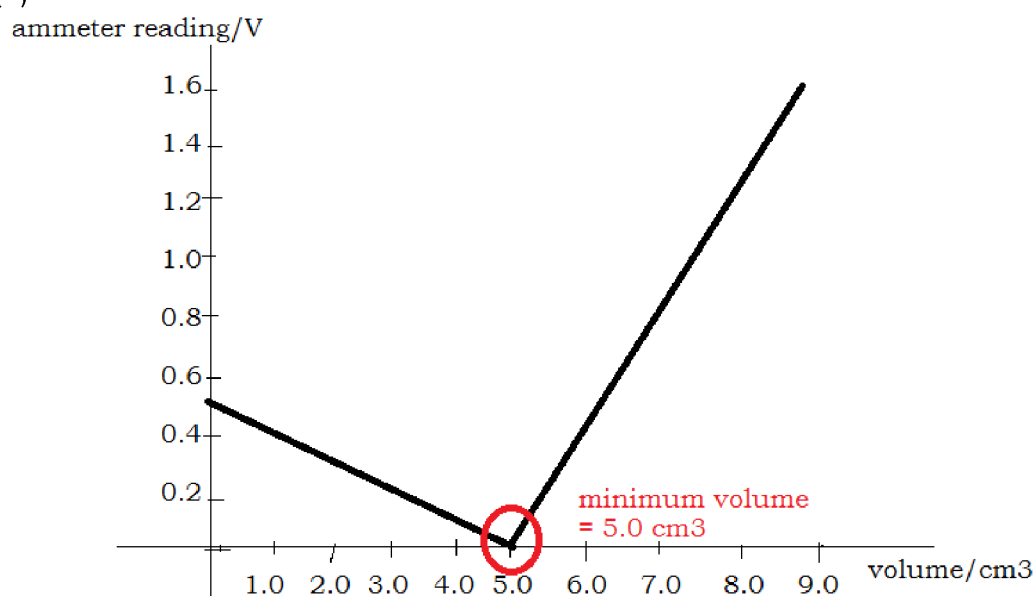
(b) White precipitate formed

(c) The white precipitate is Barium sulphate, the insoluble salt

(d)



(e)



(f) 14.0 V

Volume of H ₂ SO ₄ (cm ³)	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0
Ammeter readings (A)	0.5	0.4	0.3	0.2	0.1	0.0	0.4	0.8	1.2	1.6

(g) The higher volume of sulphuric acid adding, the reaching of end point is closed, the reading of ammeter is decreased

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