Acid

[SPM06-10] Which of the following substances is acidic?

A Ammonia
B Potassium oxide
C Carbon dioxide
D Sodium hydroxide

[SBPmidYearF5-09] Which of the following substance is acidic?

A Sodium hydroxide
B Sulphur dioxide
C Potassium oxide
D Ammonia

[SPM11-17] Which characteristic of hydrogen chloride enables it to show acidic properties in water?

A Dissolves in water
B Contains hydrogen in its molecule
C Contains chlorine in its molecule
D Ionises in water to form hydrogen ions

[SPM09-14] Which of the following particles in a solution of hydrogen chloride is responsible for its acidity properties?

A H^+
B OH^-
C Cl^-
D HCl

[SBPdiag08-06] The properties of acids are due to the presence of

A hydrogen ion
B hydroxide ions
C hydrogen atoms
D hydrogen molecules

[SPM10-25] Which of the following is not a chemical property of acids?

A Reacts with carbonate to produce salt, water and carbon dioxide
B Reacts with reactive metal to produce salt and hydrogen
C Reacts with metal oxide to produce salt and water
D Reacts with alkali to produce salt and hydrogen.

[SBPdiag08-14] Which of the following statement describes the property of hydrochloric acid?

A It reacts with any metal to give hydrogen
B It liberates ammonia from ammonium salts
C It causes colour of litmus paper to change from red to blue
D It reacts with any bases to produce a salt.

[MRSM10-13] Which of the following is/are weak acid?

I HCl
II HNO_3
III H_2SO_4
IV CH_3COOH

A I only
B I and II
C III and IV
D IV only

[SBPmidYearF5-48] Which of the following are the properties of acid?

I Changes the blue litmus paper to red
II Reacts with metal to produce salt and hydrogen gas only
III Reacts with metal oxide to produce salt and water only
IV Reacts with metal carbonate to produce salt and carbon dioxide only

A I and II only
B II and III only
C I, II and III only
D I, II, III and IV

[MRSM04-15] The acidity of hydrogen chloride gas cannot be shown when dissolved in the following solvents

I water
II ethanol
III benzene
IV tetra chloromethane

A I and II only
B III and IV only
C I and III only
D II, III and IV only

[SBPTrial09-06] A student dissolved hydrogen chloride gas into tetrachloromethane. Which of the following statements is true of the solution obtained?

A It does not conduct electricity
B It turns dry blue litmus paper to red
C There is effervescence when calcium carbonate powder is added to it
D The hydrochloric acid molecules undergo complete dissociation

[SBPTrial07-19] Dry hydrogen chloride gas is passed through methyl benzene for a few minutes. Which of the following statements is true about the liquid produced?

I it has a pH value of less than 7
II it consists of hydrogen chloride molecules
III it changes blue litmus to red
IV it does not conduct electric current

A I and III only
B II and IV only
C I, II and III only
D IV only

[MRSM11-26] Diagram 9 shows the reaction between calcium carbonate and glacial ethanoic acid.

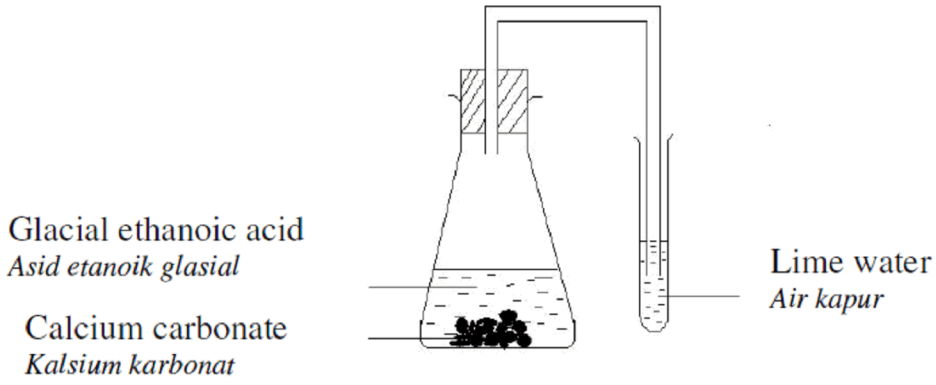


Diagram 9

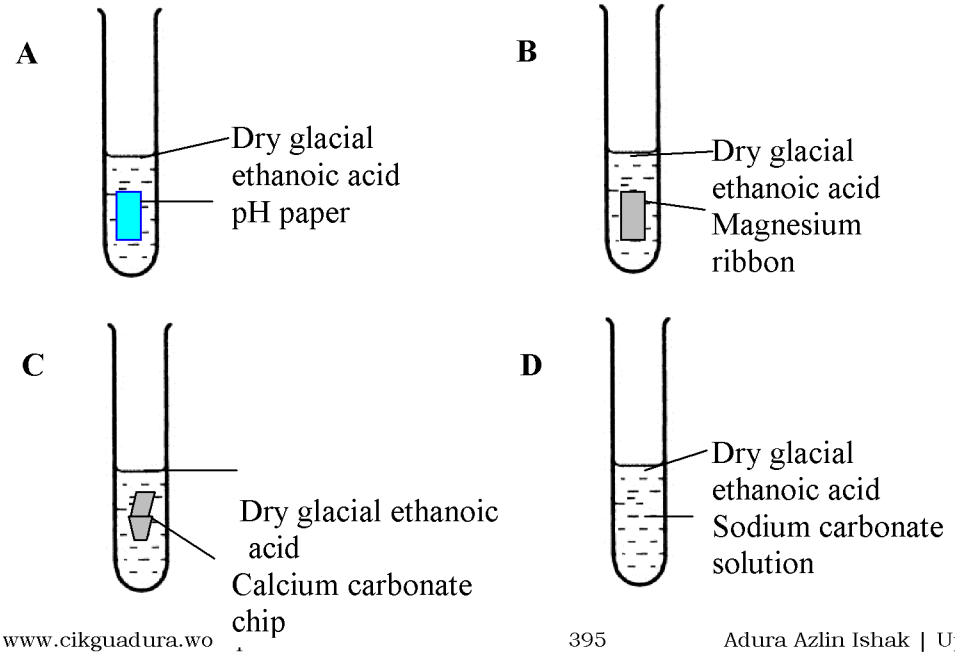
No changes are observed after the reaction.
What should be done in order to make the lime water cloudy?

A Change calcium carbonate chips to calcium carbonate powder
B Substitute calcium carbonate with zinc powder
C Shake vigorously the mixture
D Add water to the mixture

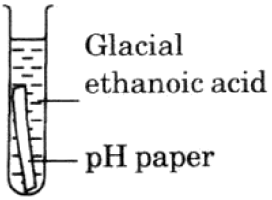
[SPM04-04] Which of the following is true about acids?

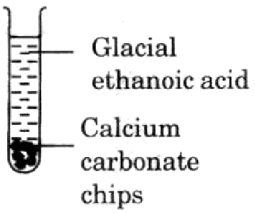
A acids react with metal to produce salt and water
B acids react with alkali to produce salt and hydrogen gas
C acids react with metal oxide to produce salt, water and hydrogen gas
D acids react with carbonate of metal to produce salt, water and carbon dioxide gas

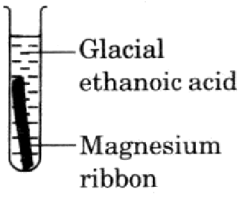
[SBPdiag06-30] Glacial ethanoic acid is put into four test tubes A, B, C and D.
In which test tube does a reaction occur?

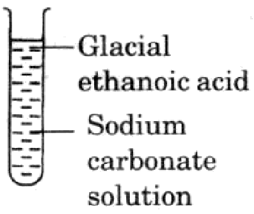


[SPM05-07] Glacial ethanoic acid is put into four test tubes A, B, C and D.
In which test does a reaction occur?

A


B


C


D


[MRSM06-13] The table shows observations for the reaction between ethanoic acid and magnesium.

Reaction	**Observation**
Magnesium powder + glacial ethanoic acid	No changes
Magnesium powder + glacial ethanoic acid + water	Effervescence

Which of the following explains the observation?

A Acetic acid dissolves in water producing hydrogen gas
B Acetic acid ionises to produce hydrogen ions in the presence of water
C Water ionises to hydrogen ions and react with magnesium
D Acetic acid ionises to hydrogen ions which combine with each other to form hydrogen gas

[SBPdiag07-19] The table below shows the observation of the reaction between calcium carbonate and ethanoic acid in two different solvents.

Beaker	**Reaction**	**Observation**
X	Calcium carbonate + ethanoic acid in distilled water.	Effervescence occurs
Y	Calcium carbonate + ethanoic acid in benzene	No visible change

Which of the following statements are true about the observation in beaker X and beaker Y?

I Water ionizes ethanoic acid in beaker X
II Benzene ionizes ethanoic acid in beaker
III Water reacts with calcium carbonate in beaker X.
IV Ethanoic acid remains as molecule in beaker Y.

A I and II only
B I and IV only
C II and III only
D III and IV only

[MRSM09-09] Which element reacts with dilute sulphuric acid to produce hydrogen gas?

A Zinc
B Iodine
C Carbon
D Copper

[SPM03-16] What are the products of the reaction between ethanoic acid and sodium carbonate?

I Water
II Ethyl ethanoate
III Carbon dioxide
IV Sodium ethanoate

A I and III only
B II and IV only
C I, II and III only
D I, III, IV only

[SBPTrial09-19] Table 2 shows the concentration and pH value of hydrochloric acid and ethanoic acid

Type of acid	Concentration / mol dm^{-3}	pH value
Hydrochloric acid	0.1	1
Ethanoic acid	0.1	4

Table 2

Which of the following statements are true about both acids?

I Hydrochloric acid is a stronger acid compared to ethanoic acid.
II Concentration of hydrogen ions is higher in hydrochloric acid compared with ethanoic acid.
III The degree of dissociation of hydrochloric acid in water is higher than ethanoic acid.
IV Both acids can neutralized an alkali to produce salt and water
A I and III
B III and IV
C I, II and III
D I, II, III and IV

[MRSM06-14] The table shows information about two acids.

Acid	Concentration	pH
Sulphuric acid	0.01 mol dm-3	1.1
Hydrochloric acid	0.01 mol dm-3	2.0

Which of the following statement is true?

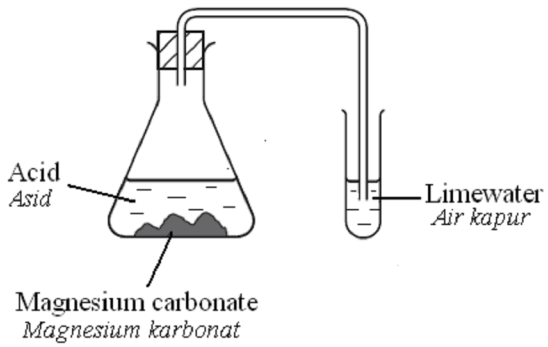
A Sulphuric acid is more concentrated than hydrochloric acid
B Sulphuric acid is a strong acid while hydrochloric acid is a weak acid
C Concentration of H+ ions in sulphuric acid is higher than that of hydrochloric acid
D Sulphuric acid ionises completely while hydrochloric acid ionizes partially in Water

[MRSM07-08] Baking powder contains sodium hydrogen carbonate. It reacts with acidic substances to release

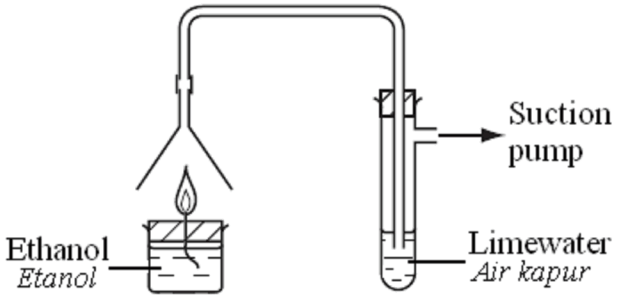
A hydrogen
B nitrogen
C carbon dioxide
D nitrogen dioxide

[MRSM07-06] In which experiment the limewater does not turn cloudy?

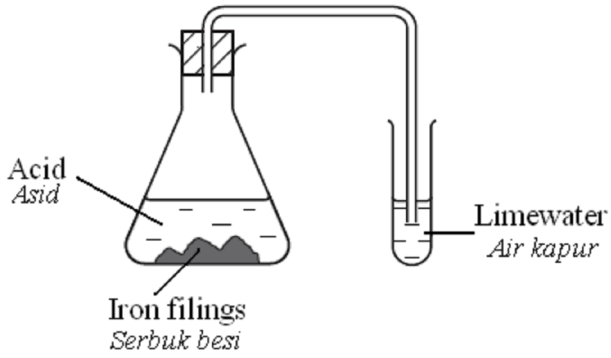
A



B



C



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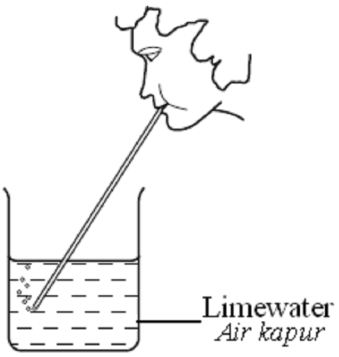


[MRSM03-25] Which of the following solutions has the highest concentration of hydrogen ions?

A 50 cm^3 of 2 mol dm^{-3} hydrochloric acid
B 50 cm^3 of 2 mol dm^{-3} ethanoic acid
C 50 cm^3 of 2 mol dm^{-3} nitric acid
D 50 cm^3 of 2 mol dm^{-3} sulphuric acid

[SPM03-41] Sulphuric acid used as an electrolyte in a car battery has a concentration of 0.5 mol dm^{-3}. How many moles of sulphuric acid is there in 100 cm^3?

A 0.025
B 0.05
C 0.1
D 0.5

[SBPdiag07-14] Sulphuric acid used as an electrolyte in car battery has concentration of 0.5 mol dm^{-3}. How many moles of sulphuric acid is there in 100 cm^3?

A 0.025
B 0.05
C 0.1
D 0.5

[SPM07-09] Which of the following statements correctly describe a strong acid?

I Has a high pH value
II Ionizes completely in water
III Has a high concentration of hydrogen ions
IV Exists as molecules in water

A I and II
B II and III
C I and IV
D III and IV

[SPM03-05] Which of the following is true of a weak acid?

A Unable to neutralize alkali
B The pH value is more than 7
C Able to change red litmus paper to blue
D Ionizes partially in water to produce hydrogen ions

[SBPdiag06-06] Which of the following is true about a strong acid?

A Unable to neutralize alkali
B The pH value is more than 7
C Able to change red litmus paper to blue.
D Ionizes completely in water to produce hydrogen ions

[SBPdiag06-15] Which of the following is a diprotic acid?

A Hydrochloric acid
B Sulphuric acid
C Ethanoic acid
D Nitric acid

[SBPdiag08-30] Sulphuric acid is a diprotic acid because

A sulphuric acid has the properties of acid and also a dehydrating agent.
B one mole of sulphuric acid can neutralise two moles of bases.
C one molecule of sulphuric acid contains two moles OH^- ions.
D one molecule of sulphuric acid produces two H^+ ions in water.

[SBPmidYearF508-37] Which of the following solutions has the highest concentration of hydrogen ion?

A 50 cm^3 of 1.0 mol dm^{-3} H_2SO_4 solution
B 50 cm^3 of 2.0 mol dm^{-3} H_2SO_4 solution
C 100 cm^3 of 1.0 mol dm^{-3} H_2SO_4 solution
D 150 cm^3 of 1.0 mol dm^{-3} H_2SO_4 solution

[MRSM05-11] Which of the following facts is matched correctly?

	Acid formula	Types of acid	Basicity of acid
A	HNO_3	Weak acid	3
B	H_2CO_3	Strong acid	2
C	HCl	Weak acid	1
D	H_2SO_4	Strong acid	2

[SBPTrial08-21] Which of the following solutions have the same number of hydrogen ions, H^+, as in 50 cm^3 of 0.1 mol dm^{-3} sulphuric acid, H_2SO_4?

I 100 cm^3 of 0.1 mol dm^{-3} hydrochloric acid, HCl
I 50 cm^3 of 0.2 mol dm^{-3} nitric acid, HNO_3
III 100 cm^3 of 0.1 mol dm^{-3} ethanoic acid, CH_3COOH
IV 50 cm^3 of 0.1 mol dm^{-3} phosphoric acid, H_3PO_4

A I and II only
B I and III only
C III and IV only
D I, II and III only

Alkali

[SBPTrial10-06] Which of the following causes alkaline properties of ammonia aqueous solution?

A H^+
B OH^-
C NH_3
D NH_4^+

[SBPtrial11-19] Which of the following properties is **true** about alkali?

I Soluble in water
II Alkali is not corrosive
III Changes red litmus paper to blue
IV Has pH more than 7

A I, II and III
B I, II and IV
C I, III and IV
D II, III and IV

[SPM05-05] Which of the following is true about an alkali?

A an alkali is not corrosive
B and alkali is a base that is soluble in water
C a strong alkali has a low pH value
D a weak alkali base has a high degree of ionization

[SBPmidYearF5-10] Which of the following is not true about the properties of alkali?

A Undergoes neutralisation with acid.
B Has a pH value greater than 7.
C Reacts with ammonium salt when heated to produce ammonia gas.
D Reacts with metal carbonates to produce carbon dioxide

[SPM11-01] Which of the following is correct about weak alkaline solution?

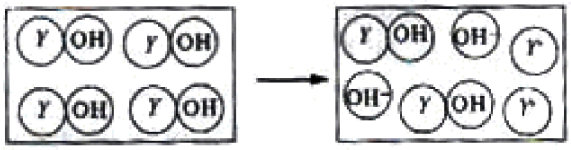
A Have pH value of 13
B Partially ionised in water
C Concentration of the solution is low
D Solution does not react with acid

[MRSM10-09] Why ammonia solution is a weak alkali?

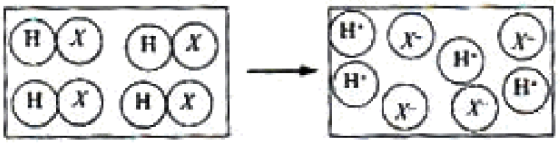
A It has high pH value
B It dissociates partially in water
C It contains a lot of ammonium ions
D It produces high concentration of hydroxide ions in the water

[SPM07-29] Which of the following shows the process of dissociation in a strong alkali when it is added to water? The letters X and Y are not actual symbol of the elements.

A



B



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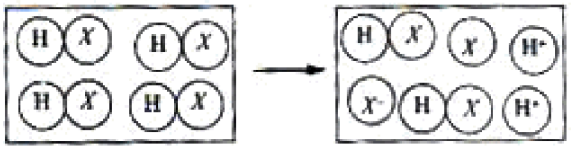
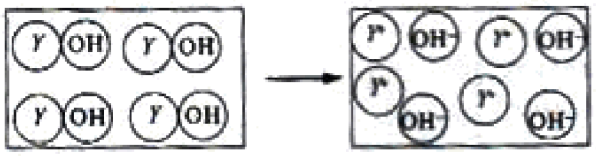


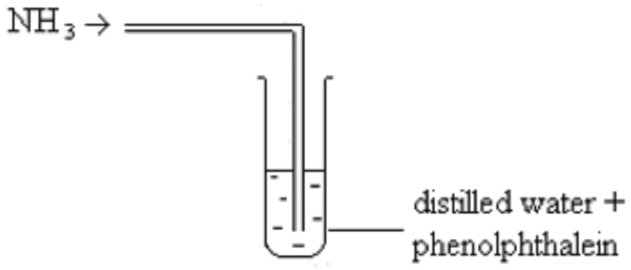
D



[SBPmidYearF5-33] Which of the following is **NOT** a characteristic of ammonia?

A Very soluble in water.
B Has a pungent smell.
C A white fume gas.
D Alkaline gas.

[MRSM06-05] The diagram shows the flow of ammonia gas into distilled water which contains a few drops of phenolphthalein



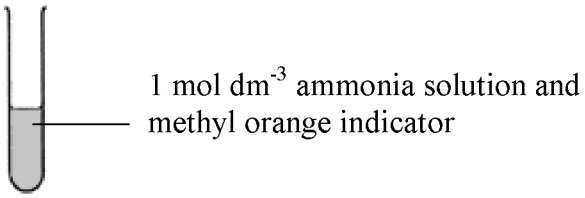
Which of the following is the correct observation?

A Solution remains colourless
B Solution turns from red to purple
C Solution turns from green to red
D Solution turns from colourless to pink

[SBPdiag07-44] What is the colour of aqueous ammonia when added with a few drops of methyl orange solution?

A remain colourless
B orange
C yellow
D pink

[SBPdiag06-14] The diagram shows a test tubes containing ammonia solution.



What is the colour of the solution?

A Orange
B Yellow
C Blue
D Red

[SBPmidYearF508-07] Which of the following is a weak alkali?

A Lithium hydroxide
B Aqueous ammonia
C Cooper(II) hydroxide
D Potassium hydroxide

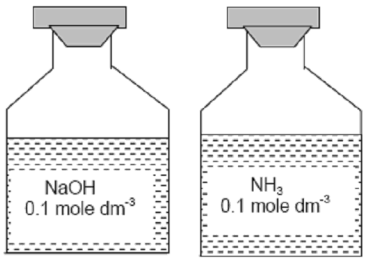
[SBPTrial07-06] Which of the following statements is true about alkali?

A Weak alkali is an alkali that undergoes high rate of ionization.
B Strong alkali has low pH value
C Alkalis are bases that are soluble in water.
D Alkalis are not corrosive

[SBPdiag07-38] Which of the following statements are true about alkali?

A Weak alkali is an alkali that has higher degree of ionisation
B Strong alkali has a low pH value
C Alkalis are bases that are soluble in water
D Alkalis are not corrosive

[MRSM05-10] The figures show two aqueous solutions.



Which of the following statements is true?

A Both solutions are strong alkaline
B The pH of both solutions are equal
C Both solutions are strong electrolyte
D 25.0 cm^3 of each solution requires 25.0 cm^3 of 0.1 mole dm^{-3} hydrochloric acid to be neutralized

[SPM07-38] A student is stung by an insect with an alkaline sting.
Which of the following substances is the most suitable to be applied to the part stung to treat the student?

A Vinegar
B Ethanol
C Tooth paste
D Cooking oil

[SPM09-19] Which of the following substances ionize completely in water?

I Ammonia
II nitric acid
III Ethanoic acid
IV sodium hydroxide

A I and II
B I and III
C II and IV
D III and IV

Base

[SPM07-10] Which of the following statements is true about all bases?

A. React with acids
B. Dissolve in water
C. Contain hydroxide ions
D. Have alkaline properties

[SPM09-41] Which of the following is a use of neutralization in daily lives?

A vinegar cures bee stings
B Limestone treats acidic soil
C Baking powder cures wasp stings
D Methanoic acid prevents coagulation of latex

[SPM09-49] A factory worker wants to remove the oxide layer on the surface of the steel used to make the body of a car.
Which substance is suitable to be used for that purpose?

A Detergent
B Sulphur dioxide
C Dilute hydrochloric acid
D Dilute potassium hydroxide

pH

[MRSM11-10] Which of the following solutions has the lowest pH value?

A 0.1mol dm^{-3} ethanoic acid
B 0.1mol dm^{-3} sulphuric acid
C 0.1mol dm^{-3} aqueous ammonia
D 0.1mol dm^{-3} sodium chloride

[SBPtrial11-06] Which of the following is true of the pH of an acid?

A The more dilute the acid, the higher its pH
B The stronger the acid, the higher its pH
C The higher the degree of dissociation, the higher its pH
D The higher the concentration of hydrogen ions, the higher its pH

[SPM11-43] Which acid contains the highest number of hydrogen ions?

A 25 cm^3 of 1 mol dm^{-3} nitric acid
B 25 cm^3 of 1 mol dm^{-3} ethanoic acid
C 25 cm^3 of 1 mol dm^{-3} sulphuric acid
D 25 cm^3 of 1 mol dm^{-3} hydrochloric acid

[SBPTrial10-19] Which of the following solutions has the highest pH value?

A 0.01 mol dm^{-3} nitric acid
B 0.10 mol dm^{-3} nitric acid
C 0.01 mol dm^{-3} sodium hydroxide
D 0.10 mol dm^{-3} sodium hydroxide

[SBPdiag07-29] Two different acids have pH values 1 and 4 respectively. The difference in the pH values is due to the

A different degree of ionisation
B different concentrations
C different acidic properties
D different electrical conductivities

[MRSM10-26] The pH of 0.1 mol dm^{-3} hydrochloric acid, HCl and 0.1 mol dm^{-3} sulphuric acid, H_2SO_4 are not the same because

A HCl does not ionize completely in water
B concentration of H^+ ions in H_2SO_4 is higher than HCl
C number of ions in H_2SO_4 is more than HCl
D The strength of HCl and H_2SO_4 are not the same

[MRSM03-05] Which of the following substances when added to a solution of pH 4 can change its pH to pH 7?

A Methyl orange
B Ethanoic acid
C Sodium chloride
D Sodium carbonate

[SPM08-07] Table 1 shows the pH values of four acidic solutions which have the same concentration.

Solution	pH value
K	**1.0**
L	**3.0**
M	**5.0**
N	**6.0**

Table 1

Which acidic solution has the highest degree of dissociation?

A K
B L
C M
D N

[MRSM03-04] Which of the following has a pH value less than 7?

A An aqueous solution of ammonia
B An aqueous solution of sodium hydroxide
C An aqueous solution of hydrogen chloride
D An aqueous solution of copper(II) chloride

[SPM08-33] Alkali Y of concentration 1 mol dm^{-3} has a pH of 13. Which statement is true about alkali Y?

A Slightly soluble in water
B Reacts only with a week acid
C The degree of ionization in water is high
D Has a low concentration of hydroxide ions.

[SPM10-24] 0.1 mol dm^{-3} solution of X has a pH value of 13. Which statement is correct about the solution?

A X is a weak acid
B X is a strong alkali
C X dissociates partially in water
D X has a high concentration of hydrogen ions

[SPM09-34] Table 2 shows the degree of dissociation of four solutions of alkalis which have the same concentration.

Solution	Degree of dissociation
W	High
X	Medium
Y	Very high
Z	Low

Which solution has the highest pH value?

A W
B X
C Y
D Z

[SBPTrial08-06] Which of the following solutions can show a pH value of 8?

A 0.1 mol dm^{-3} of ethanoic acid
B 0.1 mol dm^{-3} of hydrochloric acid
C 0.1 mol dm^{-3} of ammonia solution
D 0.1 mol dm^{-3} of sodium hydroxide solution

[SBPdiag07-24] Which of the following solution has the lowest pH value?

A 0.1 mol dm^{-3} ethanoic acid
B 0.1 mol dm^{-3} potassium hydroxide
C 0.1 mol dm^{-3} ammonia solution
D 0.1 mol dm^{-3} nitric acid

[SBPdiag08-38] Which of the following solutions has the lowest pH value?

A 0.1 mol dm^{-3} sulphuric acid, H_2SO_4
B 0.1 mol dm^{-3} ethanoic acid, CH_3COOH
C 1.0 mol dm^{-3} aqueous ammonia, NH_4OH
D 1.0 mol dm^{-3} sodium hydroxide solution, NaOH

[SBPmidYearF5-45] Between these aqueous solutions, which will give the increasing number in pH value?

A CH_3COOH, HCl, NaOH, NaCl
B HCl, NaCl, CH_3COOH, NaOH
C NaOH, NaCl, CH_3COOH, HCl
D HCl, CH_3COOH, NaCl, NaOH

[SBPTrial10-32] Table 4 shows the pH values of two acids.

Acid *Asid*	**Concentration/ mol dm^{-3}**	**pH value**
Hydrochloric acid	0.1	1
Ethanoic acid	0.1	4

Table 4

Which of the following statements explain the differences in the pH value?

I Hydrochloric acid contains hydrogen ions whereas ethanoic acid does not
II Hydrochloric acid is a weak acid whereas ethanoic acid is a strong acid
III Hydrochloric acid dissociates completely in water whereas ethanoic acid dissociates partially
IV The concentration of hydrogen ions in hydrochloric acid is higher whereas in ethanoic acid is lower

A I and II
B II and III
C III and IV
D I, II, III and IV

Standard Solution

[MRSM10-47] Diagram 11 shows the preparation of standard solution of potassium hydroxide, KOH by dissolving 5.6 g of potassium hydroxide in distilled water and making the volume up to 100 cm^3.

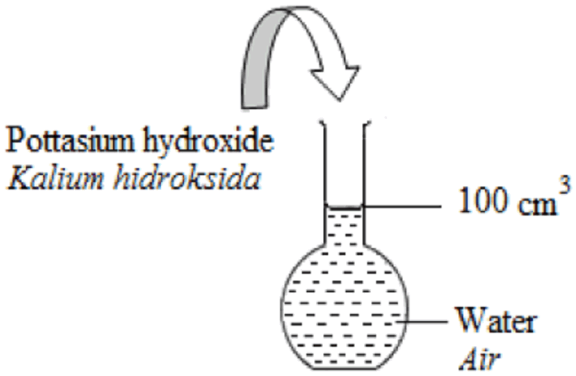
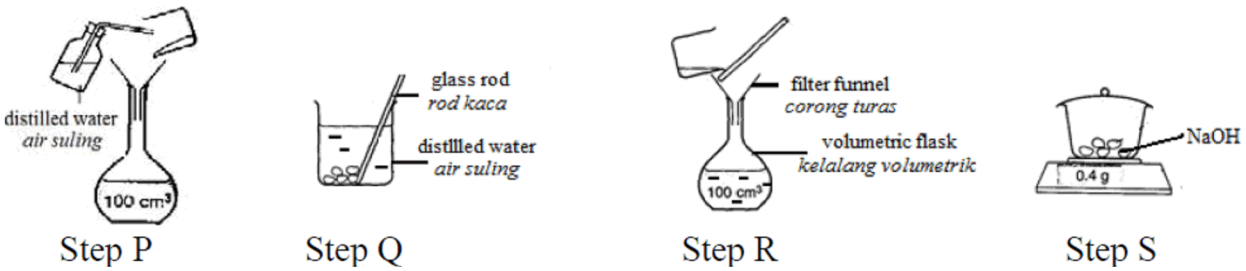


Diagram 11

What is the volume of the standard solution prepared above that should be used if a student wants to prepare 50 cm^3 of 0.5 mol dm^{-3} potassium hydroxide solution?

A 12.5 cm^3
B 25.0 cm^3
C 37.5 cm^3
D 50.0 cm^3

[MRSM07-28] Diagram 10 shows the steps taken to prepare a standard solution.



Step P Step Q Step R Step S

DIAGRAM 10

Arrange the steps in the correct order of preparing a standard solution.

A S, Q, R and P
B S, R, P and Q
C Q, P, R and S
D P, R, S and Q

[SBPTrial07-32] The diagram below shows 5 steps for preparing a standard solution of sodium hydroxide, NaOH but not in correct order.

P - Transfer the solid sodium hydroxide into volume into the volumetric flask.
Q - Weigh the mass of sodium hydroxide
R - Add distilled water until the graduation mark.
S - Rinse the weighing bottle and pour the solution into the volumetric flask.
T - Shake the volumetric flask.

Which of the following steps is correct?

A Q, S, P, R, T
B R, Q, S, P, T
C Q, P, S, R, T
D R, Q, S, T, P

[MRSM06-46] 4.60 g of sodium is burnt in excess chlorine gas. The equation for the reaction is as follows:

$$2Na\ (p) + Cl2\ (g) \text{ -- > } 2NaCl\ (p)$$

The product is dissolved in water to produce 250.0 cm^3 of solution.
What is the molarity of the solution?
[Relative atomic mass of Na=23]

A 0.05 mol dm^{-3}
B 0.20 mol dm^{-3}
C 0.40 mol dm^{-3}
D 0.80 mol dm^{-3}

[SBPTrial08-40] 7 g of potassium hydroxide is dissolved in distilled water to form 250 cm^3 of solution. What is the molarity of the potassium hydroxide solution?
[Relative atomic mass: H=1, O=16, K=39]

A 0.03 mol dm^{-3}
B 0.05 mol dm^{-3}
C 0.30 mol dm^{-3}
D 0.50 mol dm^{-3}

[SBPmidYearF5-31] When 10 cm^3 of 0.50 mol dm^{-3} NaOH is diluted with water to 100 cm^3, the concentration of NaOH solution is

A 0.05 mol dm^{-3}
B 0.10 mol dm^{-3}
C 0.15 mol dm^{-3}
D 0.20 mol dm^{-3}

[SBPmidYearF508-27] The distilled water is added to 20 cm^3 of 1.0 mol dm^{-3} sodium hydroxide solution to produce 250 cm^3 of sodium hydroxide solution.
What is the concentration of the sodium hydroxide solution produced?

A 0.02 mol dm^{-3}
B 0.04 mol dm^{-3}
C 0.06 mol dm^{-3}
D 0.08 mol dm^{-3}

[SPM08-45] The molarities of a solution of sulphuric acid is 2.0 mol dm^{-3}.
What is the concentration of the acid in g dm^{-3}?
[Relative atomic mass: H=1, O=16, S=32]

A 97
B 98
C 194
D 196

Dilution

[MRSM06-44] What is the volume of distilled water required to be added to 25.0 cm^3 of 0.5 mol dm^{-3} sulphuric acid in order to produce a solution of 0.1 mol dm^{-3}?

A 75.0 cm^3
B 100.0 cm^3
C 125.0 cm^3
D 150.0 cm^3

Neutralisation

[MRSM11-28] Diagram 10 shows a word equation for the reaction between R and Q.

R + Q → Potassium chloride + Water

Diagram 10

R reacts with Q to form potassium chloride and water.
Which of the following are the possible substances for R and Q?

	R	Q
A	Potassium hydroxide	Hydrochloric acid
B	Potassium carbonate	Hydrochloric acid
C	Potassium nitrate	Ammonium chloride
D	Potassium	Chlorine gas

[MRSM11-11] A few drops of phenolphthalein are added into nitric acid and sodium hydroxide solution respectively.
What is the colour of the solutions after phenolphthalein is added?

	Nitric acid	Sodium hydroxide solution
A	Pink	Colourless
B	Colourless	Purple
C	Colourless	Pink
D	Purple	Colourless

[MRSM07-06] Sodium hydroxide solution is added to hydrochloric acid in a beaker.
Which of the following ionic equations represents the reaction that occurs?

A $Na^+ + Cl^- \rightarrow NaCl$
B $H^+ + OH^- \rightarrow H_2O$
C $Na^+ + OH^- \rightarrow NaOH$
D $H^+ + Cl^- \rightarrow HCl$

[SBPdiag07-37] The reaction between hydrochloric acid and copper(II) oxide is an example of

A displacement reaction
B neutralization reaction
C decomposition reaction
D precipitation reaction

[SPM04-19] The following equation represents a neutralization reaction

Acid + base -- > salt + water

Which pairs are reactants in neutralizations reactions?

I sulphuric acid + sodium hydroxide
II hydrochloric acid + solid copper (II) oxide
III sulphuric acid + solid calcium carbonate
IV hydrochloric acid + potassium carbonate solution

A I and II only
B I and IV only
C II and III only
D III and IV only

[SBPdiag06-22] The following equation represents a neutralization reaction.

Acid + Base -- > Salt + Water

Which pairs are reactants in the neutralization reactions?

I Sulphuric acid + Solid calcium carbonate
II Hydrochloric acid + solid copper (II) oxide
III Sulphuric acid + sodium hydroxide
IV Hydrochloric acid + Potassium carbonate solution

A I and III only
B I and IV only
C II and III only
D II and IV only

[SBPmidYearF508-17] Which of the following equations shows the neutralization process?

I $CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$
II $Zn + 2HCl \rightarrow ZnCl_2 + H_2$
III $NH_3 + HNO_3 \rightarrow NH_4NO_3$
IV $CaCO_3 + H_2SO_4 \rightarrow CaSO_4 + H_2O + CO_2$

A I only
B II and IV only
C I and III only
D I, II and IV only

[SPM03-17] Which pair of substances represented by the following formulae would result in a reaction?

I HCl (aq) + KOH (aq)
II HNO_3(aq) + $NaNO_3$(aq)
III H_2SO_4(aq) + $CuSO_4$(aq)
IV CH_3COOH (aq) + NaOH (aq)

A I and IV only
B II and III only
C I, II and IV only
D I, II, III and IV

[MRSM11-48] Diagram 20 shows the apparatus set-up for the reaction between acid V and alkali W.

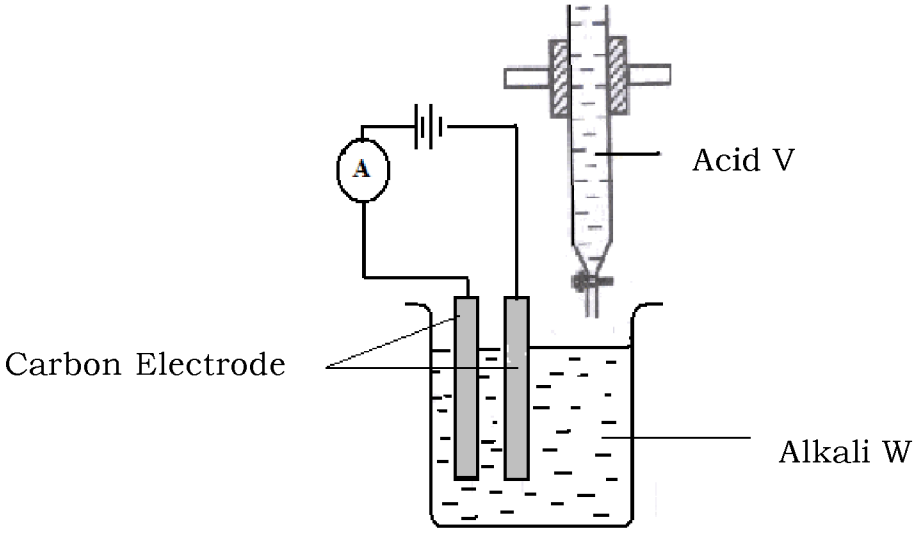


Diagram 20

The graph of ammeter reading against volume of acid V added is shown in Diagram 21.

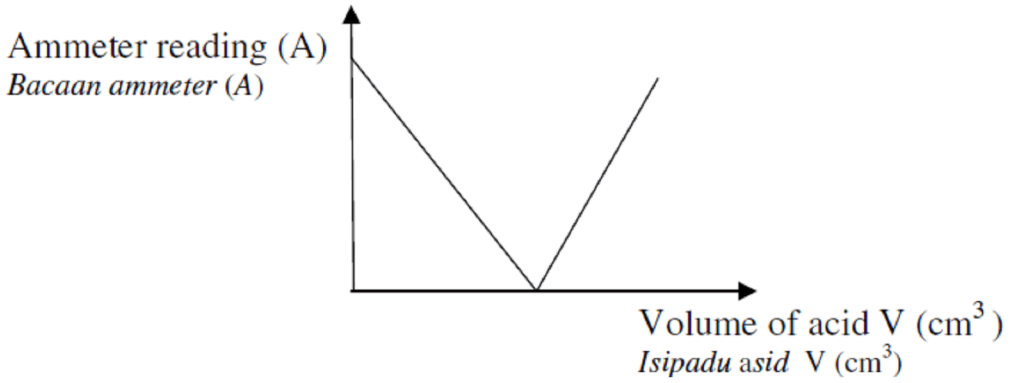


Diagram 21

Based on the graph in Diagram 21, which of the following pairs of substances represent acid V and alkali W?

	Acid V	**Alkali W**
A	Sulphuric acid	Barium hydroxide
B	Hydrochloric acid	Sodium hydroxide
C	Nitric acid	Potassium hydroxide
D	Ethanoic acid	Ammonium hydroxide

[MRSM07-45] When solution X is added gradually to sulphuric acid, the electric current decreases slowly and then increases as shown in Diagram 17.

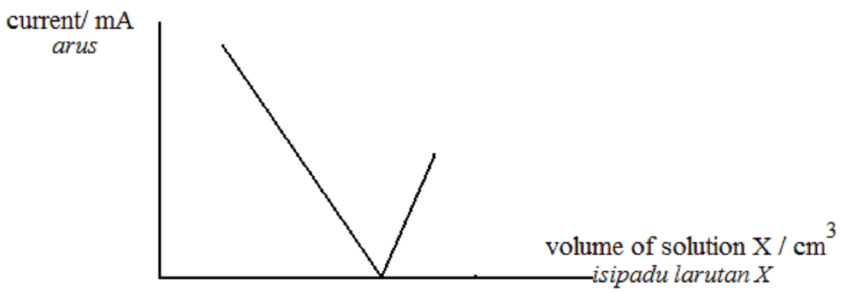


Diagram 17

Which of the following is solution X?

A Silver nitrate
B Ammonium hydroxide
C Zinc chloride
D Barium hydroxide

[MRSM09-26] Calcium carbonate is added to solutions V and W in two different test tubes. Table 2 shows the experimental result for solutions V and W.

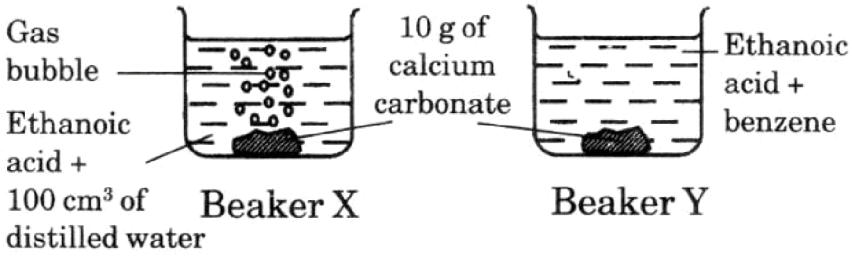
Solution	**V**	**W**
Observation	No changes	Bubbles given off

Table 2

From the result, solutions V and W are

	V	**W**
A	glacial ethanoic acid	aqueous hydrochloric acid
B	glacial ethanoic acid	aqueous sodium hydroxide
C	aqueous sodium hydroxide	glacial ethanoic acid
D	aqueous hydrochloric acid	aqueous ethanoic acid

[SPM05-28] The diagram shows the setup of the apparatus for the reaction between calcium carbonate and ethanoic acid in two different solvents.



Which of the following statements are true about the observation in beaker X and Y?

I water ionizes ethanoic acid in beaker X
II benzene ionizes ethanoic acid in beaker Y
III water reacts with calcium carbonate in beaker X
IV ethanoic acid remains as molecules in beaker Y

A I and II only
B I and IV only
C II and III only
D III and IV only

[MRSM07-26] Diagram 14 shows the pH values of the soil in part F and part G of a palm oil plantation.

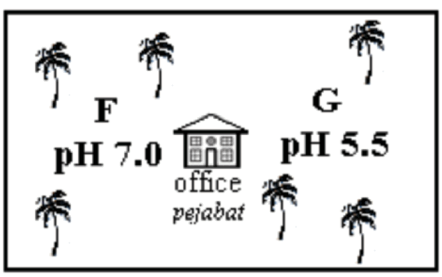


Diagram 14

The owner wishes to use lime to neutralise the soil in one part of the plantation
Which part should the lime (calcium oxide) be added, and why?

A F because lime is acidic
B F because lime is basic
C G because lime is acidic
D G because lime is basic

[SPM10-26] A farmer found that his soil is too acidic for some plants to grow well. Which substance is suitable to reduce the acidity of the soil?

A Barium chloride
B Calcium chloride
C Sodium chloride
D Potassium iodide

[SBPtrial11-32] Acid rain causes the land to become acidic. Farmers neutralize acidity in the soil by adding

A Lime
B Sulphur
C Zinc nitrate
D Ammonium sulphate

Calculation of Neutralisation

[MRSM11-42] Diagram 16 shows the reaction between sulphuric acid and potassium hydroxide solution.

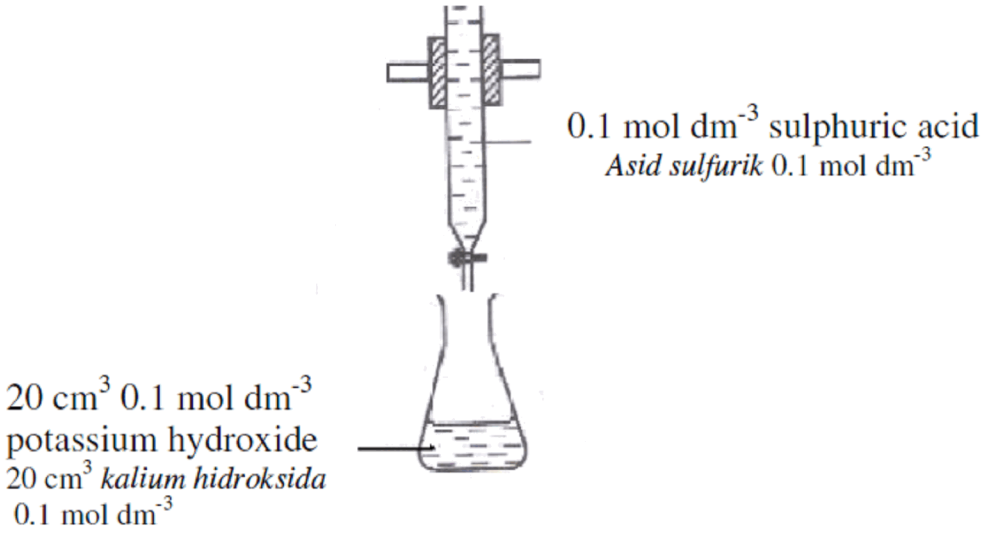


Diagram 16

The chemical equation for the reaction is:

$$H_2SO_4 + \quad 2\ KOH \quad \rightarrow \quad K_2SO_4 + \quad 2\ H_2O$$

What is the volume of 0.1 mol dm^{-3} sulphuric acid needed to exactly neutralise 20 cm^3 0.1 mol dm^{-3} potassium hydroxide?

A 10 cm^3
B 20 cm^3
C 30 cm^3
D 40 cm^3

[MRSM10-41] Diagram 8 shows the set-up of apparatus for the titration of sodium hydroxide solution with hydrochloric acid.

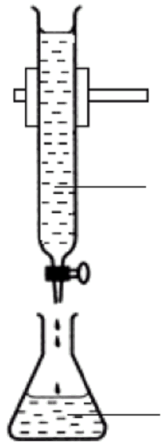


Diagram 8

What is the total volume of the mixture in the conical flask at end point?

A 40 cm^3
B 30 cm^3
C 20 cm^3
D 10 cm^3

[SBPTrial10-47] Diagram 10 shows the titration of hydrochloric acid and potassium hydroxide solution.

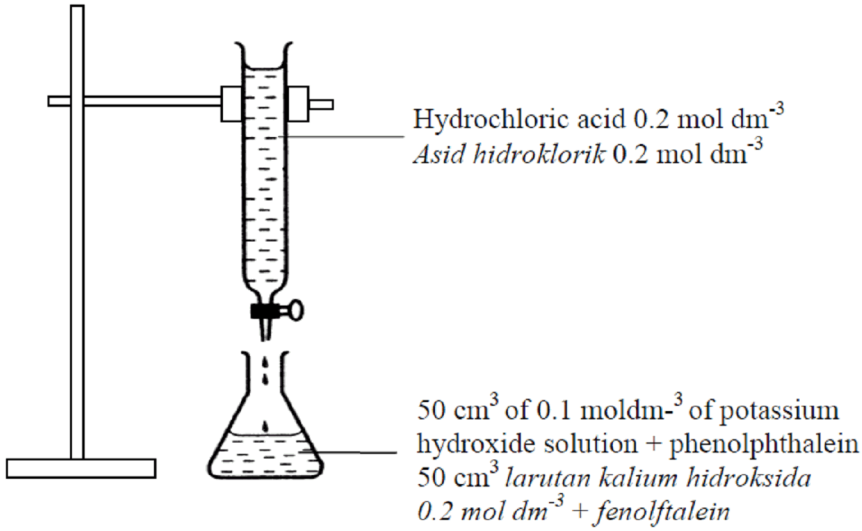


Diagram 10

What is the volume of hydrochloric acid needed to neutralise potassium hydroxide solution?

A 25 cm^3
B 50 cm^3
C 75 cm^3
D 100 cm^3

[SBPtrial11-45] The equation represents a neutralisation reaction.

$$2\ HNO_3 + Ba(OH)_2 \rightarrow Ba(NO_3)_2 + 2\ H_2O$$

10.0 cm^3 of barium hydroxide solution 0.1 mol dm^{-3} is titrated with nitric acid 0.1 mol dm^{-3}. If the initial reading of the burette is 10.00 cm^3, what is the final reading of the burette?

A 20.00 cm^3
B 30.00 cm^3
C 40.00 cm^3
D 50.00 cm^3

[SPM10-27] The following equation represents the neutralization reaction between barium hydroxide, $Ba(OH)_2$ and hydrochloric acid, HCl.

$$Ba(OH)_2 + 2\ HCl \rightarrow BaCl_2 + 2H_2O$$

What is the volume of 0.5 mol dm^{-3} hydrochloric acid needed to neutralize 25 cm^3 of 0.1 mol dm^{-3} barium hydroxide?

A 2.5 cm^3
B 5.0 cm^3
C 10.0 cm^3
D 12.5 cm^3

[SPM11-47] The following chemical equation shows the reaction between sulphuric acid and sodium hydroxide.

$$H_2S0_{4(aq)} + 2\ NaOH_{(aq)} \rightarrow Na_2S0_{4(aq)} + 2\ H_20_{(1)}$$

What is the molarity of sulphuric acid used when 100 cm^3 of the acid neutralises 0.04 mol of sodium hydroxide?

A 0.02 mol dm^{-3}
B 0.08 mol dm^{-3}
C 0.20 mol dm^{-3}
D 0.80 mol dm^{-3}

[MRSM04-43] The equation below represents the neutralization reaction of aqueous W hydroxide and nitric acid.

$$W(OH)_2 + 2HNO_3 \text{ -- > } W(NO_3)_2 + 2H_2O$$

20 cm^3 of aqueous W hydroxide 0.5 mol dm^{-3} neutralizes 20 cm^3 of nitric acid. What is the concentration of the nitric acid?

A 0.25 mol dm^{-3}
B 0.50 mol dm^{-3}
C 1.00 mol dm^{-3}
D 2.00 mol dm^{-3}

[SPM03-34] The information about two solutions is as follows:

Concentration of barium hydroxide solution = 0.5 mol dm^{-3}
Concentration of aqueous ammonia = 0.5 mol dm^{-3}

Which of the following statements are true based on the information?

I Aqueous ammonia is a walker alkali than barium hydroxide solution
II The pH value of barium hydroxide solution higher than aqueous ammonia
III The degree of dissociation of barium hydroxide in water is higher than in ammonia
IV The concentration of OH- ions in barium hydroxide solution is higher than in aqueous ammonia

A I and III only
B III and IV only
C I, II and III only
D I, II , III and IV

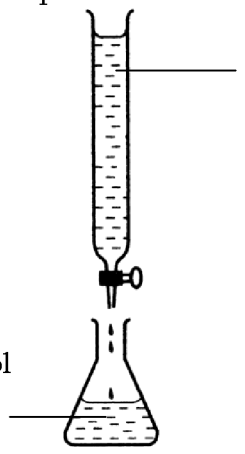
[MRSM09-41] The following chemical equation represents the neutralization reaction between sulphuric acid and sodium hydroxide solution.

$$H_2SO_4 + 2\ NaOH \rightarrow Na_2SO_4 + 2H_2O$$

20.00 cm^3 of 0.1 mol dm^{-3} sodium hydroxide solution was titrated with 0.1 mol dm^{-3} sulphuric acid. What is the final reading of the burette if the initial reading is 5.00 cm^3?

A 10.00 cm^3
B 15.00 cm^3
C 20.00 cm^3
D 25.00 cm^3

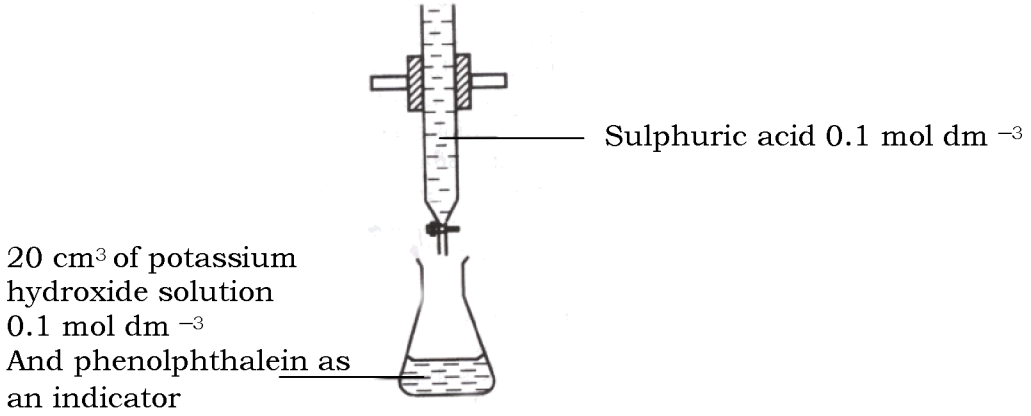
[SPM03-42| SBPdiag06-38] The diagram shows the set–up of apparatus for the titration of sodium hydroxide solution with sulphuric acid.



What is the volume of sulphuric acid at the end point of the titration?

A 10 cm^3
B 20 cm^3
C 30 cm^3
D 40 cm^3

[SBPdiag07-08] The figure below shows the set-up of apparatus for the titration of potassium hydroxide solution with sulphuric acid.



What is the total volume of the mixture in the conical flask at the end point of the titration?

A 10 cm^3
B 20 cm^3
C 30 cm^3
D 40 cm^3

[SPM04-40] The equation shows the reaction between sulphuric acid and sodium hydroxide.

$$\mathbf{H_2SO_4 + 2NaOH \longrightarrow Na_2SO_4 + 2H_2O}$$

What is the volume of 1.0 mol dm^{-3} sodium hydroxide solution which can neutralize 25.0 cm^3 of 1.0 mol dm^{-3} sulphuric acid?

A 12.5 cm^3
B 25.0 cm^3
C 50.0 cm^3
D 75.0 cm^3

[SPM06-40] A dibase acid, H_2J has the concentration of 0.5mol dm^{-3}. Letter J is not the actual symbol of the element.
What is the volume of potassium hydroxide, KOH, 1.0mol dm^{-3} that can neutralize 2.50cm^3 of the H_2J acid solution?

A 6.25cm^3
B 12.50cm^3
C 25.00cm^3
D 50.00cm^3

[SPM08-50] 50.0 cm^3 of 0.4 mol dm^{-3} potassium hydroxide solution, KOH, is titrated with sulphuric acid, H_2SO_4.
What volume of 1.0 mol dm^{-3} sulphuric acid is needed to neutralize this potassium hydroxide solution?

A 10.0 cm^3
B 20.0 cm^3
C 40.0 cm^3
D 50.0 cm^3

[SBPTrial07-28] The equation below shows the reaction between sulphuric acid and sodium hydroxide solution.

$$H_2SO_4 + 2KOH \longrightarrow K_2SO_4 + 2H_2O$$

What is the number of moles of sodium sulphate salt produced if 0.2 mol of sodium hydroxide is used?

A 0.10 mol
B 0.05 mol
C 0.22 mol
D 0.25 mol

[SBPTrial07-44] Calculate the volume of sodium hydroxide of concentration 0.5 mol dm^{-3} needed to neutralize 25.0 cm^3 sulphuric acid of concentration 0.20 mol dm^{-3}.

A 10 cm^3
B 20 cm^3
C 25 cm^3
D 50 cm^3

[SBPTrial08-33] The following equation represents the reaction between sodium hydroxide solution and dilute sulphuric acid.

$$H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$$

What is the volume of 0.5 mol dm^{-3} sulphuric acid needed to neutralise 50 cm^3 of 0.5 mol dm^{-3} sodium hydroxide?

A 12.5 cm^3
B 25.0 cm^3
C 50.0 cm^3
D 75.0 cm^3

[SBPTrial09-31] What is the volume of 2.0 mol dm^{-3} potassium hydroxide solution is needed to prepare 500 cm^3 of 0.1 mol dm^{-3} potassium hydroxide solution.

A 25 cm^3
B 50 cm^3
C 100 cm^3
D 500 cm^3

[SBPTrial09-44] The following equation shows the reaction between sulphuric acid and potassium hydroxide.

$$H_2SO_4 + 2KOH \rightarrow K_2SO_4 + 2\ H_2O$$

What is the volume of 0.5 mol dm^{-3} potassium hydroxide solution which can neutralize 50.0 cm^3 of 0.5 mol dm^{-3} sulphuric acid?

A 25.0 cm^3
B 50.0 cm^3
C 75.0 cm^3
D 100.0 cm^3

[MRSM07-44] Which of the following solutions reacts completely with 40 cm^3 of 1.0 mol dm^{-3} sulphuric acid, H_2SO_4.

I 40 cm^3 of 1.0 mol dm^{-3} NaOH
II 20 cm^3 of 2.0 mol dm^{-3} KOH
III 10 cm^3 of 2.0 mol dm^{-3} Ba(OH)2
IV 10 cm^3 of 4.0 mol dm^{-3} Ba(OH)2

A I and II only
B I and III only
C II and IV only
D IV only

[SBPdiag08-22] $Zn(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)$
Based on the equation above we can conclude that
[Relative atomic mass: Zn=65, H=1, O=16, S=32]

I 1 mol of sulphuric acid will produce 1 mol of zinc sulphate
II 1 mol of zinc will react with 1 mol of sulphuric acid
III 100 cm^3 sulphuric acid 1 mol dm^{-3} will produce 16.1 g zinc sulphate if the zinc used is in excess.
IV The total volume of hydrogen gas liberated will be determined by the amount of zinc and sulphuric acid reacted.
A II and IV only
B I, II and III only
C I, III and IV only
D I, II, III and IV

[SBPdiag06-45] Which of the following solution has the highest concentration of hydrogen ions?

A 50 cm^3 1.0 mol dm^{-3} H_2SO_4 solution
B 50 cm^3 2.0 mol dm^{-3} H_2SO_4 solution
C 100 cm^3 1.0 mol dm^{-3} HNO_3 solution
D 150 cm^3 1.0 mol dm^{-3} HNO_3 solution

[SBPdiag08-46] Neutralization reaction between nitric acid and calcium hydroxide is shown in the chemical equation below.

$$2HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_{3)2} + 2H_2O$$

What is the minimum volume of nitric acid of 0.2 mol dm^{-3} needed to completely neutralise 50 cm^3 calcium hydroxide solution 0.05 mol dm^{-3}.

A 12.5 cm^3
B 25.0 cm^3
C 37.5 cm^3
D 50.0 cm^3

[SBPmidYearF5-32] The reaction between lead (II) nitrate and potassium iodide solution is represented by the equation below

$$Pb(NO_3)_{2\ (aq)} + 2KI_{\ (aq)} \rightarrow PbI_{2\ (s)} + 2KNO_{3\ (aq)}$$

25.0 cm^3 of 1.0 mol dm^{-3} potassium iodide solution is mixed with 25.0 cm^3 of 1.0 mol dm^{-3} lead (II) nitrate solution. What is the maximum mass of lead(II) iodide produced in this reaction? [Relative atomic mass: I=127, Pb=207]

A 4.175 g
B 5.76 g
C 8.35 g
D 11.52 g

[SBPmidYearF5-41] The equation shows neutralization reaction between W hydroxide solution and nitric acid.

$$W(OH)_2 + 2HNO_3 \rightarrow W(NO_3)_2 + 2H_2O$$

20 cm^3 of W hydroxide solution 0.5 mol dm^{-3} neutralized 20 cm^3 of nitric acid. What is the concentration of the nitric acid needed?

A 0.25 mol dm^{-3}
B 0.50 mol dm^{-3}
C 1.00 mol dm^{-3}
D 2.00 mol dm^{-3}

[SBPmidYearF508-46] What is the volume of 0.2 mol dm^{-3}sulphuric acid solution required to completely neutralize 50 cm^3 of 0.2 mol dm^{-3} potassium hydroxide solution?

A 25 cm^3
B 30 cm^3
C 45 cm^3
D 50 cm^3

[SPM07-40] Diagram 13 shows the neutralization reaction between a strong acid and a strong alkali.

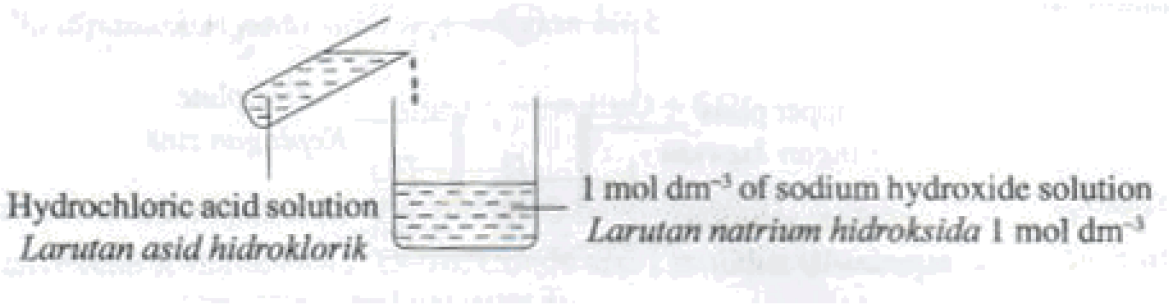


Diagram 13

What is the volume of the alkali needed to produce 1.4625 g of salt?
[Relative atomic mass: Na =23, Cl =35.5, H =1, O =16]

A 0.005 cm^3
B 0.025 cm^3
C 5.000 cm^3
D 25.000 cm^3

[MRSM07-38] The equation represents the displacement of copper from aqueous copper (II) sulphate using metal Q.

$$Q + CuSO_4 \text{ -- > } QSO_4 + Cu$$

What is the volume of aqueous 1 mol dm^{-3} of copper (II) sulphate that reacts completely with 0.96 g of metal Q?
[Relative atomic mass Q: 24]

A 60 cm^3
B 40 cm^3
C 25 cm^3
D 23 cm^3

[MRSM10-42] The following equation represents the reaction between magnesium oxide and nitric acid.

$$MgO + 2HNO_3 \rightarrow Mg(NO_3)_2 + H_2O$$

Excess magnesium oxide is reacted with 50 cm^3 of 2.0 mol dm^{-3} nitric acid. What is the maximum mass of magnesium nitrate salt formed?
[Relative atomic mass: N = 14, O = 16, Mg = 24]

A 1.48 g
B 3.70 g
C 4.30 g
D 7.40 g

[SPM08-47] The following equation shows the reaction between copper (II) oxide and sulphuric acid.

$$CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$$

6.0g copper (II) oxide is added to 50.0 cm^3 of 1.0 mol dm^{-3} sulphuric acid.
What is the mass of copper (II) oxide left at the end of the reaction?
[Relative atomic mass: O = 16, Cu = 64]

A 0.3 g
B 2.0 g
C 2.8 g
D 4.0 g

Structure {Paper02}

[SBPTrial10-03]

(a) Diagram 3.1 shows the pH value of glacial ethanoic acid in solvent P and solvent Q respectively

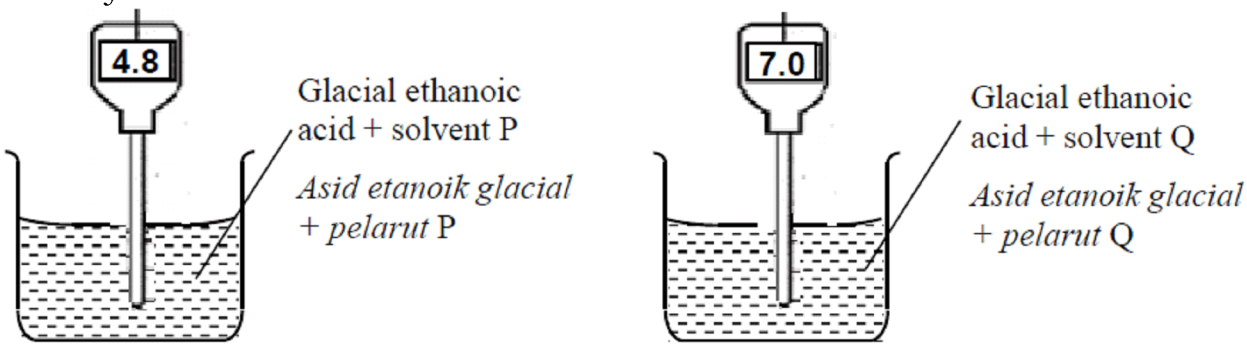


Diagram 3.1

(i) Give one example of each solvent P and solvent Q. [2M]

Solvent P : .....

Solvent Q : .....

(ii) If magnesium ribbon is added into beaker containing glacial ethanoic acid and solvent P, what can be observed? [1M]

.....

(iii)Explain why ethanoic acid in solvent P has the pH value of 4.8. [3M]

.....

.....

.....

(b) Diagram 3.2 shows the concentration of hydrochloric acid decrease when water is added into beaker J

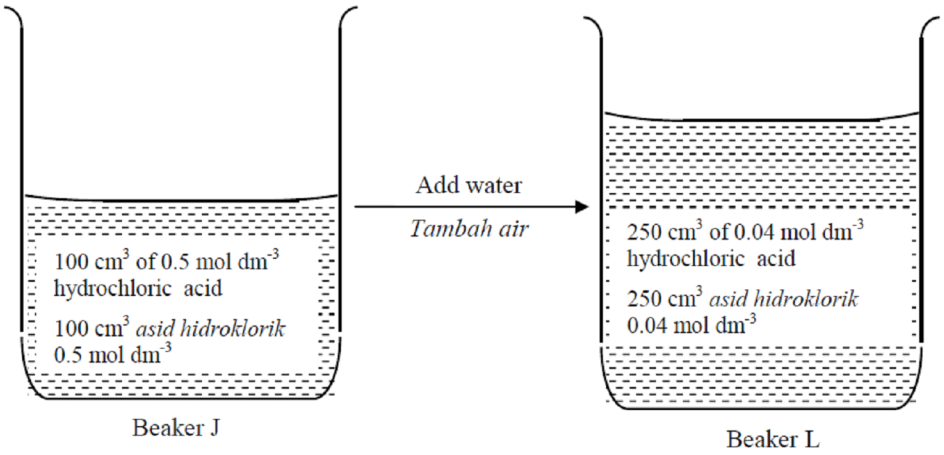


Diagram 3.2

(i) When water is added into beaker J, what happen to the pH value of the hydrochloric acid? Give reason to your answer. [2M]

.....

.....

.....

(ii) Calculate the volume of hydrochloric acid in beaker J that is needed to prepare hydrochloric acid in beaker L. [2M]

[SBPdiag07-05]

X and Y are hydrogen chloride solutions in different solvents. Table 5 shows the observation obtained when the properties of these two solutions are compared.

Test	Solution X	Solution Y
Using a dry blue litmus paper	Turns from blue to red	No visible change
Ability to conduct electricity	Can conduct electricity	Cannot conduct electricity

Table 5

(a) Based on the observations in Table 5, name a suitable solvent for [2M]

(i) solution X : .....

(ii) solution Y : .....

(b) What type of particles is present in solution X which enables it to conduct electricity? [1M]

.....

(c) Explain why solution X turns blue litmus paper red but solution Y does not.[2M]

.....

.....

(d) In the experiment, 8.0 cm^3 of solution X 0.6 mol dm^{-3} requires 20.0 cm^3 of barium hydroxide solution for complete reaction.

(i) Name the type of reaction occurred. [1M]

.....

(ii) Write a chemical equation for the reaction. [1M]

.....

(iii) Calculate the concentration of barium hydroxide solution in mol dm^{-3}. [3M]
[Relative atomic mass: H=1, O=16, Ba=137]

[SBPdiag06-06]

Figure 6 shows four test tubes contain dry glacial ethanoic acid, aqueous solution of ethanoic acid, dilute hydrochloric acid and aqueous solution of X.

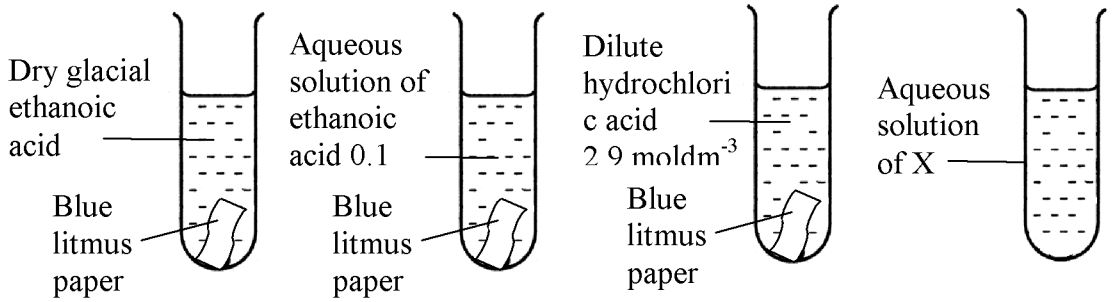


FIGURE 6

(a) (i) State the colour change of the litmus paper in test tubes Q and R. [1M]

.....

(ii) Write the formula of ion which caused the colour change of the litmus paper. [1M]

.....

(b) Is there any changes of colour of the litmus paper in test tube P? Explain why. [2M]

.....

.....

(c) Table 6 shows the pH value of aqueous solution of ethanoic acid and dilute hydrochloric acid of the same molarity.

Type of acid	**aqueous solution of ethanoic acid**	**dilute hydrochloric acid**
Molarity	0.1 moldm^{-3}	0.1 moldm^{-3}
pH value	1.0	2.9

TABLE 6

Explain why the pH value of aqueous solution of ethanoic acid is higher than the pH value of dilute hydrochloric acid. [2M]

.....

.....

.....

(d) Calcium carbonate powder is added into test tube R. Write the chemical equation for the reaction that takes place. [1M]

.....

(e) Aqueous solution of X is an acidic solution. As a chemistry student, describe briefly how you are able to prove that X is an acidic solution. You are not allow to use litmus paper, pH meter or any indicators.

Procedure: [2M]

.....

.....

.....

.....

.....

Observation: [1M]

.....

.....

[MRSM09-04]

Diagram 4 shows a test tube containing 5 cm^3 of glacial ethanoic acid and magnesium ribbon.

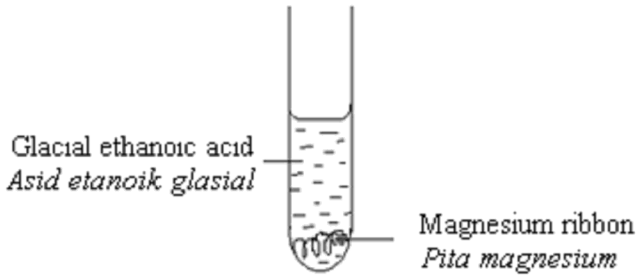


Diagram 4

(*a*) (i) What type of particle is present in glacial ethanoic acid? [1M]

.....

(ii) What can be observed when magnesium ribbon is added to glacial ethanoic acid? [1M]

.....

(iii) What can be observed if water is added to the glacial ethanoic acid containing magnesium ribbon? Explain your answer. [2M]

.....

.....

(*b*) 50 cm^3 of distilled water is added to 50 cm^3 of ethanoic acid 1.0 mol dm^{-3}. Calculate the molarity of the solution formed. [1M]

(*c*) In a separate experiment, 25 cm^3 of 0.5 mol dm^{-3} sodium hydroxide solutions is titrated with 1.0 mol dm^{-3} hydrochloric acid.

(i) Draw the apparatus set up for this titration process. [2M]

(ii) Calculate the volume of hydrochloric acid needed to neutralize the sodium hydroxide solution. [3M]

[SPM11-04]

Hydrochloric acid is a strong acid. Table 4 shows two solutions of hydrochloric acid, P and Q, of different concentrations.

Hydrochloric acid solution	**Concentration (mol dm^{-3})**
P	0.100
Q	0.001

Table 4

(a) State the meaning of an acid. [1M]

.....

(b) Why hydrochloric acid is a strong acid? [1M]

.....

(c). Solutions P and Q have different pH values.

(i) Which solution gives a lower pH value? [1M]

.....

(ii). Give one reason for the answer in 4(c)(1). [1M]

.....

(d) 25 cm^3 of 0.1 mol dm^{-3} sodium hydroxide solution is put in a conical flask. Then a few drops of phenolphthalein are added. This solution is titrated with solution P.

(i). State the type of reaction between sodium hydroxide solution and solution P. [1M]

.....

(ii) What is the colour change of the mixture at the end point? [1M]

.....

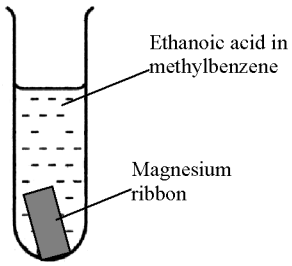
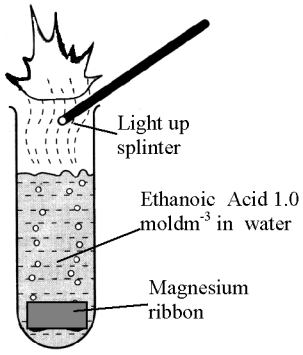
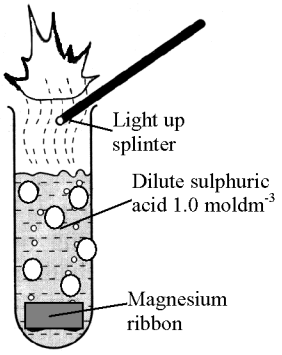
(iii) Write the chemical equation for the reaction. [2M]

.....

(iv). Calculate the volume of hydrochloric acid used. [2M]

[SBPdiag05-04]

Table 2 shows three experiments conducted to compare the acidic properties ethanoic acid and dilute sulphuric acid in different solvents.

Experiment	**I**	**II**	**III**
Set-up of Apparatus			
Observation	No bubble gas is released. No "Pop" sound when tested with light up splinter.	A little bubble gas is released. A "Pop" sound produced when tested with light-up splinter.	A lot of bubble gas is released. A "Pop" sound is produced when tested with light-up splinter.

(a) Give the definition of weak acid? [1M]

.....

(b) Name the gas released in both experiment II and experiment III. [1M]

.....

(c) State the type of ethanoic acid particles in methylbenzene solvent and water. [1M]

Solvent	**Methylbenzene**	**Water**
Type of particles		

(d) What can you observe if water is added into the test tube in experiment I? [1M]

.....

(e) Which acid in Experiment II and Experiment III, is strong acid? Explain why. [3M]

.....

.....

.....

(f) Write the chemical equation for the chemical reaction between sulphuric acid with magnesium. [1M]

.....

(g) If 20 cm^3 dilute sulphuric acid 1.0 mol dm^{-3} complete its reaction with magnesium ribbon, calculate the volume of gas that has been released in room condition. [2M]
[1 mole gas occupied 24 dm^3 at room condition]

[MRSM11-02]

Table 2 shows the pH values of solutions V, W, X, Y and Z with a concentration of 0.1 mol dm^{-3}.

Solution	V	W	X	Y	Z
pH value	1	4	7	10	13

Table 2

(*a*) Based on Table 2, state which solution is [2M]

(i) neutral : .....

(ii) alkaline: : .....

(*b*) State which solution contains [2M]

(i) the highest concentration of hydrogen ion : .....

(ii) the highest concentration of hydroxide ion : .....

(*c*) (i) Give an example of solution V. [1M]

.....

(ii) Give **one** chemical property of solution V. [1M]

.....

(*d*) (i) Give **one** example of solution Z. [1M]

.....

(ii) Distilled water is added to 20.0 cm^3 of solution Z to make 100.0 cm^3 of solution. Calculate the new concentration of solution Z. [2M]

[SPM06-04]

(a) 8g of solid sodium hydroxide, NaOH is dissolved in distil water to produce a solution of 1000 cm^3. The NaOH solution produced has the concentration of 8 g dm^{-3} and the **molarity** of 0.2 mol dm^{-3}.

(i) State the meaning of the **concentration** for the solution produced. [1M]

.....

.....

(ii) State the meaning of the **molarity** for the solution produced. [1M]

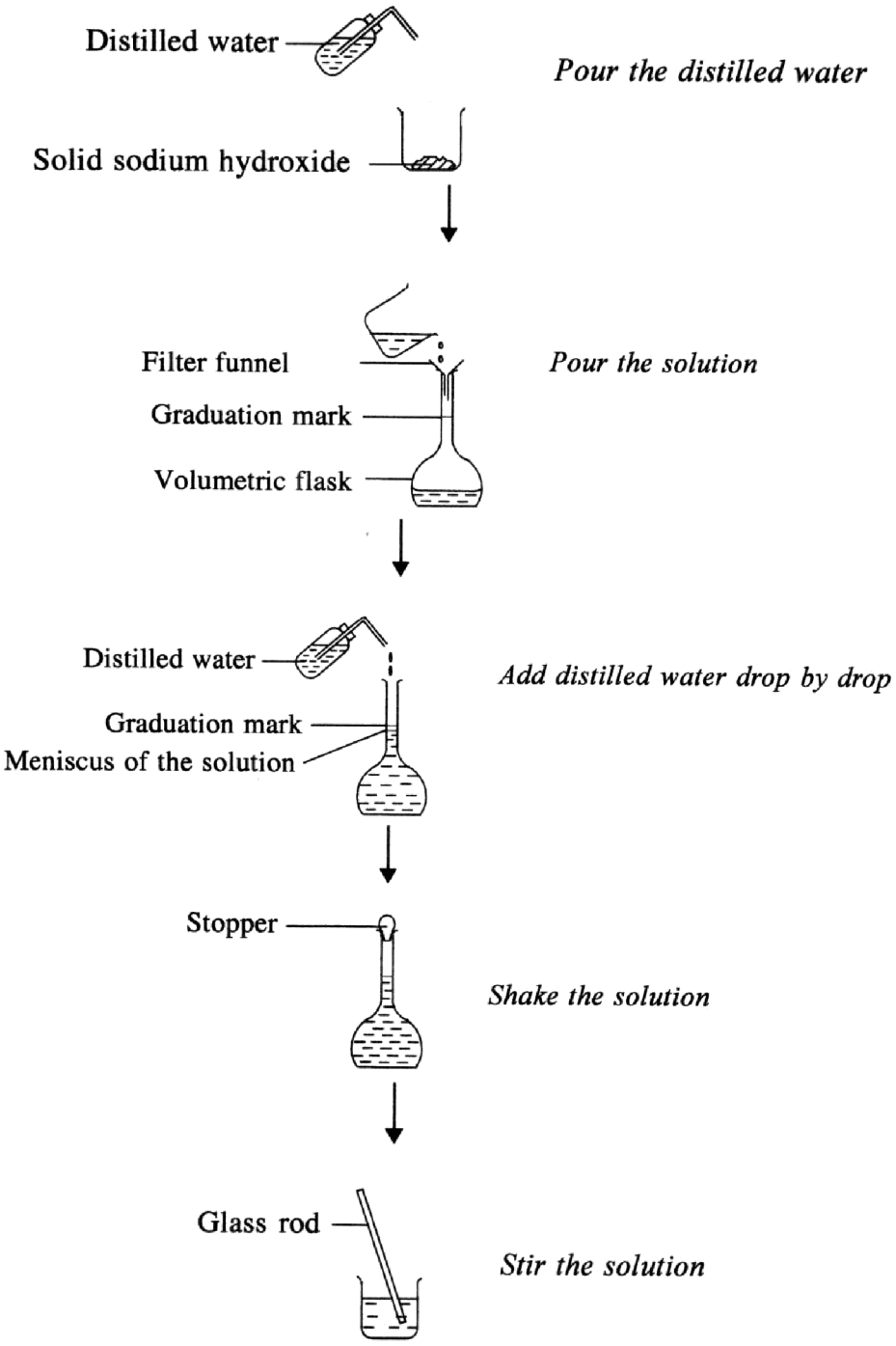
.....

.....

(iii) Write the formula that represents the relationship between the number of mole (n), molarity (M) and volume (V) for the solution. [1M]

(iv) Substitute the actual values of the number of mole, molarity and volume of the NaOH solution into the formula in 4 (a)(iii). [1M]
[Relative molecular mass of NaOH = 40]

(b) Diagram 4.1 shows the preparation of the standard solution of NaOH, 0.2 mol dm^{-3}



(i) What are the two parameters that should be measured accurately to prepare the standard solution of NaOH? [2M]

Parameter I : .....

Parameter II : .....

(ii) After all the NaOH solution is poured into volumetric flask, the beaker and the filter funnel must be rinse several times with distilled water. After each rinse, all of this water is transferred into the volumetric flask. Give **one** reason for doing this. [1M]

.....

.....

(iii) What step should be taken to ensure that the meniscus level of the standard solution is exactly in line with the graduation mark on the volumetric flask?[1M]

.....

.....

(iv) A volumetric flask is more suitable to be used in the preparation of the standard solution rather than a beaker. Why? [1M]

.....

(v) Why is the volumetric flask stoppered after the standard solution is prepared? [1M]

.....

[MRSM10-04]

(*a*) Table 4 shows example of strong acid and weak acid with the concentration of 0.1 mol dm^{-3}.

Type of acid	Example	pH
Strong acid	Hydrochloric acid	1.0
Weak acid	Oxalic acid	3.0

Based on the information shown in Table 4, answer the following questions:

(i) What is meant by a weak acid? [1M]

.....

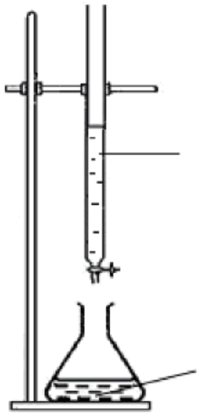
.....

(ii) Why is the pH value of hydrochloric acid lower than the pH value of oxalic acid? [2M]

.....

.....

(*b*) Diagram 4.1 shows the apparatus set-up for a titration between sodium hydroxide solution and dilute hydrochloric acid.



Hydrochloric acid

25 cm^3 of 0.1 $moldm^{-3}$ sodium hydroxide

(i) Write a chemical equation to represent the reaction. [1M]

.....

(ii) 25 cm^3 of 0.1 mol dm^{-3} sodium hydroxide solution is required to react completely with 12.50 cm^3 of dilute hydrochloric acid. Calculate the molarity of the dilute hydrochloric acid used. [3M]

[SPM10-06]

(a) Diagram 6 shows the apparatus set-up for the titration of 25.0 cm^3 of 0.1 mol dm^{-3} sodium hydroxide, NaOH solution with dilute hydrochloric acid, HCl, using phenolphthalein as an indicator.

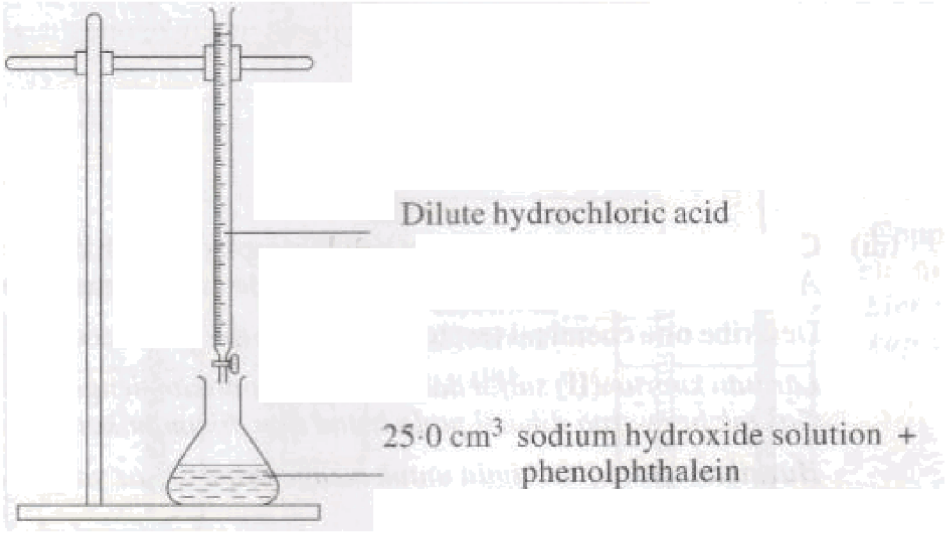


Diagram 6

(i) Name the type of reaction that occurs in the conical flask. [1M]

.....

(ii) Write a balanced chemical equation for the reaction in 6(a)(i). [2M]

.....

(iii) State the colour change of the solution in the conical flask when the end point of titration is reached. [1M]

.....

(iv) 20.0 cm^3 of hydrochloric acid is needed to neutralise completely the sodium hydroxide solution in the conical flask. [2M]

(b) Table 6 shows the concentration and volume of two different types of strong acid, X and Y, which are used to neutralise 20.0 cm^3 of 0.5 mol dm^{-3} potassium hydroxide solution.

Acid	**X**	**Y**
X	0.5 mol dm^{-3}	0.5 mol dm^{-3}
Y	V cm^3	2 V cm^3

Based on the information in Table 6, identify acid X and Y. [2M]

X: .....

Y: .....

(c) Sulphuric acid solution contains sulphate ion, SO_4^{2-}. Describe one confirmatory test for sulphate ion, SO_4^{2-}. [3M]

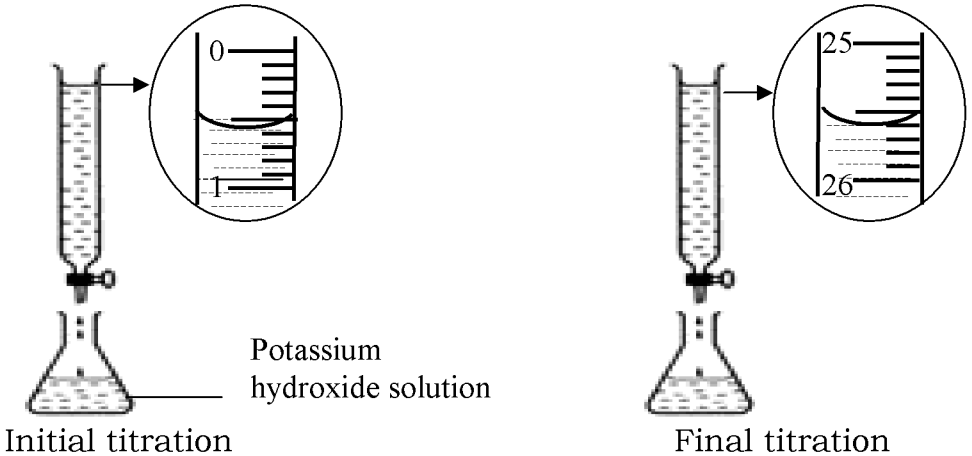
.....

.....

.....

[SBPdiag08-05]

Diagram 5 shows the setup of the apparatus and the magnification of the burette reading for the titration of 25.0 cm^3 of potassium hydroxide solution and 1.0 mol dm^{-3} of hydrochloric acid using phenolphthalein as indicator.



Initial titration Final titration

(a) Complete the table below. [2M]

Final burette reading/cm^3	.....
Initial burette reading/cm^3	.....
Volume of acid/cm^3	.....

(b) State the change of colour to the phenolphthalein indicator in the titration. [1M]

.....

(c) Write the chemical equation for the neutralisation reaction. [1M]

.....

(d) Calculate the concentration of the potassium hydroxide solution in mol dm^{-3}. [3M]

(e) The experiment above is repeated by using 1.0 mol dm^{-3} of sulphuric acid to replace the hydrochloric acid to titrate the 25.0 cm^3 potassium hydroxide solution.

(i) State the volume of the sulphuric acid needed to titrate the potassium hydroxide solution. [1M]

.....

(ii) Explain your answer in (e) (i). [2M]

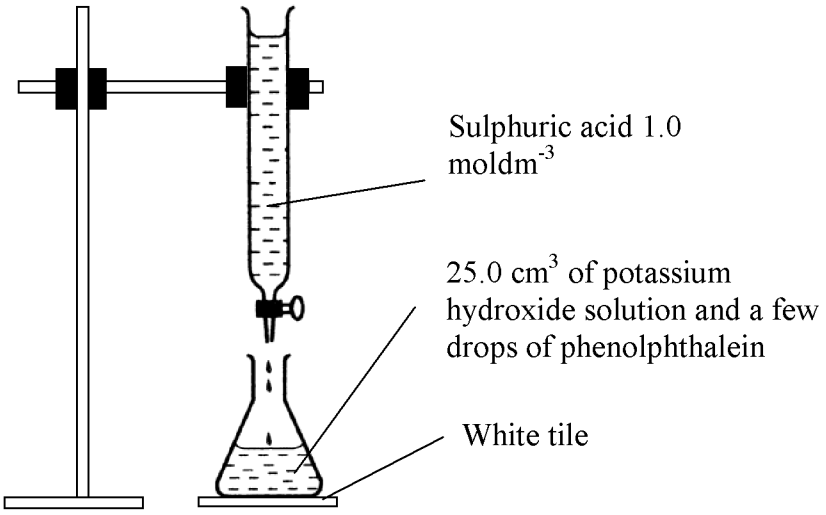
.....

.....

.....

[SBPdiag06-04]

An activity is carried out in the laboratory to determine the end point of the reaction between 25.0 cm^3 of potassium hydroxide solution and 1.0 $moldm^{-3}$ of sulphuric acid. Phenolphthalein is used in the titration to detect the end point of the reaction. Figure 4 shows the set-up of apparatus for the titration.



The volume of sulphuric acid added and the changes of the colour of potassium hydroxide solution are shown in the Table 4 below.

Volume of sulphuric acid (cm^3)	**4.50**	**4.60**	**4.70**	**4.80**	**4.90**	**5.00**	**5.10**	**5.20**	**5.30**	**5.40**
Colour of potassium hydroxide solution	Pink	Pink	Pink	Pink	Pink	Colour-less	Colour-less	Colour-less	Colour-less	Colour-less

TABLE 4

(a) Name the chemical reaction between potassium hydroxide solution and sulphuric acid. [1M]

.....

(b) Write a chemical equation for the reaction. [1M]

.....

(c) Write the formula of ions which are present in the conical flask when the volume of sulphuric acid added is:

(i) 4.50 cm^3 : .....

(ii) 5.30 cm^3: .....

(d) How much sulphuric acid is required to neutralise 25.0 cm^3 of potassium hydroxide solution?

.....

(e) Calculate the molarity of potassium hydroxide used in the above activity. [3M]

If sulphuric acid is replaced with nitric acid with the same molarity, predict the volume of nitric acid require to neutralise 25.0 cm^3 of the potassium hydroxide solution. Explain why. [2M]

.....

.....

.....

[SBPtrial04-03] {Translate}

One experiment was done in the laboratory to determine the end point of neutralisation reaction between 1.0 mol dm^{-3} of dilute sulphuric acid solution with 25.0 cm^3 of potassium hydroxide solution using the phenolphthalein as indicator. The result as show in the table below:

Experiment	**I**	**II**	**III**
Final burette reading/cm^3	25.65	49.00	30.30
Initial burette reading/cm^3	0.55	24.00	5.40
Volume of sulphuric acid used/cm^3	------	------	------

Table 1

(a) Sulphuric acid is a strong acid. What mean by 'strong acid'? [2M]

.....

.....

(b) Write the chemical equation to presentation the reaction between sulphuric acid with potassium hydroxide. [1M]

.....

(c) (i) Compete the table above to determine the volume of sulphuric acid used in every the experiments. [1M]

(ii) Calculate the average of volume sulphuric acid used in the experiment. [1M]

(iii) Calculate the molarity of potassium hydroxide solutions used in the experiment. [2M]

(c) (i) if 1.0 mol dm^{-3} hydrochloric acid used to titrate the 25.0 cm^3 of potassium hydroxide solutions, what is the volume of hydrochloric acid should be used? [1M]

.....

(ii) Explain your answer at (d)(i). [2M]

.....

.....

.....

.....

[SBPtrial06-04] {Translate}

Diagram 4 shows the arrangement of set-up apparatus to study of reaction between one strong acid with one strong alkali.

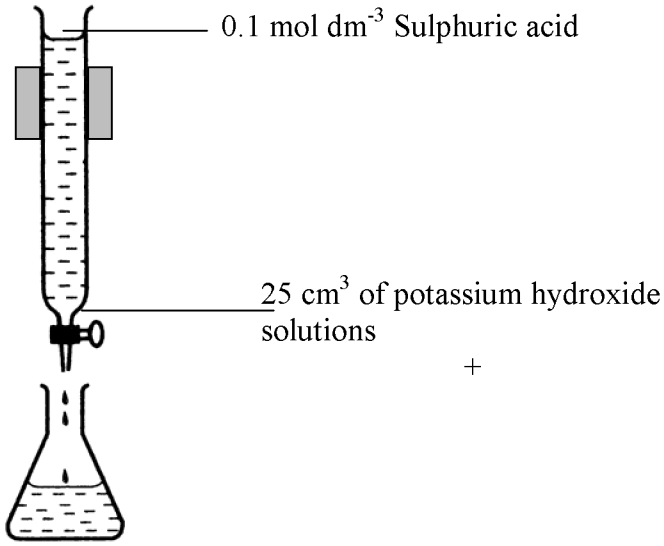


Diagram 4

25.0 cm^3 of potassium hydroxide solution was poured into conical flask. A few drop methyl orange was added. The solutions in the conical flask then was titrate by 0.1 mol dm^{-3} of sulphuric acid.

(a) What mean by strong alkali? [2M]

.....

.....

(b) Suggest one apparatus that can be used to measure 25.0 cm^3 of potassium hydroxide solutions. [1M]

.....

(c) What a function of methyl orange in the experiment? [1M]

.....

(d) (i) Name the type of reaction happen. [1M]

.....

(ii) Write the chemical equation for the reaction. [1M]

.....

(iii) State the change of colour for the solutions in the conical flask during the end point of neutralisation process achieves. [1M]

.....

(e) In this experiment, 20.0 cm^3 of sulphuric acid needed to achieve the end point.

(i) Calculate the number of moles of sulphuric acid used. [1M]

(ii) Calculate the number of moles of potassium hydroxide that contains in the conical flask. [2M]

[MRSM08-04]

Vinegar is aqueous ethanoic acid. The concentration of ethanoic acid in the vinegar was determined by titrating the vinegar with 0.10 mol dm^{-3} sodium hydroxide solution using phenolphthalein as an indicator. The result of the experiment is shown in Table 4.

The following equation represents the reaction:

$$CH_3COOH + NaOH \text{ -- > } CH_3COONa + H_2O$$

	Titration I	Titration II	Titration III
Initial burette reading / cm^3	0.00	23.40	0.00
Final burette reading / cm^3	23.40	47.00	23.50
Volume of NaOH used / cm^3	_____	_____	_____

Table 4

(a) Ethanoic acid is a weak acid. What is meant by weak acid? [[1M]

.....

.....

(b) State the colour change of phenolphthalein at the end point. [1M]

.....

(c) (i) Complete Table 4 by calculating the volume of sodium hydroxide solution used in each titration. [1M]

(ii) Calculate the average volume of 0.10 mol dm^{-3} of sodium hydroxide solution used to neutralize 25.00 cm^3 of vinegar. [1M]

(d) (i) Calculate the number of moles of sodium hydroxide used to neutralize 25.0 cm^3 of vinegar.[1M]

(ii) Calculate the concentration of ethanoic acid in the vinegar.[3M]

(e) The experiment is repeated using 0.10 mol dm^{-3} of barium hydroxide to replace sodium hydroxide.

Predict the volume of barium hydroxide solution required to neutralize 25.00 cm^3 of vinegar. Explain your answer.[2M]

.....

.....

.....

Essay {Paper02}

[SBPmidyearF508-09a,b]

(a) Write two balanced chemical equation to show the chemical properties of an acid. [2M]

Diagram 9 shows the structural formula of methanoic acid.

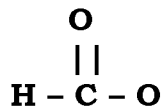


Diagram 9

(b) (i) Explain why methanoic acid is a weak acid. [2M]

(ii) Glacial methanoic acid does not conduct electricity but the aqueous methanoic acid does. Explain. [3M]

----------oooOO aĎaŽ OOooo----------

[SBPtrial05-09a,b]

Table 1 shows the example of acids with the concentration 2 mol dm^{-3}.

Hydrochloric acid
Sulphuric acid
Ethanoic aid

JADUAL 1

(a) What mean by strong acid?
Compare the conductivity property between hydrochloric acid with ethanoic acid. [6M]

(b) Hydrochloric acid and sulphuric acid can react with magnesium metal to produce salt and hydrogen gas. Compare the rate of reaction for the both reaction. Explain your answer. [4M]

----------oooOO aĎaŽ OOooo----------

[SBPtrial07-07a,b]

(a)

Type of acid	Concentration	pH value
Ethanoic acid	0.1 mol dm^{-3}	3.0
Nitric acid	0.1 mol dm^{-3}	1.0

Explain why the pH values of these two acids are different. [4M]

(b) The two solutions are tested with a dry red litmus paper and the results are tabulated below:

Solution	Observation
Ammonia in chloroform	No change in colour
Ammonia in water	Red litmus paper turns blue

Explain why only the aqueous ammonia solution turns red litmus paper blue. [5M]

----------oooOO aĎaŽ OOooo----------

[MRSM05-07a]

Table 1 shows the pH values of two different types of acid.

Types of acid	Concentration of acid	pH value
Hydrochloric acid	0.1 mole dm^{-3}	1.0
Sulphuric acid	0.1 mole dm^{-3}	0.7

Table 1

(a) Explain why the pH value of both acids are different. [4M]

----------oooOO aĎaŽ OOooo----------

[MRSM06-10a]

(a) Vinegar is dilute ethanoic acid solution. Diagram 10 shows the reaction occurred when an egg is placed into a beaker of vinegar.

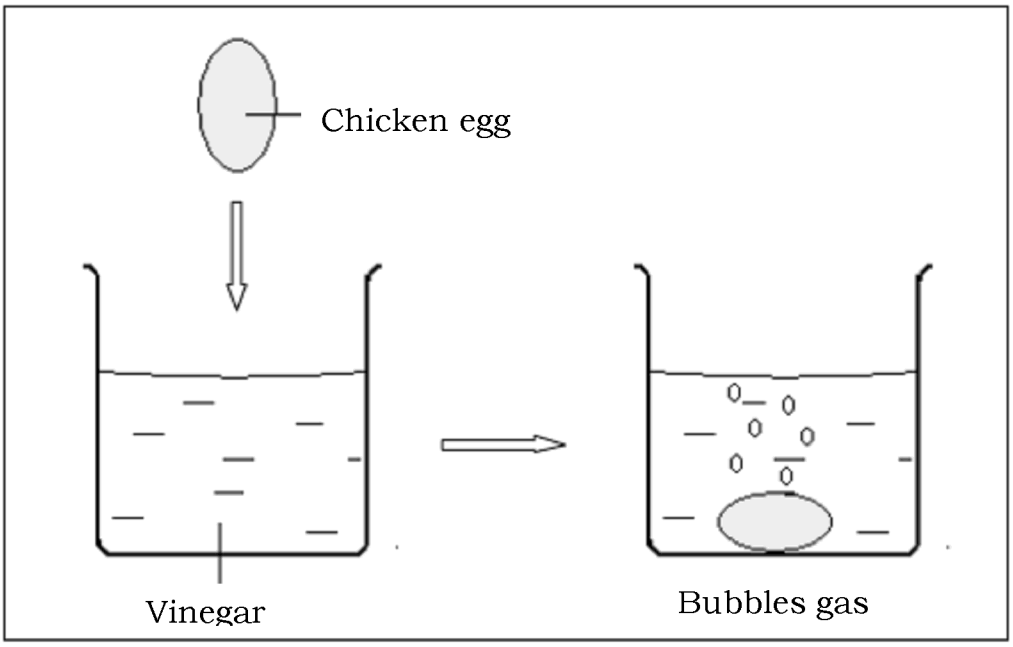


Diagram 10

Explain the observation and include the chemical equations involved. [4M]

----------oooOO aĎaŽ OOooo----------

[MRSM04-09a,b]

(a) Magnesium hydroxide is one of the chemical compounds found in tooth paste. Write the chemical formula for magnesium hydroxide and explain its function in toothpaste. [3M]

(b) Diagram 6 shows two beakers containing 0.1 mol dm^{-3} solutions X and solution Y and their pH readings.

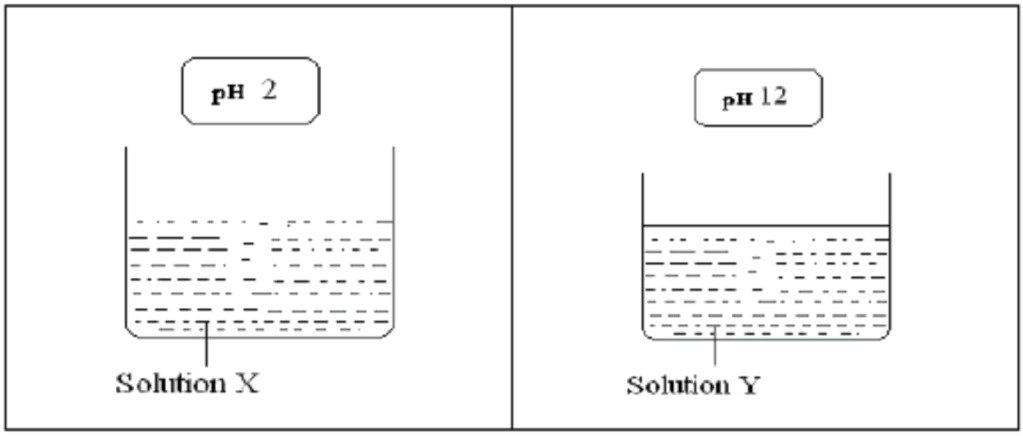


Diagram 6

Compare and contrast both solution X and solution Y in terms of their physical and chemical properties. Give a suitable example for both solutions X and Y. [8M]

----------oooOO aĎaŽ OOooo----------

[SBPtrial11-08]

(a) Diagram 8 shows the apparatus set up of Experiment I, Experiment II and the observations when copper(II) oxide is added into hydrochloric acid in two difference solvent.

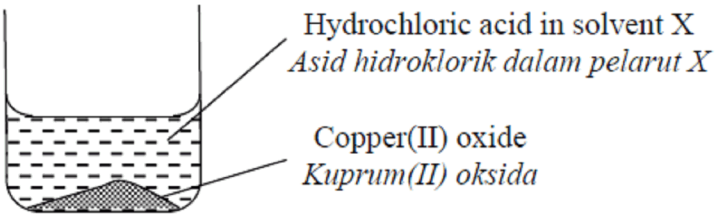
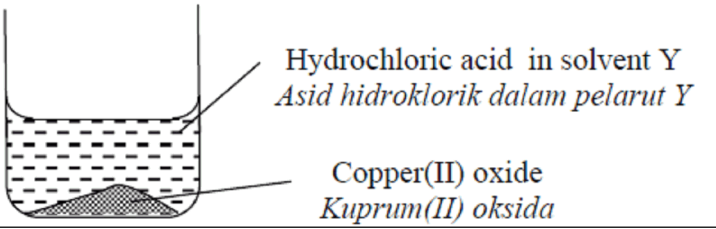
Experiment	**Apparatus set up**	**Observation**
I		- Black solid dissolves - Colourless solution turns blue
II		- No change

Diagram 8

Based on the information in Diagram 8

(i) Name one suitable example of each solvent X and solvent Y. [2M]

(ii) Compare observations in Experiment I and Experiment II. Explain your answer and include an ionic equation that involved. [8M]

(iii)Referring to the observation in Experiment I, [6M]

- state the type of reaction that occur
- write the chemical equation for the reaction between hydrochloric acid and copper(II) oxide
- calculate the mass of copper(II) oxide needed to react completely with 50 cm^3 of 1.0 $moldm^{-3}$ of hydrochloric acid

[Relative atomic mass: Cu = 64, O = 16]

(b) Table 8 shows the concentrations and pH values of two different alkalis.

Alkali	Concentration /mol dm^{-3}	pH
Sodium hydroxide solution	0.1	13
Ammonia aqueous solution	0.1	10

Table 8

Explain why the alkalis in Table 8 have different pH values. [4M]

----------oooOO aĎaŽ OOooo----------

[SBPdiag07-09]

(a) The following information is about nitric acid and ethanoic acid.

- The pH of 0.1 mol dm^{-3} nitric acid solution is 1
- The pH of 0.1 mol dm^{-3} ethanoic acid solution is 4

Explain why these two solutions have different pH values. [4M]

(b) Describe one chemical test that can be used to identify the presence of an acid. Your answer should consist of the following: [6M]

- Procedures of the experiment including the test to identify the gas liberated.
- Chemical equations
- Observation

(c) (i) What is meant by ' standard solution' ? [1M]

(ii) Describe an activity for preparation of 250 cm^3 of a standard solution of mol dm^{-3} sodium hydroxide. [9M]
Given the relative formula mass NaOH= 40.

Your answer should consist of the following:

- Lists of materials and apparatus
- Calculations involved
- Procedures of the experiment

----------oooOO aĎaŽ OOooo----------

[MRSM07-08]

(a) Table 8 shows the pH of two solutions.

Solution	**pH**
0.1 mol dm-3 of potassium hydroxide solution	13
0.1 mol dm^{-3} of aqueous ammonia	11

Table 8

Explain why the two solutions have different pH. [4M]

(b) An unlabelled reagent bottle is said to contain sulphuric acid solution. Describe how you would confirm the solution. [4M]

(c) The structural formula of ethanoic acid is shown in Diagram 8.

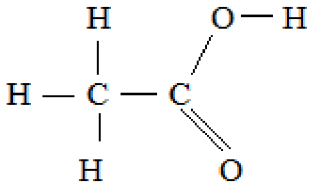


Diagram 8

(i) Explain why ethanoic acid is a monoprotic acid. [2M]

(ii) Glacial ethanoic acid does not conduct electricity but the aqueous solution of ethanoic acid does. Explain why.[3M]

(iii) When zinc powder is added into aqueous ethanoic acid, bubbles of colourless gas are evolved. Write a chemical equation for the reaction.[2M]

(d) The equation below shows the reaction between hydrochloric acid and magnesium.

$$Mg + 2HCl \text{ -- > } MgCl_2 + H_2$$

50.0 cm^3 of hydrochloric acid solution reacts with excess magnesium to produce 48 cm^3 of hydrogen gas. Calculate the concentration of the hydrochloric acid used. [Molar volume of gas = 24.0 dm^3 mol^{-1}] [3M]

(e) Emission of gaseous pollutant from vehicles and industries leads to the formation of acid rain. Explain the effect of acid rain to the structure of buildings. [2M]

----------oooOO aĎaŽ OOooo----------

[SPM09-10a,b]

(a) In an experiment, 50 cm^3 of 0.1 mol dm^3 of ethanoic acid, CH_3COOH reacts completely with x g of sodium hydroxide, NaOH and is dissolved in 100 cm^3 of solution. Calculate the value of x. [4]

(b) Table 10 shows the results when zinc reacts with hydrogen chloride in solvent L and solvent M.

Substance	solvent	observation
Zinc + Hydrogen chloride	L	Bubbles of gas
Zinc + Hydrogen chloride	M	No bubbles of gas

Table 10

Based on table 10, suggest the name of solvent L and solvent M.
Explain the observations.
Write the equation for the reaction that occurs in solvent L. [6M]

----------oooOO aĎaŽ OOooo----------

[SPM08-10a,c]

(a) Table 10 shows the pH values for solutions of acid A and Acid B which have the same concentration.

Acid	pH value
A	1
B	5

Table 10

By using one named example for each acid, explain why the pH values of the acids are different. [6M]

(c) The sting of a jelly-fish is alkaline and causes pain.
Suggest one substance that can be applied to the skin to relieve the pain without causing further injury.
Give three reasons for your suggestion. [4 M]

----------oooOO aĎaŽ OOooo----------

[SBPmidyearF507-10a]

(a) Describe an experiment to determine the concentration of an alkali solution by using the titration method. In your answer include the chemical equation and all the relevant calculations involved. [12M]

----------oooOO aĎaŽ OOooo----------

[MRSM03-09b]

(b) A reagent bottle contains an unknown concentration of sodium hydroxide solution. You are asked by your chemistry teacher to determine the concentration of the sodium hydroxide solution using titration method.

Explain how you will go about doing it. In your explanation include all the calculations involved. [10M]

----------oooOO aĎaŽ OOooo----------

Structure {Paper03}

[SPM10-02]
Table 2 shows the results from an experiment to investigate the acidic properties of ethanoic acid.

Reaction	**Observation**
Ethanoic acid in water + magnesium	Effervescence
Ethanoic acid in methylbenzene + magnesium	No Effervescence

Table 2

(a) For this experiment, state:

(i) The manipulated variable

.....

(ii) The responding variable

.....

(iii) The constant variable

.....

(b) Ethanoic acid reacts with reactive metals to produce salt and hydrogen gas. Sketch a graph to show the volume of hydrogen gas produced against time. [3M]

(c) Classify the following acids into strong acids and weak acids. [3M]

Hydrochloric acid	Sulphuric acid
Ethanoic acid	Nitric acid

Strong acids	Weak acids

[SBPtrial08-01]

A student carried out an experiment to determine the end-point for the titration of 25.0 cm^3 of 1.0 mol dm^{-3} sodium hydroxide solution with 1.0 mol dm^{-3} hydrochloric acid. Phenolphthalein is used as the acid-base indicator.

Table 1 shows the three titrations that were conducted and the magnification of the burette readings.

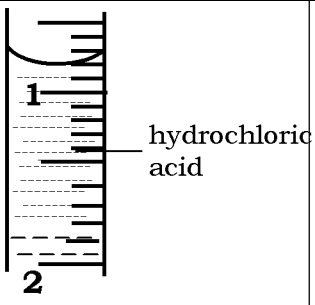
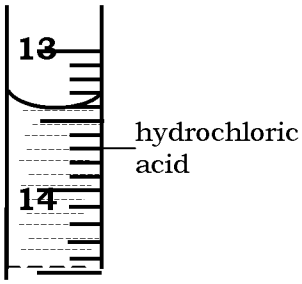
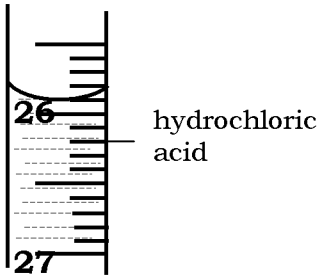
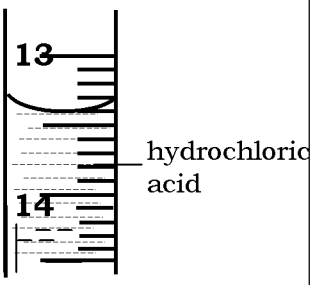
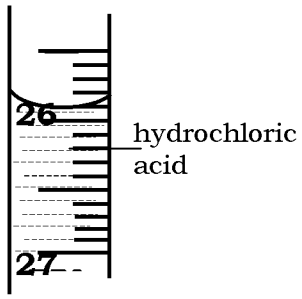
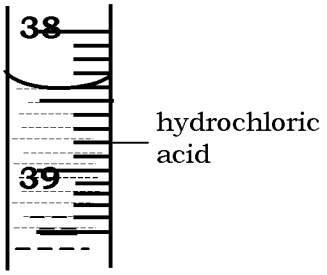
Experiment	**I**	**II**	**III**
Initial burette reading			 .....
Final burette reading			 .....

Table 1

(a) Record the burette readings for the three titrations in the space provided in Table 1. [3M]

(b) Construct a table and record the initial burette reading, final burette reading and the volume of acid used for each titration. [3M]

(c) Calculate the average volume of hydrochloric acid used in the experiment. [3M]

(d) If the experiment is repeated by replacing 1.0 mol dm^{-3} of hydrochloric acid with 1.0 mol dm^{-3} of sulphuric acid, predict the end-point of the titration. [3M]

.....

(e) Acids can be classified into strong acid and weak acid.
Classify the following acids into strong acids and weak acids. [3M]

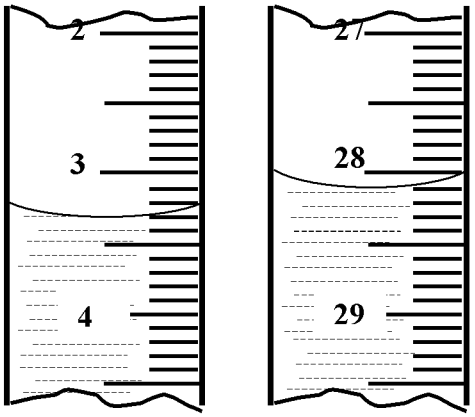
Ethanoic acid, hydrochloric acid, phosphoric acid, carbonic acid, nitric acid

[SBPtrial06-01]

A student does a experiment to determine the concentration of hydrochloric acid. The experiment was done by titration hydrochloric acid into 25.0 cm^3 of 0.10 mol dm^{-3} of sodium hydroxide using phenolphthalein as indicator.

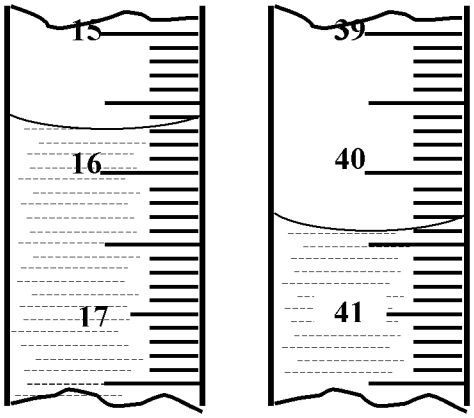
Diagram below show the initial reading and final reading of burette for three experiments was done.

Titration I



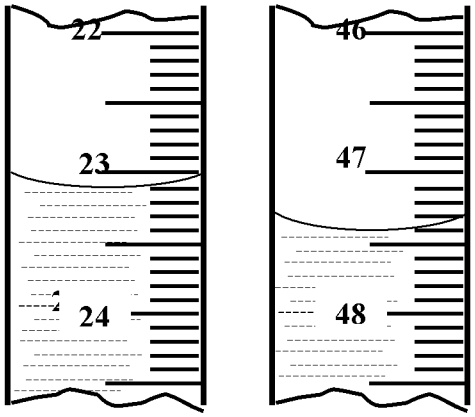
Initial ..... Final .....

Titration II



Initial ..... Final .....

Titration III



Initial ..... Final .....

(a) At the end point of titration, the phenolphthalein was change the colour.

(i) State the change of colour. [3M]

.....

(ii) State the inference based on the answer at (a) (i). [3M]

.....

.....

(iii) What mean by end point of titration? [3M]

.....

.....

.....

(b) Construct a table and record the initial reading of burette, final reading of burette and the volume of hydrochloric acid involve in the experiment. [3M]

(c) Calculate the concentration of hydrochloric acid used in the experiment. [3M]

(d) If the titration was repeated using 0.10 mol dm^{-3} sulphuric acid for replacement of hydrochloric acid without changing the others, predict the volume sulphuric acid needed to achieve end point of titration. Give reason for your answer. [3M]

.....

.....

.....

(e) Classify the ion in sodium hydroxide and hydrochloric acid into positive ions and negative ions. [3M]

[SBP07 F5midyear-02]

An experiment was carried out by a student to study the relationship between the concentration of hydroxide ions and the pH value of ammonia solution.

The pH value of different concentration of ammonia solutions was measured using a pH meter.

Table 2 shows the concentrations of ammonia solution and the respective pH values.

Beaker	Concentration of ammonia solution (mol dm^{-3})	pH value
1	0.100	9.0
2	0.060	8.8
3	0.040	8.6
4	0.025	8.4
5	0.015	8.2
6	0.010	8.0

Table 2

(a) Based on table 2, state the variables involved in this experiment. [3M]

Manipulated variable : .....

Responding variable : .....

Fixed variable : .....

(b) State the general relationship between concentration of hydroxide ions and the pH value of ammonia solution. [3M]

.....

.....

.....

(c) 0.010 mol dm^{-3} of ammonia solution has a pH value of 8.0 but sodium hydroxide solution of the same concentration has a pH value of 14.0. Explain. [3M]

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(d) Predict the pH value of ammonia solution with the concentration 0.005 $moldm^{-3}$. [3M]

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(e) Write the chemical equation to show the ionization of ammonia in water. [3M]

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(f) If the ammonia solution used in this experiment is replaced by hydrochloric acid, state the relationship between the concentration of acid and the pH value. [3M]

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[MRSM09-02]

Two experiments are carried out to determine the relationship between the pH value and the concentration of two alkaline solutions. The pH values of three different concentrations of sodium hydroxide and ammonia solutions are recorded using pH meter.

Diagram 2 shows the pH readings of the solutions in the experiments.

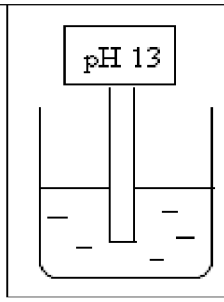
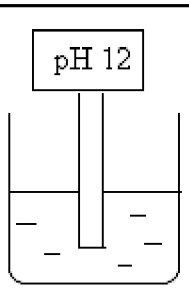
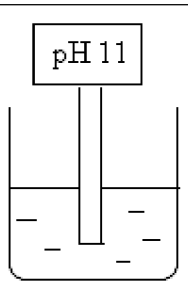
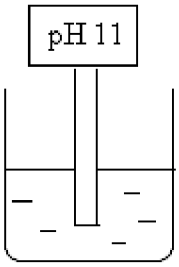
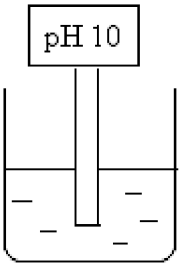
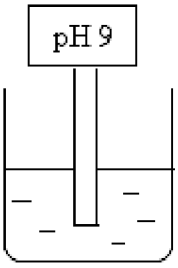
Experiment	**Solution**	**Concentration (mol dm^{-3})**		
		0.1	0.01	0.001
I	Sodium hydroxide			
II	Ammonia			

Diagram 2

(a) Based on Experiment I, complete Table 2.1

Name of variable	**Action to be taken**
(i) Manipulated variable:	(i) The way to manipulate the variable: ....
(ii) Responding variable:	(ii) What to observe in the responding variable: ....
(iii) Controlled variable:	(iii) The way to maintain the controlled variable: ....

Table 2.1

(b) Construct a table and record the results for Experiment I and II in the space provided below. [3M]

(c) Based on the answer in Table 2.1, state the relationship between the concentration of OH^- ions and the pH value. [3M]

.....

.....

.....

(d) Ammonia solution of 0.1 mol dm-3 has different pH value compared to sodium hydroxide solution of the same concentration. Explain why? [3M]

.....

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.....

(e) Sodium hydroxide solution is a strong alkali while ammonia solution is a weak alkali. State the operational definition for the strong alkali and weak alkali. [3M]

.....

.....

.....

(f) A sodium hydroxide solution has pH value of 9. Estimate the concentration of the solution. [3M]

.....

.....

.....

[MRSM07-01]

An experiment is carried out to determine the end point of a neutralisation process.

50.00 cm^3 of aqueous potassium hydroxide 0.1 mol dm^{-3} is titrated against hydrochloric acid with an unknown concentration using phenolphthalein as an indicator.

The titration is repeated twice. Diagram 1.1 shows the results of the experiment.

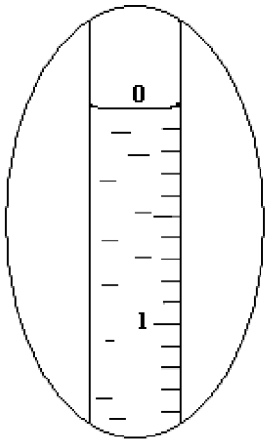
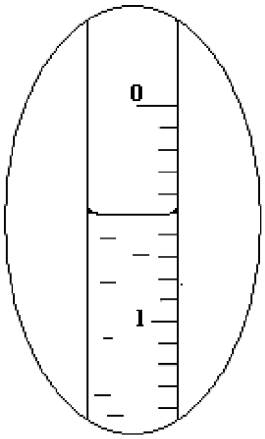
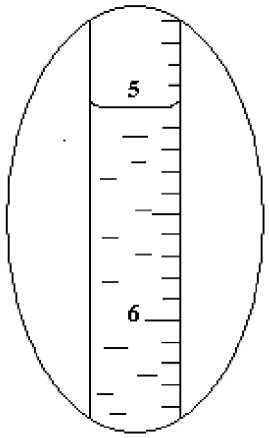
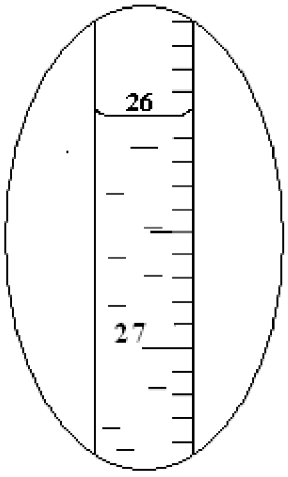
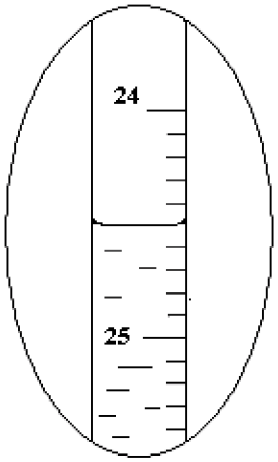
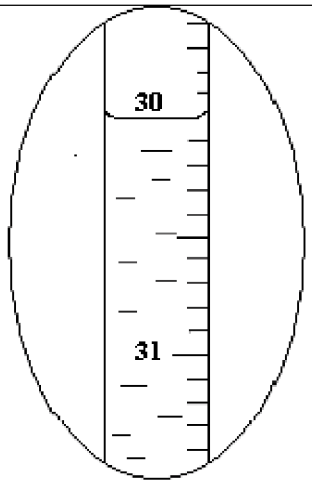
Titration Set	**1**	**2**	**3**
Initial Burette Reading	 .....cm^3	 .....cm^3	 .....cm^3
Final Burette Reading	 .....cm^3	 .....cm^3	 .....cm^3

Diagram 1.1

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

.....

.....

.....

(b) Record the burette readings in the spaces provided in Diagram 1.1.

(c) Construct a table and record the initial burette readings, final burette readings and volume of hydrochloric acid needed for each titration set.

(d)(i) What is the average volume of hydrochloric acid used in the experiment?

(ii) The chemical equation for the reaction is:

$$KOH + HCl \text{ -- > } KCl + H_2O$$

Determine the concentration of hydrochloric acid used.

(e) The experiment is repeated using sulphuric acid to replace hydrochloric acid. It was found that the volume of sulphuric acid required is half the volume of hydrochloric acid used.
State the inference of this observation.

.....

.....

.....

(f) Potassium chloride which is produced in this experiment is an example of a soluble salt. Classify the following substances into soluble and insoluble salt.

Substances

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

(g) Diagram 1.2 shows three test tubes containing potassium hydroxide solution with different concentrations and pH values.

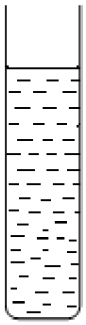
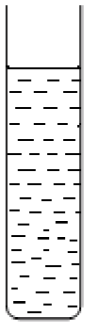
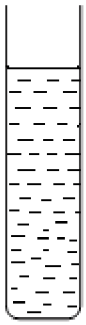
Test tube	**1**	**2**	**3**
Concentration	 0.1 mol dm^{-3} potassium hydroxide	 0.01mol dm^{-3} potassium hydroxide	 0.001 mol dm^{-3} potassium hydroxide
pH value	13	12	11

Diagram 1.2

Based on Diagram 1.2,

(i) Give the operational definition for the pH value of an alkali.

.....

.....

.....

(ii) Predict the pH value if the concentration of potassium hydroxide solution is 0.0001 mol dm^{-3}

.....

.....

.....

(iii) As the concentration of the potassium hydroxide solution changes, the pH value also changes. Explain why.

.....

.....

.....

(iv) State the variable involved in this experiment.

Manipulated variable : .....

Responding variable : .....

Controlled variable : .....

(v) State the hypothesis for this experiment.

.....

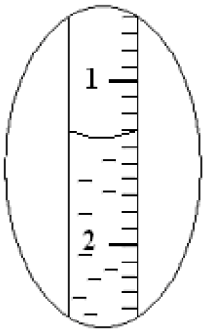
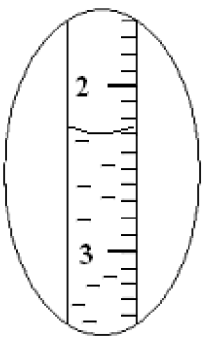
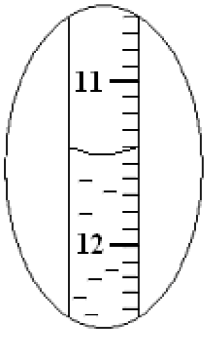
.....

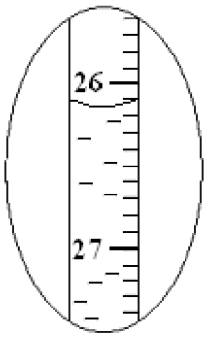
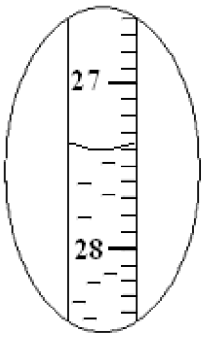
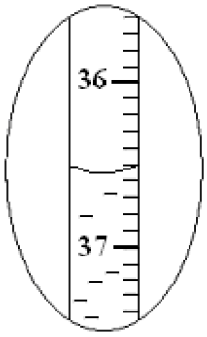
.....

[MRSM06-02]

A student carried out an experiment to determine the concentration of sodium hydroxide. 20.00 cm^3 of aqueous sodium hydroxide and a few drops of phenolphthalein is titrated using hydrochloric acid 0.50 mol dm^{-3} from a burette. Titration is stopped when the solution in the conical flask changes colour from pink to colourless. Experiment was repeated three times.

Figure shows the readings of the burette during titration.

	Experiment 1	Experiment 2	Experiment 3
Initial readings of burette	 .....cm^3	 .....cm^3	 .....cm^3

End point readings	 .....cm^3	 .....cm^3	 .....cm^3

(a) Record the burette readings in the spaces provided.

(b) Construct a table and record the initial reading, end point reading and volume of hydrochloric acid used.

(c) What is meant by the end point in the above experiment?

.....

.....

.....

(d) The chemical equation for the reaction is

$$NaOH + HCl \text{ -- > } NaCl + H_2O$$

(i) What is the average volume of hydrochloric acid used?

(ii) Calculate the concentration of sodium hydroxide used in the experiment.

(e) The experiment is repeated using aqueous barium hydroxide, $Ba(OH)_2$.
Predict the volume of hydrochloric acid required to reach the end point.

.....

.....

.....

(f) The table shows the concentrations and the pH values of four different acids.
Based on the information, classify the acid into strong acid and weak acid.

Acid	**Concentration / mol dm^{-3}**	**pH**
Nitric acid	0.10	1.1
Oxalic acid,	0.05	3.2
Sulphuric acid	0.05	1.0
Methanoic acid	0.10	3.5

[MRSM04-01]

A student carried out an experiment to determine the end point for the neutralization process between 50.0 cm^3 barium hydroxide 0.1 mol dm^{-3} solution and sulphuric acid.

The apparatus setup for this experiment is shown in Diagram 1.

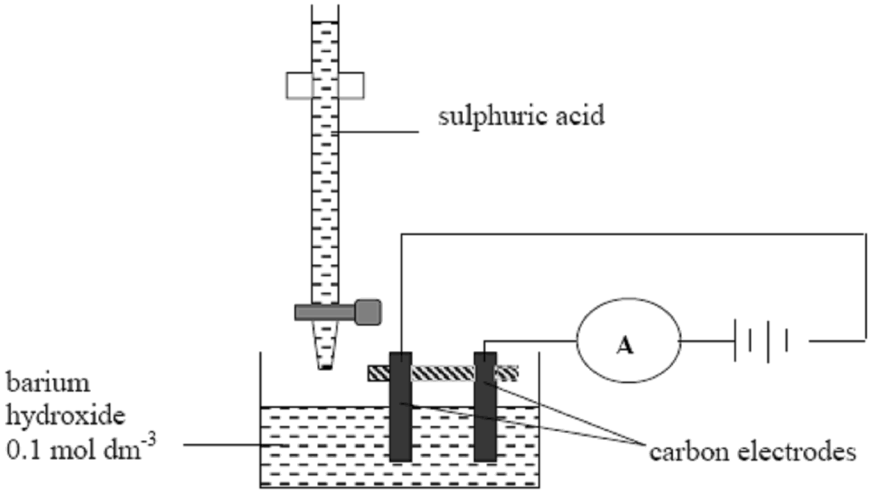
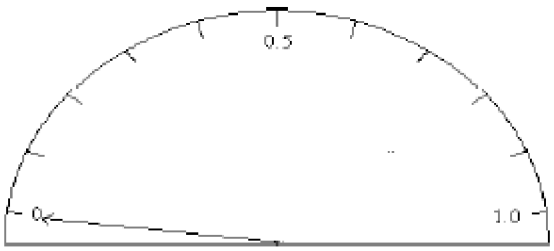


Diagram 1

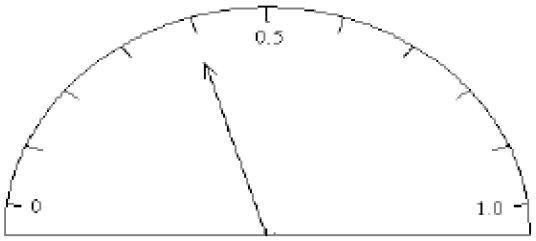
Table 1 shows several ammeter readings for every addition of 1.0 cm^3 of sulphuric acid to barium hydroxide solution.

Volume of H_2SO_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					

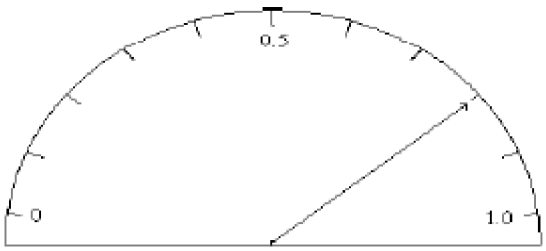
Diagram 2 shows the ammeter readings when 5.0 cm^3, 6.0 cm^3 and 7.0 cm^3 sulphuric acid were added.



Ammeter reading after 5.0 cm^3 added of sulphuric acid added



Ammeter reading after 6.0 cm^3 of sulphuric acid added



Ammeter reading after 7.0 cm^3 of sulphuric acid added

Diagram 2

(*a*) Referring to Diagram 2, record the ammeter readings for the addition of 5.0 cm^3, 6.0 cm^3 and 7.0 cm^3 of sulphuric acid in Table 1.

(*b*) State one observation for this experiment.

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(*c*) Based on your answer in (*b*) what is your inference for this experiment?

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(*d*) Plot a graph of ammeter reading against the volume of sulphuric acid added on the graph paper.

(*e*) On the graph plotted in (*d*), mark and write down the minimum volume of sulphuric acid needed to neutralize 50.0 cm^3 of aqueous barium hydroxide 0.1 mol dm^{-3}.

.....

(*f*) Estimate the reading of the ammeter if 8.5 cm3 of sulphuric acid is added to the mixture in the beaker.

.....

(*g*) This experiment is repeated using aqueous sodium hydroxide 0.2 mol dm^{-3} to replace the aqueous barium hydroxide. Table 2 shows the ammeter readings for every addition of 1.0 cm^3 of sulphuric acid to sodium hydroxide.

H_2SO_4 added (cm^3)	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0
Ammeter readings (A)	0.8	0.7	0.6	0.5	0.3	0.2	0.4	0.6

Table 2

Derive a relationship between the end point of neutralization and the ammeter readings in Table 1 and 2.

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Essay {Paper03}

[SPM08-03]

Diagram 3 shows four reagent bottles containing nitric acid, HNO_3 with different concentrations.

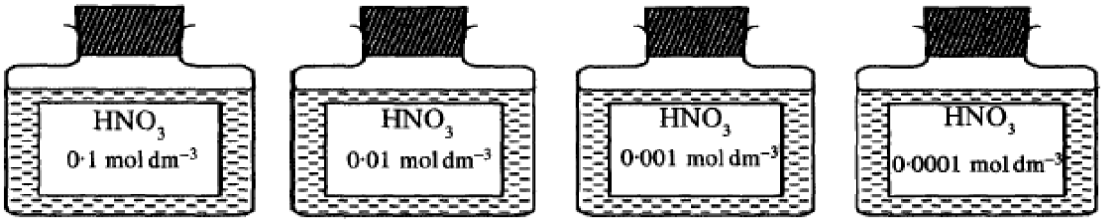

Diagram 3

Using the acid given, plan a laboratory experiment to determine the relationship between the concentration of nitric acid and pH value.

Your planning should include the following aspects: [17M]

(a) Problem statement
(b) All the variables
(c) Hypothesis
(d) List of materials and apparatus
(e) Procedure
(f) Tabulation of data