

Chemistry trial paper 3 SPM Kedah 2006

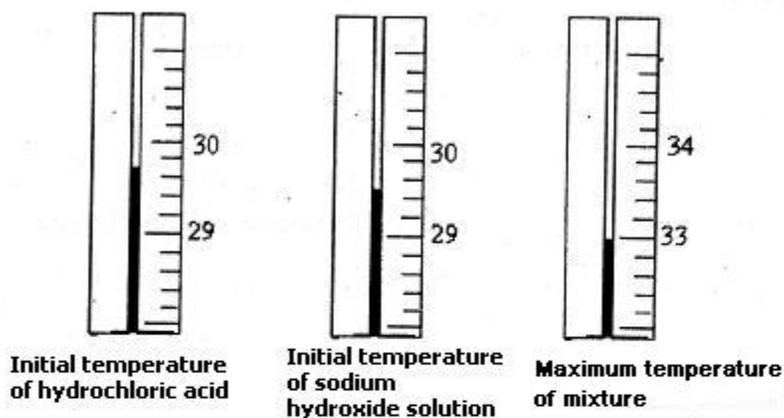
1. Two experiments were carried out to determine the heat of neutralization between acid and alkali.

In experiment I, 50 cm^3 hydrochloric acid 0.5 mol dm^{-3} was added to 50 cm^3 sodium hydroxide solution 0.5 mol dm^{-3} in a polystyrene cup.

In experiment II, 50 cm^3 ethanoic acid 0.5 mol dm^{-3} was added to 50 cm^3 sodium hydroxide solution 0.5 mol dm^{-3} in another polystyrene cup.

Figure 1 shows the thermometer readings for the acid and alkali before and after they were mixed.

Experiment I :



Experiment II:

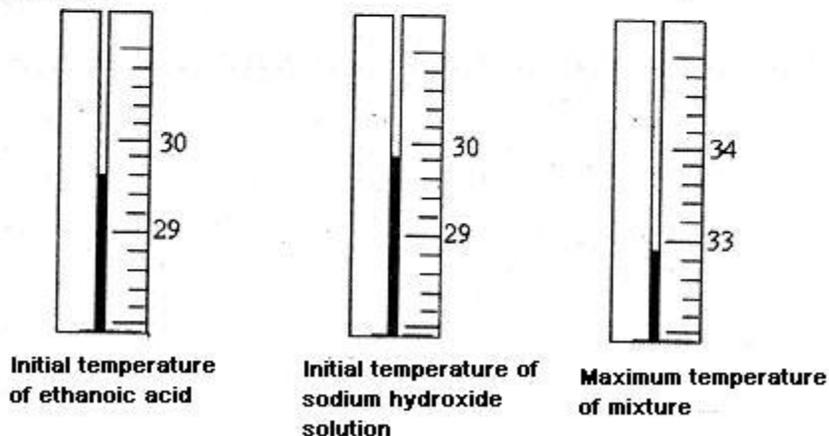


Figure 1

(a) (i) Record the temperatures in the spaces provided in Figure 1. [3 marks]

(ii) Construct a table and record the initial and maximum temperatures for the substances involved and also record the difference in temperature in the experiments.

[3 marks]

(b) For experiment I,

(i) Calculate the heat change for the reaction.

(ii) Determine the heat of neutralization for the reaction between hydrochloric acid and sodium hydroxide solution.

[3 marks]

(c) Explain why there is a difference in temperature change for reactions in experiment I and experiment II.

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.....
.....

[3 marks]

(d) (i) State the variables involved in the experiments.

Manipulated variable:.....

Responding variable :.....

Controlled variable:.....

[3 marks]

(ii) State the hypothesis for this experiment.

.....

.....

[3 marks]

2. A student had carried out an experiment to investigate the change in iron(III) chloride solution. The experiment was carried out as stated in the following steps.

Step I : 2 cm³ iron(III) chloride solution was poured into a test tube.

Step II: A half spatula of zinc powder was added to the iron(III) solution.

Step III: The mixture was shaken and warmed slowly for a few minutes.

Step IV: The mixture was filtered.

Step V: Sodium hydroxide solution was added to the filtrate obtained.

(a) Complete the table below by stating the observation and related inference in the experiment.

Observation		Inference	
(i)	(i)
(ii)	(ii)

[6 marks]

(b) What will happen to the iron(III) chloride solution if the heating in step III was continued until no further change?

.....
.....

[3 marks]

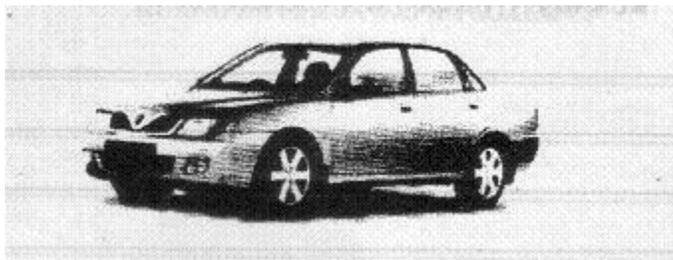
(c) What is the change of colour expected if the filtrate in step IV was added with potassium hexacyanoferrate(III) solution?

.....
.....

[3 marks]

(d) Sodium hydroxide solution and iron(III) chloride solution consist of positive and negative ions. Classify the ions in the solutions into positive ions and negative ions.

[3 marks]



3. The photo above shows a car. The tyres of the car are made of vulcanized rubber. Vulcanized rubber is found to be stronger and more elastic than unvulcanized rubber. Referring to the above statement, plan a laboratory experiment to compare the elasticity of vulcanized and unvulcanized rubber.

Your planning should include the following aspects:

- (a) Aim of experiment
- (b) Hypothesis
- (c) List of substances and apparatus
- (d) Procedure of experiment
- (e) Tabulation of data

[17 marks]

SUGGESTED ANSWERS :

1. (a) (i) Experiment I:

Initial temperature of HCl = 29.7°C

Initial temperature of NaOH = 29.5°C

Maximum temperature of mixture = 33.0°C

Experiment II:

Initial temperature of CH₃ COOH = 29.6°C

Initial temperature of NaOH = 29.8°C

Maximum temperature of mixture = 32.9°C

(ii)

Expt	Initial temperature of acid / °C	Initial temperature of NaOH / °C	Maximum temperature of mixture / °C	Temperature change / °C
I	29.7	29.5	33.0	3.4
II	29.6	29.8	32.9	3.2

(b) (i) Heat change = 100 x 4.2 x 3.4 = 1428 J

(ii) Heat of neutralization = 1428 ÷ 0.025 = 57120 J mol⁻¹

OR 57.12 kJ mol⁻¹

(c) Hydrochloric acid is a strong acid

Ethanoic acid is a weak acid

Some heat released during neutralization reaction is absorbed to ionize the weak acid molecules

(d) (i) Manipulated variable: type of acid

Responding variable : temperature change // heat of neutralization

Controlled variable: sodium hydroxide solution

(ii) The temperature change for the reaction between strong acid and strong alkali is higher than the temperature change for the reaction between weak acid and strong alkali //

the heat of neutralization between strong acid and strong alkali is higher than the heat of neutralization between weak acid and strong alkali

2. (a) Observation:

(i) Brown solution turns green

(ii) zinc dissolves

(iii) Green precipitate formed

Inference

Fe³⁺ ions become Fe²⁺ ions

zinc atoms become zinc ions

the precipitate is iron(II) hydroxide, Fe²⁺ ions are present

(b) The brown solution turns green and then colourless

(c) Dark blue precipitate is formed.

(d)

Positive ions	Negative ions
Na^+ , Fe^{3+}	OH^- , Cl^-

3.

(a) Aim of experiment

To compare the elasticity between vulcanized rubber and unvulcanized rubber

(b) Hypothesis

Vulcanized rubber is more elastic than unvulcanised rubber

(c) List of substances and apparatus

Substances: vulcanized and unvulcanised rubber strips

Apparatus: retort stand and clamp, weight 10g, bulldog clip, meter rule, string

(d) Procedure of experiment

1. A strip of vulcanized rubber is hung using a retort stand and clamp and bulldog clip.
2. The length of the rubber strip is measured using a meter rule.
3. A 10g weight is hung at the end of the rubber strip using a bulldog clip.
4. The length of the rubber strip is measured again
5. The weight is removed and again the length of the rubber strip is measured.
6. Steps 1-5 are repeated by replacing the vulcanized rubber strip with unvulcanized rubber strip.

(e) Tabulation of data

Type of rubber strip	Vulcanized rubber	Unvulcanized rubber
Length of rubber strip without weight /cm		
Length of rubber strip with weight /cm		
Length of rubber strip when weight is removed /cm		
Stretch length /cm		