Name $\qquad$
$\qquad$
$\qquad$
Candidate's Signature $\qquad$ .Date $\qquad$

## 233/3

## CHEMISTRY

Paper 3
(PRACTICAL)
July 2016
2 $1 / 4$ hours

## KAMDARA JET - 2016

## Instructions to candidates

(a) Write your name and index number and school in the spaces provided.
(b) Sign and write the date of examination in the spaces provided above.
(c) Answer ALL the questions in the spaces provided in the question paper.
(d) You are not allowed to start working with apparatus for the first 15 minutes of the $2 \frac{1}{4}$ hours allowed for this paper. This is to enable youto read the question paper and make sure you have all the chemicals and apparatus that you may need.
(e) All working MUST be clearly shown where necessary.
(f) Mathematical tables and electronic calculators may be used.
(g) This paper consists of 6 printed pages.
(h) Candidates should check the questionepaper to ascertain that all pages are printed as indicated and that no questions are missing.
(i) Candidates should answer all the questions in English.

For Examiners use only

| Question | Maximum <br> Score | Candidate's <br> score |
| :---: | :---: | :---: |
| 1 | 22 |  |
| 2 | 13 |  |
| 3 | 5 |  |
| Total <br> Score | 40 |  |
|  |  |  |
|  |  |  |

1. You are provided with:

- Solid P
- 2.0M hydrochloric acid, solution $\mathbf{Q}$
- 0.1 M sodium hydroxide, solution $\mathbf{R}$

You are required to determine the enthalpy change $\Delta H$, for the reaction between solid $P$ and one mole of hydrochloric acid.

## Procedure I

Transfer $20.0 \mathrm{~cm}^{3}$ of 2.0 M hydrochloric acid, solution $\mathbf{Q}$ in a 100 ml . beaker using a burette. Measure the temperature of the solution after every half-minute and record the values in Table 1. At exactly $\mathbf{2} 1 / 2$ minutes, add all of solid $\mathbf{P}$ to the acid carefully. Stir the mixture gently with the thermometer. Measure the temperature of the mixture after every half-mingte and record the values in Table 1. (Retain the mixture for use in procedure II)

Table 1

(ii) Using the graph, determine the change in temperature $\Delta \mathrm{T}$.
(iii) Calculate the heat change for the reaction (Assume that the specific heat capacity of the mixture is $4.2 \mathrm{Jg}^{-1} \mathrm{~K}^{-1}$ and the density of the mixture is $1 \mathrm{~g} / \mathrm{cm}^{3}$ ).
( 2 mks )

## Procedure II

Rinse the burette thoroughly and fill it with sodium hydroxide. Transferall the contents of the 100 ml . beaker in procedure I into a 250 ml . volumetric flask. Add distilled water to make up to the mark. Label this as solution $\mathbf{N}$. Using a pipette filler, place $25.0 \mathrm{~cm}^{3}$ of solution $\mathbf{N}$ into a 250 ml . conical flask. Add two or three drops of phenolphthakein indicator and titrate against solution R. Record your results in table 2. Repeat titrationtwo more times and complete Table 2.

Table 2


Calculate the:
(i) average volume of sodium hydroxide solution R .
(ii) the number of moles of :

I Sodium hydroxide solution R.

II hydrochloric acid in $25 \mathrm{~cm}^{3}$ of solution $\mathbf{N}$.

IV hydrochloric acid in $20.0 \mathrm{~cm}^{3}$ of solution $\mathbf{Q}$

V hydrochloric acid that reacted with solid $\mathbf{P}$
(c) Calculate the enthalpy of reaction between solid $\mathbf{P}$ and one mole of hydrochloric acid. (Show the sign of $\Delta \mathrm{H}$ ).
(2 mks)

2 You are provided with solid E. Carryeout the following tests and write your observations and inferences in the spaces provided.
a) Place all of solid $\mathbf{E}$ intg boiling tube. Add about $12 \mathrm{~cm}^{3}$ of distilled water and shake thoroughly. Filter the mixture and place the filtrate into another boiling tube. Dry the residue using pieces of filter paper.
Retain the filtrate for use in 2(b) below.
(i) Transfer half of the dry residue into a dry test tube. Heat the residue strongly and test any gas produced using a burning wooden splint.

|  | Observations |
| ---: | :---: |
| $(2 \mathrm{mks})$ | Inferences |

(ii) Place the other half of the residue in a dry test-tube. Add $4 \mathrm{~cm}^{3}$ of 2 M nitric acid. Retain the mixture for test (iii) and (iv) below .

Observations
( 1 mk )

Inferences
( 1 mk )
(iii) To $2 \mathrm{~cm}^{3}$ of solution obtained from a(ii) above, add aqueous ammonia drop by drop until in excess.

## Observations

(1/2mk)

## Inferences

(1/2mk)
(iv) To $2 \mathrm{~cm}^{3}$ of the other solution obtained in a(ii) above, add $2 \mathrm{~cm}^{3}$ of potassium iodide solution

| Observations | Inferences |
| :---: | :---: |
| ( 1 mk ) | ( 1 mk ) |

(b) Divide the filtrate obtained in 2(a) above into 5 portions.
(i)To the first portion of the filtrate add aqueous ammonia drop by drop until in excess.

Observations
Inferences
( 1 mk )
(ii) To the second portion of the filtrate add 2 drops of sodium sulphate solution.

(iii) To the third portion of the filtrate, add 2 drops of barium nitrate solution followed by about $2 \mathrm{~cm}^{3}$ of nitric acid solution

## Observations

## Inferences

3. You are provided with solid F. Carry out the tests below and record your observations and inferences in the spaces provided.
(a)(i) Using a metallic spatula, heat half of solid F in a non-luminous Bunsen burner flame for some time then remove when it ignites.

## Observations

Inferences
(1mk)
(1mk)
(b) Put a half spatula endful of solid F into a boiling tube. Add about $10 \mathrm{~cm}^{3}$ of distilled water and shake vigorously.
Divide the resulting solution into two portions.
(i) To the first portion, dip a piece of universal indicator paper and determine its pH Observations

(ii) To the second portion, add two drops of acidified potassium manganate (VII) solution and shake vigorously.

Observations

