PRACTICAL

QUESTION 1

Calcium hydrogen carbonate is seen to be responsible for temporary hardness in water. It is possible to find the amount of calcium hydrogen carbonate in water by titration against standard hydrochloric acid.

Solution **P**is hard water with unknown concentration of calcium hydrogen carbonate solution **Q**is 0.25M of hydrochloric acid. Put Q in a burette and use it to titrate against 25.0 cm3 (20.0 cm3) position of P in a conical flask. Use Phenolphthalein as an indicator.

**(a) Titration Results**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Rough | 1 | 2 |  |
| Final burette reading/cm3 |  |  |  |  |
| Initial burette reading/ cm3 |  |  |  |  |
| Volume of Q used/ cm3 |  |  |  |  |
| Best titration results tick ( ) |  |  |  |  |

Summary; \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cm3 of P required \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cm3 of Q for complete reaction.

The equation for the reaction is shown below;

Ca(HCO3)2 (aq) + 2HCl (aq) CaCl2 (aq) + 2CO2 (g) + 2H2O (l)

(b) Determine the concentration of calcium hydrogen carbonate in P in mol/dm3

Concentration of P is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mol/dm3

(c) Calculate the mass of calcium hydrogen carbonate which reacted.

Mass is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ g

(d) Calculate the concentration of calcium hydrogen carbonate in g/dm3 (R.M.M = 162)

Concentration \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ g/dm3 [1]

(e) Use the formula below to calculate for percentage hardness of the sample of hard water.

% hardness = Mass of Ca (HCO3)2 in the sample

Volume of hard water in sample

% = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ [2]

(f) State the ion present in calcium hydrogen carbonate responsible for the hardness in water.

Ion \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ [1]

QUESTION 2

You are provided with solid R and solution S. You are to carry out the following experiments on R and S. Record your observations in the table. Identify any gases that may be evolved.

|  |  |  |
| --- | --- | --- |
| Test NO. | TEST | OBSERVATION ON R |
| 1 | 1. Put a small portion of R in a test tube and add water. 2. Divide the resulting solution in 3 portions |  |
| 2 | 1. To the first portion, add sodium hydroxide and warm gently |  |
|  | 1. To a second portion add acidified silver nitrate |  |
|  | 1. To a third portion add acidified barium nitrate |  |

|  |  |  |
| --- | --- | --- |
| Test No. | TEST | OBSERVATION ON S |
| 1 | Put small portions of S in 4 test tubes   1. To a first portion add little sodium hydroxide. |  |
| 1. To a mixture add excess sodium hydroxide. |  |
| 2 | 1. To a second portion, add little ammonia solution |  |
| 1. To a mixture in (a) add excess ammonia solution. |  |
| 3 | To a third portion add acidified silver nitrate solution. |  |
| 4 | To a fourth portion add barium nitrate solution. |  |

CONCLUSION

(i) Name the cation present in compound

R \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ [1]

S \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ [1]

(ii) Name the anion present in compound

R \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ [1]

S \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ [1]

(iii) Suggest chemical formulae for

R \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ [1]

S \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ [1]