Chem!stry

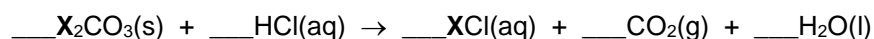**Mole Calculations Assignment Five**

Question 1.

A carbonate of metal **X** has the formula X_2CO_3. The equation for the reaction of the carbonate with hydrochloric acid is as follows:

___X_2CO_3(s) + ___HCl(aq) → ___XCl(aq) + ___CO_2(g) + ___H_2O(l)

A sample of X_2CO_3 of mass 0.394 g required 21.7 cm³ of 0.263 mol dm⁻³ hydrochloric acid for complete reaction.

a) Balance the chemical equation, shown above, by writing the appropriate numbers in the spaces provided.

b) Calculate the number of moles of hydrochloric acid that were used.

c) Hence, determine the number of moles of X_2CO_3 used in the reaction.

d) Calculate the relative molar mass of X_2CO_3 to the nearest whole number.

e) Determine the identity of **X**.

Question 2.

In a titration experiment, 20.0 cm^3 of solution **P** was required to completely react with 40.0 cm^3 of 0.100 mol dm^{-3} sodium hydroxide. Solution **P** contains 20.1 g dm^{-3} of a monobasic acid, H**Z**O$_4$.

a) Calculate:

    i) The number of moles of sodium hydroxide used in the titration.

    ii) The number of moles of **P** used in the titration. **Note**: You will need to first write a balanced chemical equation for the reaction between NaOH(aq) and H**Z**O$_4$(aq).

    iii) The concentration of **P** in mol dm^{-3}.

    iv) The molar mass of H**Z**O$_4$.

    v) The relative atomic mass of element **Z**.

b) Suggest a possible identity for **Z**.

c) 0.12 g of magnesium was added to the same volume and concentration of solution **P** used in the above titration.

i) Write a balanced chemical equation for the reaction between magnesium and **P**.

i) Calculate the number of moles of magnesium added.

ii) Which substance is the limiting reagent, magnesium or **P**? Show clearly how you arrived at your answer.

iii) Calculate the volume of hydrogen gas that is produced by the reaction between magnesium and **P**.

• Scan the QR code below for the answers to this assignment.

http://www.chemist.sg/mole/assignments/mole_five_ans.pdf