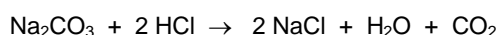


1.2 – AMOUNT OF SUBSTANCE – PPQ1



Name Form

- 1) a) Sodium carbonate forms a number of hydrates of general formula $\text{Na}_2\text{CO}_3 \cdot x\text{H}_2\text{O}$. A 3.01 g sample of one of these hydrates was dissolved in water and the solution made up to 250 cm^3 . In a titration, a 25.0 cm^3 portion of this solution required 24.3 cm^3 of $0.200 \text{ mol}^{-1} \text{ dm}^{-3}$ hydrochloric acid for complete reaction. The equation for this reaction is shown below.



- i) Calculate the number of moles of HCl in 24.3 cm^3 of $0.200 \text{ mol dm}^{-3}$ hydrochloric acid.

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- ii) Deduce the number of moles of Na_2CO_3 in 25.0 cm^3 of the Na_2CO_3 solution.

.....

- iii) Hence deduce the number of moles of Na_2CO_3 in the original 250 cm^3 of solution.

..... (5)

- b) In an experiment, the M_r of a different hydrated sodium carbonate was found to be 250. Use this value to calculate the number of molecules of water of crystallisation, x , in this hydrated sodium carbonate, $\text{Na}_2\text{CO}_3 \cdot x\text{H}_2\text{O}$

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..... (3)

- c) A gas cylinder, of volume $5.00 \times 10^{-3} \text{ m}^3$, contains 325 g of argon gas.

- i) Give the ideal gas equation.

- ii) Use the ideal gas equation to calculate the pressure of the argon gas in the cylinder at a temperature of 298 K. (The gas constant $R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$)

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..... (4)