

Moles Questions Mixed

- 1 Iron can be extracted from its ore by heating with carbon monoxide:



When 10.00 kg of iron ore, containing mostly Fe_2O_3 , was heated with excess carbon monoxide 6.72 kg of iron was obtained. Determine the percentage Fe_2O_3 in the iron ore. (Assume that no other compounds in the iron ore react with carbon monoxide).

- 2 Hydrogen peroxide decomposes rapidly in the presence of a catalyst such as MnO_2 .



Determine the concentration of the hydrogen peroxide solution (in mol dm^{-3}) if 50.0 cm^3 of the solution decomposes to form 1.00 dm^3 of oxygen, measured at 20°C and 100 kPa .

- 3 Calculate the volume (in cm^3) of oxygen (measured at STP) produced when 25.0 cm^3 of $0.0180 \text{ mol dm}^{-3}$ potassium manganate(VII) reacts with 30.0 cm^3 $0.0250 \text{ mol dm}^{-3}$ hydrogen peroxide solution in the presence of excess sulfuric acid, according to the equation:



- 4 Zinc metal reacts with dilute hydrochloric acid according to the equation:

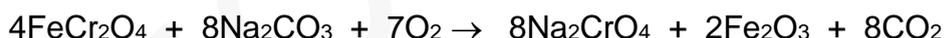


Calculate the volume (in cm^3) of hydrogen produced, measured at 22°C and $9.88 \times 10^4 \text{ Pa}$, if 5.00 g of zinc is reacted with 30.0 cm^3 of 2.00 mol dm^{-3} hydrochloric acid.

- 5 4.09 g of hydrated iron(II) sulfate ($\text{FeSO}_4 \cdot x\text{H}_2\text{O}$) is dissolved in water and made up to a total volume of 100.0 cm^3 . 20.0 cm^3 of this solution is acidified and then reacted with $0.0200 \text{ mol dm}^{-3}$ potassium manganate(VII) solution ($\text{KMnO}_4(\text{aq})$). 29.40 cm^3 of $\text{KMnO}_4(\text{aq})$ was required for exact reaction. Calculate the value of x in $\text{FeSO}_4 \cdot x\text{H}_2\text{O}$.

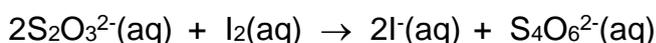


- 6 Pure chromium can be extracted from chromite (FeCr_2O_4) in the following series of reactions:



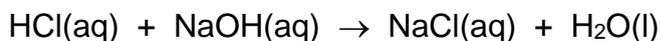
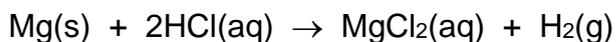
If 2.000 kg of pure chromium is obtained how much chromite was used?

- 7 1.12 g of hydrated copper nitrate ($\text{Cu}(\text{NO}_3)_2 \cdot x\text{H}_2\text{O}$) is dissolved in water and the solution made up to a total volume of 250.0 cm^3 . 25.00 cm^3 of this solution is taken and excess potassium iodide solution added. The iodine liberated completely reacted with 23.20 cm^3 of $0.0200 \text{ mol dm}^{-3}$ sodium thiosulfate solution. Calculate the value of x in $\text{Cu}(\text{NO}_3)_2 \cdot x\text{H}_2\text{O}$. The ionic equations for the reactions involved are:

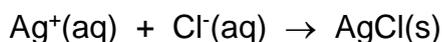


Moles Questions Mixed

- 8 1.020 g of magnesium was placed in a beaker and 50.00 cm³ of 2.000 mol dm⁻³ hydrochloric acid added. The resulting solution was transferred to a volumetric flask and made up to a total volume of 100.0 cm³ with water. 25.00 cm³ of this solution was titrated against 0.1120 mol dm⁻³ sodium hydroxide solution and 34.30 cm³ of the sodium hydroxide was required for neutralisation. Use this information to work out the relative atomic mass of magnesium to 2 decimal places. The relevant equations are:



- 9 A bottle of a white crystalline salt was found in a cupboard. All that was left of the label is shown in the diagram. 5.000 g of the substance was dissolved in water and made up to a total volume of 50.00 cm³. 10.00 cm³ of this solution was reacted with 25 cm³ of 2.0 mol dm⁻³ silver nitrate solution (this was an excess). The precipitate was filtered off, washed, dried and weighed. The total mass of precipitate formed was 1.410 g. Work out the element missing from the formula of the substance.



- 10 When the nitrate of element **X** is heated it decomposes to form the solid oxide of **X**, nitrogen dioxide and oxygen.

Use the following data to work out the ratio (in terms of number of moles) of nitrogen dioxide to oxygen in the gas given off.

0.0865 g of the gas collected occupied a volume of 50.0 cm³ at a temperature of 27 °C and a pressure of 9.98x10⁴ Pa.