

IB MOLES PRACTICE TEST

- 1 Balance the following equation [1]



- 2 In the decomposition of a certain mass of KClO_3 , 1.60 g of oxygen gas was produced:



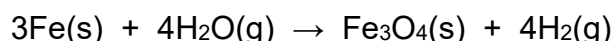
- Calculate the mass of KClO_3 that decomposed? [3]

Amount in mol of oxygen gas = $1.60/32.00 = 0.0500$ mol

Amount in mol of $\text{KClO}_3 = 0.0500 \times 2/3 = 0.0333$ mol

Mass of $\text{KClO}_3 = 0.0333 \times 122.55 = 4.085$ g

- 3 Red hot iron reacts with steam to produce hydrogen gas:



- Calculate the volume of hydrogen gas (measured at STP) produced when 2.80 g iron reacts with excess steam. [3]

Amount in mol of iron = $2.80/55.85 = 0.0501$ mol

Amount in mol of $\text{H}_2 = 0.0501 \times 4/3 = 0.0668$ mol

Volume of $\text{H}_2 = 0.0668 \times 22.7 = 1.52$ dm³

- 4 Manganate(VII) ions [MnO_4^- (aq)] react with iron(II) ions in the presence of acid (H^+):



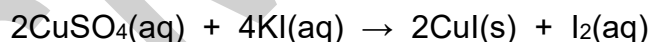
- Calculate the volume of 0.100 mol dm⁻³ iron(II) solution required to react exactly with 25.00 cm³ of 0.0200 mol dm⁻³ MnO_4^- (aq) in the presence of excess acid. [3]

Amount in mol of $\text{MnO}_4^-(\text{aq}) = 25.00/1000 \times 0.0200 = 5.00 \times 10^{-4}$ mol

Amount in mol of $\text{Fe}^{2+}(\text{aq}) = 5.00 \times 10^{-4} \times 5 = 2.50 \times 10^{-3}$ mol

Volume of $\text{Fe}^{2+}(\text{aq}) = 2.50 \times 10^{-3} / 0.100 \times 1000 = 25.0$ cm³

- 5 Copper(II) sulfate reacts with potassium iodide to form a precipitate of copper(I) iodide:



- Calculate the mass of copper(I) iodide produced when 25.00 cm³ 0.100 mol dm⁻³ CuSO_4 reacts with 30.00 cm³ 0.120 mol dm⁻³ KI. [3]

Since enough information is given to work out the amount in mol of more than one substance, one of these is likely to be a limiting reactant.

Amount in mol of $\text{CuSO}_4(\text{aq}) = 25.00/1000 \times 0.100 = 2.50 \times 10^{-3}$ mol

Amount in mol of $\text{KI}(\text{aq}) = 30.00/1000 \times 0.120 = 3.60 \times 10^{-3}$ mol

$2.50 \times 10^{-3} \times 2 > 3.60 \times 10^{-3}$ therefore KI is the limiting reactant

Amount in mol of $\text{CuI} = 3.60 \times 10^{-3} / 2 = 1.80 \times 10^{-3}$ mol

Mass of $\text{CuI} = 1.80 \times 10^{-3} \times 190.45 = 0.343$ g