Answers:

1. **Calculate the concentration of the following solutions in mol/dm³:**
   a) 0.10 moles of NaCl in 200 cm³
   - Convert cm³ to dm³: 200 cm³ ÷ 1000 = 0.2 dm³
   - Concentration = moles ÷ volume = 0.10 moles ÷ 0.2 dm³ = **0.5 mol/dm³**

   b) 0.20 moles of H_2SO_4 in 100 cm³
   - Convert cm³ to dm³: 100 cm³ ÷ 1000 = 0.1 dm³
   - Concentration = moles ÷ volume = 0.20 moles ÷ 0.1 dm³ = **2.0 mol/dm³**

   c) 0.020 moles of NaOH in 25 cm³
   - Convert cm³ to dm³: 25 cm³ ÷ 1000 = 0.025 dm³
   - Concentration = moles ÷ volume = 0.020 moles ÷ 0.025 dm³ = **0.80 mol/dm³**
2. **Calculate the number of moles in the following solutions:**
   a) 100 cm³ of 0.20 mol/dm³ HNO_3
   - Convert cm³ to dm³: 100 cm³ ÷ 1000 = 0.1 dm³
   - Moles = concentration × volume = 0.20 mol/dm³ × 0.1 dm³ = **0.020 moles**

   b) 25 cm³ of 1.50 mol/dm³ KOH
   - Convert cm³ to dm³: 25 cm³ ÷ 1000 = 0.025 dm³
   - Moles = concentration × volume = 1.50 mol/dm³ × 0.025 dm³ = **0.0375 moles**

   c) 50 cm³ of 0.10 mol/dm³ H_2SO_4
   - Convert cm³ to dm³: 50 cm³ ÷ 1000 = 0.05 dm³
   - Moles = concentration × volume = 0.10 mol/dm³ × 0.05 dm³ = **0.0050 moles**
3. **Calculate the concentration of the following solutions in g/dm³:**
   a) 0.100 mol/dm³ NaOH
   - Molar mass (Mr) of NaOH = 23 + 16 + 1 = 40 g/mol
   - Concentration = concentration (mol/dm³) × Mr = 0.100 mol/dm³ × 40 g/mol = **4.00 g/dm³**

   b) 0.250 mol/dm³ CH_3COOH
   - Molar mass (Mr) of CH_3COOH = 12 + 3(1) + 12 + 16 + 16 + 1 = 60 g/mol
   - Concentration = concentration (mol/dm³) × Mr = 0.250 mol/dm³ × 60 g/mol = **15.0 g/dm³**

   c) 1.50 mol/dm³ HNO_3
   - Molar mass (Mr) of HNO_3 = 1 + 14 + 3(16) = 63 g/mol
   - Concentration = concentration (mol/dm³) × Mr = 1.50 mol/dm³ × 63 g/mol = **94.5 g/dm³**
4. **0.20 moles of NaOH is dissolved in 250 cm³ of water.**
   a) Calculate the concentration in mol/dm³.
   - Convert cm³ to dm³: 250 cm³ ÷ 1000 = 0.25 dm³
   - Concentration = moles ÷ volume = 0.20 moles ÷ 0.25 dm³ = **0.80 mol/dm³**

   b) Calculate the concentration in g/dm³.
   - Molar mass (Mr) of NaOH = 40 g/mol (calculated in 3a)
   - Concentration = concentration (mol/dm³) × Mr = 0.80 mol/dm³ × 40 g/mol = **32 g/dm³**
5. **5.0 g of KNO_3 is dissolved in 100 cm³ of water.**
   a) Calculate the concentration in g/dm³.
   - Convert cm³ to dm³: 100 cm³ ÷ 1000 = 0.1 dm³

- Concentration = mass ÷ volume = 5.0 g ÷ 0.1 dm^3 = **50 g/dm^3**

b) Calculate the concentration in mol/dm^3.

- Molar mass (Mr) of KNO_3 = 39 + 14 + 3(16) = 101 g/mol
- Moles = mass ÷ Mr = 5.0 g ÷ 101 g/mol = 0.0495 moles
- Concentration = moles ÷ volume = 0.0495 moles ÷ 0.1 dm^3 = **0.495 mol/dm^3**