

CONCENTRATION OF SOLUTIONS



Answer all the questions below and then check your answers.

1. Convert the following volumes into dm^3 .

- a. 500ml b. 250 cm^3 c. 100ml d. 70 cm^3

2. Calculate the concentration of the following solutions. Express the concentrations in units of g/dm^3

- a. 20g of sodium chloride in 1 dm^3 of solution.
b. 15g of magnesium chloride in 250 ml of solution.
c. 25g of potassium chloride in 800 cm^3 of solution.
d. 10g of potassium oxide in 2500ml of solution.

Use the following formula to solve all the problems on this page

c = concentration

v = volume

n = number of moles

$c = n/v$

$v = n/c$

3. Calculate the mass required to make up the following solutions:

- a. 0.25 dm^3 of $0.5 \text{ mol}/\text{dm}^3$ of potassium chloride (KCl) solution.
b. 0.1 dm^3 of $0.75 \text{ mol}/\text{dm}^3$ of sodium nitrate (NaNO_3) solution.
c. 500ml of $0.5 \text{ mol}/\text{dm}^3$ of sodium carbonate (Na_2CO_3) solution.
d. 0.1 cm^3 of $0.35 \text{ mol}/\text{dm}^3$ of silver nitrate (AgNO_3) solution.

4. Calculate the concentration in mol/dm³ of each of the following hydrochloric acid solution:

a. 2 mol of HCl to make a solution of volume 0.5 dm³.

b. 1 mol of HCl to make a solution of volume 0.75 dm³.

c. 0.5 mol of HCl to make a solution of volume 500ml.

d. 0.9 mol of HCl to make a solution of volume 350cm³.

5. What mass of solute is required to make up the following solutions.

a. 0.5dm³ of a 2g/dm³ solution of sodium hydroxide (NaOH)

b. 0.25dm³ of a 1.5g/dm³ solution of sodium chloride (NaCl)

c. 500ml of a 3g/dm³ solution of glucose (C₆H₁₂O₆)

6. Calculate the concentration in mol/dm³ of each of the following solutions.

a. 12g of sodium chloride (NaCl) dissolved to make a solution of volume 250ml

b. 10g of potassium nitrate (KNO₃) dissolved to make a solution of volume 250ml

c. 25g of sodium carbonate (Na₂CO₃) dissolved to make a solution of volume 125cm³

d. 30g of ammonium nitrate (NH₄NO₃) dissolved to make a solution of volume 350ml

Answers

a. 500ml 0.5dm^3 b. 250 cm^3 0.25dm^3 c. 100ml 0.1dm^3

d. 70cm^3 0.07dm^3 Hint : simply divide by 1000 to convert ml or cm^3 into dm^3

2. Calculate the concentration of the following solutions. Express the concentrations in units of g/dm^3

a. 20g of sodium chloride in 1dm^3 of solution.

$$20\text{g}/1\text{dm}^3 = 20\text{g}/\text{dm}^3$$

b. 15g of magnesium chloride in 250 ml of solution.

$$15\text{g}/0.25\text{dm}^3 = 60\text{g}/\text{dm}^3$$

c. 25g of potassium chloride in 800cm^3 of solution.

$$25\text{g}/0.8\text{dm}^3 = 31.25\text{g}/\text{dm}^3$$

d. 10g of potassium oxide in 2500ml of solution.

$$10\text{g}/2.5\text{dm}^3 = 4\text{g}/\text{dm}^3$$

Use the following formula to solve all the problems on this page

c = concentration

v = volume

n = number of moles

$$c = n/v$$

$$v = n/c$$

$$n = c \times v$$

3. Calculate the mass required to make up the following solutions:

a. 0.25dm^3 of 0.5 mol/ dm^3 of potassium chloride (KCl) solution.

$$M_r \text{ of potassium chloride} = 39 + 35.5 = 74.5$$

$$n = c \times v$$

$$= 0.25 \times 0.5$$

$$= 0.125 \text{ moles.}$$

$$1 \text{ mole} = 74.5\text{g, so mass of } 0.125\text{moles} = 74 \times 0.125 = 9.25\text{g}$$

b. 0.1 dm^3 of 0.75 mol/ dm^3 of sodium nitrate (NaNO_3) solution.

$$M_r \text{ of sodium nitrate} = 23 + 14 + 48 = 85$$

$$n = c \times v$$

$$= 0.1 \times 0.75$$

$$= 0.075 \text{ moles.}$$

$$1 \text{ mole} = 85\text{g, so mass of } 0.075\text{moles} = 85 \times 0.075 = 6.375\text{g}$$

c. 500ml of 0.5 mol/ dm^3 of sodium carbonate (Na_2CO_3) solution.

Don't forget to convert volume into dm^3

$$M_r \text{ of sodium carbonate} = (23 \times 2) + 12 + 48 = 106$$

$$n = c \times v$$

$$= 0.5 \times 0.5$$

$$= 0.25 \text{ moles.}$$

$$1 \text{ mole} = 106\text{g, so mass of } 0.25\text{moles} = 106 \times 0.25 = 26.5\text{g}$$

d. 0.1 cm^3 of 0.35 mol/dm^3 of silver nitrate (AgNO_3) solution.

$$M_r \text{ of silver nitrate} = 108 + 14 + 48 = 170$$

$$n = c \times v$$

$$= 0.1 \times 0.35$$

$$= 0.035 \text{ moles.}$$

$$1 \text{ mole} = 170\text{g, so mass of } 0.035\text{moles} = 170 \times 0.035 = 5.95\text{g}$$

4. Calculate the concentration in mol/dm^3 of each of the following hydrochloric acid solution:

a. 2 mol of HCl to make a solution of volume 0.5 dm^3 .

$$C = n/v$$

$$C = 2 \text{ mol}/0.5 \text{ dm}^3 = 4 \text{ mol dm}^{-3} \text{ or } 4 \text{ mol/dm}^3$$

b. 1 mol of HCl to make a solution of volume 0.75 dm^3 .

$$C = n/v$$

$$C = 1 \text{ mol}/0.75 \text{ dm}^3 = 1.3 \text{ mol dm}^{-3} \text{ or } 1.3 \text{ mol/dm}^3$$

c. 0.5 mol of HCl to make a solution of volume 500ml.

$$C = n/v$$

$$C = 0.5 \text{ mol}/0.5 \text{ dm}^3 = 1 \text{ mol dm}^{-3} \text{ or } 1 \text{ mol/dm}^3$$

d. 0.9 mol of HCl to make a solution of volume 350cm^3 .

$$C = n/v$$

$$C = 0.9 \text{ mol}/0.35 \text{ dm}^3 = 2.5 \text{ mol dm}^{-3} \text{ or } 2.5 \text{ mol/dm}^3$$