

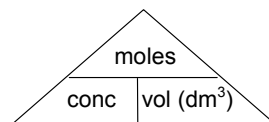


CONCENTRATION

The concentration of a solution is usually measured in moles per cubic decimetre (mol/dm^3). This is a measure of the number of moles in one cubic decimetre.

The volume must be in dm^3 (there are 1000 cm^3 in 1 dm^3). $\text{vol in dm}^3 = \frac{\text{vol in cm}^3}{1000}$

$$\text{concentration (mol/dm}^3\text{)} = \frac{\text{moles}}{\text{volume (dm}^3\text{)}}$$



- 1) Calculate the concentration of the following solutions in mol/dm^3 .
 - a) 0.1 moles of NaCl in 200 cm^3
 - b) 0.2 moles of H_2SO_4 in 100 cm^3
 - c) 0.02 moles of NaOH in 25 cm^3
- 2) Calculate the number of moles in the following solutions.
 - a) 100 cm^3 of $0.20 \text{ mol/dm}^3 \text{ HNO}_3$
 - b) 25 cm^3 of $1.50 \text{ mol/dm}^3 \text{ KOH}$
 - c) 50 cm^3 of $0.10 \text{ mol/dm}^3 \text{ H}_2\text{SO}_4$

Concentration can also be measured in grams per cubic decimetre (g/dm^3). This is a measure of the number of grams in one cubic decimetre. [remember that $\text{mass} = M_r \times \text{moles}$]

1 dm³
2 moles of H₂SO₄
196 g of H₂SO₄

Concentration = 2 mol/dm^3
 M_r of $\text{H}_2\text{SO}_4 = 98$
Concentration = $2 \times 98 = 196 \text{ g/dm}^3$

A simple conversion is: $\text{conc (g/dm}^3\text{)} = \text{conc (mol/dm}^3\text{)} \times M_r$

- 3) Calculate the concentration of the following solutions in g/dm^3 .
 - a) $0.100 \text{ mol/dm}^3 \text{ NaOH}$
 - b) $0.250 \text{ mol/dm}^3 \text{ CH}_3\text{COOH}$
 - c) $1.50 \text{ mol/dm}^3 \text{ HNO}_3$
- 4) 0.2 moles of NaOH is dissolved in 250 cm^3 of water.
 - a) Calculate the concentration in mol/dm^3
 - b) Calculate the concentration in g/dm^3
- 5) 5 g of KNO_3 is dissolved in 100 cm^3 of water.
 - a) Calculate the concentration in g/dm^3
 - b) Calculate the concentration in mol/dm^3

Drawing Dot and Cross Diagrams

Fill in the chart for each of the following compounds

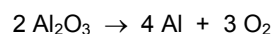
Name	Formula	Ionic or Covalent	Dot Cross Diagram
Carbon Dioxide	CO ₂		
Sodium Bromide	NaBr		
Magnesium Chloride			
	Li ₃ N		
	PH ₃		
Strontium Sulfide			
	SiO ₂		
Methanal	H ₂ CO		

Name	Formula	Ionic or Covalent	Dot and Cross Diagram
	K_3P		
Hydrogen Cyanide	HCN		
Hydrogen Sulfide			
Sodium Phosphide			
Beryllium Nitride			
Ethene	C_2H_4		
Methanol	CH_3OH		
Bromoethane	C_2H_5Br		



MOLE CALCULATIONS 1

- 1) Aluminium is extracted from aluminium oxide as shown. Calculate the mass of aluminium that can be formed from 1020 g of aluminium oxide.

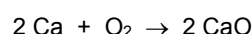


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- 2) Calculate the mass of oxygen needed to react 10 g of calcium to form calcium oxide.

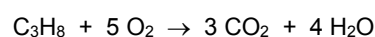


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- 3) What mass of propane could burn in 50 g of oxygen?

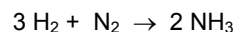


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- 4) What mass of ammonia can be made from 20 g of hydrogen?

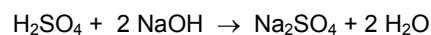


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- 5) What mass of sodium hydroxide is needed to neutralise 10 kg of sulfuric acid?

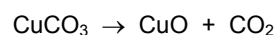


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- 6) What mass of carbon dioxide is formed when 10 g of copper carbonate decomposes on heating?



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- 7) What mass of carbon monoxide is needed to react with 1 kg of iron oxide? $\text{Fe}_2\text{O}_3 + 3 \text{CO} \rightarrow 2 \text{Fe} + 3 \text{CO}_2$

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- 8) What mass of chlorine reacts with 20 g of iron to form iron (III) chloride? $2 \text{Fe} + 3 \text{Cl}_2 \rightarrow 2 \text{FeCl}_3$

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- 9) Hydrazine (N_2H_4) is used as a rocket fuel. It can be made by reacting ammonia with hydrogen peroxide. What mass of ammonia is needed to make 100 g of hydrazine? $2 \text{NH}_3 + \text{H}_2\text{O}_2 \rightarrow \text{N}_2\text{H}_4 + 2 \text{H}_2\text{O}$

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- 10) 10.0 g of hydrated sodium sulfate decompose to form 4.40 g of anhydrous sodium sulfate on heating. Calculate the formula mass of hydrated sodium sulfate and the value of x . $\text{Na}_2\text{SO}_4 \cdot x\text{H}_2\text{O} \rightarrow \text{Na}_2\text{SO}_4 + x \text{H}_2\text{O}$

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