

Understanding Moles

1. Calculate the number of moles present in each of the following cases:	2. Calculate the mass of substance present in the following cases:	3. Calculate the relative molecular mass of the following substances and suggest a possible identity of each substance:
a) 2.3 g of Na	a) 0.05 moles of Cl ₂	a) 0.015 moles, 0.42 g
b) 2.5 g of O ₂	b) 0.125 moles of KBr	b) 0.0125 moles, 0.50 g
c) 240 kg of CO ₂	c) 0.075 moles of Ca(OH) ₂	c) 0.55 moles, 88 g
d) 12.5 g of Al(OH) ₃	d) 250 moles of Fe ₂ O ₃	d) 2.25 moles, 63 g
e) 5.2 g of PbO ₂	e) 0.02 moles of Al ₂ (SO ₄) ₃	e) 0.00125 moles, 0.312 g

4. Calculate the number of particles in the following substances:

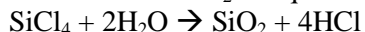
- a) 0.025 moles b) 2.5 g of CO₂ c) 5.0 g of Pb d) 100 g of N₂

5. Calculate the mass of the following substances:

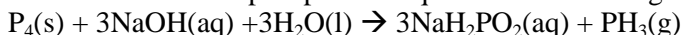
- a) 2.5×10^{23} molecules of N₂
 b) 1.5×10^{24} molecules of CO₂
 c) 2×10^{20} atoms of Mg

Reacting Masses

6. Calculate the mass of H₂O required to react completely with 5.0 g of SiCl₄:



7. Calculate the mass of phosphorus required to make 200 g of phosphine, PH₃, by the reaction:

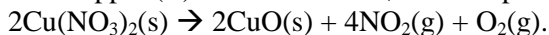


8. Lead (IV) oxide reacts with concentrated hydrochloric acid as follows:



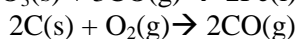
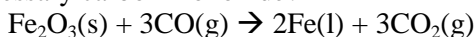
What mass of lead chloride would be obtained from 37.2g of PbO₂, and what mass of chlorine gas would be produced?

9. When copper (II) nitrate is heated, it decomposes according to the following equation:



When 20.0g of copper (II) nitrate is heated, what mass of copper (II) oxide would be produced? What mass of NO₂ would be produced?

10. A blast furnace can produce about 700 tonnes of iron a day. How much iron (III) oxide will be consumed? Assuming coke is pure carbon, how much coke would be needed to produce the necessary carbon monoxide?



Solutions

Using molarities and concentrations

1. Calculate the number of moles of H_2SO_4 in 50 cm^3 of a 0.50 mol dm^{-3} solution.
2. Calculate the number of moles of FeSO_4 in 25 cm^3 of a 0.2 mol dm^{-3} solution.
3. Calculate the mass of KMnO_4 in 25 cm^3 of a 0.02 mol dm^{-3} solution.
4. Calculate the mass of $\text{Pb}(\text{NO}_3)_2$ in 30 cm^3 of a 0.1 mol dm^{-3} solution.
5. What is the molarity of 1.06 g of H_2SO_4 in 250 cm^3 of solution?
6. What is the molarity of 15.0 g of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ in 250 cm^3 of solution?
7. What volume of a $0.833 \text{ mol dm}^{-3}$ solution of H_2O_2 will be required to make 250 cm^3 of a $0.100 \text{ mol dm}^{-3}$ solution?
8. What volume of a 0.50 mol dm^{-3} solution of HCl will be required to make 100 cm^3 of a 0.050 M solution?
9. How many moles of NaCl are there in 25 cm^3 of a 50 g dm^{-3} solution?

Formulae, equations and ionic equations

A: Deduce the formulae of the following compounds:

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|------------------------|--------------------------|
| 1. Sodium chloride | 2. Aluminium chloride |
| 3. Ammonium sulphate | 4. Magnesium nitrate |
| 5. Magnesium oxide | 6. Copper (II) hydroxide |
| 7. Aluminium oxide | 8. Sodium carbonate |
| 9. Copper (I) oxide | 10. Copper (II) oxide |
| 11. Aluminium sulphate | 12. Lead (II) sulphide |
| 13. Lead (IV) oxide | 14. Calcium nitride |

B: Write out the full stoichiometric and ionic equations for the following reactions:

1. When aqueous magnesium chloride is added to aqueous silver nitrate, a white precipitate is formed.
2. When aqueous sodium hydroxide is added to aqueous aluminium sulphate, a white precipitate is formed.
3. When aqueous barium chloride is treated with dilute sodium sulphate, a white precipitate is formed.
4. Dilute sulphuric acid is neutralised by sodium hydroxide solution.
5. A pale blue precipitate is formed on slow addition of potassium hydroxide solution to copper (II) sulphate solution.
6. A white precipitate is formed when dilute hydrochloric acid is added to a solution of lead (II) nitrate.
7. When dilute calcium chloride is mixed with sulphuric acid, a white precipitate is formed.
8. Calcium carbonate dissolves in dilute hydrochloric acid with the evolution of a colourless gas.
9. When dilute sulphuric acid is added to sodium carbonate solution, a gas is given off.
10. When aqueous calcium chloride is mixed with aqueous sodium carbonate, a white precipitate is formed.
11. Ammonia gas dissolves in dilute nitric acid.