

Chem!stry

Name: ()

Class:

Date: / /

Elementary Pie – Percentage Composition – Answers

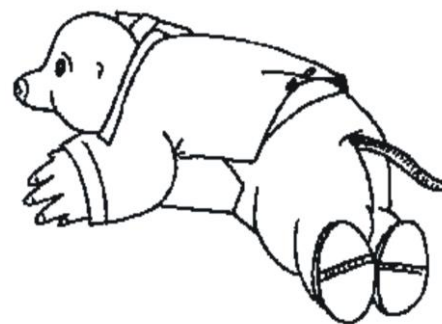
Question 1.

$$1 \text{ mole of } \text{Ca}(\text{NO}_3)_2 = 40 + (2 \times 14) + (6 \times 16) = 164 \text{ g}$$

$$\% \text{ Ca} = (40 \div 164) \times 100 = \mathbf{24.4\%}$$

$$\% \text{ N} = (28 \div 164) \times 100 = \mathbf{17.1\%}$$

$$\% \text{ O} = (96 \div 164) \times 100 = \mathbf{58.5\%}$$



Question 2.

$$1 \text{ mole of } \text{NH}_4\text{NO}_3 = 14 + (4 \times 1) + 14 + (3 \times 16) = 80 \text{ g}$$

$$\% \text{ N} = (28 \div 80) \times 100 = \mathbf{35.0\%*}$$

$$1 \text{ mole of } \text{KNO}_3 = 39 + 14 + (3 \times 16) = 101 \text{ g}$$

$$\% \text{ N} = (14 \div 101) \times 100 = \mathbf{13.9\%}$$

$$1 \text{ mole of } (\text{NH}_4)_2\text{SO}_4 = (2 \times 14) + (8 \times 1) + 32 + (4 \times 16) = 132 \text{ g}$$

$$\% \text{ N} = (28 \div 132) \times 100 = \mathbf{21.2\%}$$

*Ammonium nitrate, NH_4NO_3 , contains the greatest percentage nitrogen by mass.

Question 3.

$$1 \text{ mole of } \text{CuSO}_4 \cdot 5\text{H}_2\text{O} = 64 + 32 + (4 \times 16) + (5 \times ((2 \times 1) + 16)) = 250 \text{ g}$$

$$\% \text{ H}_2\text{O} = (90 \div 250) \times 100 = \mathbf{36.0\%}$$

Question 4.

Carbon = 75.0%	Hydrogen = 25.0%
$75.0 \div 12$ = 6.25 mol	$25.0 \div 1$ = 25.0 mol
$6.25 \div 6.25$ = 1	$25.0 \div 6.25$ = 4
CH₄ (this is methane)	

Question 5.

Sodium = 32.4%	Sulphur = 22.6%	Oxygen = 45.0%
$32.4 \div 23$ = 1.41 mol	$22.6 \div 32$ = 0.706 mol	$45.0 \div 16$ = 2.81 mol
$1.41 \div 0.706$ = 2	$0.706 \div 0.706$ = 1	$2.81 \div 0.706$ = 4
Na₂SO₄ (this is sodium sulphate)		

Question 6.

Mass of iron = 0.3450 g, mass of oxygen = 0.4764 g – 0.3450 g = 0.1314g.

Iron = 0.3450 g	Oxygen = 0.1314 g
$0.3450 \div 56$ = 0.00616 mol	$0.1314 \div 16$ = 0.00821 mol
$0.00616 \div 0.00616$ = 1	$0.00821 \div 0.00616$ = 1.33
$1 \times 3 = 3$ (whole number)	$1.33 \times 3 = 4$ (whole number)
a ratio of 1 : 1.33 = a whole number ratio of 3:4 = Fe₃O₄	

Question 7.

Carbon = 85.7%	Hydrogen = 14.3%
$85.7 \div 12$ = 7.14 mol	$14.3 \div 1$ = 14.3 mol
$7.14 \div 7.14$ = 1	$14.3 \div 7.14$ = 2
empirical formula = CH ₂	
M_r of CH ₂ = 12.0 + (2 × 1.0) = 14.0	
$84.0 \div 14.0 = 6$	
$6 \times \text{CH}_2 = \text{C}_6\text{H}_{12}$ (this could be cyclohexane)	

Question 8.

Carbon = 40.0%	Hydrogen = 6.67%	Oxygen = 53.3%
$40.0 \div 12$ = 3.33 mol	$6.67 \div 1$ = 6.67 mol	$53.3 \div 16$ = 3.33 mol
$3.33 \div 3.33$ = 1	$6.67 \div 3.33$ = 2	$3.33 \div 3.33$ = 1
empirical formula = CH ₂ O		
M_r of CH ₂ O = 12.0 + (2 × 1.0) + 16.0 = 30.0		
$60.0 \div 30.0 = 2$		
$2 \times \text{CH}_2\text{O} = \mathbf{C_2H_4O_2}$ (this is ethanoic acid, molecular formula CH ₃ COOH)		