Relative formula mass and percentage composition calculations

Answer these questions. Make sure you show your working out.

- 1. Calculate the relative formula masses, *M*_r, of the following compounds.
 - (a) Iron(II) sulfide, FeS (c) Ammonium chloride, NH₄Cl
 - (b) Copper(II) sulfate, CuSO₄ (d) Aluminium sulfate, $Al_2(SO_4)_3$
- 2. Calculate the percentage by mass of one of the elements in the following compounds. Give your answers to an appropriate number of significant figures.
 - (a) O in sodium hydroxide, NaOH $M_{\rm r}$ of NaOH = 40
 - (b) N in ammonium nitrate, NH₄NO₃
 - (c) Cu in copper(II) hydroxide, $Cu(OH)_2$ $M_{\rm r}$ of Cu(OH)₂ = 97.5
 - (d) Al in aluminium oxide, Al_2O_3

Use these relative atomic masses.

Element	Н	Ν	0	Al	S	Cl	Fe	Cu
A _r	1	14	16	27	32	35.5	56	63.5

 $M_{\rm r}$ of NH₄NO₃ = 80

 $M_{\rm r}$ of Al₂O₃ = 102

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Relative formula mass and percentage composition calculations

ANSWERS

1. (a) 56 + 32 = 88(b) $63.5 + 32 + (4 \times 16) = 159.5$ (c) $14 + (4 \times 1) + 35.5 = 53.5$ (d) *M*r of SO₄ = 32 + (4 × 16) = 96 *M*_r of Al₂(SO₄)₃ = (2 × 27) + (96 × 3) = 342 2. (a) % O = $\frac{16}{40} \times 100$ = 40% (b) % N = $\frac{(2 \times 14)}{80} \times 100$ (c) % Cu = $\frac{63.5}{97.5} \times 100$ = 65.1% (d) % Al = $\frac{(2 \times 27)}{102} \times 100$ = $\frac{28}{80} \times 100$ (e) $\frac{54}{102} \times 100$

= 35%

Relative formula mass and percentage composition calculations

ANSWERS

- 1. (a) 56 + 32 = 88
 - (b) $63.5 + 32 + (4 \times 16) = 159.5$
 - (c) $14 + (4 \times 1) + 35.5 = 53.5$
 - (d) $Mr \text{ of } SO_4 = 32 + (4 \times 16) = 96$

 M_r of Al₂(SO₄)₃ = (2 × 27) + (96 × 3) = 342

2. (a)
$$\% O = \frac{16}{40} \times 100$$

 $= 40\%$
(b) $\% N = \frac{(2 \times 14)}{80} \times 100$
 $= \frac{28}{80} \times 100$
(c) $\% Cu = \frac{63.5}{97.5} \times 100$
 $= 65.1\%$
(d) $\% Al = \frac{(2 \times 27)}{102} \times 100$
 $= \frac{54}{102} \times 100$

= 53% (52.9%)



= 35%

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