Calculating Percentage Mass of an Element in a Compound

Bronze

To calculate the percentage mass of an element in a compound you will need to follow the general formula.

$$\%\ \text{mass of an element in a compound} = \frac{\text{relative atomic mass of the element } (A_r) \times \text{number of atoms of the element in the formula.}}{\text{relative formula mass } (M_r)} \times 100$$

For example: calculate the percentage of hydrogen in H_2O.

A_r of hydrogen = 1

A_r of oxygen = 16

First of all, find the M_r of the compound. For water, this would be (1 x 2) + 16 = 18.

The M_r of water is 18.

The question asks you to find the percentage of hydrogen in water: how many atoms of hydrogen are there? There are two atoms of hydrogen.

Multiply the A_r of the element by the number of atoms: 1 x 2 = 2

To calculate the % mass of the element, you now need to divide the answer above by the **M_r** of the compound. **2 ÷ 18 = 0.111**

Multiply by 100 to turn the answer into a percentage: **0.111 x 100 = 11.1%**

Have a go at calculating the percentage mass of an element in different chemical compounds. The first one has been done for you.

		Calculate the M_r of the compound.	Use this space to show your working out.	Write your answer in the box below.
1	Calculate the percentage mass of **potassium** in potassium nitrate.	KNO_3 39 + 14 + (16 × 3) = 101	39 × 1 = 39 39 ÷ 101 = 0.386 0.386 × 100 38.6 **Final answer to one decimal place.**	38.6%

2	Calculate the percentage mass of **carbon** in carbon monoxide.	CO 12 + 16 = 28	12 × 1 = 12 12 ÷ 28 =	
3	Calculate the percentage mass of **sodium** in sodium chloride.	NaCl 23 + 35.5 = 58.5	23 × 1 = 23 23 ÷ 58.5 =	
4	Calculate the percentage mass of **fluorine** in lithium fluoride.	LiF 7 + 19 = 26	19 × 1 = 19	
5	Calculate the percentage mass of **oxygen** in sulfur dioxide.	SO_2 32 + (16 × 2) = 64	16 × 2 = 32	
6	Calculate the percentage mass of **hydrogen** in ethanol.	C_2H_6O (12 × 2) + (1 × 6) + 16 = 46	1 × 6 = 6	
7	Calculate the percentage mass of **nitrogen** in ammonia.	NH_3 14 + (1 × 3) = 17		

8	Calculate the percentage mass of **carbon** in carbon dioxide	CO_2 12 + (16 × 2) = 44		
9	Calculate the percentage mass of **aluminium** in aluminium oxide.	Al_2O_3 (27 × 2) + (16 × 3) = 102		
10	Calculate the percentage mass of **chlorine** in aluminium chloride.	$AlCl_3$ 27 + (35.5 × 3) = 133.5		
11	Calculate the percentage mass of **nitrogen** in ammonium chloride.	NH_4Cl 14 + (1 × 4) + 35.5 = 53.5		
12	Calculate the percentage mass of **oxygen** in ammonium hydroxide.	NH_4OH 14 + (1 × 4) + 16 + 1 = 35		
13	Calculate the percentage mass of **fluorine** in antimony pentafluoride	SbF_5 122 + (19 × 5) = 217		

14	Calculate the percentage mass of **barium** in barium chloride.	$BaCl_2$ 137 + (35.5 × 2) = 208		
15	Calculate the percentage mass of **fluorine** in barium fluoride.	BaF_2 137 + (19 × 2) = 175		
16	Calculate the mass of **oxygen** in barium oxide.	BaO 137 + 16 = 153		
17	Calculate the mass of **beryllium** in beryllium hydride.	BeH_2 9 + (1 × 2) = 11		
18	Calculate the mass of **bromine** in bromine chloride.	BrCl 80 + 35.5 = 115.5		
19	Calculate the mass of **caesium** in caesium fluoride.	CsF 133 + 19 = 152		
20	Calculate the mass of **copper** in copper chloride.	$CuCl_2$ 63.5 + (35.5 × 2) = 134.5		

Calculating Percentage Mass of an Element in a Compound Answers

		Calculate the M_r of the compound.	Use this space to show your working out.	Write your answer in the box below.
1	Calculate the percentage mass of **oxygen** in carbon dioxide.	KNO_3 39 + 14 + (16 × 3) = 101	39 × 1 = 39 39 ÷ 101 = 0.386 0.386 × 100 38.6 **Final answer to one decimal place.**	38.6%
2	Calculate the percentage mass of **carbon** in carbon monoxide.	CO 12 + 16 = 28	12 × 1 = 12 12 ÷ 28 = **0.428** 0.428 × **100** **42.9**	**42.9%**
3	Calculate the percentage mass of **sodium** in sodium chloride.	NaCl 23 + 35.5 = 58.5	23 × 1 = 23 23 ÷ 58.5 = **0.393** **0.393 × 100** **39.3**	**39.3%**
4	Calculate the percentage mass of **fluorine** in lithium fluoride.	LiF 7 + 19 = 26	19 × 1 = 19 **19 ÷ 26 = 0.731** **0.731 × 100** **73.1**	**73.1%**
5	Calculate the percentage mass of **oxygen** in sulfur dioxide.	SO_2 32 + (16 × 2) = 64	16 × 2 = 32 **32 ÷ 64 = 0.50** **0.50 × 100** **50.0**	**50.0%**

6	Calculate the percentage mass of **hydrogen** in ethanol.	C_2H_6O (12 × 2) + (1 × 6) + 16 = 46	1 × 6 = 6 **6 ÷ 46 = 0.13** **0.13 × 100** **13.0**	**13.0%**
7	Calculate the percentage mass of **nitrogen** in ammonia.	NH_3 I4 + (1 × 3) = 17	**14 × 1 = 14** **14 ÷ 17 = 0.824** **0.824 × 100** **82.4**	**82.4%**
8	Calculate the percentage mass of **carbon** in carbon dioxide	CO_2 12 + (16 × 2) = 44	**12 × 1 = 12** **12 ÷ 44 = 0.272** **0.272 × 100** **27.3**	**27.3%**
9	Calculate the percentage mass of **aluminium** in aluminium oxide.	$Al2O_3$ (27 × 2) + (16 × 3) = 102	**27 × 2 = 54** **54 ÷ 102 = 0.529** **0.529 × 100** **52.9**	**52.9%**
10	Calculate the percentage mass of **chlorine** in aluminium chloride.	$AlCl_3$ 27 + (35.5 × 3) = 133.5	**35.5 × 3 = 106.5** **106.5 ÷ 133.5 = 0.797** **0.797 × 100** **79.8**	**79.8%**
11	Calculate the percentage mass of **nitrogen** in ammonium chloride.	NH_4Cl 14 + (1 × 4) + 35.5 = 53.5	**14 × 1 = 14** **14 ÷ 53.5 = 0.261** **0.261 × 100** **26.2**	**26.2%**

12	Calculate the percentage mass of **oxygen** in ammonium hydroxide.	NH_4OH 14 + (1 × 4) + 16 + 1 = 35	**16 × 1 = 16** **16 ÷ 35 = 0.457** **0.457 × 100** **45.7**	**45.7%**
13	Calculate the percentage mass of **fluorine** in antimony pentafluoride	SbF_5 122 + (19 × 5) = 217	**19 × 5 = 95** **95 ÷ 217 = 0.437** **0.437 × 100** **43.8**	**43.8%**
14	Calculate the percentage mass of **barium** in barium chloride.	$BaCl_2$ 137 + (35.5 × 2) = 208	**137 × 1 = 137** **137 ÷ 208 = 0.658** **0.658 × 100** **65.9**	**65.9**
15	Calculate the percentage mass of **fluorine** in barium fluoride.	BaF_2 137 + (19 × 2) = 175	**19 × 2 = 38** **38 ÷ 175 = 0.217** **0.217 × 100** **21.7**	**21.7%**
16	Calculate the mass of **oxygen** in barium oxide.	BaO 137 + 16 = 153	**16 × 1 = 16** **16 ÷ 153 = 0.104** **0.104 × 100** **10.5**	**10.5%**
17	Calculate the mass of **beryllium** in beryllium hydride.	BeH_2 9 + (1 × 2) = 11	**9 × 1 = 9** **9 ÷ 11 = 0.818** **0.818 × 100** **81.8%**	**81.8%**

18	Calculate the mass of **bromine** in bromine chloride.	BrCl 80 + 35.5 = 115.5	**80 × 1 = 80** **80 ÷ 115.5 = 0.692** **0.692 × 100** **69.3%**	**69.3%**
19	Calculate the mass of **caesium** in caesium fluoride.	CsF 133 + 19 = 152	**133 × 1 = 133** **133 ÷ 152 = 0.875** **0.875 × 100** **87.5%**	**87.5%**
20	Calculate the mass of **copper** in copper chloride..	$CuCl_2$ 63.5 + (35.5 × 2) = 134.5	**63.5 × 1 = 63.5** **63.5 ÷ 134.5 = 0.472** **0.472 × 100** **47.2%**	**47.2%**