Relative formula mass and percentage by mass

Chemistry calculations | AQA Combined Science 8464 and AQA GCSE Chemistry 8462 | 12 questions, 33 marks

GCSE science calculations

Scan for the solutions

Equations for this topic (cover this box to practise recalling them)

- relative formula mass = sum of the relative atomic masses of the atoms in the formula — learn this one
- percentage by mass of an element = $\frac{(\text{Ar} \times \text{number of atoms of that element})}{\text{Mr}} \times 100$ — learn this one

Name: _____ **Date:** _____ **Score:** _____ **/ 33**

1 Yeast in bread dough at a bakery makes carbon dioxide, CO_2. The bubbles of gas make the bread rise.

Relative atomic masses (A_r): C = 12, O = 16

Calculate the relative formula mass (M_r) of carbon dioxide.

(1 mark)

Answer _____

2 Sodium carbonate, Na_2CO_3, is sold as washing soda for softening hard water.

Relative atomic masses (A_r): Na = 23, C = 12, O = 16

Calculate the relative formula mass (M_r) of sodium carbonate.

(2 marks)

Answer _____

3 Mr Hughes spreads calcium hydroxide, $Ca(OH)_2$, on his allotment to make the soil less acidic.

Relative atomic masses (A_r): Ca = 40, O = 16, H = 1

Calculate the relative formula mass (M_r) of calcium hydroxide.

(2 marks)

Answer _____

4 Ammonium sulfate, $(NH_4)_2SO_4$, is a fertiliser used by farmers in Lincolnshire.

Relative atomic masses (A_r): N = 14, H = 1, S = 32, O = 16

Calculate the relative formula mass (M_r) of ammonium sulfate.

(2 marks)

Answer _____

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5 Ammonium nitrate, NH_4NO_3, is a fertiliser that adds nitrogen to soil.

Relative atomic masses (A_r): N = 14, H = 1, O = 16

Calculate the percentage by mass of nitrogen in ammonium nitrate.

(3 marks)

Answer _____

6 Glucose, $C_6H_{12}O_6$, is made in leaves by photosynthesis.

Relative atomic masses (A_r): C = 12, H = 1, O = 16

Calculate the percentage by mass of oxygen in glucose.

Give your answer to 3 significant figures.

(3 marks)

Answer _____

7 A garden centre sells a 2.5 kg bag of pure calcium carbonate, $CaCO_3$.

Relative atomic masses (A_r): Ca = 40, C = 12, O = 16

Calculate the mass of calcium in the bag, in grams.

(3 marks)

Answer _____

8 A sample of bauxite ore has a mass of 1.20 kg. The sample contains 0.51 kg of aluminium oxide, Al_2O_3. The rest of the ore is other rock.

Relative atomic masses (A_r): Al = 27, O = 16

Calculate the mass of aluminium in the sample, in grams.

(3 marks)

Answer _____

9 Chen tests a white solid with the formula XCl_2, where X is a metal. The relative formula mass (M_r) of XCl_2 is 95.

Relative atomic mass (A_r): Cl = 35.5

Calculate the relative atomic mass of X.

(2 marks)

Answer _____

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10 A dietitian at a hospital in Leeds advises that an adult should eat no more than 2.4 g of sodium a day. Most of this sodium comes from salt, sodium chloride, NaCl.

Relative atomic masses (A_r): Na = 23, Cl = 35.5

Calculate the mass of sodium chloride that contains 2.4 g of sodium. Show your working.

(3 marks)

Answer _____

11 A farm shop sells two nitrogen fertilisers. Both come in 25 kg bags.

- Urea, $CO(NH_2)_2$
- Ammonium sulfate, $(NH_4)_2SO_4$

Relative atomic masses (A_r): C = 12, O = 16, N = 14, H = 1, S = 32

a. Calculate the percentage by mass of nitrogen in urea. Give your answer to 3 significant figures.

b. Calculate the percentage by mass of nitrogen in ammonium sulfate. Give your answer to 3 significant figures.

c. Which fertiliser gives more nitrogen per bag?

Show your working.

(5 marks)

Answer _____

12 A blast furnace is loaded with 3.0 tonnes of iron ore. 80% of the ore by mass is iron(III) oxide, Fe_2O_3.

Relative atomic masses (A_r): Fe = 56, O = 16

1 tonne = 1000 kg

Calculate the maximum mass of iron that could be extracted from the ore, in kg. Show your working.

(4 marks)

Answer _____

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End of questions | Total 33 marks

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