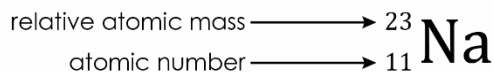


Relative mass

The periodic table shows the chemical symbols of elements, along with their atomic number and relative atomic mass (A_r).



As atoms are so tiny, it is not possible to measure their mass with normal weighing scales. Instead, scientists use a measure called relative atomic mass (A_r).

1.

(a) What is the approximate radius of an atom? Circle the correct answer.

- A** 0.1 μm **B** 0.1 nm **C** 0.1 mm **D** 0.1 cm

(1 mark)

Most of the mass of the atom is concentrated in the central nucleus of an atom.

(b) How does the radius of the nucleus of the atom compare to the radius of the whole atom? Circle the correct answer.

The radius of the whole atom is _____ times larger than the radius of the nucleus.

- A** 10 **B** 100 **C** 1000 **D** 10 000

(1 mark)

The chemical symbol for an atom of carbon is:



(c) State the number and location of each type of subatomic particle found in an atom of ${}^{12}\text{C}$.

Protons: _____

Neutrons: _____

Electrons: _____

(2 marks)

(d) Compare the masses of electrons, protons and neutrons and explain why an atom of ${}^{12}\text{C}$ has a relative mass of 12.

(2 marks)

2.

(a) Choose the correct element to complete the following definition for relative atomic mass? Circle the correct answer.

Relative atomic mass (A_r) is the average mass of the atoms of an element relative to 1/12th of the mass of an atom of ...

A ^1H
C ^{16}O

B ^{12}C
D ^{23}Na

(1 mark)

(b) Use the periodic table to draw a line matching each element to their correct relative atomic mass.

(3 marks)

Element	Relative atomic mass (A_r)
Beryllium (Be)	63.5
Nitrogen (N)	127
Iron (Fe)	9
Copper (Cu)	56
Iodine (I)	14

(c) Use the words provided to complete the sentences explaining why the relative atomic mass of some elements is not a whole number.

average **atoms** **protons** **neutrons**

The relative atomic mass is an _____ value that takes into account the abundance of isotopes of the element.

Isotopes are _____ of the same element with the same number of _____ but a different number of _____ in the nucleus.

(4 marks)

3. The relative formula mass (M_r) of a substance is worked out by adding together the relative atomic masses of the elements present.

For example, the relative atomic mass of nitrogen is 14 and the relative atomic mass of oxygen is 16, so the relative formula mass of nitrogen monoxide (NO) is calculated as: $14 + 16 = 30$.

- (a) Using the values of relative atomic mass shown in the periodic table, work out the relative formula mass (M_r) for each of the following substances.

Hint: Remember, when calculating relative formula mass you need to include any subscript numbers in the chemical formula. Subscript numbers outside brackets tell you to multiply everything inside the brackets by the same number.

- i. Copper oxide, CuO

_____ (1 mark)

- ii. Potassium chloride, KCl

_____ (1 mark)

- iii. Magnesium sulfide, MgS

_____ (1 mark)

- iv. Buckminsterfullerene, C₆₀

_____ (1 mark)

- v. Magnesium chloride, MgCl₂

_____ (1 mark)

- vi. Calcium hydroxide, Ca(OH)₂

_____ (2 marks)

- vii. Magnesium nitrate, Mg(NO₃)₂

_____ (2 marks)

- (b) A compound with the formula XOH has a relative formula mass of 40.

Given that the relative atomic mass of oxygen is 16 and hydrogen is 1, work out the identity of element X.

(3 marks)

4. Glucose is an organic compound containing carbon, hydrogen and oxygen. The chemical formula of glucose is $C_6H_{12}O_6$.

(a) Calculate the relative formula mass of glucose.

(2 marks)

The percentage of an element present in a compound can be determined using the equation:

$$\text{Percentage of element in compound (\%)} = \frac{\text{relative atomic mass of element}}{\text{relative formula mass of compound}} \times 100$$

- (b) Use your answer to **part (a)**, along with the equation provided, to calculate the percentage of carbon in glucose.

Hint: Remember there are six carbon atoms in glucose so the relative atomic mass will need to be multiplied by six in the equation.

(2 marks)

[Total: 30 marks]



Which question(s) did you get wrong? Why?

What will you do next time you're asked a similar question?