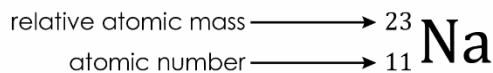


## Relative mass

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 using a top-pan balance. 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  $\mu\text{m}$       **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 information from the periodic table for carbon is:



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

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(2 marks)

(d) Use your answer to **part (c)** to explain why an atom of  ${}^{12}\text{C}$  has a relative mass of 12.

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(2 marks)

2.

- (a) Complete the following definition for relative atomic mass with the correct chemical symbol and atomic mass.

Relative atomic mass ( $A_r$ ) is the average mass of the atoms of an element relative to  $\frac{1}{12}$ th of the mass of an atom of \_\_\_\_\_.

(1 mark)

- (b) Use the periodic table to complete the table below with the name, relative atomic mass and chemical symbol for each element.

(3 marks)

Element name	Chemical symbol	Relative atomic mass ( $A_r$ )
Beryllium		
	Mg	
		35.5
Potassium		
	Fe	
		63.5
	S	
Iodine		

- (c) Complete the sentences to explain why the relative atomic mass of some elements is not a whole number.

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.

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

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

i. Rubidium chloride, RbCl

\_\_\_\_\_ (1 mark)

ii. Buckminsterfullerene, C<sub>60</sub>

\_\_\_\_\_ (1 mark)

iii. Calcium bromide, CaBr<sub>2</sub>

\_\_\_\_\_ (1 mark)

iv. Aluminium oxide, Al<sub>2</sub>O<sub>3</sub>

\_\_\_\_\_ (2 marks)

v. Calcium nitrate, Ca(NO<sub>3</sub>)<sub>2</sub>

\_\_\_\_\_ (2 marks)

vi. Ammonium sulfate, (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>

\_\_\_\_\_ (3 marks)

(b) A compound with the formula X<sub>2</sub>CO<sub>3</sub> has a relative formula mass of 106. Given that the relative atomic mass of carbon is 12 and oxygen is 16, work out the identity of element X.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(3 marks)

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

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

Calculate the percentage of the element named in each of the following compounds.

Give your answers to three significant figures.

*Hint: Remember to multiply the relative atomic mass by the number of atoms of that element in the formula.*

- (a) Zinc in zinc chloride,  $\text{ZnCl}_2$

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(3 marks)

- (b) Hydrogen in ethene,  $\text{C}_2\text{H}_4$

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(3 marks)

- (c) Carbon in glucose,  $\text{C}_6\text{H}_{12}\text{O}_6$

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(3 marks)

[Total: 36 marks]



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

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