Nat 5 : Unit 1 – Chemical Changes and Structure

Key area – Atomic Structure

Lesson 5 – Relative Atomic Mass

Learning Outcomes

By the end of the lesson, you should be able to …

1. Explain that the Relative Atomic Mass (RAM) is the average mass of the isotopes present, taking into account their relative proportions.
2. Given data, identify the most or least abundant isotope
3. Calculate the Relative Atomic Mass using a given formula.

Success Criteria

You will have been successful in this lesson if you:

1. Read and learn the notes given
2. Watch the links provided
3. Complete the self-checks provided
4. Complete homework 8 questions 1,2 &3 **(Attached at the end of the document)** for **Friday 22nd January to be submitted via MS teams or glow email to your class teacher.**

If you have any questions about the content of this lesson, you should ask your **class teacher** either through your class MS team or via email. MS Teams will be monitored throughout the week by a chemistry teacher. If you need help or clarification with either the task or the content of the lesson, just ask.

Links to Prior Knowledge

You may wish to revise the following to help you understand this lesson:

- Atomic structure

What to do

Watch the power point slide .

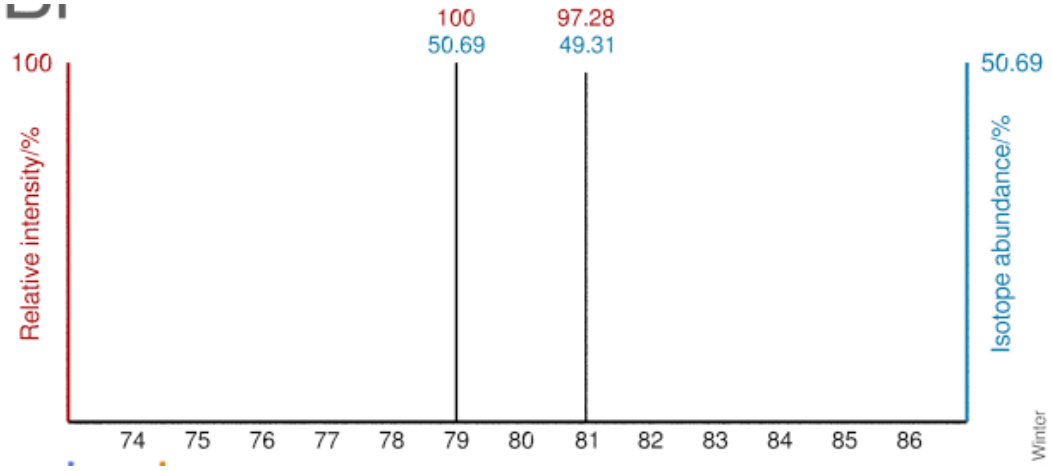
Copy the notes (or print and stick into your note book). Follow the instructions to complete diagrams or tables. Remember to watch the video links

WATCH - Mass Spectrometry - Chemical analysis is inte... - ClickView

YouTube – R.A.M. https://youtu.be/8AKalCm3Ros

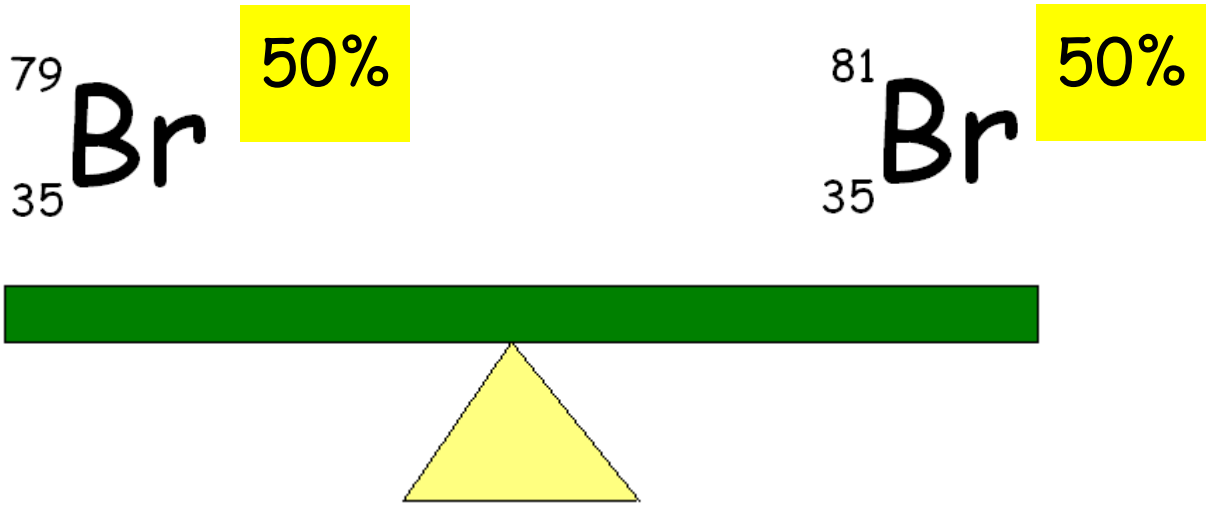
Relative atomic mass

Actual masses of atoms are far too small for convenient use. It takes six million million million million hydrogen atoms, for example, to weigh just 10 g. Because of this, a relative scale is used based on one atom of carbon-12 given a mass of 12 atomic mass units (amu) exactly. The effect of this is that we can treat the mass number of an atom as being a good approximation to the mass of an atom in atomic mass units. Information from a mass spectrometer for the element Bromine is shown



It can be seen from the graph that Bromine has **two** isotopes. This means that there are two different masses for Bromine atoms. As a result, an average is taken of both the isotopes.

The masses of the bromine atoms are 79 and 81 respectively. In bromine half of the atoms have a mass of 79 and half a mass of 81.



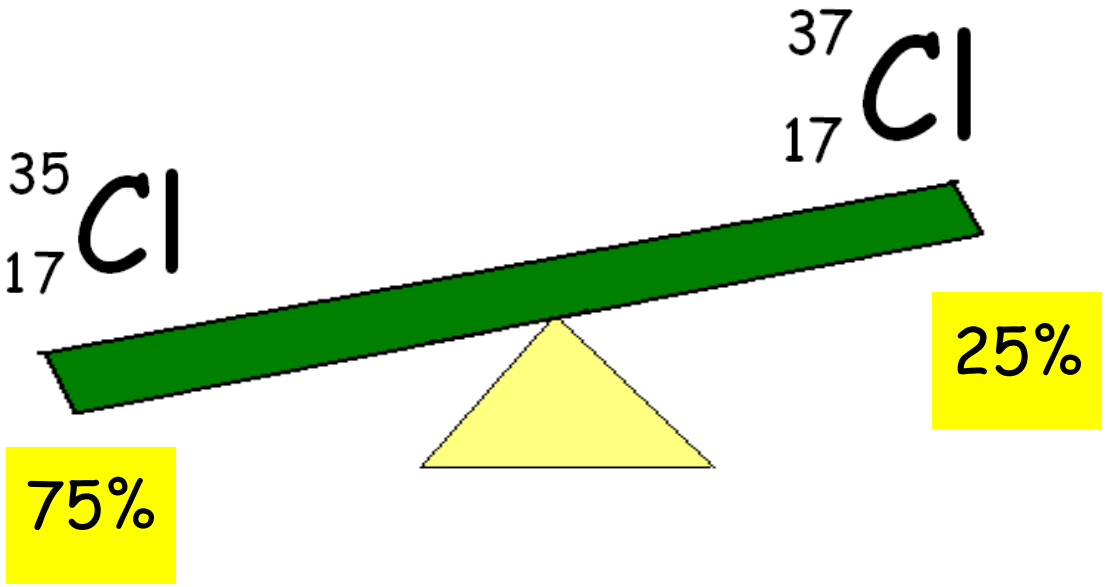
Because half of all bromine atoms have a mass of 79 and the other half have a mass of 81 than the average mass is 80.

We say that the relative atomic mass of bromine is 80. This also tells us there is equal proportions of Bromine isotopes as 80 is in the middle of 79 and 81.

The relative atomic mass (RAM) of an element is the average of the mass numbers of its isotopes, taking into account the proportions of each.

The relative atomic masses of most elements are not whole numbers because of the existence of isotopes.

Chlorine, for instance, has two isotopes



It might seem that the average mass (relative atomic mass) of chlorine should be 36. This is not so, because this is where the abundance of each isotope is important

75% of all chlorine atoms have a mass of 35.

Only 25 % of the atoms have a mass of 37.

The average is closer to 35 than to 37. In fact, the relative atomic mass of chlorine is 35.5.

CLick on the link below to access the power point lesson on isotopes

Remember to add to your notes by copying or printing out and sticking in.

Further Work

BBC bitesize Relative atomic mass - Atomic number, mass number and isotopes - GCSE Chemistry (Single Science) Revision - Other - BBC Bitesize

Watch How To Calculate Relative Atomic Mass | Chemical Calculations | Chemistry | FuseSchool - YouTube

Evans2 chem web: https://www.evans2chemweb.co.uk/login/index.php#

Username: snhs password: giffnock

Select any teacher → revision material → Nat5 chemistry → Unit 1:chemical changes and structure → relative atomic mas

Check your understanding - Answers the questions below in you class jotter

Self Check 14

1. Two types of neon atom exist, one has a mass number of 20, the other has a mass number of 22.
   a) Write the symbol for each atom showing the atomic and mass numbers.
   b) Calculate the number of protons, neutrons, and electrons for the neon atom with a mass of 22.
   c) Give the electron arrangement of a neon atom.
   d) What name is given to atoms like the neon atoms described above.

2. Chlorine has two isotopes, one with a mass of 35 and one with a mass of 37.The relative atomic mass of chlorine is 35·5.Which atom of chlorine is more common?

3. Atom **A** has an atomic number of 93 and a mass number of 239. Atom **B** has an atomic number of 93 and a mass number of 241.

   a) How many protons are present in atom **A**?
   b) How many neutrons are present in atom **B**?
   c) Are **A** and **B** isotopes? Explain your answer.

4. Two types of Lithium atom exist. They are ^{6}Li and ^{7}Li.

a) What name is used to describe the two atoms of lithium?
b) Calculate the number of protons, neutrons, and electrons in each type of lithium atom.
c) The relative atomic mass of lithium is 6·9. Which type of atom is the most common?

5. The following symbols represent some atoms:-

$^{90}_{40}X$ $^{88}_{38}X$ $^{90}_{38}X$ $^{89}_{39}X$

Which two atoms are isotopes?

HOMEWORK

Isotopes/Relative Atomic Mass 8

1. Atom **A** has an atomic number of 93 and a mass number of 239. Atom **B** has an atomic number of 94 and a mass number of 239. Are A and B isotopes? Explain your answer.

2. Two types of neon atom exist, one has a mass number of 20, the other has a mass number of 22.

   (a) Write the symbol for each atom showing the atomic and mass numbers.
   (b) Calculate the number of protons, neutrons, and electrons for the neon atom with a mass of 22.
   (c) Give the electron arrangement of a neon atom.
   (d) What name is given to atoms like the neon atoms described above.
   (e) Explain why you cannot calculate the relative atomic mass of neon from the above information.

3. A sample of nitrogen was found to contain equal amounts of two isotopes. One isotope has mass number 14 and the other has mass number 15. What is the relative atomic mass of this sample of nitrogen?

Extra work

Read through BBC bitesize Attempt the quiz once you have read through all the pages.
https://www.bbc.co.uk/bitesize/guides/zw2gpbk/revision/1

Check your knowledge with this online test Atoms, isotopes and ions - AQA test questions - AQA Trilogy - GCSE Combined Science Revision - BBC Bitesize