Nat 5 : Unit 1 – Chemical Changes and Structure

Key Area – Atomic Structure

Lesson 3 – Nuclide notation of ions

Learning Outcomes

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

1. Show that nuclide notation is used to show the atomic number, mass number and charge of ions from which the number of protons, electrons and neutrons can be determined.

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. Practice writing nuclide notation using the link
4. Complete the self-checks provided
5. Complete the homework and posted it to YOUR CLASS TEACHER through your class MS team or via email.

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:

-Nuclide notation

You may wish to have a copy of the data booklet handy for this lesson. Download or print a copy of the Higher Chemistry Data Booklet from MS Teams or from the SQA website - ChemistryDataBookletSQPN5.pdf (sqa.org.uk)

What to do

Work through the power point slide in class materials. 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

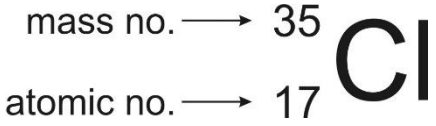
WATCH - National 5: Nuclide Notation - YouTube

Be Involved - National 5: Nuclide Notation Practice Questions - YouTube

Nuclide notation of ions

Remember protons = electrons in a neutral atom

Remember:



Complete the table

Element	Atomic No.	Mass No.	Protons	Neutrons	Electrons
$^{16}_{8}O$	-	-	-	-	-
$^{22}_{10}Ne$	-	-	-	-	-
$^{12}_{6}C$	-	-	-	-	-
	20	40			
		7		4	
		9			4
				7	7
	1			1	

Positively charged ions

If an atom ***loses*** an electron during the reaction then it will become a ***positively charged ion***. This can be shown in nuclide notation by adding a positive sign to the symbol. For example, if sodium gains an electron and becomes positively charged it can be written as:

$$^{23}_{11}Na^{+}$$

If an atom ***loses*** 2 electrons during the reaction then it will become a 2+ ***positively charged ion***. This can be shown in nuclide notation by adding a 2+ sign to the symbol. For example, if calcium **loses** two electrons it can be written as:

$$^{40}_{20}Ca^{2+}$$

Atomic number 20 = 20 protons
20 (electrons) – 2 = 18 electrons

Extra 2 protons therefor 2 positive charge

Negatively charged ions

If an atom ***gains*** an electron during the reaction then it will become a ***negatively charged ion***. This can be shown in nuclide notation by adding a negative sign to the symbol. For example, if fluorine gains an electron and becomes negatively charged it can be written as:

$$^{19}_{9}F^{-}$$

If an atom ***gains*** 3 electrons during the reaction then it will become a 3 ***negatively charged ion***. This can be shown in nuclide notation by adding a 3- sign to the symbol. For example, if nitrogen gains three electrons it can be written as:

$$^{14}_{7}N^{3-}$$

Atomic number 7 = 7 protons
7 (electrons) +3 = 10 electrons

Extra 3 electrons therefor 3 negative charge

Exercise

Now calculate the number of protons, neutrons and electrons in each of the following ions:

a) $^{35}_{17}Cl^{-}$

b) $^{7}_{3}Li^{+}$

c) $^{32}_{16}S^{2-}$

Further Reading

To learn more about atomic structure, try the following online resources:

BBC Bitesize: Atomic numbers - Atomic structure - National 5 Chemistry Revision - BBC Bitesize

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 → atomic structure

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

Self Check 12

1. Give the number of protons, neutrons, and electrons in each of the following ions.
Also give the electron arrangement of each ion.

(a) $^{9}_{4}Be^{2+}$ (b) $^{35}_{17}Cl^{-}$ (c) $^{19}_{9}F^{-}$ (d) $^{7}_{3}Li^{+}$ (e) $^{24}_{12}Mg^{2+}$

(f) $^{23}_{11}Na^{+}$ (g) $^{14}_{7}N^{3-}$ (h) $^{31}_{15}P^{3-}$ (i) $^{16}_{8}O^{2-}$ (j) $^{39}_{19}K^{+}$

2. Fluoride ions are effective in preventing tooth decay.
A fluoride ion contains 9 protons, 10 neutrons, and 10 electrons.
The symbol for a fluoride ion is $^{19}F^{-}$.

Write the symbols for the following ions.

(a) An oxide ion which contains 8 protons, 9 neutrons, and 10 electrons.

(b) A magnesium ion which contains 12 protons, 12 neutrons, and 10 electrons.

(c) A chloride ion which contains 17 protons, 20 neutrons, and 18 electrons.

(d) A lithium ion which contains 3 protons, 4 neutrons and 2 electrons.

(e) An aluminium ion which contains 13 protons, 14 neutrons, and 10 electrons.

(f) An iron ion which contains 26 protons, 30 neutrons, and 23 electrons.

ANSWERS WORK WILL BE POSTED ON FRIDAY