

Dr Clays A-level Chemistry

UNIT 1 TOPIC 1

ATOMIC STRUCTURE

Dr Chris Clay
http://drclays-alevelchemistry.com/

Unit 1 Topic 1 – ATOMIC STRUCTURE

Exercise 1 - atomic symbols

Deduce the number of protons, neutrons and electrons in the following species:

1. $^{1}_{1}H$
2. $^{17}_{8}O$
3. $^{4}_{2}He^{2+}$
4. $^{132}_{54}Xe$
5. $^{27}_{13}Al^{3+}$
6. $^{235}_{92}U$
7. $^{1}_{1}H^{+}$
8. $^{45}_{21}Sc^{3+}$
9. $^{37}_{17}Cl^{-}$
10. $^{14}_{6}C$

Use the periodic table to write symbols for the following species:

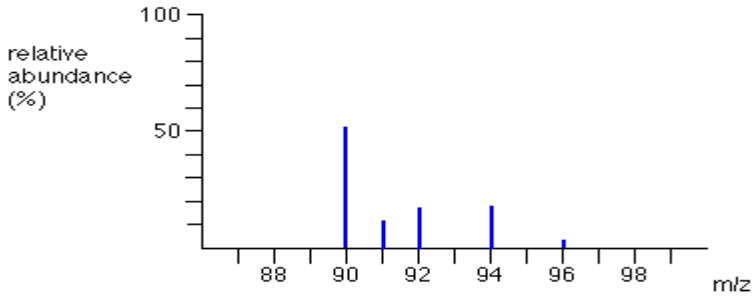
11. 19 protons, 20 neutrons, 18 electrons
12. 8 protons, 8 neutrons, 10 electrons
13. 1 proton, 2 neutrons, 1 electron
14. 82 protons, 126 neutrons, 80 electrons
15. 53 protons, 74 neutrons, 54 electrons

Unit 1 Topic 1 – ATOMIC STRUCTURE

Exercise 2 – ram, rmm and mass spectra

Deduce the relative atomic masses of the following elements.

1. Silicon (^{28}Si 92.21%, ^{29}Si 4.70%, ^{30}Si 3.09%)
2. Silver (^{107}Ag 51.88%, ^{109}Ag 48.12%)
3. Boron (^{10}B 19.7%, ^{11}B 80.7%)
4. Gallium (^{69}Ga 60.2%, ^{71}Ga 39.8%)
5. Zirconium:

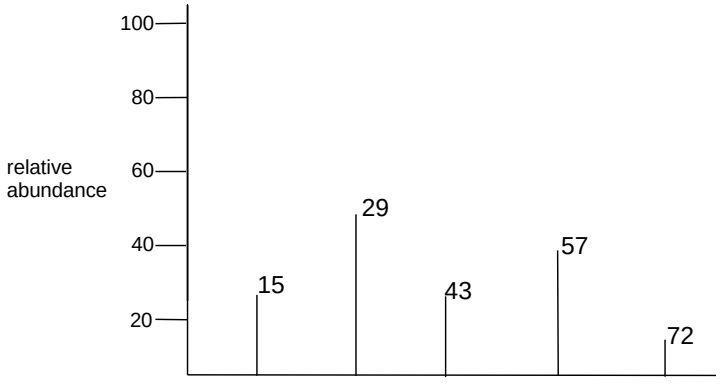


Assume in all cases the relative isotopic mass is equal to the mass number.

6. Bromine has two isotopes, with mass numbers 79 and 81. Its relative atomic mass is often given as 80. What does that tell you about the relative abundance of the two isotopes?
7. Most argon atoms have a mass number 40. How many neutrons does this isotope have? The relative isotopic mass of this isotope is 39.961, but the relative atomic mass of argon is 39.948. What can you deduce about the other isotopes of argon?
8. For each of the following stages in a mass spectrometer, state which part of the spectrometer is responsible for it and how it works:

a) electrospray ionization b) acceleration c) ion drift d) detection

9. Deduce, giving reasons, the relative molecular mass of compound A, which has the following mass spectrum:



Unit 1 Topic 1 – ATOMIC STRUCTURE

Exercise 3 - electronic configuration

Write the electronic configuration of the following using the arrow and box method:

1. C
2. Cu
3. Mg^{+}

Write the electronic configuration of the following using the orbital method:

4. N^{3-}
5. Ar
6. Sc^{3+}
7. Mn^{2+}
8. Fe^{3+}
9. V^{3+}

Write the electronic configuration of the following using the shorthand arrow and box method:

10. Cl^{-}
11. Fe
12. Br

Write the electronic configuration of the following using the shorthand orbital method:

13. Cr
14. Ga^{3+}
15. Pb^{2+}