Worksheet 1.2

Revisiting atomic structure

NAME: **CLASS:**

INTRODUCTION

Some points relevant to the Level 3 atomic structure topic are:

- Atoms are composed of protons, electrons and neutrons.
- The number of protons in an atom is called the atomic number.
- The mass number of an atom is the total number of protons and neutrons in the nucleus.
- Atoms of the same element but with a different number of neutrons are called isotopes.
- Ions are atoms with an unequal number of protons compared to electrons.
- Electrons in atoms are arranged in electron shells or energy levels.
- The periodic table is an ordered list of all the known elements organised in periods and groups.
- Ionisation energy data provides evidence of electron shells.

No.	Question	Answer
1	How many protons, neutrons and protons are in the ion Ga^{3+}?	
2	An ion contains 11 protons and 13 neutrons in the nucleus which is surrounded by 10 electrons. Give the formula of this ion.	
3	A selenide ion, Se^{2-}, has a mass number of 78. How many protons, neutrons and electrons are in this ion?	
4	How many electron and protons are in a carbonate ion, CO_3^{2-}?	
5	Two isotopes of chlorine are Cl and Cl. Which of the following statements about these two atoms are correct? **A** They have the same number of protons. **B** Both atoms have the same mass number. **C** The lighter isotope has 35 neutrons but the other has 37 neutrons. **D** Both isotopes will react with sodium to form ions with a -1 charge.	
6	Give the electron configuration of the following species. **a** Ca **b** P^{3-} ion **c** aluminium ion **d** H^+ ion	
7	Give the formulas of two negative ions with an electron configuration of 2, 8.	
8	A neutral atom has the electron configuration 2, 8, 3. In which	

	period and group of the periodic table would this element be located?	
9	Why are C, Si, Ge, Sn and Pb placed in the same group in the periodic table?	
10	Predict whether the first ionisation energy of each of the following will be higher, lower or the same as the first ionisation energy of magnesium. **a** sodium **b** aluminium **c** strontium	
11	The first eight successive ionisation energies of a particular element are: 1.12, 1.91, 2.92, 4.96, 6.28, 21.28, 25.40, 29.86. How many valence (outer-shell) electrons would you expect this element to have?	

Atomic and ionic radii

The atomic radius of a particular atom or ion is determined by the number of shells occupied by electrons and the core charge on the atom. The core charge is the effective nuclear charge experienced by the outermost electrons and it is determined by subtracting the number of electrons in complete shells from the nuclear charge of the atom. The radii of four atoms or ions are:

magnesium 160 pm magnesium ion 86 pm sulfur 104 pm oxygen 74 pm

12	Propose an explanation for why a magnesium atom is larger than a sulfur atom.	
13	Propose an explanation for why an oxygen atom is smaller than a sulfur atom.	
14	Propose an explanation for why a magnesium atom is larger than a magnesium ion.	