

# A.1 Atomic Structure

Practice Worksheet — name: \_\_\_\_\_ date: \_\_\_\_\_

## FORMULAS FOR THIS TOPIC

MASS NUMBER  $A = Z + N$

### SECTION A — MULTIPLE CHOICE

**A1.** An atom has 11 protons, 12 neutrons and 11 electrons. Its electron arrangement is:

- A 2, 8, 1
- B 2, 9
- C 11
- D 2, 8, 2

**A2.** Chlorine-35 and chlorine-37 differ in their number of:

- A Protons
- B Electrons
- C Neutrons
- D Shells

**A3.** When a magnesium atom (2, 8, 2) becomes an ion it:

- A Gains 2 electrons to form  $\text{Mg}^{2-}$
- B Loses 2 electrons to form  $\text{Mg}^{2+}$
- C Loses 2 protons to form  $\text{Mg}^{2-}$
- D Gains 6 electrons to form  $\text{Mg}^{6-}$

### SECTION B — SHORT ANSWER

**B1.** Copy and complete: the ion  $^{16}_8\text{O}^{2-}$  contains \_\_\_\_ protons, \_\_\_\_ neutrons and \_\_\_\_ electrons. Explain each number. [3 marks]

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**B2.** Explain why isotopes of an element have identical chemical properties. [2 marks]

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**B3.** Describe the experimental evidence that led to the nuclear model of the atom. [3 marks]

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## ANSWER KEY

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### Section A

**A1: 2, 8, 1** — Eleven electrons fill the shells in order: 2 in the first, 8 in the second, leaving 1 in the third — sodium's arrangement, and the reason it reacts by losing that lone outer electron.

**A2: Neutrons** — Isotopes share the same proton number (17 for chlorine — otherwise they would be different elements) but have different neutron counts: 18 versus 20. Chemical behaviour, set by electrons, is identical.

**A3: Loses 2 electrons to form  $\text{Mg}^{2+}$**  — Losing the 2 outer electrons leaves the stable arrangement 2, 8 and a 2+ charge (12 protons versus 10 electrons). Metals lose electrons; the nucleus is never involved in chemical changes.

### Section B

**B1: 8 protons (atomic number), 8 neutrons (16 – 8), and 10 electrons (8 for a neutral atom, plus 2 gained to give the 2– charge).** The oxide ion has the stable arrangement 2, 8.

**B2: Chemical behaviour is determined by the electron arrangement, which depends on the proton number. Isotopes have the same protons and therefore the same electrons and arrangement — only the neutron count (and hence mass) differs.**

**B3: In the Geiger–Marsden experiment, alpha particles were fired at thin gold foil. Most passed straight through (atoms are mostly empty space), but a tiny fraction deflected at large angles or bounced back (the positive charge and mass are concentrated in a tiny, dense nucleus) — replacing the plum-pudding model.**