03 Atomic Structure

Set A **Answer key**

A From the lesson

9 MARKS

1 **C** They have the same number of electrons. [1]

A Chlorine-35 has 18 neutrons and chlorine-37 has 20 neutrons.

B The nucleon numbers are 35 and 37.

D The extra neutrons make chlorine-37 heavier.

2 **D** 2.8.8.2 [1]

A The first shell holds only 2 electrons.

B The second shell is filled before the third shell, so 2.6.8.4 is in the wrong order.

C The third shell usually holds a maximum of 8 electrons.

3 Uranium-235: 92 protons, 143 neutrons (235 – 92) and 92 electrons [1]

Sodium ion: 11 protons, 12 neutrons and 10 electrons (11 – 1) [1]

Sulfide ion: 16 protons, 16 neutrons (32 – 16) and 18 electrons (16 + 2) [1]

4 **(a)** 5 protons, 6 neutrons (11 – 5) and 5 electrons [1]

(b) **2.3** [1]

5 Phosphorus has the electronic configuration 2.8.5, so it also has 5 valence electrons. [1]

Elements with the same number of valence electrons have similar chemical properties. [1]

B Practice

19 MARKS

6 **A** proton in the nucleus, neutron in the nucleus, electron orbiting the nucleus [1]

Protons and neutrons are found in the nucleus of an atom while electrons are found in the electron shells around the nucleus.

7 **B** The proton number of all atoms of an element is the same. [1]

A The nucleon number is the number of protons plus the number of neutrons, so it is never less than the proton number.

C An atom of hydrogen-1 has no neutrons, so its nucleon number (1) equals its proton number (1).

D A hydrogen-1 atom has 1 nucleon and 1 electron, so the two can be equal.

8 **C** K^+, Ca^{2+}, P^{3-} [1]

A F^- has 10 electrons, Cl^- has 18 and Br^- has 36.

B H^+ has 0 electrons, He has 2 and N^{3-} has 10.

C K^+, Ca^{2+} and P^{3-} each have 18 electrons.

D Na^+ has 10 electrons, Mg^{2+} has 10 and S^{2-} has 18.

9 **(a)** Isotopes are atoms of the same element with the same number of protons but different numbers of neutrons. [1] [1]

(b)

particle	number	name of particle
X	20	neutron
Y	18	electron
Z	17	proton

All three correct (two correct earns 1 mark). [2]

(c)

particle	number
X (neutrons)	18
Y (electrons)	17
Z (protons)	17

All three correct (two correct earns 1 mark). [2]

10 **(a)**

	relative mass	relative charge
proton	1	+1
neutron	1	0
electron	1/1836 *or* 1/1840	−1

Three blanks correct and the other three blanks correct [1] [1]

(b)(i) 27 − 13 = **14** [1]

(ii) **2.8.3** [1]

(iii)

They are isotopes. They are atoms of the same element with the same proton number (13) but different numbers of neutrons (14 and 13). **[1]**

11 **(a)**

Atoms of the same element with the same number of protons but different numbers of neutrons. **[1]**

(b)

isotope	protons	neutrons	electrons
^{286}Fl	114	172	114
^{289}Fl	114	175	114

Each correct row **[1]** **[1]**

12

atom	protons	neutrons	electrons
$^{39}_{19}K$	19	20	19
$^{52}_{24}Cr$	24	28	24

Each correct row **[1]** **[1]**

The atom is neutral, so protons = electrons = 24, which is chromium, and the nucleon number is 24 + 28 = 52.