Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

2.1

- atoms of the **same element** (same number of protons)
- with **different numbers of neutrons**

2.2

- protons: 3 and 3
- neutrons: 3 and 4
- electrons: 3 and 3

2.3

- $A_r = \dfrac{(6 \times 7.5) + (7 \times 92.5)}{100} = \dfrac{45 + 647.5}{100}$
- $= 6.925 =$ **6.9**

2.4

- they have the **same electronic configuration** $(2, 1)$: the same number of outer-shell electrons

3.1

C

- neutrons: C-12 has 6 (= 6 protons), C-14 has $8 > 6$, N-14 has $7 = 7$, Si-29 has $15 > 14$

3.2

C

- same element means same protons and (as atoms) same electrons; isotopes differ only in neutrons, so their nucleon numbers differ

3.3

(a) one mark per correct column:

- protons: 12, 12
- neutrons: 14, 12
- electrons: 12, 10 (the ion has lost two electrons)

(b)

- $\dfrac{(24 \times 79) + (25 \times 10) + (26 \times 11)}{100} = \dfrac{1896 + 250 + 286}{100}$
- $= 24.32=$ **24.3**

(c) **carbon-12** ($^{12}_{6}\mathrm{C}$)

(d)

- they have the **same number of electrons** / the same electronic configuration, $2, 8, 2$
- chemical reactions involve the **outer-shell electrons**; the neutrons do not take part