

Solutions

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

2.1

- relative charge 0; relative mass 1

2.2

- protons 20; neutrons $40 - 20 = 20$; electrons $20 - 2 = 18$

3.1 B

- The electron is lightest, so it deflects most, toward the positive plate

3.2 B

- The rising nuclear charge with similar shielding pulls the outer shell in

3.3

(a)

- Na^+ has lost its outer (third) shell, so it has one fewer shell; the remaining electrons are pulled in more strongly by the same nucleus

(b)

- Al^{3+} is smallest; it has the most protons (13) for the same 10 electrons, so the strongest pull per electron

3.4

- each step down Group 2 adds a shell, so the outer electrons are further out and more shielded from the nucleus

3.5

(a)

- **A** $^{24}\text{Mg}^{2+}$, **B** $^{18}\text{O}^{2-}$, **C** ^{26}Mg , **D** $^{35}\text{Cl}^-$. Mass number = protons + neutrons; the charge is protons – electrons

(b)

- **A** and **C** — both have 12 protons, and the proton number is what fixes the element

(c)

- **A** has lost both 3s electrons, so its outermost occupied shell is now the second, not the third; the same 12 protons now hold only 10 electrons, so the pull per electron is greater; there is also less electron–electron repulsion, so the remaining shells are drawn in

(d)

- Larger. The extra electron adds repulsion within the same third shell while the nuclear charge is unchanged, so the shell expands