Solutions

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

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

2.1

S: $1s^2 2s^2 2p^6 3s^2 3p^4$; Fe^{2+}: $[Ar]3d^6$

2.2

1s and 2s each have a pair of opposite arrows; each 2p box has one arrow, all the same direction; **3** unpaired electrons; Hund's rule: electrons occupy orbitals of a sublevel singly before pairing

2.3

electrons fall from higher levels to $n = 2$, each emitting a photon of one energy / frequency; energy levels are fixed (quantized), so only certain frequencies appear; the levels get closer together at higher energy, so the lines converge

2.4

$E = hf = 6.63 \times 10^{-34} \times 3.29 \times 10^{15} = 2.18 \times 10^{-18}$ J; $\times 6.02 \times 10^{23} \div 1000 =$ **1310 kJ mol^{-1}**

3.1

(a) $[Ar]3d^{10}4s^1$

(b) $[Ar]3d^9$

(c) **18**; **10**

(d) heat excites electrons to higher energy levels; they fall back and emit photons; the levels are fixed, so the photons have only certain energies / frequencies / colours