Solutions

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

2.1

- the enthalpy change when 1 mol of an ionic solid (lattice) forms from its gaseous ions

2.2

- the atom gains an electron, and the attraction of the nucleus for the added electron releases energy

2.3

- the enthalpy change when one mole of electrons is added to one mole of gaseous atoms
- to form one mole of gaseous 1− ions

2.4

- the incoming electron is added to a negative O^- ion, so energy is needed to overcome the repulsion

3.1 B

- Atomisation always requires energy (bonds break), so it is positive

3.2 B

- EA becomes less exothermic down the group

3.3

(a)

- $\Delta H_{\text{latt}} = \Delta H_f - [\Delta H_{\text{at}}(\text{Na}) + \text{IE}_1 + \Delta H_{\text{at}}(\text{Cl}) + \text{EA}_1]$; $= -411 - [107 + 496 + 122 - 349]$ $= -411 - 376 = -787$ kJ mol^{-1}

(b)

- strong electrostatic attractions form between the oppositely charged ions (energy released)

3.4

- MgO has ions with higher charges (2+/2−) and smaller radii than NaCl; so the electrostatic attraction is much stronger, making the lattice energy more exothermic

3.5

- $\Delta H_{\text{latt}} = \Delta H_f - [\Delta H_{\text{at}}(\text{K}) + \text{IE}_1(\text{K}) + \Delta H_{\text{at}}(\text{Br}) + \text{EA}_1(\text{Br})] = -394 - (89 + 419 + 112 - 325)$
- $\Delta H_{\text{latt}} = -394 - 295 = \mathbf{-689}$ kJ mol^{-1}

3.6

- Li^+ and F^- are smaller ions than K^+ and Br^-, with the same charges
- so the ions are closer together and the electrostatic attraction between them is stronger