Born - Haber Cycle

① What is the lattice enthalpy of sodium chloride?

formation of sodium chloride $\Delta H^{\ominus}_f = -411\ kJmol^{-1}$

atomisation of sodium $\Delta H^{\ominus}_a = +109\ kJmol^{-1}$

1st electron affinity (chlorine) $\Delta H^{\ominus}_{EA} = -364\ kJmol^{-1}$

atomisation of chlorine $\Delta H^{\ominus}_a = +121\ kJmol^{-1}$

1st ionisation enthalpy (sodium) $\Delta H^{\ominus}_{IE} = +494\ kJmol^{-1}$

② Draw a Born-Haber cycle for Sodium Bromide and then calculate the electron affinity of bromine.

Enthalpy of atomisation (sodium) $\Delta H^{\ominus}_{a} = +109\ kJmol^{-1}$

1st ionisation enthalpy (sodium) $\Delta H^{\ominus}_{ie} = +494\ kJmol^{-1}$

Enthalpy of atomisation (Bromine) $\Delta H^{\ominus}_{a} = +112\ kJmol^{-1}$

Enthalpy of formation (Sodium Bromide) $\Delta H^{\ominus}_{f} = -360\ kJmol^{-1}$

Latice formation Enthalpy (NaBr) $\Delta H^{\ominus}_{Le} = -733\ kJmol^{-1}$

③ Draw a Born-Haber cycle for Strontium Chloride, $SrCl_2$, and use it to find the enthalpy change of formation of $SrCl_2(s)$.

Enthalpy changes of atomisation (strontium)	$\Delta H^{\ominus}_{a} = +164\ kJmol^{-1}$
Enthalpy changes of atomisation (chlorine)	$\Delta H^{\ominus}_{a} = +121\ kJmol^{-1}$
1st ionisation enthalpies of strontium	$\Delta H^{\ominus}_{IE} = +548\ kJmol^{-1}$
2nd ionisation enthalpies of strontium	$\Delta H^{\ominus}_{IE} = +1060\ kJmol^{-1}$
1st electron affinity of chlorine	$\Delta H^{\ominus}_{EA} = -364\ kJmol^{-1}$
Lattice enthalpy of formation ($SrCl_2$)	$\Delta H^{\ominus}_{LE} = -2112\ kJmol^{-1}$

④ Draw a Born Haber cycle for sodium oxide and use it to find the lattice enthalpy.

(Na_2O) Enthalpy of formation $\Delta H^{\ominus}_f = -416$

atomisation of sodium $\Delta H^{\ominus}_a = +109$

1st ionisation of sodium $\Delta H^{\ominus}_{IE} = +494$

atomisation of oxygen $\Delta H^{\ominus}_a = +248$

1st electron affinity oxygen $\Delta H^{\ominus}_{EA} = -142$

2nd electron affinity oxygen $\Delta H^{\ominus}_{EA} = +844$