Name of the Student:_____
Max. Marks : 14 Marks **Time : 14 Minutes**

Q1.

This question is about enthalpy changes.

(a) Theoretical values for enthalpies of lattice dissociation can be calculated using a perfect ionic model.

State the meaning of the term perfect ionic model.

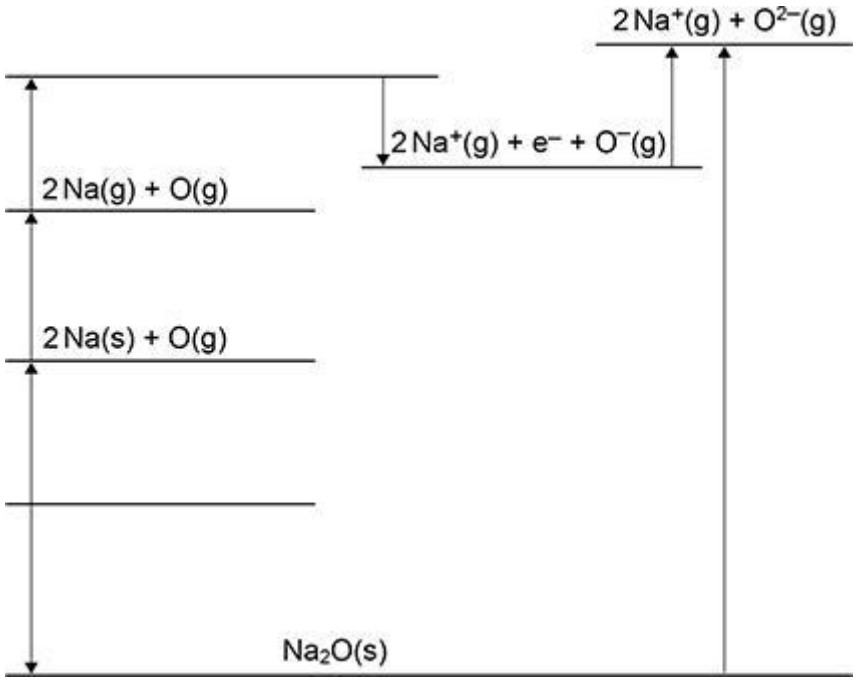
_____

_____

(1)

(b) Enthalpies of lattice dissociation can also be obtained from Born–Haber cycles.

The figure below shows an incomplete Born–Haber cycle for the formation of sodium oxide.



Complete above figure by writing formulas, including state symbols, of the appropriate species on each of the two blank lines.

(2)

(c) **Table 1** shows some enthalpy changes.

Table 1

Downloaded from www.merit-minds.com

Enthalpy change	ΔH / kJ mol^{-1}
Enthalpy of atomisation of oxygen	+248
Enthalpy of atomisation of sodium	+109
Enthalpy of formation of sodium oxide	–416
First ionisation energy of sodium	+494
First electron affinity of oxygen	–142
Second electron affinity of oxygen	+844

Use the data in **Table 1** to calculate the enthalpy of lattice dissociation of sodium oxide.

Enthalpy of lattice dissociation _____ kJ mol^{-1}

(2)

(d) Explain why the second electron affinity of oxygen has a positive value.

_____

_____

_____

(1)

(e) Explain why the enthalpy of lattice dissociation for sodium oxide is greater than the enthalpy of lattice dissociation for sodium chloride.

_____

_____

_____

_____

(2)

(f) Sodium chloride dissolves in water.

Table 2 shows some more enthalpy changes.

Table 2

Enthalpy change	ΔH / kJ mol^{-1}
Enthalpy of hydration for Cl^- ions	–364
Enthalpy of hydration for Na^+ ions	–406
Enthalpy of lattice dissociation for NaCl	+771

Downloaded from www.merit-minds.com

Use the data in **Table 2** to calculate the enthalpy of solution for sodium chloride.

Enthalpy of solution _____ kJ mol^{-1}

(2)

(g) Give a reason why data books do **not** contain a value for the enthalpy of solution of sodium oxide.

_____

_____

(1)

(h) Calculate the temperature, in °C, at which this reaction becomes feasible.

$NaCl(s) \rightarrow Na(s) + \frac{1}{2} Cl_2(g)$ $\quad \Delta H = +411$ kJ mol^{-1}

$\Delta S = +90.1$ J K^{-1} mol^{-1}

Temperature _____ °C

(3)

(Total 14 marks)

Downloaded from www.merit-minds.com