

## WORKSHEET-Born-Haber Cycle

1. a. Draw Born-Haber cycle for the formation of strontium chloride

b. Use the following data to calculate the enthalpy of formation of strontium chloride. You must write all thermochemical equations for the steps of the cycle.

The enthalpy of sublimation of strontium = + 164 kJ/mole

First ionization energy for strontium = + 549 kJ/mole

Second ionization energy for strontium = + 1064 kJ/mole

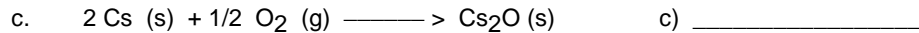
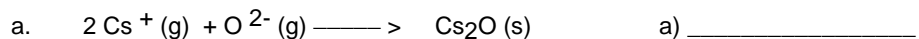
The enthalpy of dissociation of chlorine,  $\text{Cl}_2$  = + 243 kJ/mole

The electron affinity of chlorine,  $\text{Cl}$  = - 349 kJ/mole

Lattice energy of strontium chloride = - 2150 kJ/mole

Answer = - 828 kJ

2. Name the energy,  $\Delta H$ , in each of the following processes



Answer: a) Lattice energy                      b) Electron affinity                      c) Heat of formation

3. a. Draw Born-Haber cycle for the formation of calcium oxide.

b. Use the following data to calculate the lattice energy of calcium oxide. You must write all thermochemical equations for the steps of the cycle.

The enthalpy of formation of calcium oxide (solid) = - 636 kJ/mole

The enthalpy of sublimation of calcium = + 192 kJ/mole

First ionization energy of Ca = + 590 kJ/mole

Second ionization energy of Ca = +1145 kJ/mole

The enthalpy of dissociation of  $\text{O}_2 (\text{g})$  = + 494 kJ/mole

First electron affinity of O (g) = - 141 kJ/mole

Second electron affinity of O (g) = + 845 kJ/mole

Answer : -3514 kJ

4. a. Draw Born-Haber cycle for the formation of cesium oxide .

b. Use the following data to calculate the lattice energy of cesium oxide. You must write all thermochemical equations for the steps of the cycle.

Enthalpy of formation of cesium oxide = - 233 kJ/mole

Enthalpy of sublimation of Cs = + 78 kJ/mole

First ionization energy of Cs = + 375 kJ/mole

Enthalpy of dissociation of O<sub>2</sub> (g) = + 494 kJ/mole of O<sub>2</sub> molecules

First electron affinity of O = - 141 kJ/mole of O atoms

Second electron affinity of O = + 845 kJ/mole of O<sup>-</sup> ions

Answer : - 2090 kJ