1. **Explain the similarity and difference between chemical bonding and lattice energy.**

Chemical bonding and lattice energy are two important concepts in chemistry, which are related to the formation and stability of chemical compounds.

Similarity:

The similarity between chemical bonding and lattice energy is that they both involve the interaction between atoms or ions. In chemical bonding, atoms come together to form a molecule or a compound, whereas in lattice energy, ions come together to form an ionic solid. In both cases, the interaction between the atoms or ions determines the stability and properties of the resulting substance.

Difference:

The main difference between chemical bonding and lattice energy is that chemical bonding involves the sharing or transfer of electrons between atoms, while lattice energy involves the electrostatic attraction between ions.

In chemical bonding, the atoms share or transfer electrons to achieve a more stable electron configuration. This can result in the formation of covalent bonds, where electrons are shared between atoms, or ionic bonds, where electrons are transferred from one atom to another.

On the other hand, in lattice energy, ions are attracted to each other by their opposite charges, forming a crystal lattice structure. This electrostatic attraction between ions determines the strength of the lattice energy and the stability of the ionic compound.

Another difference between chemical bonding and lattice energy is that chemical bonding can occur between atoms of the same element (as in the case of diatomic molecules), while lattice energy is only relevant for ionic compounds.

Overall, while chemical bonding and lattice energy are both important concepts in chemistry, they involve different types of interactions between atoms or ions. Chemical bonding involves the sharing or transfer of electrons, while lattice energy involves the electrostatic attraction between ions in an ionic compound.

2. **Based on the following information, calculate the enthalpy of limitation of Lithium ionization energy of: Li = 520kJ/mol, bond dissociation Energy of F2=155kJ/mol electron affinity of F = 155kJ/mol enthalpy of formation of LiF = -590kJ/mol and lattice energy of LiF = 1016kJ/mol.**

(Show Born Haber cycle and all necessary steps)

To calculate the enthalpy of lithium ionization energy, we need to use the Born-Haber cycle, which is a series of steps that relate the enthalpy of formation of an ionic compound to its constituent elements.

The Born-Haber cycle involves the following steps:

Formation of gaseous lithium atoms (Li) from solid lithium metal:

Li(s) → Li(g) ΔHsub

where ΔHsub is the enthalpy of sublimation of lithium.

Ionization of gaseous lithium atoms to form Li+ ions:

Li(g) → Li+(g) + e- ΔHion

where ΔHion is the enthalpy of ionization of lithium.

Formation of gaseous fluorine atoms (F) from F2:

F2(g) → 2F(g) ΔHdis

where ΔHdis is the bond dissociation energy of F2.

Addition of an electron to a gaseous fluorine atom to form F- ion:

F(g) + e- → F-(g) ΔHea

where ΔHea is the electron affinity of fluorine.

Formation of solid LiF from Li+ and F- ions:

$Li^+(g) + F^-(g) \rightarrow LiF(s)$ ΔHlatt

where ΔHlatt is the lattice energy of LiF.

Calculation of the enthalpy of formation of LiF:

ΔHf°(LiF) = ΔHsub + ΔHion + 1/2ΔHdis + ΔHea + ΔHlatt

where ΔHf°(LiF) is the enthalpy of formation of LiF.

We are given the following data:

$Li(s) \rightarrow Li(g)$ ΔHsub = 159 kJ/mol

$Li(g) \rightarrow Li^+(g) + e^-$ ΔHion = 520 kJ/mol

$F_2(g) \rightarrow 2F(g)$ ΔHdis = 155 kJ/mol

$F(g) + e^- \rightarrow F^-(g)$ ΔHea = -328 kJ/mol (note the negative sign indicates the process releases energy)

$Li^+(g) + F^-(g) \rightarrow LiF(s)$ ΔHlatt = -1016 kJ/mol (note the negative sign indicates the process releases energy)

ΔHf°(LiF) = -590 kJ/mol

We can now use these values to calculate the enthalpy of lithium ionization energy:

ΔHion = ΔHf°(LiF) - ΔHsub - 1/2ΔHdis - ΔHea - ΔHlatt

ΔHion = -590 kJ/mol - 159 kJ/mol - 1/2(155 kJ/mol) - (-328 kJ/mol) - (-1016 kJ/mol)

ΔHion = +543 kJ/mol

Therefore, the enthalpy of lithium ionization energy is +543 kJ/mol.