

### Exercise 4.51 – Lattice enthalpy

**Q451-01** The lattice enthalpies for sodium chloride, potassium chloride and potassium bromide are + 780, +710 and +680 kJ mol<sup>-1</sup> respectively. Comment on these results and suggest a value for that of lithium chloride.

**Q451-02** In which of the following are the compounds CaF<sub>2</sub>, CaCl<sub>2</sub>, CsF, and LiF arranged in order of increasing lattice enthalpy?

- A. CaCl<sub>2</sub>, CaF<sub>2</sub>, CsF, LiF
- B. CsF, LiF, CaCl<sub>2</sub>, CaF<sub>2</sub>,
- C. CaCl<sub>2</sub>, CaF<sub>2</sub>, LiF, CsF
- D. CaCl<sub>2</sub>, CaF<sub>2</sub>, CsF, LiF
- E. LiF, CaF<sub>2</sub>, CsF, CaCl<sub>2</sub>

**Q451-03** Which combination of ionic charge and ionic radius give the largest lattice enthalpy for an ionic compound?

Ionic charge	Ionic radius
A. high	large
B. high	small
C. low	small
D. low	large

**Q451-04** The lattice enthalpy values for lithium fluoride and calcium fluoride are shown below:

LiF(s)	$\Delta H = +1022 \text{ kJ mol}^{-1}$
CaF <sub>2</sub> (s)	$\Delta H = +2602 \text{ kJ mol}^{-1}$

Which of the following statement(s) helps to explain why the value for lithium fluoride is less than that of calcium fluoride?

- 1. The ionic radius of lithium is less than that of calcium
  - 2. The ionic charge of lithium is less than that of calcium
- A. 1 only
  - B. 2 only
  - C. 1 and 2 only
  - D. Neither 1 nor 2

**Q451-05** Which of the following reactions has the most negative  $\Delta H^\ominus$  value?

- A.  $\text{LiF(s)} \longrightarrow \text{Li}^+(\text{g}) + \text{F}^-(\text{g})$
- B.  $\text{Li}^+(\text{g}) + \text{F}^-(\text{g}) \longrightarrow \text{LiF(s)}$
- C.  $\text{NaCl(s)} \longrightarrow \text{Na}^+(\text{g}) + \text{Cl}^-(\text{g})$
- D.  $\text{Na}^+(\text{g}) + \text{Cl}^-(\text{g}) \longrightarrow \text{NaCl(s)}$

**Q451-06** The lattice enthalpy of CaCl<sub>2</sub>(s) is -2260 kJ/mol and the enthalpy of hydration is -2340 kJ/mol. How much heat will be released when 0.25 mol of CaCl<sub>2</sub>(s) dissolves in water?

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**Q451-07** Which equation represents the lattice enthalpy of magnesium oxide?

- A.  $\text{Mg(s)} + \frac{1}{2}\text{O}_2(\text{g}) \longrightarrow \text{MgO(s)}$
  - B.  $\text{Mg}^{2+}(\text{g}) + \text{O}^{2-}(\text{g}) \longrightarrow \text{MgO(g)}$
  - C.  $\text{Mg}^{2+}(\text{g}) + \frac{1}{2}\text{O}_2(\text{g}) \longrightarrow \text{MgO(s)}$
  - D.  $\text{Mg}^{2+}(\text{g}) + \text{O}^{2-}(\text{g}) \longrightarrow \text{MgO(s)}$
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**Q451-08** Which of the following reactions is the most exothermic?

- A.  $\text{Li}^+(\text{g}) + \text{F}^-(\text{g}) \longrightarrow \text{LiF(s)}$
  - B.  $\text{Na}^+(\text{g}) + \text{Cl}^-(\text{g}) \longrightarrow \text{NaCl(s)}$
  - C.  $\text{Mg}^{2+}(\text{g}) + \text{O}^{2-}(\text{g}) \longrightarrow \text{MgO(s)}$
  - D.  $\text{Ca}^{2+}(\text{g}) + \text{S}^{2-}(\text{g}) \longrightarrow \text{CaS(s)}$
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**Q451-09** Which compound has the highest lattice enthalpy?

- A. CaO
  - B. CaS
  - C. LiF
  - D. LiI
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**Q451-10** What is a correct equation to represent the lattice enthalpy of magnesium sulphide?

- A.  $\text{MgS(s)} \longrightarrow \text{Mg(s)} + \text{S(s)}$
  - B.  $\text{MgS(s)} \longrightarrow \text{Mg(g)} + \text{S(g)}$
  - C.  $\text{MgS(s)} \longrightarrow \text{Mg}^+(\text{g}) + \text{S}^-(\text{g})$
  - D.  $\text{MgS(s)} \longrightarrow \text{Mg}^{2+}(\text{g}) + \text{S}^{2-}(\text{g})$
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