

SC151 - CHAPTER 10 LEARNING OBJECTIVES

To satisfy the minimum requirements for this course, you should master the following learning objectives.

Understand and be able to use the terms spontaneous reaction and nonspontaneous reaction.

Describe how entropy is related to randomness/disorder or dispersal of energy, and

- predict whether the sign of ΔS is positive, negative, or near zero for a chemical or physical change.
- describe how and why the entropy of a substance changes with temperature or when a phase change occurs.
- calculate ΔS° for any reaction from tabulated absolute entropy values, S° .

Know the Second Law of Thermodynamics and explain the role that entropy plays in determining whether a process will be spontaneous.

Know the Third Law of Thermodynamics and explain why it's needed to calculate absolute entropies.

Know the definition of standard state for elements, solids, liquids, gases and solutes in solution.

Calculate the standard free-energy change, ΔG° , at 25 °C from standard free energies of formation.

Explain the relationship between the sign of the free-energy change, ΔG , and whether a process is spontaneous in the forward direction.

Predict how ΔG will change with temperature, given the signs for ΔH and ΔS .

Use the equation $\Delta G = \Delta H - T\Delta S$ to calculate the free energy change for a reaction and to determine the temperature at which a nonspontaneous reaction becomes spontaneous.

Understand the relationship between ΔG° and K and be able to

- calculate ΔG° from K and perform the reverse operation.
- explain how ΔG differs from ΔG° and discuss how ΔG changes during the course of a reaction.
- calculate the free-energy ΔG for given reaction concentrations.