

## SC151 - CHAPTER 6 LEARNING OBJECTIVES

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

Describe the properties of chemical equilibrium and be able to

- write the equilibrium expression ( $K$ , or  $K_p$  for gaseous reactions) for a balanced chemical equation.
- define the concept of activity, how it relates to the “true” equilibrium constant, and how activity contributes to  $K$  being unitless.
- classify any equilibrium as heterogeneous or homogeneous.
- given a chemical reaction and its equilibrium constant, determine the new equilibrium constant when the reaction has been reversed or multiplied by a constant numerically.
- evaluate  $K$  and  $K_p$  from knowledge of the equilibrium concentrations (or pressures) of reactants or products, or from the initial concentration and the equilibrium concentration of at least one substance.
- interpret the magnitude of  $K$  and  $K_p$  and what this tells you about the extent of reaction and the composition of the equilibrium mixture.
  - use  $K_p$  and  $K$  to calculate equilibrium concentrations (i.e., apply *ICE* tables).

Describe the concept of reaction quotient,  $Q$ , explain the difference between  $Q$  and  $K$ , and by comparison with the value of the equilibrium constant,  $K$ ,

- determine whether a reaction is at equilibrium.
- predict in which direction a reaction will shift to reach equilibrium.

Explain how the relative equilibrium quantities of reactants and products are shifted by changes in temperature, pressure, volume, or the concentrations of substances in the equilibrium reaction (Le Châtelier’s Principle).

### NavApp: Submarine Atmosphere

give an overview of the submarine atmosphere:

- (i) closed system;
- (ii) oxygen must be generated;
- (iii) gaseous substances such as  $\text{CO}_2$ ,  $\text{CO}$ , and hydrocarbons are produced during the normal operation of a submarine;
- (iv) unwanted gases must be removed.

describe how carbon dioxide is removed from the submarine atmosphere using the  $\text{CO}_2$  scrubber.

discuss the impact of changes in the partial pressures of biologically essential and/or sensitive gases such as oxygen, carbon monoxide and carbon dioxide on the suitability of the submarine atmosphere.