Conceptual Example 7.1: write equations to show the ionization of nitric acid HNO3 in water

HNO3 (aq) → H+ (aq) + NO3- (aq)

Now show ionization of solid potassium hydroxide (KOH) in water

KOH (aq) → OH- (aq) + K+

Limitations on Arrhenius Theory:

- a simple free proton does not exist in water solution. The H+ ion seeks out a negative charge and finds a lone pair of electons on the O atom of an H2O molecule and attaches itself to form H3O+
- does not explain the basicity of ammonia and related compounds (contains no hydroxide ions)
- applies only to reactions in aqueous solutions

Bronsted-Lowry Acide Base THoery:

- acid is a proton donor
- base is a proton acceptor

Theory describes ionization of hydrogen chloride in this way:

HCL (aq) + H2O → CL – (AQ) + H3O+ (AQ)

Conceptual Example for Bronsted Lowry Acids:
Write an equation to show the reaction of HN03 as a Bronsted Lowry acid with water.

HNO3 (AQ) + H20 → NO3 – (AQ) + H3O +

Ammonia is gas at room temperature- when dissolved in water, some of the ammonia molecules react as shown:

NH3 (aq) + H20 → NH4+ (aq) + OH- (aq)

Salts: formed from the neutralization reaction of acids and bases, are ionic compounds composed of cations and anions.

- salts that conduct electricity when dissolved are called electrolytes

7.3 Acidic and Basic Anhydrides:

Nonmetal Oxides: Acidic Anhydrides: acids are made by the reaction of nonmetal oxides with water:

Biochemical Oxygen Demand (BOD): is the measure of amount of oxygen needed for this degradation (aerobic)

- if BOD is high enough dissolved oxygen is depleted and no life can survive in lake or stream

Flowing streams can recover (more oxygen) still streams can remain dead for years

Eutrophication: when algae dies they become organic waste and increases BOD

Anaerobic Decay: instead of oxidizing the organic matter, anaerobic bacteria reduces it and Methane CH4 is formed.

Excess Phosphates in a lake or river cause eutrophication

14.4 industrial Water Use:

Cyanide is treated with chlorine and a base to form nitrogen gas, bicarbonate and chloride ions

$10OH^- + 2\ N^- + 5Cl_2 \rightarrow N_2\ 2HCO_3^- + 10\ Cl^- + 4H_2O$

14.5 ground water contamination:

Nitrates: in ground water come from fertilizers used on farms and lawns

- nitrate (NO_3^-) is reduced to nitrite ion can cause babies to turn blue and DIE
- methemoglobinemia (blue baby)

Volatile Organic Chemicals: adds odor to water and are suspected carcinogens

Common VOCs are hydrocarbon solvents such as benzene and toluene and chlorinated hydrocarbons

Leaking underground storage tanks: UST of gasoline or hazardous material leaks and contaminates underground water sources

14.6 Making Water fit to Drink:

Water Treatment Plants: 2/3 water comes from treatment plants

Chemical Disinfection: chlorine is added to kill and remaining bacteria

Ozone (O3) can kill viruses while chlorine cannot , 100 times more effective in killing polioviruses

other technologies;