Answer Key: Review Guide

Chapter 16 – WATER RESOURCES

1. Explain how reverse osmosis (RO) works. (See lecture notes)
   What does reverse osmosis remove from water? Dissolved salts/minerals
2. (a) Identify the four stages involved in the purification of drinking water. (b) What kind of water contaminants is/are removed during each of these stages?
   (1) Aeration – removes odor-causing gases, organics and dissolved iron
   (2) Coagulation and precipitation – removes suspended solids and colloids
   (3) Hardness removal – to get rid of calcium and magnesium ions that lead to "hard" water
   (4) Disinfection – removes pathogenic microorganisms
3. (a) What is considered "hard" water? (See lecture notes) (b) Why is "hard" water undesirable? (See lecture notes) (c) What are the major ions responsible for water hardness? calcium and magnesium ions
4. What are pathogens? Disease-causing microorganisms. Why could they be present in water? (See lecture notes)
5. Give two examples of pathogenic *bacteria* that can be found in drinking water. What health problems do they cause if not removed from water? *Salmonella* (causes ***typhoid***) and *E. coli* (can cause diarrhea; can be deadly)
6. What kinds of pathogens can cause polio and hepatitis-A? Viruses
7. Give two examples of protozoan pathogens and their health effect. *Crystoporidium* and *Giardia lambia* (can cause *diarrhea*; *death*)
8. (a) Identify the 4 groups of drinking water contaminants whose standards (as maximum contaminant level) have been set by the Safe Drinking Water Act (SDWA). See lecture notes, slide #11. (b) Give examples of specific contaminants under each group. **Microorganisms** Ex. *Fecal coliform* and *E. coli*; Viruses (enteric); **Inorganic chemicals** Ex. Heavy metals Cd, Hg, Pb and As; *Anions* such as nitrates and fluoride; **Organic chemicals** Ex. Pesticides; Acrylamide (from sewage/wastewater treatment); Dioxin (from waste incinerators); Disinfection by-products (chlorinated organics); **Radionuclides** – Ex. Uranium, Thorium, Plutonium
9. Specify two carcinogens whose maximum contaminant level goal (MCLG) is zero. Lead, benzene, dioxin, PCBs
10. Identify the (a) source and (b) health effect of each of the following contaminants:

- Lead
- Mercury
- Arsenic
- Fluoride
- Nitrate, NO_3^-

See lecture notes (Chapter 16)