

## 15.4 LIFE SUPPORT SYSTEMS: WATER AND AIR

### Section 15.4 Questions

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#### Understanding Concepts

- Stresses on global water supplies would include the following:
  - Reduction of aquifers, especially by irrigation.
  - Salt buildup, especially by agricultural runoff.
  - Pollution by organic and chemical wastes.
- Flood irrigation covers the entire field with water. This method is relatively cheap and requires simple technologies. The evaporation rate and salt buildup are rapid. Drip irrigation is concentrated only on the crop plant. The technology is relatively complex and expensive but minimizes evaporation loss and salt buildup.
- Desalination is expensive, in terms of both money and energy. Desalination is only an option in coastal areas; dry interior sites could not make use of desalination.
  - Distillation heats seawater to cause evaporation of water. The water vapour is condensed back to liquid, which separates the salt. Distillation does not rely on a membrane that can fail. It also removes more of the contaminants than reverse osmosis does.
    - Reverse osmosis uses water under pressure and a membrane that is selectively permeable to water but not salt. An advantage of reverse osmosis is that no chemicals are used to treat the water. In both situations, huge amounts of waste salts are produced. Both methods require electricity and are therefore very expensive, and both consume energy resources.
- Acid deposition refers to the formation of precipitation that has dissolved compounds to form an acid. As clouds blow in the wind, the acids are often deposited at great distances from the source.
  - The two most widespread sources are sulfur dioxide from the burning of coal and nitrous oxides from the internal combustion engines of vehicles.
- Technologies could include the following:
  - Reduction of household water use by installing low-volume toilets, installing and maintaining low-water-flow faucets, limiting watering of lawns and washing cars
  - Treatment of sewage and storm water to maintain water quality
  - Ensuring that industrial wastes remain separated from water sources
  - Maximizing the use of crops that are suited to local climatic conditions to minimize irrigation
  - Covering water reservoirs to minimize evaporation loss
- This process is called the greenhouse effect. Solar radiation passes through gases such as carbon dioxide and methane to reach the surface of the earth. This radiation is absorbed by the earth and then radiated as infrared radiation (heat). Carbon dioxide and methane reflect infrared, so heat is trapped in the atmosphere.

#### Applying Inquiry Skills

- Two trends are seen. In North America, Europe, South American, Australia, and parts of Africa, areas that are water deficient tend to have low population densities. In Asia and some parts of Africa, areas that are water deficient have high population densities.
  - Northern and eastern China, India, northern Africa, and the western United States have both high densities and water deficiencies. Many areas with high water availability have low population densities. Areas such as these may buy water from other areas and import it, treat “less clean” water sources in the area, pipe water from remotes areas, and so on.