SECTION B SUMMARY

✎ Section B Supplement

Reviewing the Concepts

1. The frequency of radiation is directly proportional to its energy. $E = h\nu$

2. It implies a range. Each type of electromagnetic radiation covers a specific range of wavelengths.

3. Only visible light interacts with chlorophyll molecules in plants.

4. a. Infrared, visible, ultraviolet
   b. Infrared radiation heats the atmosphere, visible radiation provides energy for photosynthesis, and ultraviolet radiation is essential to vitamin D production.

5. Photons in UV-C have sufficient energy to break bonds, which kills bacteria and viruses.

6. Most infrared, UV-C, UV-B, and much UV-A radiation are absorbed in the atmosphere, while more than 90% of visible radiation reaches earth's surface.

7. Warming the planet and energizing the water cycle and photosynthesis reactions

8. a. Asphalt heats up quickly, while water heats up slowly.
   b. Specific heat capacity and reflectivity

9. White reflects all frequencies of visible light; colored materials absorb some frequencies. Absorbed energy is converted to thermal energy, so wearing white helps one keep cooler.

10. The pan material should have a relatively low specific heat capacity so that it will heat up and cool down quickly. The handle material should have a much higher heat capacity. (Low conductivity is also important.)

11. Iron. The specific heat capacity of aluminum is much higher than that of iron.

19. Atmospheric CO_2, $CaCO_3$ in limestone, natural gas (CH_4), and organic compounds

20. Example: A C atom contained in a molecule of CO_2 in the atmosphere is taken up by a tree (biosphere) for photosynthesis. The C atom then becomes part of a fossil fuel (lithosphere), which is burned to emit the C atom back into the atmosphere (as CO_2). The CO_2 then dissolves in the ocean, becoming part of the hydrosphere.

21. Examples include:
$$6\,CO_2 + 6\,H_2O \longrightarrow C_6H_{12}O_6 + 6\,O_2$$
$$CH_4 + 2\,O_2 \longrightarrow CO_2 + 2\,H_2O$$

Connecting the Concepts

22. The dark lenses cause the iris to open wide, allowing harmful UV light to enter.

23. If the limiting reactant in combustion is oxygen, other products, such as CO and C, will form instead of CO_2.

24. a. H_2S
    b. SO_2

25. a. $? \text{ g } H_2S = 205 \text{ g } SO_2 \times$
$$\frac{1 \text{ mol } SO_2}{64.07 \text{ g } SO_2} \times \frac{2 \text{ mol } H_2S}{1 \text{ mol } SO_2} \times$$
$$\frac{34.09 \text{ g } H_2S}{1 \text{ mol } H_2S} = 218 \text{ g } H_2S$$

    b. Given 45.4 kg SO_2:
$$? \text{ g } H_2S = 45\,400 \text{ g } SO_2 \times$$
$$\frac{1 \text{ mol } SO_2}{64.07 \text{ g } SO_2} \times \frac{2 \text{ mol } H_2S}{1 \text{ mol } SO_2} \times$$
$$\frac{34.09 \text{ g } H_2S}{1 \text{ mol } H_2S} = 48.3 \text{ kg } H_2S$$

    SO_2 is the limiting reactant.

26. Incomplete fuel combustion is taking place.

27. a. i, ii, iii. An increase in surface temperature
    b. CO_2 gas stored in ice, water, and northern forests would be released, increasing its concentration in the atmosphere as well as earth's surface temperature.