2007

2. The Cobb family of Fremont is looking at ways to decrease their home water and energy usage. Their current electric hot-water heater raises the water temperature to 140°F, which requires 0.20 kWh/gallon at a cost of $0.10/kWh. Each person in the family of four showers once a day for an average of 10 minutes per shower. The shower has a flow rate of 5.0 gallons per minute.

(a) Calculate the following. Be sure to show all your work and include units with your answers.

(i) The total amount of water that the family uses per year for taking showers

(ii) The annual cost of the electricity for the family showers, assuming that 2.5 gallons per minute of the water used is from the hot-water heater

(b) The family is considering replacing their current hot-water heater with a new energy-efficient hot-water heater that costs $1,000 and uses half the energy that their current hot-water heater uses. How many days would it take for the new hot-water heater to recover the $1,000 initial cost?

(c) Describe TWO practical measures that the family could take that would reduce their overall water use at home.

(d) Describe TWO conservation measures (other than reducing hot water use) that the family could take to reduce the total amount of energy that they use at home.

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3. In the mid 1970s, Sherwood Rowland and Mario Molina predicted a thinning of the stratospheric ozone layer over Antarctica. The thinning was confirmed in the late twentieth century and has continued into the twenty-first century.

(a) Identify the class of chemical compounds that is primarily responsible for the thinning of the stratospheric ozone layer and describe TWO major uses for which these chemicals were manufactured.

(b) Describe how the chemical compounds that you identified in part (a) destroy stratospheric ozone molecules. You may include chemical equations as part of your answer.

(c) Identify the major environmental consequence of the depletion of stratospheric ozone and describe TWO effects on ecosystems and/or human health that can result.

(d) Ozone formed at ground level is a harmful pollutant. Describe TWO effects that ground-level ozone can have on ecosystems and/or human health.

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3. The Colorado River flows from the Colorado Rockies to the Gulf of California. The primary source of Colorado River water is melting Rocky Mountain snowpack. Once the river descends from the Rockies, it flows through a landscape that is dominated by desert. Colorado River water carries a high load of sediment.

(a) Multiple dams have been erected along the Colorado River. Identify TWO benefits other than agriculture and recreation that people derive from that system of dams.

(b) Discuss TWO potential environmental consequences of damming a major river.

(c) Competition for access to Colorado River water has increased dramatically due to increased population size and intensive agricultural use. Describe TWO conservation strategies for reducing agricultural water consumption.

(d) Identify TWO possible environmental consequences of climate change on the hydrology of the Colorado River system.

(e) In addition to impacts on the Colorado River system, climate change is impacting the hydrology of coastal ecosystems. Identify and describe TWO possible consequences of climate change on coastal ecosystems.