Comprehension

PCBs and the orca

Page 36

1. PCBs are synthetic chemicals. Their full chemical name is polychlorinated biphenyl.
2. PCBs were used for industrial products, such as heat exchange fluids, paints, plastics, and lubricants for electrical transformers.
3. PCBs stay in the environment for a long time. Aquatic ecosystems and species that feed on aquatic organisms are especially sensitive to the effects of PCBs. PCBs bioaccumulate and biomagnify and also have a long half-life.
4. PCBs become concentrated in the orca's blubber.
5. When salmon stocks are low, the orca's blubber is burned for energy. The PCBs are released into the orca's bloodstream and interfere with its immune system making it more susceptible to disease.
6. Diagram should be similar to Fig. 2.55 on page 95 of the student textbook. The pyramid should include the food chain for orcas and demonstrate the total PCB load that the orca is exposed to.

Assessment

Effects of bioaccumulation on ecosystems

Page 37

1. F **2.** D **3.** E **4.** B **5.** C **6.** A **7.** C **8.** D **9.** B **10.** C **11.** A **12.** D

Chapter 3 Ecosystems continually change over time.

Section 3.1 How Changes Occur Naturally in Ecosystems

Cloze Activity

Change in ecosystems

Page 40

1. natural selection
2. adaptive radiation
3. ecological succession
4. primary succession
5. pioneer species
6. climax community
7. secondary succession
8. flooding
9. tsunami
10. drought
11. insect infestations

Analyzing Information

Primary and secondary succession

Page 41

1. Answer should include the following sequence:
   - Lichens begin to grow. This begins the process of soil formation.
   - Plants, such as mosses, begin to grow.
   - Insects, micro-organisms, and other organisms move in.
   - Grasses, wildflowers, and shrubs begin to grow. More insects and micro-organisms move in.
   - Tree seeds are transported by animals. Deciduous trees grow.
   - Coniferous trees germinate.
   - Mature community develops.
2. Answer should include the following sequence:
   - Exposed soil will contain micro-organisms, worms, and insects as well as the seeds of wildflowers, weeds, grasses, and trees.
   - Other seeds may blow in or be carried in by animals.
   - Deciduous trees grow.
   - Coniferous trees return.
   - Mature community may only take decades to establish.

Applying Knowledge

How natural events affect ecosystems

Page 42

NATURAL EVENT	EFFECTS ON MATURE COMMUNITY
Fire	• causes secondary succession • results in regrowth
Flooding	• causes soil erosion • results in soil and water pollution, leading to widespread disease
Tsunami	• water carries away or destroys plants and animals • disrupts habitats and foods webs • salt from salt water changes composition of soil
Drought	• destroys habitats • results in the death of plants and animals • leads to crop failures and livestock deaths
Insect Infestation	• results in losses to forest canopy • disrupts habitats and food webs

Assessment

How changes occur naturally in ecosystems

Page 43

1. B **2.** A **3.** D **4.** E **5.** C **6.** C **7.** D **8.** C **9.** B

Section 3.2 How Humans Influence Ecosystems

Comprehension
Sustainability
Page 46

1. Sustainability is the ability of an ecosystem to sustain ecological processes and maintain biodiversity over time. It also means that humans use natural resources in a way that maintains ecosystem health now and for future generations.
2. Habitat loss refers to the destruction of habitats while habitat fragmentation is the division of habitats into smaller, isolated fragments.
3. Deforestation is the practice in which forests are logged or cleared for human use and never reforested. This practice results in a reduction of the number of plants and animals living in an ecosystem. Erosion occurs since few plants are left to hold the soil in place. As a result of the erosion, nutrients are lost so plants are not able to grow.
4. Aeration, or breaking up compacted soil, reduces run-off by improving the movement of air and water through soil.
5. Examples of contamination due to mining could include introduction of chemicals, toxins, wastes, or micro-organisms into the environment.
6. Overexploitation can result in extinction of a species and a loss of genetic diversity. In turn, the populations are less resistant to disease and less able to adapt to changes in their environment.
7. Traditional ecological knowledge takes the form of stories, songs, cultural beliefs, rituals, community laws, and practices related to agriculture, forests, and ocean resources. It reflects the knowledge about local climate and resources, biotic and abiotic characteristics, and animal and plant cycles.

Applying Knowledge
Effects of human activities on ecosystems
Page 47

HUMAN ACTIVITY	EFFECTS ON ECOSYSTEM
deforestation	• reduction in number of plants and animals living in an ecosystem • erosion due to lack of plant roots holding soil in place • removal of nutrients from topsoil
agricultural practices, such as leaving fields bare during non-planting seasons	• wind erosion • soil compaction • hindering growth of plants • addition of excess nitrogen and pollutants due to increased run-off
exploitation of mining resources	• contamination of ground water and surface water through introduction of chemicals, toxins, wastes, or micro-organisms • contaminants affect local plant and animals
overexploitation of natural resources, such as fish	• reduction in population of particular fish • loss of genetic diversity in food web • species less resistant to disease and changes in environment

Analyzing Information
Sustainability
Page 48

EXAMPLE OF LAND USE	EFFECTS ON HABITAT	SUSTAINABLE APPROACH SUGGESTIONS
the conversion of grasslands into cattle ranches in the Interior of British Columbia	• livestock overgrazing • soil compaction • vehicles cause erosion and plant destruction • introduced plants compete with native plants	• grassland management programs • protection of natural grasslands • aeration • weed control
clear-cutting of forests on Vancouver Island	• erosion • stream habitat destruction	• forestry management practices that allow more trees to remain uncut • streambed restoration • less harmful road-building
urbanization of the Fraser Valley	• biodiversity loss • greater reliance on motorized vehicles • increased energy consumption	• redevelopment of industrial areas or buildings • mix of residence, business, and industry • waste treatment • storm water collection • native plantings • additional green areas

Assessment
How humans influence ecosystems
Page 49

1. B **2.** D **3.** G **4.** E **5.** F **6.** A **7.** C **8.** C **9.** D **10.** A **11.** B

Section 3.3 How Introduced Species Affect Ecosystems

Comprehension

Introduced species

Page 52

1. Native species are plants and animals that naturally inhabit an area.
2. An invasive species are organisms that can take over the habitat of native species or invade their bodies.
3. Invasive species often have high reproduction rates, are aggressive competitors, and lack natural predators in their new habitat. Exploiting the new niche, an invasive species can dramatically change an ecosystem.
4. An introduced species can affect a native species through competition, predation, disease, parasitism, and habitat alteration.
5. Examples could include Eurasian milfoil, purple loosestrife, Norway rat, American bullfrog, European starling, Scotch broom, English ivy, and invasive grasses.
6. Scotch broom, English ivy, and invasive grasses are competing with Garry oak trees.
7. Scotch broom produces up to 18 000 seeds per plant. Its yellow flower attracts bees for pollination and it is well adapted for drought.

Applying Knowledge

The impact of introduced invasive species

Page 53

Answers could vary depending on the ecosystem. Answers given are referenced from textbook pages 140–141.

METHOD	INVASIVE SPECIES	EFFECT ON ECOSYSTEM
competition	carpet burweed	• burweed competes with four native plants • spiny tips pierce skin of animals and humans
predation	yellow crazy ants	• ants build supercolonies • devour all plants and prey on young of reptiles, birds, and mammals • ants killed 20 million land crabs on Christmas Island
disease and/or parasites	parasitic lampreys blister rust	• lampreys use sucker-like mouths to attach to fish, then suck the body fluids from prey • blister rust fungus weakens whitebark pine tree defenses making it more vulnerable to insect infestations
habitat alteration	wild boars	• damage environment by rooting and wallowing • spread weeds that interfere with natural succession • eat native birds, reptiles, frogs, soil organisms, fruit, seeds, and bulbs • boars are considered world's most invasive species

Extension Activity

Invasive species in British Columbia

Page 54

Answers may include:

SPECIES	METHOD OF INTRODUCTION	EFFECT ON ENVIRONMENT
purple loosestrife	seeds from Europe in 1800s	• destroys wetlands and chokes out other plants • too dense to effectively shelter wildife
Eurasian milfoil	brought to North America in 1800s	• cuts off sunlight to organisms below • interferes with recreational activities
Norway rat	escaped from early European explorer and fur-trading ships	• feeds on any food source • eats eggs and young of ground-nesting sea birds, causing their decline
American bullfrog	brought to British Columbia in 1930s for frogs' legs in restaurants	• takes over habitats • eats native frogs • attacks ducks and small mammals
European starling	late 1800s, fifty pairs brought to North America	• outcompetes native birds for nesting sites • devastates fruit and grain crops
Scotch broom	Mid-1800s, introduced as decorative garden plant	• replaces native scrubs • ruins habitat for native birds and butterflies • creates an overload of nitrogen that interferes with growth of some native species

Assessment

How introduced species affect ecosystems

Page 55

1. E **2.** A **3.** G **4.** D **5.** B **6.** F **7.** C **8.** A **9.** A **10.** D **11.** B **12.** C

UNIT 2 Chemical Reactions and Radioactivity

Chapter 4 Atomic theory explains the formation of compounds.

Section 4.1 Atomic Theory and Bonding

Comprehension

The atom and the subatomic particles

Page 60

1. (a) atomic number
(b) symbol
(c) name
(d) average atomic mass
(e) common ion charge
(f) other ion charge

2. (a) 35
(b) 79.9
(c) 1–
(d) 35
(e) bromine
(f) 45

3.

Element Name	Atomic Number	Ion Charge	Number of Protons	Number of Electrons	Number of Neutrons
potassium	19	1+	19	18	20
phosphorus	15	0	15	15	16
lithium	3	0	**3**	**3**	**4**
calcium	**20**	2+	20	**18**	**20**
nitrogen	**7**	3–	**7**	**10**	**7**
boron	5	0	**5**	**5**	**6**
argon	**18**	**0**	**18**	18	**22**
aluminum	13	**3+**	**13**	10	**14**
chlorine	**17**	0	**17**	**17**	**19**
sodium	**11**	**1+**	11	10	**12**

Applying Knowledge

Bohr diagrams

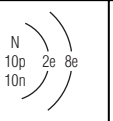
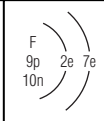
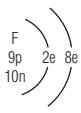
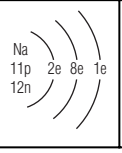
Page 61

1. (a) a diagram that shows how many electrons are in each shell surrounding the nucleus
(b) an arrangement of eight electrons in the outermost shell
(c) outermost shell that contains electrons
(d) electrons in the outermost shell

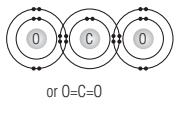
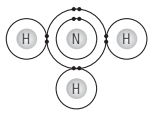
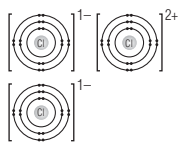
2.

Atom/Ion	Atomic Number	Number of Protons	Number of Electrons	Number of Neutrons	Number of Electron Shells
neon atom	**10**	**20**	**10**	**10**	**2**
fluorine atom	**9**	**9**	**9**	**10**	**2**
fluorine ion	**9**	**9**	**10**	**10**	**2**
sodium atom	**11**	**11**	**11**	**12**	**3**
sodium ion	**11**	**11**	**10**	**12**	**2**

3.

neon atom	fluorine atom	fluorine ion	sodium atom	sodium ion
				

4.

carbon dioxide (CO_2)	ammonia (NH_3)	calcium chloride ($CaCl_2$)
		

Illustrating Concepts

Lewis diagrams

Page 62

1. (a) a diagram that illustrates chemical bonding by showing only an atom's valence electrons and the chemical symbol
(b) pair of electrons in the valence shell that is not used in bonding
(c) pair of electrons involved in a covalent bond

2. (a) 

(b) 

(c) 

(d) 

3. (a) 

(b)