

Science 9 Unit 3: Environmental Chemistry
Reading Logs – SCIENCE in ACTION

Note – textbook pages correspond to Science in Action Text, a full PDF copy of this text is available on D2L.

Topic #	Topic Title	Science in Action Page	Due	Complete ✓ or X
1.1	Chemicals in the Environment	182 - 190		
1.2	Acids and Bases	191 - 195		
1.3	Common Substances Essential to Living Things	196 - 203		
1.4	How Organisms Take in Substances	204 - 211		
2.1	Monitoring Water Quality	212 - 224		
2.2	Monitoring Air Quality	225 - 228		
2.3	Monitoring the Atmosphere	229 - 235		
3.1	Transport of Materials through Air, Soil and Water	237 - 242		
3.2	Changing the Concentration of Harmful Chemicals in the Environment	243 - 247		
3.3	Hazardous Chemicals Affect Living Things	248 - 252		
3.4	Hazardous Household Chemicals	253 - 259		
Review		260 - 269		

Environmental Chemistry

Section 1: The environment is made up of chemicals that can support or harm living things

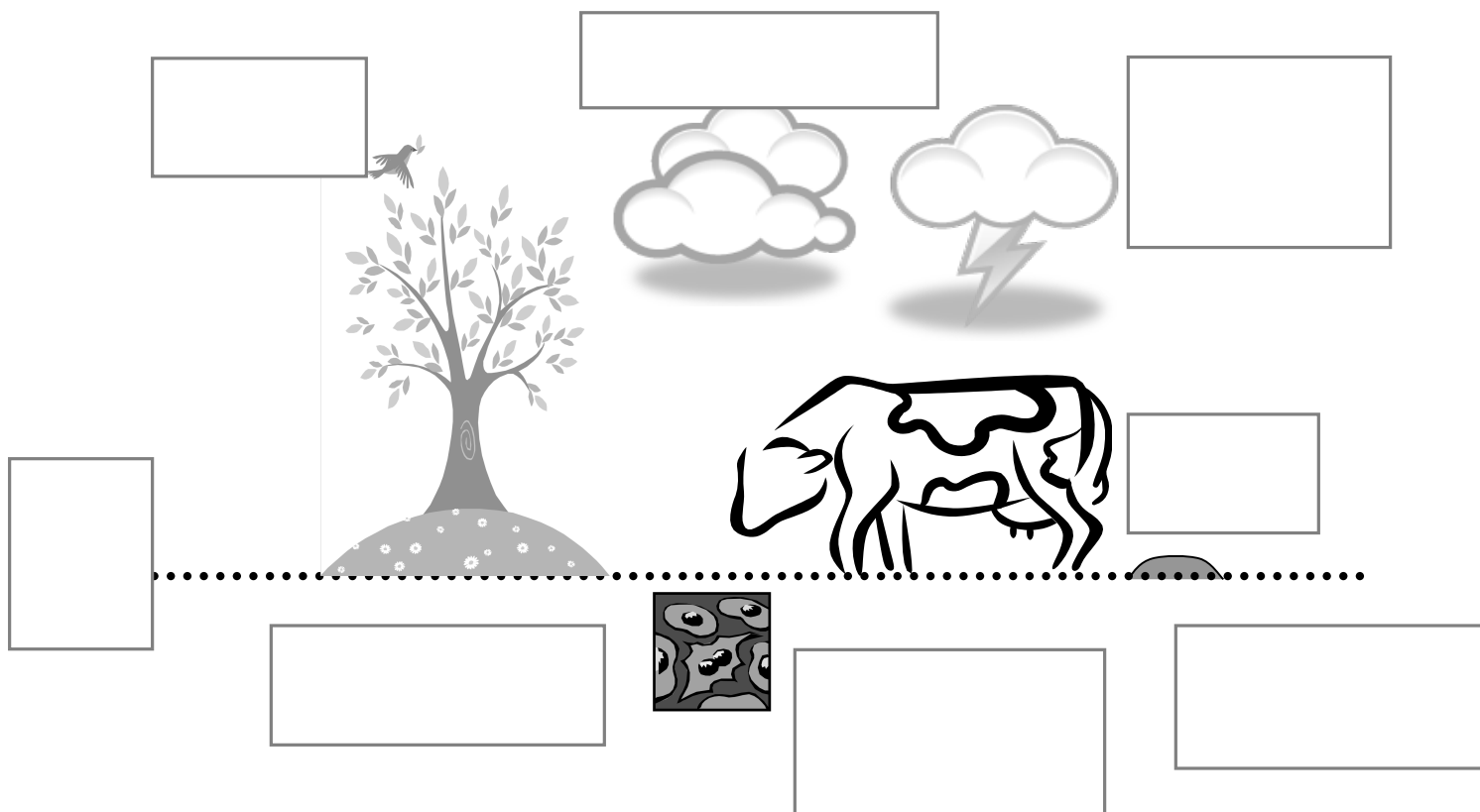
Chemicals in the environment

p.182-183

Chemical	Chemical Nomenclature	Possible Source	Role in Environment
Water			
Carbon Dioxide			
Oxygen			
Sulfur Dioxide			
Ammonia			
Nitrogen			

→ Nitrogen Cycle

Add arrows and fill in the text boxes to explain the nitrogen cycle: p.184-185



- Define NITROGEN FIXATION and explain why it is an essential process.

- What **biotic** factor is responsible for nitrogen fixation and what **abiotic** factors perform the process?
- What factors can change the amount of nitrogen that is in the soil?

.....
 Explain the following statement: "We naturally and unnaturally affect the environment's chemicals."
 p.185

Agricultural Activities p.186-187			
	Definition	Positive	Negative
Fertilizers			
Pesticides			

Industrial Processes (P. 190)

Industrial processes such as electrical power generation, mineral processing and fertilizer production may release chemicals in to the air. A common industrial process in Alberta is natural gas processing.

What is natural gas composed of?

How is natural gas processed?

What is SOUR GAS and how does it relate to Natural Gas?

POLLUTION –
p.185

Solid Wastes
Definition: p.187

Potential Problems:

Ways to reduce landfills:
(Use our community as an example)

Waste Water
What is sewage and how is it processed? p.188

What potential problems arise when a city cannot treat all of its waste water?

Processes and Activities that Affect Environmental Chemicals

Fuel Combustion p.188
Hydrocarbons + O₂ → CO₂ + H₂O + energy (fossil fuels)

Describe how the combustion equation above contributes to the issue of pollution.

Industrial Processes p.190
How does natural gas processing contribute to the issue of pollution?

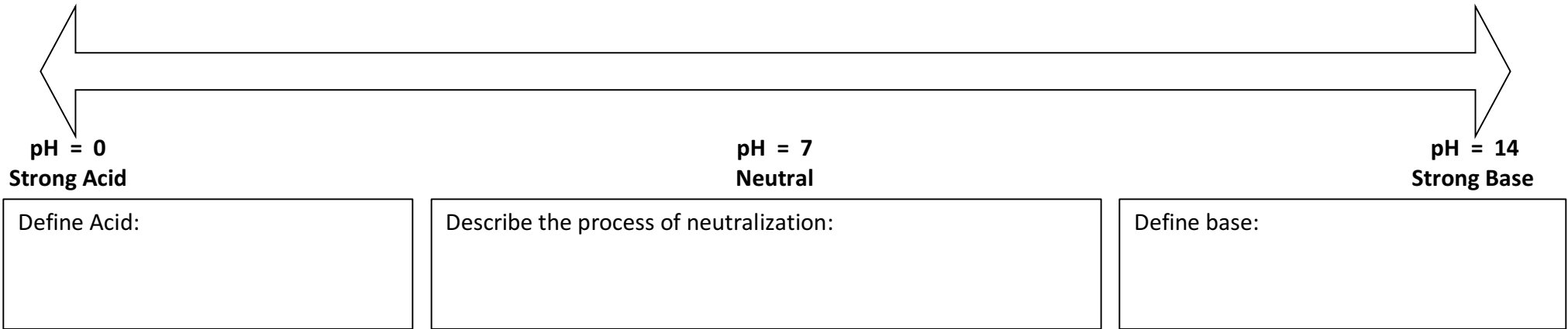
What can be done to reduce its impact?

Section 1.2: Acids and Bases p.191-195

pH is a measure of...

pH scale: As you move between numbers there is a **10 fold** difference in the acidity or basic nature of the substance. For example: a solution with a pH of 5 would be 10 times more acidic than pH of ____ and a pH of 12 is 10 times more basic than pH of ____.

Complete the pH scale below with at least 6 of the common values and substances as shown on p. 191.



What chemicals are the ingredients of acid rain and where do they come from?

Negative consequences of acid rain are:

How are acidic lakes sometimes treated?

Name and describe how the two methods for measuring pH work:

Section 1.3: Common Substances Essential to Living Things

Essential Elements for Living Things p.196

Our bodies need _____ elements for normal growth.

3 most common are: _____

NUTRIENTS p.197

Define:

Nutrients:

Macronutrients:

Micronutrients:

Nutrient	Importance in Plants	Importance in Humans
Nitrogen (N)		
Phosphorus (P)		
Potassium (K)		
Magnesium (Mg)		
Calcium (Ca)		
Sulfur (S)		

ORGANIC AND INORGANIC ELEMENTS

What is the difference between an organic and an inorganic element?

Types of Organic Elements p.199, 202-203

Draw it!	What are they?	Are found in:
Carbohydrates		
Lipids		
Proteins and Amino Acids		
Nucleic Acids		

Define Optimum Amounts and give an example: p.198

How can you tell if a plant or animal is NOT receiving optimum amounts of a nutrient?

Section 1.4: How Organisms Take in Substances p. 204-206

ANIMALS

Consumers rely on _____ compounds made by _____ for their energy, growth and repair.

PLANTS

Plants rely on _____ compounds which they turn into _____ compounds.

Uptake of Materials by Living Things

INGESTION:

PASSIVE UPTAKE:

MECHANICAL DIGESTION:

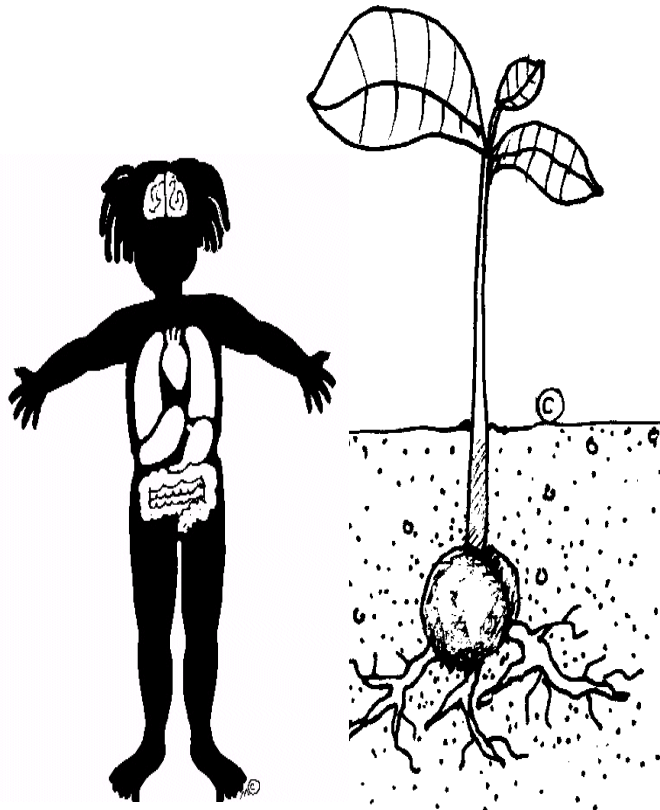
Diffusion:

CHEMICAL DIGESTION:

Osmosis

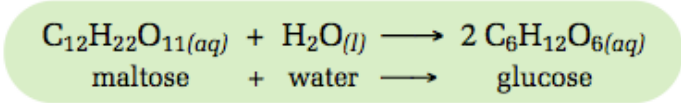
Hydrolysis:

ACTIVE UPTAKE



Active Transport:

Nutrients are transported through the body by



Adaptations for Obtaining Nutrients In Various Environments

p.208-209

Environment	Adaptation:	Substrate: define
Ocean		Provide examples of potential substrates in the environments listed on the left:
Barren Environments		
Food		
Deserts		
Grasslands		
Tundra		

MONITORING:

2.1 Monitoring Water Quality 

Explain the following statement: "Clear water does not always indicate high water quality." p.213

Water quality is determined according to...

5 Categories of Water Use are...

- 1.
- 2.
- 3.
- 4.
- 5.

Biological Indicators (remember River Watch???)

How do the following determine water quality? p.214

Microbes:

Aquatic Invertebrates:

Chemical Factors that Affect Organisms p.215 – 222 (REVIEW and UNDERSTAND PPM on page 216)

Dissolved Oxygen	Acidity	Pesticides	Heavy Metals	Nutrients	Salts
Depends on... - - - -	At what pH do fish begin to disappear?	How do pesticides affect water quality? How can only small amounts create toxic substances?	Heavy metals are... Negative consequences:	High levels of phosphorus and nitrogen impact aquatic environments by	such as sodium chloride and magnesium sulfate
	Areas most affected by changes in acidity:				
Acceptable level for most living things is _____ ppm.	Spring acid shock is...				

Measuring Chemicals and Toxicity p.216, 221

The concentration of chemicals in the environment is usually measured in _____ which means...

Toxicity:

LD₅₀ means...

2.2 Monitoring Air Quality p.225



Air Composition:

Air Quality is determined by:

Chemical Monitored for Air Quality

	Effects	Formation	Source	Reduction
Sulfur Dioxide p.225				
Nitrogen Oxides p.226				
Carbon Monoxide p.227				
Ground-Level Ozone p.227				



2.3 Monitoring Atmosphere Quality p.229-230

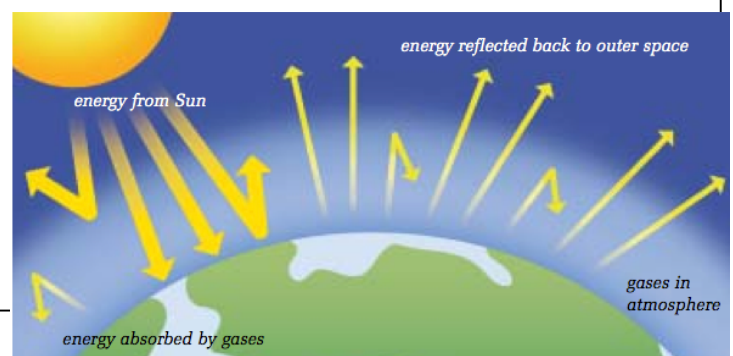
Greenhouse Effect:

<p>CO₂ <u>is</u> not considered a toxic pollutant because...</p> <p>but it is a greenhouse gas.</p>	<p>Greenhouse gasses are those that...</p>	<p>Enhanced greenhouse effect is caused by...</p>	<p>Global Warming is...</p>
--	--	---	-----------------------------

Ozone: p.232

<p>Purpose of the ozone layer is...</p>	<p>Consequences of a thinning ozone layer are...</p>	<p>The cause of a thinning ozone layer is...</p>	<p>The ozone layer is monitored in the following ways...</p>
---	--	--	--

The Greenhouse Effect: When radiant energy from the sun reaches Earth's surface, much of it is reflected back into space. But some of this energy is trapped near Earth's surface by a layer of gasses that act like the glass in a green house.



Section 3: Potentially harmful substances are spread and concentrated in the environment in various ways



3.1 Transport of Materials Through Air, Soil and Water

<p>AIR → 3 Stages: p.237</p> <p>1.</p> <p>2.</p> <p>3.</p>	<p>How are the directions and distance travelled by airborne chemicals determined?</p> <p>-</p> <p>-</p> <p>-</p>
<p>GROUNDWATER (define) p.239:</p> <p>Water table:</p>	<p>Characteristics that prevent the dispersal of chemicals...</p>
<p>What types of substances contaminate ground water?</p>	<p>What factors affect water movement?</p> <p>-</p> <p>-</p>

SURFACE WATER

p.241

Contaminant sources:

-
-
-
-

Properties of "problem" contaminants:

Become a problem when...

Importance of monitoring:

SOIL p.241

Water that soaks in to the soil and moves downward is called _____.

What properties of soil make it more susceptible to contamination?

3.2 Changing Concentration

Describe how the various techniques listed below can be used to change the concentration of pollutants in the environment.

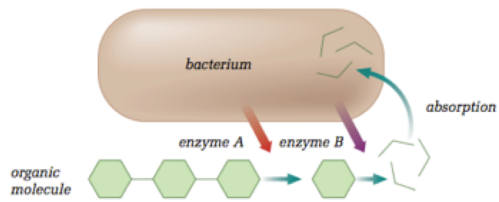
p.243-244

Dispersion:

Dilution:

Biodegradation:

- Role of Bacteria



- Factors Affecting Biodegradation p.246

Phytoremediation: p.246-247



Photolysis:



3.3 Hazardous Chemicals

Affect Living Things:

Biomagnification: p.248

Oil Spills impact on... p.250-252

Environment:

People:

Plants and Animals:

Clean-up:

3.4 Household Chemicals p.253-257

Examples:

Government Regulations:

Labeling – WHMIS

MSDS:

New Product Registration:

Transporting:

Disposal:

Hazardous Waste Collection Sites: