FOCUS IN ACTION

Grade 8 Science in Action

Unit 5 - Fresh and Saltwater Systems



http://www.edquest.ca

'Focus in Action' UNIT LEARNING PACKS

These booklets are designed to provide Grade 8 students with all the resources needed to review or reinforce concepts, covered in the Alberta Science Curriculum, and included in the Grade 8 Science Final Exam in June. There are circumstances in which **an entire unit** may be missed and covering the concepts from that unit (for the final exam) can be difficult. This can happen for a number of reasons:

- Students new to the school register throughout the year (from other provinces, school jurisdictions or countries)
- Students may be ill or have surgery and often can miss one or more units
- Students have extended holidays throughout the year
- Transfers from another school, who have completed the units in a different order

For additional support, students are directed to the **Edquest Middle School Science Website** or, Scienceman Resource (<u>www.scienceman.com/scienceinaction/pgs/hot_8u5.html</u>)

Unit 5 – Fresh and Saltwater Systems

- Section 1 Notes
- Section 1 Quiz
- Section 2 Notes
- Section 2 Quiz
- Section 3 Notes
- Section 3 Quiz
- Section 4 Notes
- Section 4 Quiz
- Unit Summary
- Review Booklet
 - (Covered in class, prior to the Final Achievement Exam)
- Unit 1 Test
- Answer Key for Section Quizzes and Unit Test

USGS Website:

http://ga.water.usgs.gov/edu/

Additional support will be provided, in the form of practice Achievement Test Questions, during the course review in June. Multiple Choice Questions and Numerical Response Questions will be reviewed, as these are the types that will make up the Science 8 Final Exam

Handouts and other activities, to reinforce the concepts covered in this Unit, will be made available based on need. If you require further information or resources, email Edquest directly: edquest@gmail.com.

Finding Solutions to Problems, instead of Making Excuses



Student Instructions for use of this Learning Pack

The purpose of this Learning Unit Pack is to provide you with the resources that will help you cover the material from the curriculum that will be tested on the Final Exam in June. Follow these steps to successfully complete this Unit Learning Pack:

Step 1 – Read the Topic Notes

Step 2 – Use a **highlighter** to identify the key words or phrases in the Topic Notes and reread the material again paying close attention to those words that you highlighted. If necessary, modify your highlights to make sure you understand the material in the notes.

Step 3 – Complete the Topic Quiz

Step 4 – Correct the Topic Quiz by checking the answers in the back of this Learning Pack.

Step 5 – Using your **textbook** and the **completed quiz**, find the page where the question and correct answer can be found and write it next to the question number in your Learning Pack.

Step 6 – Repeat Steps 1-5 for each of the other Topics in this Unit.

Step 7 – Look over the **Unit Outline** to review the **Key Concepts** once you have completed all of the Topics.

Step 8 – Complete the Unit Review, using your Learning Pack and Textbook.

Step 9 – **Highlight** those sections of the Review that you had difficulty with and review those sections with your teacher prior to taking the Unit Test.

Step 10 – Take the **Unit Test** and correct it using the answer key provided in the back of the Learning Pack.

Step 11 – You should now be ready to answer any questions on the **Final Exam** related to this Unit.

Anything you still do not understand should be discussed with your teacher. Congratulations on your **Independent Study**, and Good Luck on the Final Exam. I hope you have made good use of this resource. Please provide feedback to your teacher, so that this resource can be improved.

Additional support is available in the form of practice Achievement Test Questions. **Multiple Choice Questions** and **Numerical Response Questions** will be made available on request, as these are the types that will make up the **Science 8 Achievement Exam**.

Handouts and other activities, to reinforce the concepts covered in this Unit may be acquired by visiting the Edquest Middle School Science Resource Website

http://www.edquest.ca

1.0 Humans depend on water supply and quality.

Living systems need water to survive. Ecosystems depend on it. The land is changed by it. Industry uses large amounts of it. Climate and weather are determined by it.

Our '**blue planet**' – *as viewed from space* - is unique among the planets in our solar system, because 74% of its surface is covered by water.

1.1 The Distribution of Water on Earth

The water on our planet exists in many different forms and is evenly distributed over the entire planet.

Drinking Water For Humans

Drinking water must be fresh water, not salt water. Not all freshwater on the Earth is drinkable. Water that is drinkable (safe to drink) is called **potable** water.

Water On Earth

To put this into perspective.



Water source	Model	% of Earth's total water	Potable, or not?
Oceans		97.24%	Saltwater
Icecaps, Glaciers	1% Fresh and Liquid	2.14%	Frozen
Ground water	2% Fresh	0.61%	Fresh - but not entirely accessible
Fresh-water lakes	and Frozen	0.009%	Potable
Inland seas	97% Salty Water	0.008%	Saltwater
Soil moisture		0.005%	Indirect access
Atmosphere	e 0.001%		Indirect access
Rivers		0.0001%	Potable

A watershed (also called a drainage basin) is a region of interconnected rivers and streams.

Watersheds In Canada



Canada has 9% of the world's freshwater.

Watersheds In Alberta



A reservoir is an artificial lake. It is used for storage and management, because many of the larger populated centers in Alberta are far from major river systems.



1.2 Water Quality

Water quality describes how pure (clean) the water is. Water quality can be measured by the types of substances that are found in it; including living organisms, organic material, minerals and other chemicals. Check out the source to tap story that traces the movement of water in the environment: <u>http://www.ccme.ca/sourcetotap/story.html</u>

Substances Dissolved In Water

Many different substances can be present in water. Most substances that are found dissolved in water are *salts*. The most common salt is sodium chloride (table salt). The total amount of *all salts* found in water is called *salinity*. Saltwater (found in oceans) has a higher salinity (average of 3.5%) than freshwater.

Hard Water

Water described as "hard" is high in dissolved minerals, specifically calcium and magnesium. Hard water is not a health risk, but a nuisance because of mineral buildup on plumbing fixtures and poor soap and/or detergent performance.

Organisms In Drinking Water

Fresh water contains organisms and organic matter, some of which are harmful and some which are not. *Escherichia coli* (E coli) is a type of microscopic bacteria that can cause sickness and even death.

Water Quality Testing

Water that comes from deep below the ground is protected from pollutants. However, most cities and towns get their drinking water from surface water sources (lakes and rivers). The water they use needs to be filtered and treated with chemicals.

Water Testing Criteria

Just looking at water in a glass will not tell you if the water is safe to drink. Smelling it may give you additional information – like it may contain *hydrogen sulphide* (which is harmful to humans) giving it a rotten egg smell. Ocean water is very clear, but cannot be consumed because of its high salinity. Some of the things to test - to determine water guality - are:

- Taste and odour
- Turbidity (cloudiness) and colour
- Toxic substances and other pollutants
- Bacteria
- Hardness or mineral content
- pH (how acidic or basic the water is)
- Dissolved oxygen level
- Suspended solids (including those floating)
- Dissolved solids

Changing Salt Water to Fresh Water

There are two common processes that can change saltwater into freshwater. These processes are distillation and reverse osmosis.

Distillation - a process in which a liquid or vapour mixture of two or more substances is separated into its parts, by the application and removal of heat.



Reverse Osmosis – forces saltwater through a filter (membrane) allowing water to pass but not salt.



Fresh and Saltwater Systems – Section 1 Quiz

1.1 The Distribution of Water on Earth

- 1. Because our planet has a lot of water on it's surface and is rich in vegetation, astronauts from space have described it as the ...
- A Aqua planet
- B Water world
- C Blue planet
- D Blue Green World
- 2. Of all the water on the Earth, the only water that is fit for humans to drink is called ...
- A pure water
- B potable water
- C purified water
- D spring water
- 3. **Models** are often used to help explain a concept that is important to visualize, to help you understand it. This glass of lemonade models the distribution of all kinds of water on the Earth.



All of the frozen water on the Earth is represent in the model by the ...

- A lemon slice
- B melted water
- C lemonade
- D ice cubes
- 4. Many substances are dissolved in freshwater and saltwater. This is because water is a solvent that is widely used to dissolve substances. *'Water'* is known as the ...
- A universal solvent
- B universal solute
- C common solute
- D common solvent

1.2 Water Quality

- 5. Most of the substances that are dissolved in water are salts. Not just sodium chloride, but many different kinds of salts. The total amount of all salts dissolved in the water is referred to as its ...
- A quality
- B salinity
- C potability
- D distillation
- 6. *Hard water* is water that contains high concentrations of dissolved ...
- A Gold and silver
- B Calcium and chlorine
- C Hydrogen and oxygen
- D Calcium and magnesium

- 7. Many organisms live in water. They require it for life, just as humans do. Organisms, such as bacteria, can cause very serious problems for humans. One of the most deadly organisms is *Escherichia Coli*, which can cause extreme sickness and even death. This organism is most often referred to as...
- A E coli
- B ECB
- C SARS
- D West NILE
- 8. Water quality is a vital issue because many of the organisms, which can harm humans, are too small to see with the naked eye. Another organism, which can give humans intestinal problems, is Giardia, which is a microscopic ...
- A virus
- B bacteria
- C parasite
- D fungus
- 9. When testing samples of water for the presence of living organisms, the students put 125ml of their samples into separate flasks and added 5 drops of **bromothymol blue**. They labeled it, put a stopper in it and placed it in a warm dark place for 24 hours. What were they looking for, to indicate that living organisms were present in the water?
- A A temperature change
- B A color change
- C The presence of bubbles
- D A decrease in water level
- 10. Two common processes are used to change saltwater into freshwater. When saltwater is forced through a filter, or membrane with holes too small for the salt to fit, the process is called ...
 - A dissolving
- B distillation
- C able osmosis
- D reverse osmosis

2.0 Water in its various states affects Earth's landforms and climate.

Water exists in all three forms on the Earth: solid, liquid and gas. It is found underground, on the surface and in the air. Water affects living and non-living things within the Earth's environments.

2.1 Waves and Tides

Waves and tides are just two examples of how water moves on the Earth. Waves are movements on the surface of water. Tides are the regular rising and falling of very large bodies of water.

What Is A Wave?

Waves are surface movements "a disturbance, or variation transferring energy progressively from point to point in a medium" occurring whenever a force comes in contact with water. A boat on the surface of the water will cause a 'wash' or 'wave action' – which can affect other objects in the water, as well as the shoreline. There are different kinds of waves: http://waves/waves.htm

The Movement Of Water Waves

Waves are changes in patterns that move along the water's surface. Although waves can move a very long distance, the water doesn't move – it acts as the medium for the '*wave action*' to occur. Within each wave the particles of water move in a circular motion.

All about waves (animations): <u>http://id.mind.net/~zona/mstm/physics/waves/partsOfAWave/waveParts.htm</u> Water Waves (dynamics of movement): <u>http://www.eng.vt.edu/fluids/msc/my_pages/ocean/w_waves.htm</u>

Causes of Water Waves

Most waves are caused by the wind (a force). Stronger forces cause larger waves. As ocean waves move closer to the shore their bottoms drag on the ocean floor and their tops rise and break onto the shore (causing damage by their force).

Effects of Waves On Shorelines

The force of waves crashing against a shoreline can cause changes to the shape of the shoreline, whether it is hard rock or soft rock.

Erosion and deposition can reshape the shoreline dramatically.



Spit Recurved spit Baymouth bar

Erosion – animation showing the formation of a cliff http://www.fluidmech.net/tutorials/ocean/w_waves.htm

What are Tsunamis? <u>http://www.es.flinders.edu.au/~mattom/IntroOc/notes/figures/animations/pngtsunami.gif</u> When an earthquake occurs on the ocean floor, a huge damaging wave can be created. These waves are called **tsunamis** (which means 'harbour wave).

What are Tides?

The water level along the coast of continents changes constantly. This water level is called a **tide**. **High tide** is the highest level the water will reach on shore, while low tide is the lowest level it will reach onshore. Usually there are two high tides and two low tides each day.

What Causes Tides?

The gravitational force of the moon and the rotation of the Earth on its axis cause tides.

Animation http://www.pbs.org/wgbh/nova/venice/tides.html



2.2 Erosion and Deposition

Stream characteristics help scientists understand where different organisms live in a stream and how they might be affected by human activities. Engineers use the se characteristics to plan projects such as dams and bridges.



A <u>stream profile</u> is a description of its characteristics, including flow rate, steepness of stream's bed, erosion rate of its banks.

The **source** of a river may be high in the mountains, where a glacier is melting. As small streams form together into one **channel**, the volume and speed of the river grows. In the early stages, the river is flowing very quickly and usually fairly straight. As the river reaches lower elevations it begins to slow, causing curves to form (**meanders**), until it reaches a fairly flat **flood plain** and the sediment it has picked up is deposited in a fan-shaped deposit called a **delta**.

Erosion and Deposition

Moving water is a powerful force. When water wears away rock the fragments are carried as sediment and deposited elsewhere. A river's sediment-load is the amount of *water-borne* materials (rock, soil, organic matter) it carries. The faster the river flows, the more water-borne materials it can carry. As it slows these waterborne materials are deposited as sediment.

Topography Website: http://education.sdsc.edu/optiputer/teachers/shapingtopography.html

Chemical Weathering

Erosion of the landscape can also occur as a result of chemicals in the water. These chemicals can eat away rock forming caves and sink holes.

What Makes A Watershed?

A watershed is all the area of land that drains into one main lake or river. It can contain many smaller streams, rivers and even lakes, which all eventually drain into a larger lake, sea or ocean. The location of the highest land on the continent determines the direction that a watershed drains. This high land is called the **Continental Divide**. In North America it is in the Rocky Mountains.

On the west side of the divide, the rivers all flow into the Pacific Ocean.



On the East side of the divide, the rivers flow into either the Arctic Ocean or the Atlantic Ocean.

Streams and Drainage Systems: http://www.tulane.edu/~sanelson/geol111/streams.htm

2.3 Processes That Shape Ocean Basins and Continental Drainage The Earth is in a constant state of change.



The **Theory of Plate Tectonics** (you learned about in Grade 7) explains how the lithosphere (crust of the Earth) is in pieces and these pieces are moving because of convection currents in the magma. Some of these plates are moving toward other plates, some are moving away and some are moving in opposite directions beside each other.



CONVERGENT RATE BOUNDARY REATE BOUNDARY TENNER TEN

This illustration shows how the features on the ocean floor are formed.

Continental Drainage Systems

The changing lithosphere affects the drainage patterns of the continents. The Continental Divide marks the division whereby the rivers drain west and east from the divide. Continental drainage systems were also created and are affected by the movement of ice.

Glaciers

Large bodies of moving Ice are called **glaciers**.

Those covering large areas of land are called **continental glaciers** or **icecaps**. Continental glaciers cover Antarctica and Greenland. Glaciers also form high in the mountains and move through valleys between mountain peaks. These are called **valley glaciers**. As glaciers move, pieces of rock – embedded in the ice help to shape the landscape by gouging out chunks of the land as the glacier moves.

Glacial movement depends on the climate. In colder climates, little melting occurs and the glacier continues to grow or move forward (this is called an *advancing glacier*). If the climate is warmer, the glacier melts faster than it grows and leaves the rocks, soil and large boulders it once contained. These glaciers are called *retreating glaciers*.

As glaciers advance or retreat, they create specific **glacial features** across the landscape. Both of these sites about **Glaciers** have actual photographs of the features that a glacier creates. <u>http://www.glacier.rice.edu/land/5_glaciallandforms.html</u> <u>http://oz_plymouth.edu/.sci_ed/Turski/Courses/Farth_Science/chp5.html</u>

http://oz.plymouth.edu/~sci_ed/Turski/Courses/Earth_Science/chp5.html



This is another glacial feature, an erratic - and can be seen just outside Calgary, near Okotoks, AB.



2.4 Water and Climate



but their climates are very different. The primary reason for the difference is the fact that Nanaimo, BC is close to the Pacific Ocean, and Lethbridge, AB is not near a large body of water.

Climate

Climate is the average weather measured over a long period of time. The two cities have very different climates.

The Effect Of Large Bodies Of Water On Climate

Large bodies of water, like the ocean and the Great Lakes (in Ontario), influence the weather and the climate in their regions. Water holds the heat longer than most substances and so cities that are close to large bodies of water have warmer climates. The main effect that water has on climate is that *extreme temperatures are less likely to occur in cities near large bodies of water* (Nanaimo), because water heats up and cools down very slowly – whereas in places where there is not very much water (Lethbridge), the land heats up quickly and cools down quickly – and that is where the extremes are felt.

The Rocky Mountains have a major influence on Lethbridge's climate

The **rain shadow** that is created by the Rockies makes the climate very dry in Southern Alberta.

Current Events

Ocean currents can also affect climate. Currents are streams of water that move within a larger body of water. They can be caused by:

- Wind
- Salinity differences in the water
- Temperature differences in the water

Warm

18°C

dry

Earth's rotation

Heat

lost

added Moisture

Currents and Climate

Currents cause water to move from place to place. Surface currents are caused by steady winds. The currents that affect Labrador and Scotland are surface currents. If they start near the equator (like the **North Atlantic Current** does), they are warm. If they start near the North Pole, they carry very cold water (like the **Labrador Current** does). When the current flow to their respective shores, they can influence the climate of the land.

Ocean Currents and Precipitation

The temperature of the ocean current not only affects the **air temperature**, but they also affect the **amount of precipitation** that an area receives. Warm air (warm currents) hold more moisture than cold air (cold currents).

Fresh and Saltwater Systems – Section 2 Quiz

2.1 Waves and Tides

- 1. **Waves** are movements on the surface of the water. The kinds of waves that boats make as they travel across the surface of the water are called ...
- A tides
- B wash
- C ribbon
- D dimple
- 2. Waves moving across the surface of the water have changing patterns. The ripples can travel thousands of kilometers across the surface but the water itself ...
- A doesn't move at all
- B travels to the shore and
- C must returns to the source
- D can only travel a specific distance
- 3. Sometimes, in order to understand a concept that is important, *models* are used to help us visualize it.

The movement of waves shown here can be modeled by using ...

- A a rope tied to a door
- B a ball bouncing
- C a ball rolling down a ramp
- D dropping a rock in a pail
- 4. Most waves are caused by the wind. The stronger the wind, the bigger the wave. The most damage caused by a wave comes from ...
- A its up and down motion on the high seas
- B rising and falling as it approaches boats
- C the breaking of the waves just before the shore
- D the crashing of the waves onto the shoreline
- Extremely large waves that can grow to be as high as a 15-storey building are called tsunamis. These waves spread out over a very long distance from their source, which is ...
- A an earthquake
- B a hurricane
- C a tornado
- D a monsoon
- 6. A change in the water level in the ocean is referred to as **a tide**. Tides occur 4 times each day, every 6 hours, every day. There are two types of tides, **high tide** and **low tide**. The main reason that tides occur on the Earth is because of the ...
- A gravitational force of the Earth on the moon
- B gravitational force of the moon on the water
- C rotation of the earth and tilt of its axis
- D phases of the moon and the changing of the seasons



2.2 Erosion and Deposition

- 7. **Stream characteristics** help scientists understand where different organisms might live in a river and how they might be affected by human activities. These same stream characteristics are used when dams and bridges are designed and built by ...
- A technicians
- B biologists
- C engineers
- D environmentalists
- 8. A *stream, or river profile* is a description of its characteristics. Each stream has a pattern of flow that is shaped by its characteristics. Stream characteristics include the ...
- A size and distance of flow
- B rate of flow and degree of slope
- C course and obstacles to overcome
- D location and human activity in it
- 9. *Hot springs* are able to dissolve more minerals than ordinary surface water, because as temperature increases the solubility of substances also increases. Once it reaches the surface, the hot springs cannot hold as much solute in the water, so this happens ...
- A erosion
- B striation
- C sedimentation
- D dissolving
- 10. Use the illustration of **Stream Characteristics** to help you answer this question.

1

2

3

4

This is where you will likely find the first signs of sediment being deposited and a meandering motion to the river.



- 11. These are two characteristics you will likely see at stage # 2 (in the illustration above)
 - A slow flow and erosion
 - B fast flow and erosion
 - C slow flow and deposition
 - D fast flow and deposition
- 12. (From the illustration above) A fan-shaped deposit, called a *delta*, is formed in ...
- A Stage 1
- B Stage 2
- C Stage 3
- D Stage 4

- 13. A river's *sediment load* is the amount of ...
- A organisms it is able to sustain
- B water-borne materials it can carry
- C pollution it is able to filter out
- D erosion it can make as it flows
- Major North American watersheds are determined by the Continental Divide. This is where you find the highest land and is located in the ...



- A Appalachian Mountains
- B Great Smoky Mountains
- C Cascade Mountains
- D Rocky Mountains

2.3 Processes That Shape Ocean Basins and Continental Drainage

- 15. Alfred Wegener proposed that the Earth was divided into huge moving plates. His theory was called the *Theory of* ...
 - A Plate Resistance
 - **B** Continental Shift
- C Plate Tectonics
- D Moving Continents
- 16. Geological features on the ocean floor are a result of the continental plates moving. Where the plates are *moving away from each other* you will find ...
 - A volcanoes
- B mid-ocean ridges
- C trenches
- D seamounts
- 17. Along the ocean floor you can also find these geological features where the continental plates are *moving toward each other* ...
 - A volcanoes
 - B mid-ocean ridges
- C trenches
- D seamounts
- 18. **Continental glaciers**, or **icecaps** cover large areas of land, forming the coldest regions on the Earth. Glaciers can also form high up in mountain ranges, where snow and ice build up over long periods of time. These glaciers are known as ...
 - A mountain glaciers
 - B rocky glaciers
- C valley glaciers
- D moraine glaciers
- 19. Glaciers move and change the landscape as they move. A glacier that is melting will leave rocks and debris it has picked up when it was growing. The melting glacier is called ...
- A a retreating glacier
- B an advancing glacier
- C a shifting glacier
- D an eroding glacier

20. **Glaciers** gouge huge areas of the land and then reshape the land by the materials they collect. Some of the features include large inland lakes, where the glacier has dug a huge hole and filled it with water. These inland lakes are called ...



- A reservoirs
- B kettle lakes
- C esker lakes
- D bucket lakes

2.4 Water and Climate

- 21. The term climate refers to the average ...
 - A rainfall and hours of sunlight in a certain area
 - B precipitation and temperature in a specific area
- C weather measured over a long period of time
- D length of the seasons in a particular area
- 22. Large bodies of water can affect the climate of a particular area. The main effect that they have is to ...
 - A cause more precipitation to fall
- B cause more extreme temperatures
- C prevent more precipitation from falling
- D prevent extreme temperatures
- 23. The reason that the eastern side of the Rockies (Lethbridge and Calgary) receives a *Chinook* (warm dry wind) is because it is located in a ...
- A updraft
- B downdraft
- C rain shadow
- D snow shelter
- 24. Currents can also affect climate. Surface currents can carry warm air or cold air depending on where the current is coming from. Currents coming from the Arctic region like the Labrador current carry cold air, and that is partly what can account for Labrador's cold climate. Scotland gets warm air from the **North Atlantic Current** because it comes from ...
 - A Canada
 - B The North Pole
- C The Equator
- D The Hawaiian islands

Bonus Question – You should be able to use your common sense to answer this one!

- 25. El Niño and El Niña have important consequences for weather all around the globe. El Niño and El Niña are caused by ...
 - A earthquakes
- B volcanoes
- C pollution of the ozone
- D disruption of the ocean-atmosphere system in the tropical Pacific

Find out more about El Niño and El Niña: http://www.pmel.noaa.gov/tao/elnino/el-nino-story.html

3.0 Living things in aquatic environments are affected by many factors.

A rich variety of organisms living and interacting within a water ecosystem indicates a healthy ecosystem. The more species you find, the more likely you will also find more oxygen, and less pollutants.

3.1 The Diversity of Organisms in Salt and Freshwater Systems

Diversity refers to the variety of different kinds of organism species (both plant and animal) living in a particular ecosystem or environment.



Freshwater (Pond Life) Diversity

Saltwater (Coral Reef – 2^{nd} most diverse ecosystem in the world) Diversity



Lake Diversity (see diagram in textbook SIA p. 375)

Large bodies of water like oceans and lakes have layers or **zones**. Some organisms live in only one or two zones, while other organisms can live in all three. In Canada lakes are affected by extreme changes in temperature. Organisms living in the freshwater ecosystem of a lake or pond must be able to adapt to these changes in order to survive.

Lake Zones	Species you might find in this zone
Upper Zone – is the area of a lake from the shore down to where the aquatic plants stop growing	Plants – bulrushes, water lilies Animals – small fish, clams, insects, snails, worms, leeches, and frogs
Middle Zone – is the open water area that still has light penetration.	<i>Phytoplankton</i> are food for fish that live here. Some of the fish that live in this zone also travel to the deeper zone.
Lowest/Deep Zone – is where no light penetrates, so no plants grow there. Food for organisms living in this zone comes from the zones above, in the form of	Deep water fish (large size species)

Ocean Diversity (also, see diagram in textbook SIA pgs. 376-377)

Oceans have similarities to lakes in terms of zones, but with greater differences in water motion, salinity and depth, diversity is much greater in the oceans.



Utean Zunes

waste.

Estuary – one of the most diverse and richest ecosystems. This is where freshwater and saltwater mix to form *brackish* water.

1 Intertidal Zone – is the shoreline of an ocean.

2 Continental Self – is warmer water than out in the deep ocean and this area has full light penetration.

3 Oceanic (Deep Ocean) Zone – is where very little light penetrates, so no plants grow there. Food for organisms living in this zone comes from the zones above, usually in the form of waste.

Species you might find in this zone
Marshes grow here providing habitat for many different kinds of plants, insects and other animals that can tolerate the brackish water.
These ecosystems are also rich in bird life, because of all the food and shelter available
Plants and animals living in this zone must be able to withstand the pounding of the waves and the rise and fall of tides.
Animals with special adaptations live in this zone.
Many varieties of plants and animals live in this zone because of the rich nutrients available.
Phytoplankton are food for fish that live here.
Some of the fish that live in this zone also travel to the deeper zone.

4 Abyssal Zone - Deep water fish (specialized adaptations for survival under extreme pressure and no light)

Adaptations Of Organisms In Aquatic Environments

An **adaptation** is a *physical characteristic* or *behaviour* of a species that increases that species' chances of survival in a particular environment. All living things are adapted to live in particular environments. As changes occur within their environment, those organisms that can adapt to the changes have a better chance of surviving than those organisms that cannot adapt to the changes.

There are five factors that have led to the development of adaptations by aquatic species.

Temperature

Fish that live in cold water have adapted to the temperature. Their body would overheat in warm water. Fish that live in extremely cold water (Arctic) have a natural anitfreeze that keeps their blood and tissues from freezing. In the very deep parts of the ocean, near volcanic vents, organisms can actually survive in extremely hot water.

Light

Most organisms need light. Plants need light to photosynthesize (make food). In the deepest parts of the ocean some organisms have adapted to the absence of light by producing their own light from spots on their bodies called **photophores**.

Pressure

As you travel deeper in the ocean, the pressure increases. Those animals that have adapted to different regions of the ocean would perish in other regions because they would be unable to survive the pressure difference.

Salinity

The salt content of the ocean water can be very high. Those organisms that live in this ecosystem cannot survive in freshwater. Freshwater organisms cannot live in saltwater, because the salt makes fluid leave their bodies.

Salmon can survive in freshwater (where they are born) and saltwater (where they live most of their lives).

Water Movement

Some organisms are able to live in fast moving water.

Some organisms are adapted to dig themselves into the sand for protection. (Clams do this)

Clams show at the edge of the surf line when you pound the beach with a shovel handle or your foot. They may squirt sand and water out of the hole where they are located.



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Barnacles attach themselves to rocks or other objects in the water.







Photophores - light emitting organs

3.2 Populations in Fresh and Salt Water

Natural changes in animal populations are not unusual, but the rapid decline in a species is a cause for concern. What caused the decline is important to know because it affects other species within the ecosystem as well.

Understanding Populations

The study of populations looks at groups within a particular species. A **population** is a group of organisms of the same species **that live in a particular area**.

Changes In Populations

A change in a population can mean an increase or a decrease in the number of individuals in that population. It can also mean the change in the number of males and females, or a change in the numbers of old and young individuals. A population within an ecosystem changes as a result of something happening in that ecosystem. There are three types of changes: **seasonal**, **short-term** and **long-term**.

Seasonal Changes

There are dramatic changes in populations of freshwater organisms between the seasons in northern regions (Canada) because of extreme temperature changes. Because of these extreme shifts in temperature, populations swell in the summer and disappear in the winter. The disappearance of a population may mean only that surviving individuals are dormant, or hibernating in the winter months. Breeding cycles can also cause seasonal changes in populations.

Short-Term Changes

Short-term changes take place over a relatively short period of time and don't last very long. They happen irregularly and may be part of a natural event, or caused by human activities. **El Niño** is a natural event that might adversely affect fish populations. An oil spill can have short-term effects and long-term consequences if the clean-up is not done effectively.

Long-Term Changes

Long-term changes in populations also result from natural events or human activities. A landslide can change the course of a river or stream. Addition of a new species (zebra mussels introduced by accident) to an area (the Great Lakes) may result in overpopulation of that species because there are no natural enemies. These changes can cause ripple effects because of the interactions that occur within every ecosystem.

3.3 Water Quality and Living Things

The quality of the water supply can change when natural events or human activities affect what is being added or taken from the water.

Changes In Water Quality

A wide range of species depends on the quality of the water for survival. Some species can tolerate certain changes because those changes are within their *range of tolerance*. Other species may have a very different range of tolerance to certain conditions and will not be able to survive when the water quality changes.

Examples of Water Quality Changes

Acid rain can kill a lake. The lake's death results from altering the conditions, which specific species can tolerate. When this happens, because of a higher than normal acid level, not only the species that cannot tolerate the increased acid level dies, but those species which depend on that species for survival (in the food chain) will also perish. Sometimes light is blocked by algae growing on the surface of the water. This increased growth can occur when fertilizer is added to the water supply by runoff. Even though the **algal bloom** grows rapidly, water plants, which produce oxygen for other organisms in the water, die (because they don't get enough light). When there is not enough oxygen in the water, other organisms also perish, and soon, the lake cannot support any life at all (it dies).

Fresh and Saltwater Systems – Section 3 Quiz

3.1 The Diversity of Organisms In Saltwater and Freshwater Systems

- 1. **Diversity** occurs within many different ecosystems around the world. The ecosystem that is the most diverse is the ...
- A coral reefs
- B woodlands
- C rainforests
- D deserts
- 2. An *ecosystem* is any place where living organisms interact with other living organisms and non-living things. This many, of all the major types of organisms, live in saltwater environments for some time in their lives ...
- A one half
- B two thirds
- C one quarter
- D three quarters



Lakes are freshwater bodies in low areas of land. Like the oceans, they have layers, or zones.

The *eutrophic zone* is the open water area that still has some light penetration. This zone could be compared to this ocean zone ...

- A 1
- B 2
- C 3
- D 4
- 4. The *continental shelf* is a shelf of land that extends out from the edge of a continent below the ocean's surface. The water in this zone of the ocean is ...
- A Cold and rich in a variety of species
- B Cold and dark with few species
- C Warm and light making it rich in nutrients
- D Warm and dark with few nutrients

- 5. The *deepest lake* in the world is in Russia. Compared to the oceans, it is relatively shallow. Ocean depth can reach 11000m, whereas this lake is only 1700m. The lake in Russia is ...
- A Lake Moscow
- B Lake Ukraine
- C Lake Alexandria
- D Lake Baikal
- 6. Another important zone in the ocean ecosystem is the one that enables many of the species that live there to live part of their lives out of the water. This zone is the **shoreline**. It is called the ...
- A Intertidal Zone
- B Estuary Zone
- C Continental Zone
- D Oceanic Zone
- 7. Another important zone in the ocean ecosystem is the one that contains *brackish* water (a mixture of saltwater and freshwater). It is called the ...
- A Intertidal Zone
- B Estuary Zone
- C Continental Zone
- D Oceanic Zone
- 8. **Bioluminescence** (as you learned in the Light and Optics Unit) is a characteristic that enables some aquatic organisms to produce their own light. The organs that enable these organisms to produce their own light are called ...
- A phospores
- B pituitary glands
- C phosphorescent
- D photophores
- 9. **Adaptations** are physical characteristics, or behaviors of a species, that increase its chances of survival. All living things have adaptations that are specific for the environment they live in. Fish in arctic water have a special adaptation that prevents their blood and body tissue from freezing. It is a natural ...
- A apergum
- B antifreeze
- C sythetic
- D bladder
- 10. Organisms that live on the shoreline have adapted themselves to their environment by attaching themselves to the rocks. Their hard body shell protects them from the pounding waves that constantly bombarded them. These organisms are ...
 - A clams
- B starfish
- C oysters
- D barnacles

3.2 Populations in Fresh and Salt Water

- 11. The study of populations looks at groups of organisms within a particular species. A *population* is a group of organisms of the same species that live in...
 - A saltwater
- B freshwater
- C an ocean zone
- D a particular area

12. Using the estimation method, scientists can predict the size of a species population. They can use the *quadrant sampling method*. An example of this method follows.

24		16		12			
	40				16		
			28				
						70	
	32						
		10					
							32

To find the size of this population you would do the following ...

- A Find the average of all the numbers and multiply by the number of squares you sampled
- B Find the average of all the numbers and multiply by the total number of squares
- C Find the average of all the numbers and multiply by the number of rows
- D Find the average of all the numbers and divide by the number of squares sampled
- 13. Population changes can occur because of a number of factors. Extremes in temperatures occur because of these types of changes ...
- A short-term
- B long-term
- C permanent
- D seasonal
- 14. These types of population changes can occur naturally but do not happen every year ...
 - A short-term
- B long-term
- C permanent
- D seasonal
- 15. **Zebra mussels**, introduced into the great lakes in 1988, is an example of this type of population change ...
- A short-term
- B long-term
- C permanent
- D seasonal

3.3 Water Quality and Living Things

- 16. Prairie lakes with high concentrations of *carbonates and bicarbonates* have white coatings on the rocks near the shoreline. These minerals have been dissolved out of the soil and have made the lakes ...
 - A acidic
 - B alkaline
- C saline
- D indicative
- 17. **Brine** shrimp are microscopic organisms that live in salt lakes and brine ponds. Few other organisms can live in these environments because the environment is so ...
- A salty
- B warm
- C cold
- D acidic

- 18. Which of the following environments would have the greatest diversity?
- A pond
- B puddle
- C lake
- D sea
- 19. Often when too many chemicals are added into an environment, pollution occurs. This is evident when fertilizer runoff from farmer's fields increases the growth of green slime in a body of water nearby. This green slime is called ...
 - A algal bloom
 - B algae slime
- C creeping algae
- D fertile algae
- 20. A population is related to a species in the following way ...
- A A specific population is part of a species
- B A species is part of a specific population
- C A population is a specific species in a particular area
- D A species is specific to a particular population

The cod population off the east coast of Canada was once so huge that ships came from all over the world to fish there. When **John Cabot** – an explorer, arrived in the waters of Newfoundland, he wrote that there were so many fish in the water that the boat could only move slowly.



Today, there are so few cod that fishing for them has become very carefully controlled by regulations and catch limits.

Over-fishing may not be the only cause of the decline in the cod population within the Grand Banks

There are more than 40 possible reasons that could explain the decline in cod stock recovery, including: **The environment, Fish growth and survival, Reproduction Issues**, and **Seals**, (feeding on the cod), have also been suspected as a "possibility", that they are "preventing recovery of the cod stock." http://www.gov.nf.ca/exec/premier/gbanks.htm http://www.dfo-mpo.gc.ca/media/backgrou/2003/cod-3 e.htm

What do you suggest could be done to protect the cod stocks in the Grand banks?

What else should be done to increase the population?

4.0 Human activities affect aquatic environments.



Water is recycled around the world through the **water cycle**. This doesn't mean that any one area will always have the same amount of water. In fact, it means just the opposite. No one area can expect the same amount of water year after year. This is because of other natural cycles and human intervention (use) that can cause changes to occur.

4.1 How Humans Use Water

There are **direct** (*domestic* or *personal use*) and **indirect** (*industrial* and *agricultural*) ways that humans use water. Many indirect uses can have negative effects on Earth's water supply. Negative effects may include:

- Pollution of surface and groundwater
- Depletion of groundwater supply

There are benefits and costs to using water.

The Major Uses Of Water

Water Use	Direct/Indirect	Benefit (+)	Cost (-)
Agriculture (irrigation)	73% - indirect	Food Economy Jobs	Soil salinity Decreases vegetation Depletes groundwater supplies
Industry (coolant, solvent, washing, diluting pollutants)	22% - indirect	Jobs Consumer Products Services	Pollution contributor Depletes groundwater supplies
Domestic	5% - direct	Convenience Jobs	Cost

Practices And Technologies Affect Water Quality

Power stations – can discharge warm water into lakes or rivers (thermal pollution) killing organisms that cannot tolerate the increased temperature.



Runoff – from farmland contains fertilizers that can cause excessive plant growth. It may also contain toxic chemicals (pesticides and herbicides) that can kill living organisms.



Runoff – from **cities** contains large amounts of oil and salt, which can affect plants and animals in the water.

Factories – may add toxic chemicals (which can cause tumors, birth defects, sterility and even death) or, add to the thermal pollution problem.

Habitat destruction takes away the places where animals and plants can live and interact in an aquatic ecosystem.

Sewage – contains large amounts of nitrogen, which causes micro-organism populations to increase. These micro-organisms use up the oxygen in the water and may organisms can die as a result.

Oil Spills – from ships transporting oil from place to place can cause harm to plants and animals in, on or near the water.





4.2 Measuring Impacts

One way to help guard against problems with water quality is to monitor the water supply. To **monitor** means to observe, check, or keep track of something for a specific purpose



Town and city water supplies have to be monitored on a regular basis to ensure that the quality of the water remains high. Water technicians (*freshwater biologists*) regularly measure the level of chemicals in the water and the numbers and kinds of different species of organisms. They also make observations on how it looks and smells. In this way they can identify potential problems in the water supply and adjust the treatment of the water to eliminate them. Research scientists use monitoring techniques (evidence of toxins in the water and living organisms) to help them develop technologies to help protect the environment.

Ongoing Monitoring

Ongoing monitoring of a site helps scientists observe change. The information they gather is then interpreted and suggestions are made to help the ecosystem recover. This can be through regulations to limit human activities in this ecosystem or develop technologies, which can address the problem and protect the environment. The studies they undertake are long-term and all encompassing, so that as many of the interactions as possible that are affected, will be addressed.

Problem Solving Needs More Than Science And Technology

Problem solving requires a strong **commitment** from people. They need to decide what needs to be done and then commit themselves and others to get it done. In many cases the solutions will require money and a way to raise it so the solution can be implemented without delay.

A Success Story

The Thames River, in England, used to be an open sewer. It was so polluted by the sewage, toxins, and dead animals it contained, that people decided something needed to be done because of *PUBLIC HEALTH* issues. It is now clean and clear, with some types of fish that use to live in it now returning.

People Working Together

Water systems everywhere need to be monitored and cleaned up if they are causing a problem. The solutions to many of the problems may already be available, or new technologies should be developed to address the concern. Most importantly people must work together to solve the problems, because our water supply is our life source and without it, we will all perish.

REVIEW Outline

Unit 5 – Fresh and Saltwater Systems

1.0 Humans depend on Water Supply and Quality

- ♦ Water resources: oceans, glaciers, groundwater, lakes and rivers
- Contents of water: minerals, organisms, organic material
- Water quality testing ensure it is safe to drink

2.0 Water affects Landforms and Climate on the Earth

- Waves and Tides interact with landforms causing erosion and sedimentation
- Stream and River characteristics helps us understand erosion and deposition shape the Earth's surface
- Plate tectonics (ocean basins and continental drainage system in North America) and glaciers (further erosion of the drainage system)
- Water interacts with Earth to produce variations in climate

3.0 Aquatic Organisms are affected by many factors

- Organisms are affected by the quality of their aquatic environment
- Water conditions: light, temperature and depth of the water
- Oceans can support a much greater diversity of living organisms
- A **population** the number of a certain species living in a certain area
- Each aquatic organism has adapted to a particular quality of water

4.0 Human Activities Affect Aquatic Environments

- Water is used by humans for work, play and for survival
- Greatest use of water irrigation for agriculture (next is industry)
- Monitoring helps us to determine what impact humans have on the aquatic environments they interact with
- Science and Technology must be supported by Action and Commitment

Fresh and Saltwater Systems Review Booklet

- Humans depend on Water Supply and Quality

 Key Concepts
 Water resources: oceans, glaciers, groundwater, lakes and rivers
 Contents of water: minerals, organisms, organic material

 - quality testing ensure it is safe to drink

Illustrate a Model of how water is **distributed** on the Earth.

List the factors that are used to determine water quality

What is the difference between 'Hard' water and 'Soft' water?

There are two processes that are used to change saltwater into freshwater. Describe and illustrate each.

Distillation

Reverse Osmosis _____

2.0 Water in its various states affects Earth's landforms and climate.

Key Concepts • Waves and Tides interact with landforms causing erosion and sedimentation

- Water interacts with Earth to produce variations in climate
- Stream and River characteristics helps us understand erosion and deposition shape the Earth's surface

• Plate tectonics (ocean basins and continental drainage system in North America) and glaciers (further erosion of the drainage system)

Describe what causes waves and how do they form.

What effect does water have on shorelines?

Describe what tides are and illustrate what causes them to be formed.

The cause of tides ...

Describe the **profile of a river** (How it is formed !... the changes it goes through **2/3**... and how it dies **4**)



What is chemical weathering?

What makes a watershed?



Describe the Theories of Continental Drift and Plate Tectonics.

How do these theories explain geological features on the ocean floor?

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Describe the effects **glaciers** have on the land and what **landforms** are created as a result of their growth, decline and movement.



What effect do ocean currents have on climate?



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4.0 Human Activities Affect Aquatic Environments

Water is used by humans for work, play and for survival

- Greatest use of water irrigation for agriculture (next is industry)
- **Monitoring** helps us to determine what impact humans have on the aquatic environments they interact with
- · Science and Technology must be supported by Action and Commitment

How do humans use water? (Benefits and Costs)

Water Use	Benefits (+)	Costs (-)

Describe the **Practices and Technologies** that can affect water quality in the illustration provided.

A sample environment INDUSTRI Why is on a regular basis necessary? Monitoring and Assessing Water Ouality

What must people be in order for solutions to environmental water issues to be achieved?

Fresh and Saltwater Systems Unit Test

1.1 The Distribution of Water on Earth

- 1. Because our planet has a lot of water on it's surface and is rich in vegetation, astronauts from space have described it as the ...
- A Aqua planet
- B Water world
- C Blue planet
- D Blue Green World

2. Of all the water on the Earth, the only water that is fit for humans to drink is called ...

- A pure water
- B potable water
- C purified water
- D spring water
- 3. Many substances are dissolved in freshwater and saltwater. This is because water is a solvent that is widely used to dissolve substances. *'Water'* is known as the ...
- A universal solvent
- B universal solute
- C common solute
- D common solvent

1.2 Water Quality

- 4. Most of the substances that are dissolved in water are salts. Not just sodium chloride, but many different kinds of salts. The total amount of all salts dissolved in the water is referred to as its ...
- A quality
- B salinity
- C potability
- D distillation
- 5. Hard water is water that contains high concentrations of dissolved ...
- A Gold and silver
- B Calcium and chlorine
- C Hydrogen and oxygen
- D Calcium and magnesium
- 6. Water quality is a vital issue because many of the organisms, which can harm humans, are too small to see with the naked eye. Another organism, which can give humans intestinal problems, is Giardia, which is a microscopic ...
- A virus
- B bacteria
- C parasite
- D fungus
- 7. When testing samples of water for the presence of living organisms, the students put 125ml of their samples into separate flasks and added 5 drops of **bromothymol blue**. They labeled it, put a stopper in it and placed it in a warm dark place for 24 hours. What were they looking for, to indicate that living organisms were present in the water?
- A A temperature change
- B A color change
- C The presence of bubbles
- D A decrease in water level

2.1 Waves and Tides

- 8. **Waves** are movements on the surface of the water. The kinds of waves that boats make as they travel across the surface of the water are called ...
- A tides
- B wash
- C ribbon
- D dimple
- 9. Sometimes, in order to understand a concept that is important, *models* are used to help us visualize it.

The movement of waves shown here can be modeled by using ...

- A a rope tied to a door
- B a ball bouncing
- C a ball rolling down a ramp
- D dropping a rock in a pail



- 10. Extremely large waves that can grow to be as high as a 15-storey building are called *tsunamis*. These waves spread out over a very long distance from their source, which is ...
 - A an earthquake
- B a hurricane
- C a tornado
- D a monsoon

2.2 Erosion and Deposition

- 11. **Stream characteristics** help scientists understand where different organisms might live in a river and how they might be affected by human activities. These same stream characteristics are used when dams and bridges are designed and built by ...
 - A technicians
- B biologists
- C engineers
- D environmentalists
- 12. A *stream, or river profile* is a description of its characteristics. Each stream has a pattern of flow that is shaped by its characteristics. Stream characteristics include the ...
- A size and distance of flow
- B rate of flow and degree of slope
- C course and obstacles to overcome
- D location and human activity in it
- 13. A river's sediment load is the amount of ...
- A organisms it is able to sustain
- B water-borne materials it can carry
- C pollution it is able to filter out
- D erosion it can make as it flows

14. Major North American watersheds are determined by the **Continental Divide**.

This is where you find the highest land and is located in the ...

- A Appalachian Mountains
- B Great Smoky Mountains
- C Cascade Mountains
- D Rocky Mountains



2.3 Processes That Shape Ocean Basins and Continental Drainage

- 15. Geological features on the ocean floor are a result of the continental plates moving. Where the plates are *moving away from each other* you will find ...
 - A volcanoes
- B mid-ocean ridges
- C trenches
- D seamounts
- 16. **Continental glaciers**, or **icecaps** cover large areas of land, forming the coldest regions on the Earth. Glaciers can also form high up in mountain ranges, where snow and ice build up over long periods of time. These glaciers are known as ...
 - A mountain glaciers
- B rocky glaciers
- C valley glaciers
- D moraine glaciers
- 17. **Glaciers** gouge huge areas of the land and then reshape the land by the materials they collect and deposit. Some of the features include rounded hills. These are called ...



- A reservoirs
- B moraines
- C eskers
- D drumlins

2.4 Water and Climate

- 18. Large bodies of water affect the climate of a particular area. The main effect that they have is to ...
- A cause more precipitation to fall
- B cause more extreme temperatures
- C prevent more precipitation from falling
- D prevent extreme temperatures
- 19. The reason that the eastern side of the Rockies (Lethbridge and Calgary) receives a *Chinook* (warm dry wind) is because it is located in a ...
 - A updraft
- B downdraft
- C rain shadow
- D snow shelter

- 20. Currents coming from the Arctic region like the Labrador current carry cold air, and that is partly what can account for Labrador's cold climate. Scotland gets warm air from the **North Atlantic Current** because it comes from ...
 - A Canada
- B The North Pole
- C The Equator
- D The Hawaiian islands

3.1 The Diversity of Organisms In Saltwater and Freshwater Systems

- 21. **Diversity** occurs within many different ecosystems around the world. The ecosystem that is the most diverse is the ...
 - A coral reefs
 - B woodlands
- C rainforests
- D deserts
- 22. The *continental shelf* is a shelf of land that extends out from the edge of a continent below the ocean's surface. The water in this zone of the ocean is ...
 - A Cold and rich in a variety of species
- B Cold and dark with few species
- C Warm and light making it rich in nutrients
- D Warm and dark with few nutrients
- 23. Another important zone in the ocean ecosystem is the one that contains *brackish* water (a mixture of saltwater and freshwater). It is called the ...
- A Intertidal Zone
- B Estuary Zone
- C Continental Zone
- D Oceanic Zone

Using the estimation method, scientists can	24		16		12			
predict the size of a species population.								
		40				16		
They can use the <i>quadrant sampling</i>								
<i>method</i> . An example of this method follows.				28				
							70	
		32						
			10					
								32

To find the size of this population you would do the following ...

- A Find the average of all the numbers and multiply by the number of squares you sampled
- B Find the average of all the numbers and multiply by the total number of squares
- C Find the average of all the numbers and multiply by the number of rows
- D Find the average of all the numbers and divide by the number of squares sampled

- 25. These types of population changes can occur naturally but do not happen every year ...
- A short-term
- B long-term
- C permanent
- D seasonal
- 26. *Purple loosestrife*, introduced into a wetland ecosystem, is an example of this type of population change ...
 - A short-term
- B long-term
- C permanent
- D seasonal

3.3 Water Quality and Living Things

- 27. Prairie lakes with high concentrations of *carbonates and bicarbonates* have white coatings on the rocks near the shoreline. These minerals have been dissolved out of the soil and have made the lakes ...
 - A acidic
- B alkaline
- C saline
- D indicative
- 28. Often when too many chemicals are added into an environment, pollution occurs. This is evident when fertilizer runoff from farmer's fields increases the growth of green slime in a body of water nearby. This green slime is called ...
 - A algal bloom
 - B algae slime
- C creeping algae
- D fertile algae
- 29. A population is related to a species in the following way ...
 - A A specific population is part of a species
- B A species is part of a specific population
- C A population is a specific species in a particular area
- D A species is specific to a particular population

4.1 How Humans Use Water

- 30. Waves moving across the surface of the water have changing patterns. The ripples can travel thousands of kilometers across the surface but the water itself ...
 - A doesn't move at all
 - B travels to the shore and
- C must returns to the source
- D can only travel a specific distance

31. Sometimes, in order to understand a concept that is important, *models* are used to help us visualize it.

The movement of waves shown here can be modeled by using ...

- A a rope tied to a door
- B a ball bouncing
- C a ball rolling down a ramp
- D dropping a rock in a pail
- 32. A change in the water level in the ocean is referred to as **a tide**. Tides occur 4 times each day, every 6 hours, every day. There are two types of tides, **high tide** and **low tide**. The main reason that tides occur on the Earth is because of the ...
 - A gravitational force of the Earth on the moon
 - B gravitational force of the moon on the water
- C rotation of the earth and tilt of its axis
- D phases of the moon and the changing of the seasons

4.2 Measuring Impacts

- 33. **Stream characteristics** help scientists understand where different organisms might live in a river and how they might be affected by human activities. These same stream characteristics are used when dams and bridges are designed and built by ...
 - A technicians
 - B biologists
- C engineers
- D environmentalists
- 34. These are two characteristics you will likely see during stage 2 (when the river is free flowing and at its steepest grade)
 - A slow flow and erosion
 - B fast flow and erosion
- C slow flow and deposition
- D fast flow and deposition
- 35. Major North American watersheds are determined by the **Continental Divide**.

This is where you find the highest land and is located in the ...

- A Appalachian Mountains
- B Great Smoky Mountains
- C Cascade Mountains
- D Rocky Mountains



Numerical Response Questions



NR3 - Use this	table	to	answer	the
question				

City	Jan Temp	July Temp
1	-4	+22
2	-7	+18
3	-11	+17
4	-15	+18

Match the city with the information provided in the table.

	•	•		
0	0	0	0	
1	1	1	1	
2	2	2	2	
3	3	3	3	
4	4	4	4	
5	5	5	5	
6	6	6	6	
7	7	7	7	
8	8	8	8	
9	9	9	9	

NR4 - Table of Freshwater Use (Litres/person/day)

-			
Country	Domestic	Agricultural	Industrial
1	6	118	1
2	431	313	3136
3	110	16	424
4	129	1849	172

Identify each Country by its use of water ...

	•	•		
0	0	0	0	
1	1	1	1	
2	2	2	2	
3	3	3	3	
4	4	4	4	
5	5	5	5	
6	6	6	6	
7	7	7	7	

8 8 8

8

9 9 9 9

0

1

2

3

4

5

6

7

8

9

Calgary Toronto Halit

Halifax Edmonton

Canada

Mexico

England Cambodia

Try the Bonus Question just for fun.

BONUS QUESTION - Climate in Canadian Cities

		_					_	_		_	_		_
		J	F	Μ	Α	Μ	J	J	Α	S	0	Ν	D
Precipit	ation (mm)	146.9	119.1	122.6	124.4	110.5	98.4 9	96.8	109.6	94.9	128.9	154.4	167
Daily M	ean (°C)	-5.8 -	-6.0 -	-1.7	3.6	9.4	14.7	18.3	18.1	13.8	8.5	3.4	-3.0
The Pre	ecipitation an	nd Tempe	erature	e inform	nation i	in the ta	able al	oove	identif	ies a (Canadi	ian city	<i>'</i> .
From th	ne data you r	night be	able to	o infer t	hat thi	s data i	epres	ents f	the Cit	y of		,	
		Colorema	Б	\ A /:		с нь	life.v	–	0		:4		
	A. (Jaigary	в.	winni	peg	С. на	ilitax	υ.	Que	bec C	ity		
Your inference is likely based on the fact that													
A There are extreme periods of precipitation indicating it is leasted in the Proiries													
A. B	A. There are extreme periods of precipitation indicating it is located in the Prairies												
Б.	B. The are tew extremes in temperature indicating it is by a large body of water												
C.	C. Its highest temperature indicates that it might be near the Great Lakes												
D.	D. Its highest temperature indicates that the C of RED keeps it warm most of the time												

Fresh and Saltwater Systems Section Quiz - Answer Keys

Section 1 Quiz		Section 2 Quiz		Section	a 3 Quiz	Section 4 Quiz		
1	С	1	В	1	С	1	Α	
2	В	2	Α	2	В	2	D	
3	D	3	Α	3	С	3	С	
4	Α	4	D	4	С	4	В	
5	В	5	Α	5	D	5	Α	
6	D	6	В	6	Α	6	D	
7	Α	7	С	7	В	7	В	
8	С	8	В	8	D	8	D	
9	В	9	С	9	В	9	В	
10	D	10	С	10	D	10	С	
		11	В	11	D	11	В	
		12	D	12	В	12	D	
		13	В	13	D	13	Α	
		14	D	14	Α	14	С	
		15	С	15	В	15	С	
		16	В	16	В			
		17	С	17	Α			
		18	С	18	D			
		19	Α	19	Α			
		20	В	20	С			
		21 C						
		22	D	21. Respons	ses will vary, erstanding of			
		23	С	the concepts	will determine			
		24	С	if they unde concepts in				
		25	D					

Fresh and Saltwater Systems Unit Test

Answer Key

Questions	Answer	Questions	Answer	Questions	Answer	Questions	Answer	Numerical Response Questions	Answer
1	С	11	С	21	С	31	В	1	2134
2	В	12	В	22	В	32	D	2	3241
3	Α	13	D	23	В	33	С	3	3124
4	В	14	В	24	Α	34	С	4	2431
5	D	15	С	25	В	35	D		
6	С	16	D	26	В				
7	В	17	D	27	Α				
8	В	18	С	28	С		Bonus QuestionCB		
9	Α	19	С	29	С			1	
10	Α	20	С	30	Α				