Science 10
Module 5 Blackline Masters

This blackline master CD is designed to accompany Open School BC's ***Science 10*** course. The CD includes student worksheets and materials for teachers to make their own overhead transparencies or photocopies stored as modifiable Microsoft Word documents. The course and blackline master were developed by BC teachers, instructional designers, graphic artists, and multimedia experts.

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The ***Science 10*** course consists of five modules, *Science 10 SOS Package*, *Science 10 Kit*, *Blackline Master CD* and the *Science 10 Media CD*. Science 10 is available in both print and online formats. Science 10 can be purchased as individual components or as a complete resource, *Science 10 Resource Package*. There are no additional resources required for this course.

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Mod 2

GP 2.1A 2: The Number of Subatomic Particles
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In one document (called "Naming Organic Compounds"), combine the following items from Lesson 2.3B:

- Graphic: Ethane, Ethene, Ethyne
- Graphic: Number Prefixes Used in Organic Compounds
- Table with "number of carbons" and "prefix"

SA 2.3

Symbols Used in Chemical Equations (table from Lesson 2.4A)
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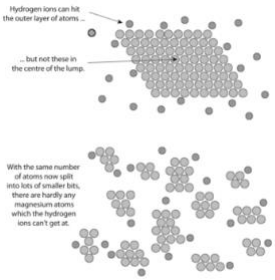
Summary of Reaction Types (table from Lesson 2.4B Summary)

Surface Area and Reaction Rate (from Lesson 2.4D include the following text and the graphic (shown in the screen shot below)
"To illustrate the effect of surface area on reaction rate, let's look at the reaction between magnesium metal and dilute hydrochloric acid). The reaction involves collisions between hydrogen ions (found in the dilute acid solution) and the magnesium metal.
$Mg_{(s)} + 2H^{+}_{(aq)} \rightarrow Mg^{2+}_{(aq)} + H_{2(g)}$ "



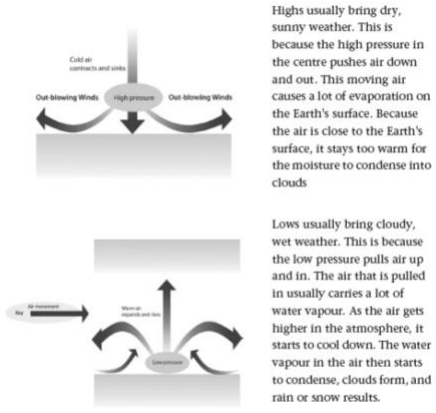
SA 2.4

GP 2.5A 2: Vocabulary Matching Quiz
SA 2.5

Mod 3

Table: States of Matter (from lesson 3.1A)
Try It Out! Heat Transfer (from Lesson 3.1B)
Summary of Heat Transfer (table from Lesson 3.1B summary)
Graphic: Energy From the Sun (from lesson 3.1D)
SA 3.1

High and Low Pressure Systems (as shown in screen capture below)

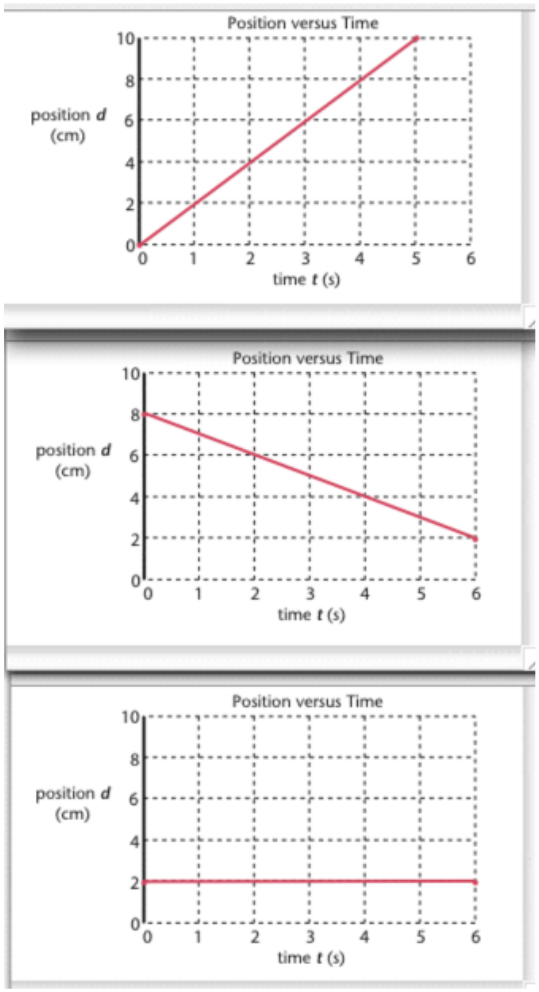


GP 3.2B 1: Weather and Pressure
SA 3.2

SA 3.3

Mod 4

Slope of "Position vs. Time" Graphs (graphics and content from Lesson 4.1D. I set it up below with screen shots to show how I'd like it set up. I only used a table to make it easier for myself – you don't need to use a table.)

Slope of "Position vs. Time" Graphs	
Positive Slope A positive slope means a positive constant velocity. The object could be moving • forward • to the right • north • east **Negative Slope** A negative slope means a negative constant velocity. The object could be moving • backward • to the left • south • west **Zero Slope** A horizontal line (zero slope) means that vav = 0. This means that the object is not moving at all	

GP 4.1D 3: Slope and Velocity
SA 4.1

GP 4.2A 2: Acceleration
GP 4.2B 2: Positive Acceleration and Velocity-Time Graphs
GP 4.2C 2: Graphing Negative Acceleration
GP 4.2C 3: Velocity versus Time Graphs
Acceleration Due to Gravity (from Lesson 4.2D. Please include the graphics and text on pg 91-92 describing motion of a ball. If possible, arrange so it fits on one page. Would be nice to have graphic on the left, text on the right. You can shrink the graphics a bit if needed)

SA 4.2

Mod 5

Energy Flow Through an Ecosystem (graphic from lesson 5.1C with sun, producer consumer, decomposer – on pg. 22)
Food Web (graphic from Lesson 5.1C - pg 27)
Food Pyramid (graphic from Lesson 5.1C - pg 30)
GP 5.1D 1: Symbiotic Relationships Chart
SA5.1

GP 5.2B 1: The Nitrogen Cycle
GP 5.2C1: The Phosphorus Cycle
SA 5.2

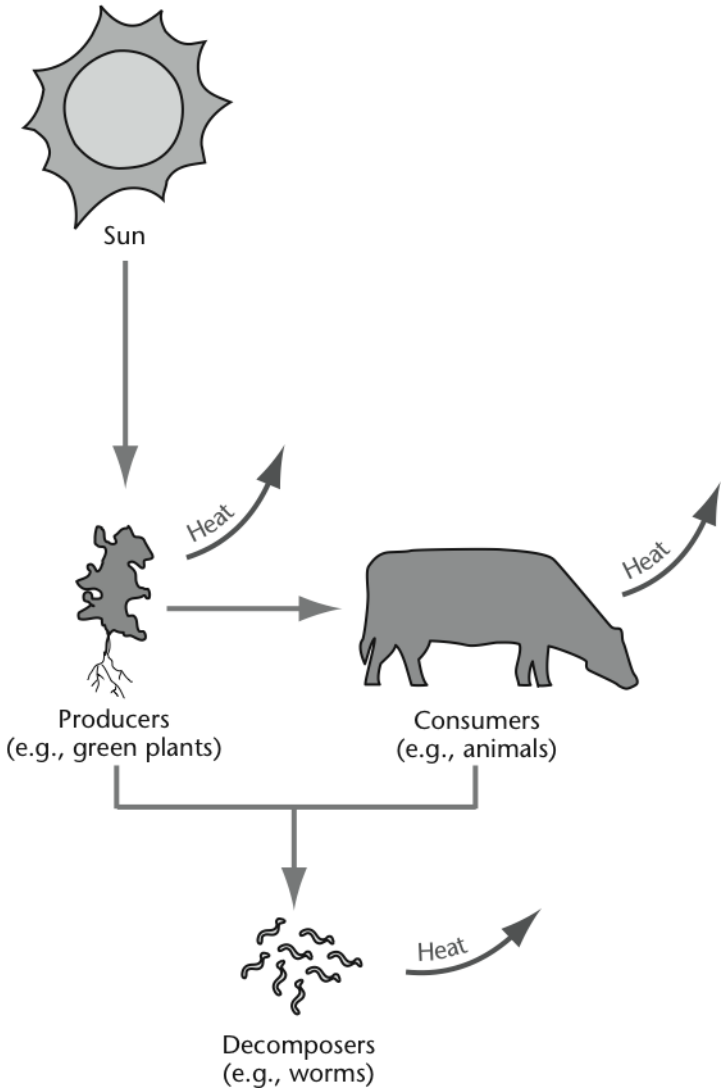
SA 5.3

SA 5.4

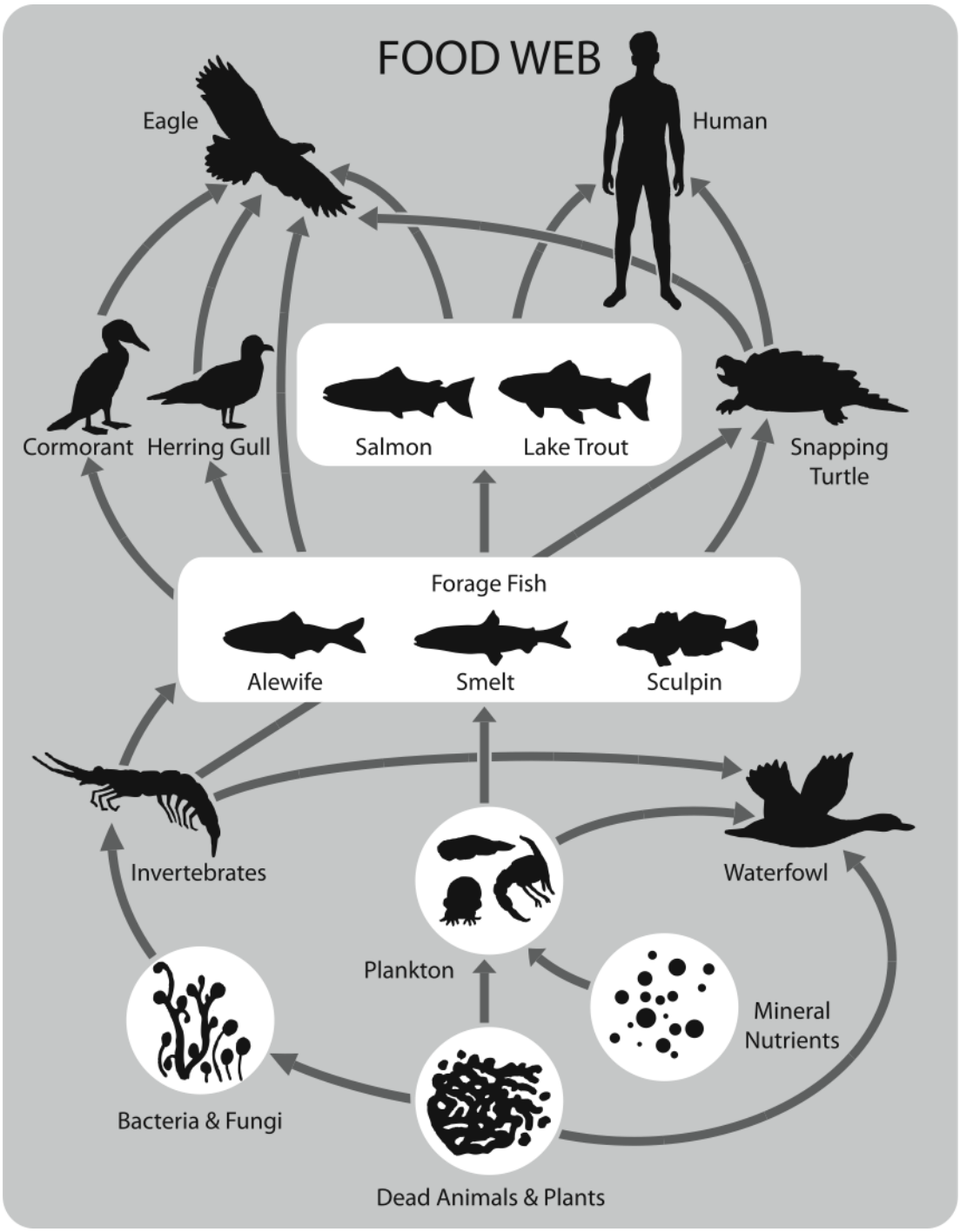
GP 5.5A 1: Looking for the Best "Fit"
Predator-Prey Cycle (graphic from lesson 5.5B showing population cycle of lynx and hare on pg 173)
GP 5.5C 1: Changing Communities
GP 5.5D 1: The Burning Question
SA 5.5

Module 5 Assignment

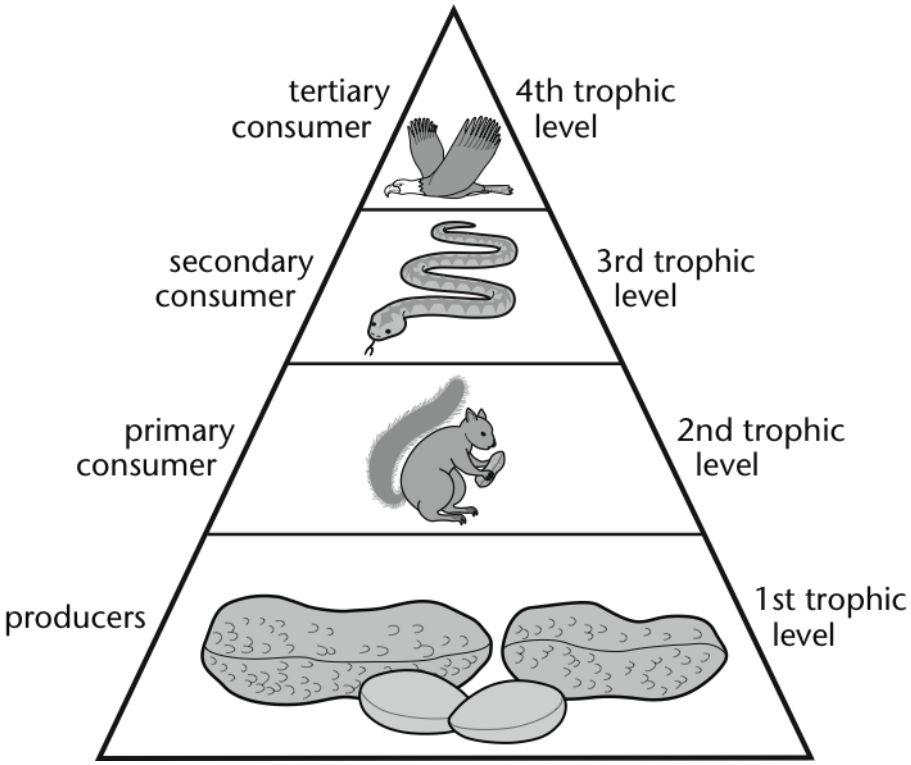
Energy Flow Through an Ecosystem



Food Web


FOOD WEB
Eagle
Human
Cormorant
Herring Gull
Salmon
Lake Trout
Snapping Turtle
Forage Fish
Alewife
Smelt
Sculpin
Invertebrates
Waterfowl
Plankton
Mineral Nutrients
Bacteria & Fungi
Dead Animals & Plants

Food Pyramid



Guided Practice 5.1D 1
Symbiotic Relationships Chart

As you go through this lesson, use the following table to organize your notes. Complete the table summarizing the three types of symbiotic relationships.

Symbolic Relationship	**Definition or Explanation**	**One Example**
Mutualism		
Commensalism		
Parasitism		

Section Assignment 5.1 Part A
Designing an Experiment: Factors Affecting Plant Growth

Background

In this activity, you will take on the role of a scientist. You will be designing an experiment to answer the question: *What factors influence growth of weeds?*

You will only be required to design the lab, and **do not** need to carry it out. Your instructions should be clear enough that someone else could perform the experiment. Try to include only the resources available in your household or in a high school science lab.

The requirements for your experimental design are given below (along with instructions and guidance). If you need more help, refer to the *SOS package* on your *Science 10 Media CD*:

- The section on "The Scientific Method" might provide some help with writing your purpose and hypothesis.
- "Tool #3: Lab Report Directions" will give you a clear outline of what each lab report component is.

Introductory Questions (3 marks)

In this section, you will develop the question: What factors influence growth of weeds? in more detail. Answer these questions in preparation for designing your experiment.

1. What factors (abiotic or non-living) are important for plant growth?

2. Classify these factors as either external or internal to the plant.

3. Which of these factors could be manipulated or changed in an experiment conducted outdoors? What if it was conducted indoors?

Purpose (1 mark)

In this section, you need to explain what purpose your experiment will fill, or what question your experiment will answer. Include the question and **two** specific factors that will be investigated.

An example purpose (for a different experiment):

> *What factors influence the distribution of barnacles on a rocky shore?*
>
> *To answer this question, I will be looking at the effects of wave action, competition for space, and tidal exposure.*

Hypothesis (2 marks)

Even though you won't be carrying out this lab, you should have enough information and background knowledge to form a hypothesis.

Please review "Writing a Hypothesis" in the *SOS package* on your *Science 10 Media CD* before completing this part.

Materials (1 mark)

Once you have laid out the purpose of your experiment, the next step is to list the materials you will need. Remember, they should be materials you have in your household or a high school science room.

Procedure (3 marks)

The procedure of an experiment is a set of directions of describing how to carry out the lab. The procedure tells you how to do the lab, in order to test your purpose.

For each factor you are testing, you need to explain what information needs to be collected and how it will be collected. The procedure should be written clearly, concisely, and in a step-by-step sequence.

Think about:

- What two factors will you be measuring with your experiment?
- How will you measure your data?
- How will you record your data?

Results (2 marks)

This is where the information gathered for your experiment will be recorded. A good idea is to use tables, as they make it easier to record and refer back to later. The tables need to indicate what information is being recorded.

Remember: since you are not carrying out this lab, you won't have any data to record. You will only provide the outlines of the tables (as if you were giving them to someone else to fill in). Make sure you include appropriate titles for rows and columns.

Discussion Questions (4 marks)

You may have noticed that, often, when you complete a lab report, questions are included to encourage critical thinking or discussion.

In this section, you will design **four** questions that encourage discussion about the data that was collected. Your questions should link ideas together and move towards answering the purpose questions posed at the start of the lab.

Here are some example questions (from a different experiment):

Part 1: Competition for Space

1. *How did the numbers of barnacles compare in the sample space between the low and mid tide levels?*
2. *Is there more or less tidal exposure in the higher density area?*
3. *Is the amount of wave action similar or different between the two sample areas?*

Marks
16

Section Assignment 5.1 Part B
Parts of Ecosystems

1. A. Take out the graphic organizer you made in the *Guided Practice 5.1B 1: Biotic and Abiotic Factors*. Make sure you have labeled the appropriate parts with the terms *abiotic* and *biotic*, and you have included at least four examples of each. You will hand this graphic organizer in with your section assignment. (2 marks)

   B. Choose one abiotic factor from your list. Imagine what would happen if you changed that one abiotic factor. Describe one possible outcome of changing the abiotic factor you have chosen. (Hint: Think of how changing the abiotic factor would influence one of the biotic parts of the ecosystem.) (1 mark)

2. A. What is the difference between a producer and a consumer? (1 mark)

   B. A food chain and a list of terms are given below. Label the organisms in the food chain using terms from the list. You may use list terms once, more than once, or not at all. More than one word may apply to each organism. (4 marks)

   (a) herbivore (b) consumer (c) producer (d) carnivore

   (e) omnivore (f) autotroph (f) heterotroph

grass	→	**goat**	→	**cougar**
_____		_____		_____
_____		_____		_____
_____		_____		

3. A. Draw a food web that includes all of the following organisms: mouse, dandelion, wheat, frog, grasshopper, hawk, sparrow, rattlesnake. Some information is provided below to help you. (2 marks)

Grasshoppers eat dandelions.
Snakes eat mice and frogs.
Mice and grasshoppers eat wheat.
Frogs eat grasshoppers.
Hawks eat mice, frogs, and snakes.

B. Imagine that there is a sudden drop in the grasshopper population in a certain ecosystem. After this decrease in the grasshopper population, you decide to monitor the other populations in the ecosystem. Your findings are presented below.

Organism	Grasshoppers	Mice	Frogs	Hawks	Snakes
Change in Population After 1 Month	decrease	no change	decrease	no change	no change
Change in Population After 3 Months	decrease	decrease	decrease	no change	no change

Explain why the mouse population showed no change after one month, but decreased after 3 months. (2 marks)

4. A. Which type of organism would have the highest level of energy available to it: a producer, a herbivore, or a carnivore? Briefly explain why. (2 marks)

B. Which type of organism would have the least amount of energy available to it: a producer, a herbivore, or a carnivore? Briefly explain why. (2 marks)

C. Why might you see a large flock of ducks in a habitat, but rarely a large number of eagles? (1 mark)

5. Label each of the scenarios as commensalism, mutualism, or parasitism. You may use each label once, more than once, or not at all. In each case, briefly describe why you chose the label you did. (1 mark each)

A. The red-billed oxpecker is a bird that lives on the skin of giraffes. It eats small insects that the giraffe considers pests.

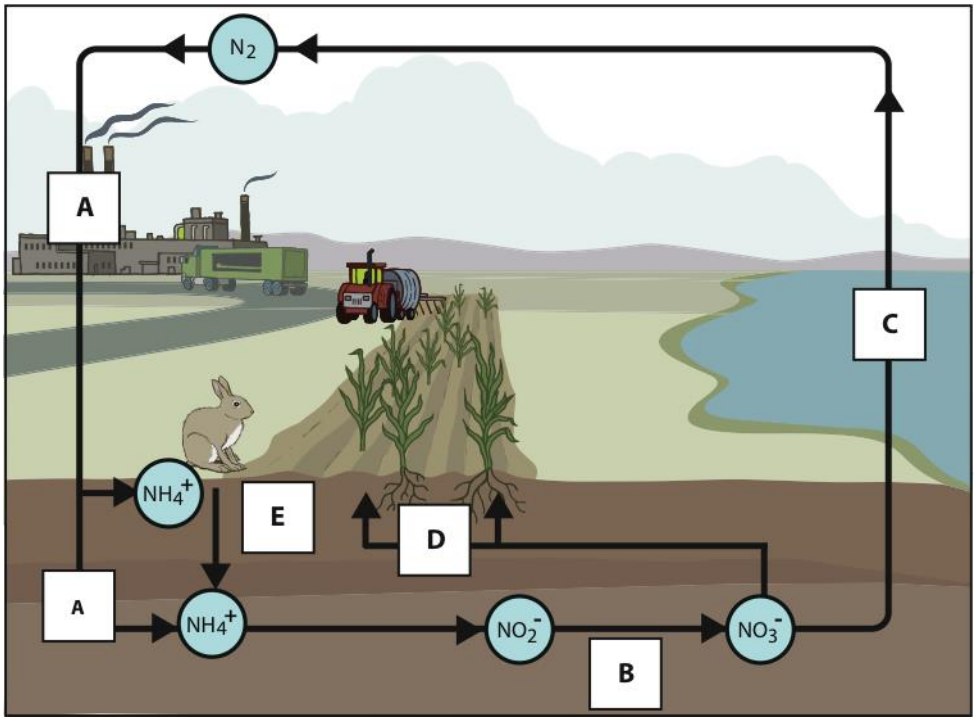
B. The dodder plant has no chlorophyll, roots, or leaves. It attaches to another plant, such as the potato plant, and develops a tangled mass of vine-like stems that hug the potato plant. The dodder penetrates the stem of the potato plant in order to obtain water and nutrients. The potato plant rarely dies, but its growth is usually limited.

C. Algae grows on the shells of freshwater snails. The algae needs a surface to attach to, and the snail is camouflaged by the algae, helping to protect the snail from predators.

Marks
20

Guided Practice 5.2B 1
The Nitrogen Cycle

1. Use the following list of terms to label the diagram below:
    - Decomposition
    - Denitrification
    - Nitrification
    - Nitrogen Fixation
    - Uptake by Plants

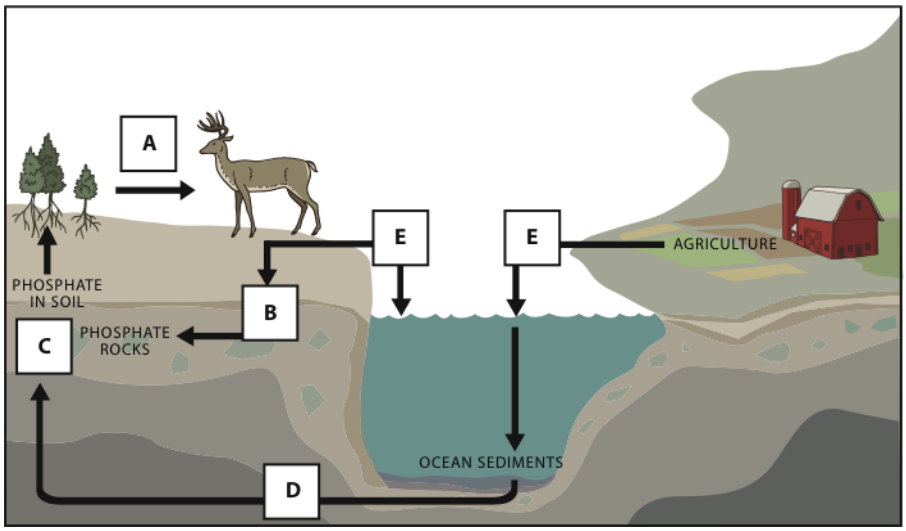


2. Crop rotation is the practice of alternating the types of plants grown in an area year to year. Using your knowledge of the nitrogen cycle, explain why it might be advantageous for farmers to alternate legume crops with other crops in their fields.

3. *Eutrophication* is the increase in nutrients (such as nitrogen and phosphorus) in an ecosystem. Eutrophication can occur on land or in water, and generally leads to increased plant growth and decay. Using your knowledge of the nitrogen cycle to explain how some human activities can lead to eutrophication.

Guided Practice 5.2C 1
The Phosphorus Cycle

1. Use the following list of terms to label the diagram below:
    - Consumption
    - Decomposition
    - Geologic uplift
    - Runoff and leaching
    - Weathering



2. List two human activities that affect the phosphorus cycle and describe how these activities upset the natural balance of the cycle.

Section Assignment 5.2 Part A
The Carbon Cycle

You may use the carbon cycle diagram from your *Data Booklet* to answer the following questions.

Go to your:

Science 10 Media CD > **Data Booklet**

1. A. Define the term *carbon sink*. (1 mark)

   B. What is the largest carbon sink on Earth? (1 mark)

2. Human activities affect the carbon cycle in many ways.

   A. **Driving Our Cars**:

   Think about the ways in which the carbon cycle is affected by our increasing use of oil and gasoline. List two points in the carbon cycle that are affected by the increase in fossil fuel combustion and describe how they are affected. (Note: you may describe carbon sources and/or sinks.) (4 marks)

   B. **Cutting Down Our Forests**:

   Our modern society, we are heavily dependant on lumber and paper products. List two processes in the carbon cycle that are affected by deforestation. Briefly describe how this impacts the carbon cycle. (4 marks)

Marks
10

Section Assignment 5.2 Part B
The Nitrogen Cycle

You may use the nitrogen cycle diagram from your *Data Booklet* to answer the following questions.

Go to your:

Science 10 Media CD > **Data Booklet**

1. Bacteria are crucial to several processes within the nitrogen cycle.

   Define each of the following bacterial processes and explain its importance in the nitrogen cycle. (2 marks each)

   A. Nitrogen fixation

   B. Nitrification

   C. Denitrification

2. A. List two points in the nitrogen cycle where human activities have affected the nitrogen balance. (1 mark)

   B. Choose one of your points from the list above and briefly describe the effects of human activities on ecosystems. (1 mark)

Marks
10

Section Assignment 5.2 Part C
The Phosphorus Cycle

You may use the phosphorus cycle diagram from your *Data Booklet* to answer the following questions.

Go to your:

Science 10 Media CD > **Data Booklet**

1. A. List the two largest sources of phosphorus. (1 mark)

   B. Of the sources you listed above, how much phosphorous is accessible to humans? (1 mark)

2. A. Briefly describe the process of weathering. (2 marks)

   B. What role does the process of weathering play in the phosphorous cycle? (Hint: think about how phosphorous is different from other nutrients and why weathering is an important process in the phosphorous cycle.) (2 marks)

3. Laundry detergents, fertilizers, and mining practices all add phosphorus into the environment. Describe the impact of excess phosphorus on freshwater ecosystems and name the process. (4 marks)

Marks
10

Section Assignment 5.2 Part D
Considering All of the Cycles

Using the Carbon, Nitrogen, and Phosphorus cycles, fill in the table below. (9 marks)

	Nutrient cycle occurs in: air, land, and/or water (1 mark each)	**Impacts of Large-scale Industrial Agriculture on nutrient cycle (2 marks each)**
Carbon		
Nitrogen		
Phosphorus		

Marks
9

Section Assignment 5.3 Part A
Biome Comparison Chart

Using the lessons in this section, complete the following chart (comparing biomes).

Biome	Climate Range (Temperature/ Precipitation)	Predominant Plant Life	Plant Life Adaptations to Biome	Animal Life Adaptations to Biome	Limiting Factors: Abiotic
Tundra					
Temperate Rainforest					
Boreal Forest					
Temperate Deciduous Forest					
Grasslands					
Tropical Rainforest					
Desert					
Permanent Ice					

Marks
20

Section Assignment 5.3 Part B
Biome Quiz

1. Which of the following is a characteristic of a desert biome?

   I. low amount of rainfall

   II. extreme high summer temperatures

   III. consistent amount of rainfall through the year

   IV. grasses are dominant plant life

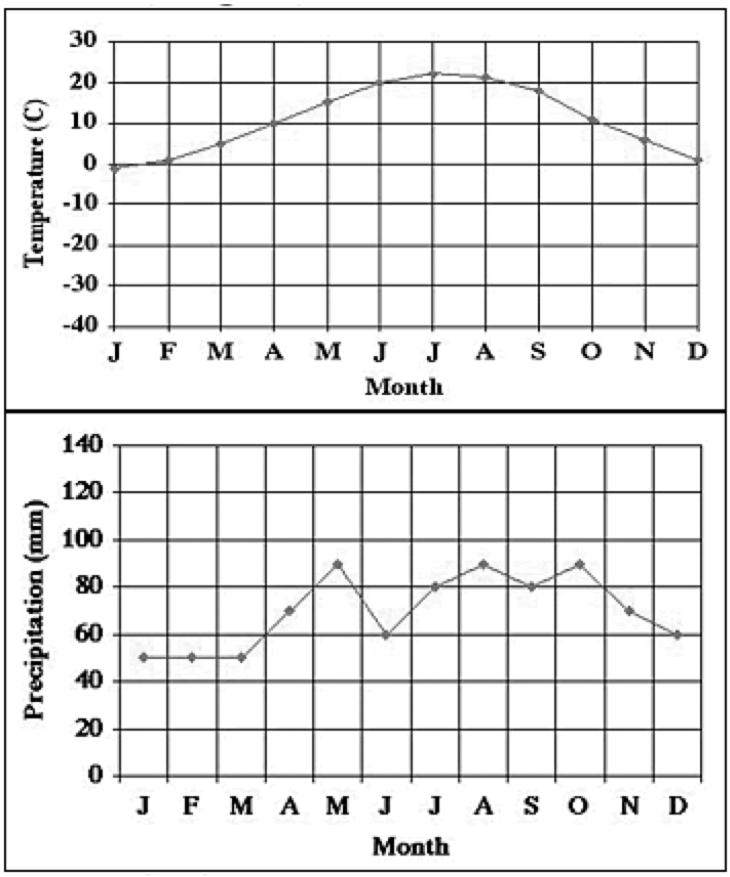
   A. both I and II

   B. both I and III

   C. both II and III

   D. all four statements are true

2. Which biome is represented by the following climatograph?



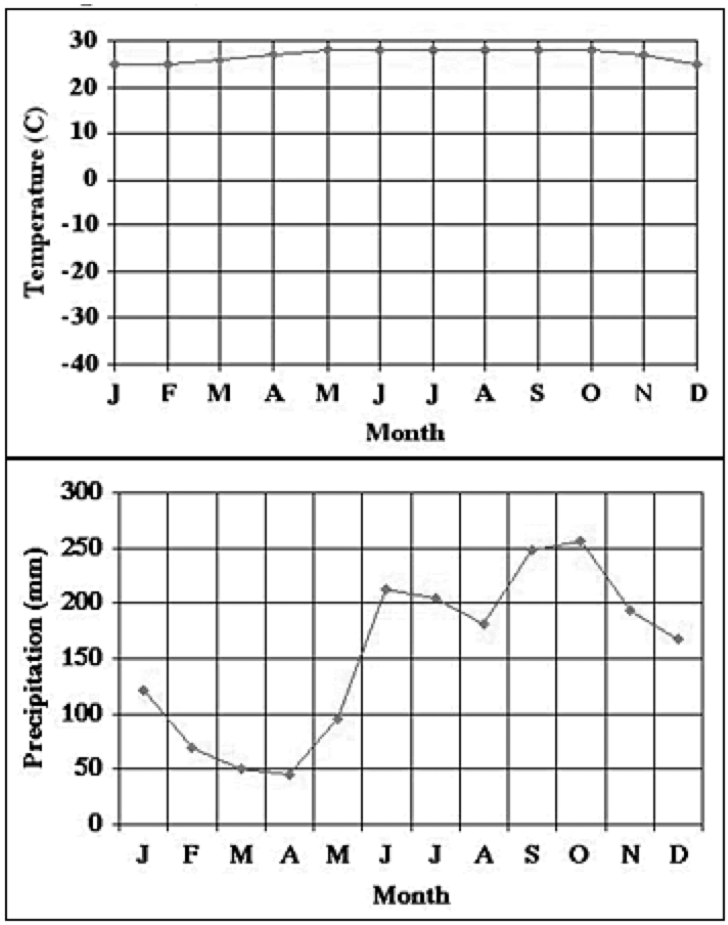
   A. boreal forest

   B. grasslands

   C. temperate rainforest

   D. temperate deciduous forest

3. Which biome is represented by the following climatograph?



A. tundra
B. grasslands
C. tropical rainforest
D. temperate rainforest

4. Which of the following biomes receives the least rainfall?
A. tundra
B. temperate deciduous forest
C. grasslands
D. tropical rainforest

5. In which of the following biomes would you expect to see the highest amount of rainfall?
A. temperate rainforest
B. boreal forest
C. grasslands
D. tundra

6. Which of the following is a characteristic of a temperate rainforest biome?
   A. vines and ferns are dominant plant life
   B. low amount and inconsistent distribution of precipitation
   C. coniferous trees are dominant plant life
   D. four seasons where trees lose leaves during the winter season

7. In a boreal forest, which of the following characteristics apply?
   A. plant growth possible throughout the year
   B. deciduous trees are dominant vegetation
   C. annual precipitation of more than 2000 mm per year
   D. coniferous trees as the dominant vegetation

8. Which of the following is NOT an adaptation used by boreal forest animals to survive the cold winter?
   A. layer of fur to keep warm air close to the body
   B. slow down of metabolism (sleep)
   C. movement out of the area
   D. high amount of surface area to facilitate heat exchange

9. In a temperate rainforest, the role of a nurse log is to:
   A remove excess nutrients from the soil
   B. provide nutrients for young trees
   C. provide nutrients for herbivores
   D. provide nutrients for mature conifers

10. Grasses are the dominant plant life in the grassland biome due to:
   A. permanently frozen layer of ground
   B. high amount of precipitation distributed evenly throughout the year
   C. low amount of rainfall preventing trees from establishing a foothold
   D. variation in temperature between summer and winter season

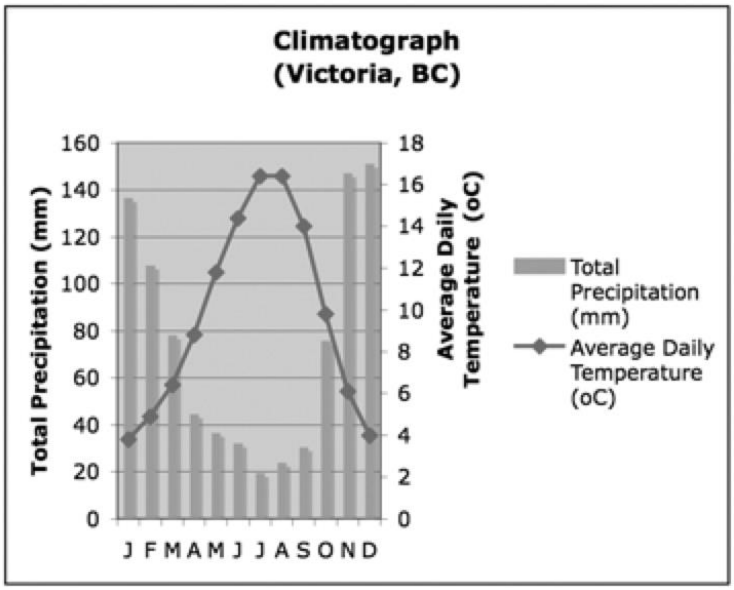
Marks
10

Section Assignment 5.3 Part C
Abiotic Factors of Biomes

1. Using a biome example of your choice, explain why ecosystems with similar characteristics can exist in different geographical locations. Discuss the significance of temperature, precipitation, and role of abiotic factors in determining plant life. Include names of specific examples (e.g., plants) in your explanation. (5 marks)

2. Building a Climatograph

   Throughout this module you've seen temperature and precipitation graphs for all of the different biomes. Instead of using two separate graphs, it is useful to place all of the information on one climatograph. In order to do this, a bar graph is used for temperature and a line graph is used for precipitation. The example below shows climate data for Victoria BC. (Remember that the data shown are averages for each month.)



   Analysing the Graph

   The graph provides a visual presentation of the data.

   Now it's easy to pick out the highest and lowest temperature to get a temperature range. The highest average monthly temperature is 16.4˚C which occurs in July and August. The lowest average monthly temperature is 3.8˚C in January. The temperature range for Victoria is 3.8 – 16.4˚C.

   In the same way you can find that the precipitation range for Victoria is 19.5 – 151.2 mm.

   It's also easier to see the general climate trends. You can see that the temperature is mild and doesn't vary much through the year. Precipitation is seasonal: it's high through the winter months and low in the summer months.

   Think about how the data in the graph relates to the location it comes from (consider what biome Victoria, BC is in).

Now that you've looked at an example, it's time to create your own climatograph!

A. Use the data given in the table below to create a climate graph for this unknown location. Please use graph paper for your graph. (7 marks)

   Specifically you should:

   - Provide a title for your graph
   - Label the axes of your graph accurately and choose an appropriate scale to display the data
   - Graph the months of the year on the horizontal or "X" axis
   - Graph the temperature on the left vertical or "Y" axis
   - Graph the precipitation on the right vertical or second "Y" axis
   - Colour bars for precipitation
   - Colour a line for temperature

B. You know that each biome has a characteristic climate. Based on the climate graph you created in A, what Canadian biome do you think the data came from? In your response, state the biome and give an explanation for why you made that choice. Your explanation should include reference to temperature ranges, precipitation ranges, and overall trends in the data. (3 marks)

Climate Data for an Unknown Canadian Location

	Mean Temperature Degree Celsius (°C)	**Total Precipitation Millimeters (mm)**
January	-0.7	65.4
February	-3.1	37.7
March	2.9	51.4
April	11.0	25.4
May	15.4	50.4
June	21.3	42.0
July	22.8	42.8
August	21.9	41.8
September	15.1	74.6
October	10.7	108.2
November	-0.4	24.4
December	-0.1	25.6

Marks
15

Section Assignment 5.4 Part A
The Three B's

Please answer the following questions.

1. Describe the difference between bioaccumulation and biomagnification. Your response should include a definition of each term and an example to illustrate each. (4 marks)

2. In Lesson 5.4A we looked closely at PCB contamination of killer whales in BC. Use that information to answer the questions below.

   A. How does the concentration of PCBs differ between male and female members of the pod? What is the reason for this difference? (2 marks)

   B. Why are PCB concentrations higher in some killer whale pods than in others? (2 marks)

   C. What makes the killer whale a keystone species? (2 marks)

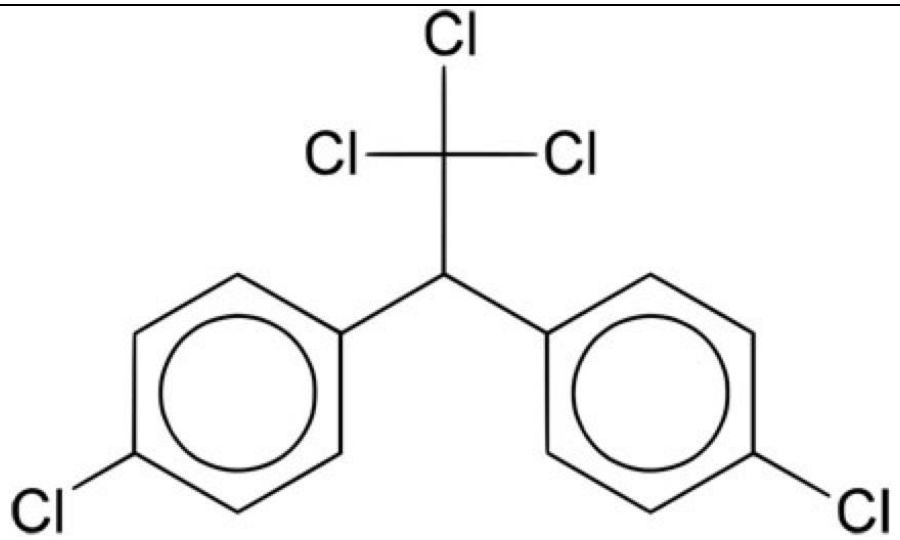
3. A. Describe why biodegradation is an important process in natural ecosystems. (2 marks)

   B. Describe one way in which humans have used their knowledge of natural biodegradation processes to reduce waste or clean up environmental damage. (1 mark)

Marks
13

Section Assignment 5.4 Part B
Case Study: DDT

Please read the case study information and answer the questions that follow.



Dichloro-Diphenyl-Trichloroethane (DDT) was used in North America and Europe in the 1940s and 1950s to help control mosquitoes and other insects.DDT is not easily broken down, and can be toxic to certain organisms. When it was used, DDT covered plants, killed insects, and washed into rivers and lakes. Herbivores ate the plants covered in DDT and drank the polluted water. Low-level consumers such as fish and other aquatic organisms were contaminated through ingesting the water, plants, and insects. Birds and other higher-level consumers that preyed on these low-level consumers ingested the stored DDT.

Fish-eating birds such as bald eagles and osprey, for example, experienced significant negative effects. Levels of DDT were high enough that it affected reproduction of many bird species. High concentrations of DDT lead to the thinning of birds' eggshells. As a result, the adult birds broke the shells of their unhatched offspring and the baby birds died. The populations of these birds plummeted. In fact, DDT is thought to be one of the main factors causing the decreasing populations of the bald eagle and the peregrine falcon in the 1950s and 1960s.

DDT was banned in Canada and the US in the early 1970s. Populations of many predatory birds have recovered since the ban, although quantities of DDT still remain in many ecosystems.

1. Using the information provided, explain how bioaccumulation played a role in DDT contamination of ecosystems. (2 marks)

2. Using the information provided, explain how biomagnification played a role in DDT contamination of ecosystems. (2 marks)

3. Why did predatory bird populations drop after the widespread use of DDT? (1 mark)

4. Your study of ecosystems so far has highlighted the complex interactions of the different parts of each system. You have learned that changes in one component can affect many other components.

   Predict two possible effects of DDT use that are not described in the case study. Be sure to clearly describe your predictions and show a logical connection between use of DDT and your prediction. (4 marks)

Marks
9

Guided Practice 5.5A 1
Looking for the Best "Fit"

1. Label each of the following adaptations as a response to biotic (living), abiotic (non-living), or both factors combined. Then explain how each might improve the organism's chances of survival.

   A. white colour of a snowshoe hare

   _____

   _____

   _____

   B. parachute-like seed of a dandelion

   _____

   _____

   _____

   C. silent wings of a Great Horned Owl

   _____

   _____

   _____

   D. rattlesnake venom

   _____

   _____

   _____

   E. bird migration

   _____

   _____

   _____

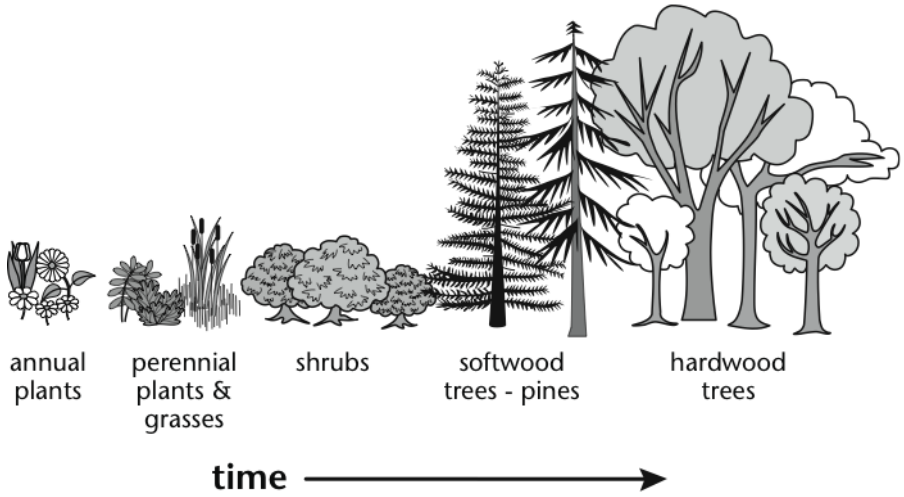
2. Match each of the following plant adaptations with the abiotic factors of an ecosystem.

1. well developed root systems _____		a. precipitation levels of a desert
2. leaves shed during prior to winter season _____		b. precipitation levels of a grassland
3. needle-like leaves help shed snow _____		c. precipitation levels of a tropical rainforest
4. stem structure able to store water _____		d. winter conditions of a boreal forest
5. leaf structure developed to shed excess water _____		e. winter conditions of a temperate deciduous forest

3. Fill in the information missing from the table below.

Term	Definition	Example
Fit		
	Change that allows an organism to live successfully	
		Darwin's Finches—One species evolved into fourteen

Guided Practice 5.5C 1
Changing Communities



Use the diagram for the first three questions.

1. The diagram illustrates which of the following terms?
   A. extinction
   B. succession
   C. biodegradation
   D. adaptive radiation

2. What does the hardwood tree forest in the diagram represent?
   A. pioneer community
   B. early community
   C. climax community
   D. succession community

3. Which of the following describes the annual plants in the diagram?
   A. pioneer community
   B. early community
   C. climax community
   D. succession community

4. Abiotic factors determine the plant composition within a community. Which of the following is NOT an abiotic factor affecting plant growth?
   A. amount of precipitation
   B. bacteria in soil
   C. amount of sunlight
   D. average annual temperature

5. How can habitat destruction of trees in a rainforest impact a climax community?
   A. Rainforest trees provide an anchor for stability and eliminate infrastructure for other species.
   B. Plant species composition will remain unchanged.
   C. The plant community will continue towards a stable climax community.
   D. None of the above

Guided Practice 5.5D 1
The Burning Question

Answer the following questions based on the video "The Burning Question: Mountain Pine Beetle and Fire in our Forests."

1. Fire suppression leads to crowding of forests and an ageing tree population. Which related statement below is true?

   A. Mature trees are highly susceptible to disease and insects.

   B. Mature trees and crowded forests promote biodiversity.

   C. Lodgepole pine trees prefer crowded growing conditions.

   D. Mature lodgepole pine trees are drought-resistant.

2. Which factors contribute to the mountain pine beetle epidemic?

   I. climate change

   II. fire suppression

   III. blue stain mould production

   IV. unhealthy tree populations

   A. I and II

   B. III and IV

   C. I, II, and IV

   D. I, II, III, and IV

3. Which of the following statements describes how mountain pine beetles help forest renewal?

   I. thinning out ageing trees

   II. prevent growth of new trees

   III. suppressing forest fires

   A. I only

   B. II only

   C. II and III

   D. III only

4. According to scientists, how much of BC's mature pine forests will be lost by 2014 if the mountain pine beetle epidemic continues?

   A. 5%

   B. 25%

   C. 80%

   D. 100%

5. How does the tiny mountain pine beetle kill the large lodgepole pine?

   I. The beetle produces a toxic resin.

   II. The beetle carries the spores of a deadly fungus.

   III. The beetle interrupts the vascular system of the tree.

   A. I only

   B. I and II

   C. II only

   D. II and III

6. Which of the following factors lead to increased numbers of forest fires?

   I. climate change (hotter, drier summers)

   II. forest crowding

   III. increasing numbers of trees killed by the mountain pine beetle

   A. I and II

   B. I and III

   C. II and III

   D. I, II, and III

Section Assignment 5.5 Part A
Adaptations

1. A. In nature, what does it mean to be 'fit'? (1 mark)

   B. Briefly explain Darwin's theory of natural selection. You may find it helpful to illustrate your explanation with an example. (3 marks)

Read the paragraphs below describing two desert organisms. Then, please answer the question that follows.

> The cactus plant is able to survive in harsh, desert conditions because of its specialized adaptations. To minimize water loss, its leaves are reduced to the spines it is well known for. These spines also function to ward off animals looking for a juicy meal! The spines help ensure continued survival, growth, and reproduction. To make up for the loss of its leaves, the cactus uses its stem for photosynthesis.
>
> Another desert organism, the rattlesnake, also exhibits many specializations. To avoid the extreme temperatures of the hot, daytime sun, it spends its time in the shade where temperatures are cooler and less water is lost from evaporation. If it feels threatened, the snake shakes its rattle as a warning. The rattlesnake has also evolved to hunt more effectively. To minimize damage from struggling prey, the snake uses toxic venom to subdue its victim.

2. From the information provided, give one example for each type of adaptation listed below. Be sure to explain your choice for each example. (3 marks)
   A. structural adaptation
   B. behavioural adaptation
   C. physiological adaptation

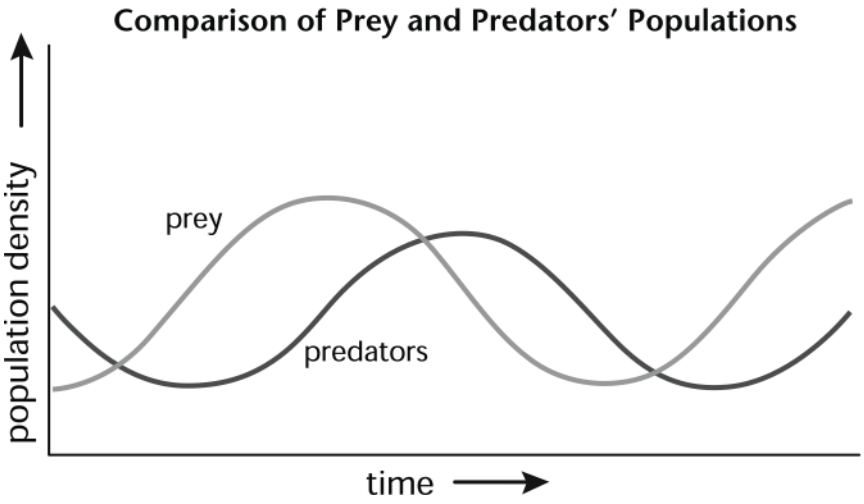
3. Use the predator prey cycle diagram to answer the following two questions.
   A. The increase in the prey population size occurs before the increase in the predator population size. Explain why this pattern occurs. (2 marks)
   B. Mark each of the following situations on the predator-prey cycle diagram. (4 marks)

      (1) Predators have a challenge capturing food when the prey numbers start to drop. The predator population declines.

      (2) Because of a reduction in predation pressure and increase in food availability, the prey numbers begin to increase.

      (3) Due to disappearing food supply and increase predation, prey numbers peak and begin to decline.

      (4) As prey numbers become more numerous, predator population begins to rise.


Comparison of Prey and Predators' Populations
population density
prey
predators
time

Marks
13

Section Assignment 5.5 Part B
Canada's Most Wanted!

You've learned about the problems that can occur when non-native species are introduced into an ecosystem. Invasive species can overrun habitat, introduce new diseases, consume other species' food sources, and just generally run amuck!

Most Wanted Poster:

In the Wild West, the Sheriff's office would post pictures of wanted criminals around town. These posters would include a brief description of the criminal, a picture, the crime they were wanted for, and often the amount of the reward.

For this assignment, the criminal is an invasive species!

Choose an introduced species that has become invasive in an ecosystem in Canada. You may choose one from Lesson 5.5B, or you may choose another species that you've heard about. You will create a "Most Wanted" poster for your selected species.

Have fun and be creative with this format, but be sure to include the following information:

- the name of the species
- a physical description of the species
- a picture or drawing of the species
- a map or description of the current areas occupied by the species
- a description of why the species is a threat (what "crime" has the species committed?)
- a description of what people should do if they encounter the species (management strategies to prevent further invasion)

You may want to start your research at the *Science 10 Web Site (http://www.openschool.bc.ca/courses/science/sc10/index/mod5.html)*.

Marking Guidelines

Marks	Description
8	Correct information is provided: • name (1 mark) • description (2 marks) • picture (1 mark) • location occupied (1 mark) • threat posed (2 marks) • management strategies (1 mark)
2	Poster is neat, organized and aesthetically pleasing

Marks
10

Section Assignment 5.5 Part C
Struggle for Survival Matching

Match the following terms to their definition.

1. the role and position of an organism in an ecosystem _____
2. a species that is not native to an area and is brought in by human actions _____
3. a species that first populates a region after a natural disaster _____
4. species that occur naturally in a particular area _____
5. diversification of a species as it adapts to different ecological niches _____
6. type of organism interaction where one species feeds on another species (or rarely, on a member of the same species) _____
7. the gradual change of plant and animal communities over time _____
8. group of plants and animals that is best able to exploit the environment in which it exists: it is the end product of succession _____
9. the disappearance of a species or a group of species _____
10. knowledge of an environment gained from generations of living and working within that environment _____

a. adaptive radiation
b. climax community
c. ecological succession
d. extinction
e. indigenous species
f. introduced species
g. niche
h. pioneer species
i. predation
j. traditional ecological knowledge

Marks
5

Section Assignment 5.5 Part D
Change in Ecosystems

1. Pioneer organisms are usually hardy plants such as lichens, mosses, or grasses. Why is this characteristic of pioneer organisms so important? (1 mark)

2. Use the information below to answer this question.

> Humans impact the environment in many ways. One example is the habitat degradation caused by replacing tropical rainforests with open pasture or farmland. The trees of a tropical rainforest are the dominant plant-life. They act as an anchor for the stability of numerous rainforest organisms. The elimination of these trees also eliminates the infrastructure needed by numerous species to live. For example, ferns depend on the shade provided by large trees. Without this protection from direct sunlight, the fern is no longer able to survive.

From the information provided:

A. list two factors that are changing

B. state whether each factor is abiotic or biotic

C. briefly describe the impact(s) of the changing factor

You may use the table below for your answer.

Changing Factor	**Abiotic or Biotic?**	**Impact(s) of Change**

3. Answer the following questions based on the video "The Burning Question: Mountain Pine Beetle and Fire in our Forests" located on your *Science 10 Media CD*.

   A. Describe how forest fires are linked to the Mountain Pine Beetle Outbreak. (2 marks)

   B. What ecological role did Mountain Pine Beetles play in a forest prior to fire suppression? (1 mark)

   C. What is prescribed burning? How can it be used to restore the ecological balance in a pine forest? (2 marks)

4. Use the information below to answer this question.

> First Nations peoples have been farming shellfish for food for hundreds of years. Clam gardens can be found in bays and coves all over the central coast of BC. Some gardens mark long-abandoned village sites, but many are still in use and maintained on a regular basis. In many cases, if you didn't know what you were looking at, you might not even realize that it was a human-made structure.
>
> While simple, the structure of a clam garden shows keen knowledge of the local environment and of the preferred habitat of clams. Carefully placed stones and boulders create a short wall at the lowest-tide level of a bay. The water runs over the wall, carrying nutrients and sediment. The sediment builds up on the inside of the wall, but remains light and "fluffy"—an ideal habitat for clams. The nutrients allow the clams to thrive and multiply.
>
> The lowest tides occur in summer and winter seasons. At these times, the clam gardens are fully exposed, and can be easily harvested. Since harvesting in the summer carries higher risk of red-tide poisoning, harvesting is carried out mostly in the winter. Clams are often dried for easy storage, and then used throughout the year.

A. Aboriginal shellfish farmers have extensive knowledge about their environment. From the information provided, list four examples of this ecological knowledge. (2 marks)

B. First Nations' clam gardens have been described as a centuries-old, sustainable industry. Explain, using your understanding of sustainability and traditional ecological knowledge, why clam gardens have been described in this way. (4 marks)

Marks
15

Module 5 Project—Great Bear Rainforest Land-use Recommendations

As the newly appointed advisor to the Minister of Environment, you must prepare a report presenting your recommendations for land use in the Great Bear Rainforest. You will have to listen to the stakeholders, do some research, and come up with a set of recommendations based on your knowledge.

The following information outlines the expectations, format, and marking criteria for this project. Be sure to read through the information carefully.

Purpose

Using the information from the stakeholders in the media piece as a starting point, you will establish a set of recommendations for land use in the Great Bear Rainforest. You must also provide the rationale for your set of recommendations.

Goals of the Recommendations

Your land-use recommendations must meet the following goals:

- Balance all stakeholders' interests
- Promote environmental sustainability
- Ensure economic sustainability

Things to Consider

Your report or presentation must clearly demonstrate how you plan to meet the above three goals. In order to address these goals, you should consider the following points:

- What are the ecological impacts of industrial, commercial, or residential development?
- How much land should be available for development? Why?
- What are the economic impacts of environmental protection?
- How much land do you recommend protecting? Why?
- Are there specific areas that are more suitable for development? Why?

- What specific recommendations would you give (if any) about the types of development that should be allowed? Are there specific practices that should be encouraged? Discouraged?
- How should stakeholder interests be balanced?

Research Steps and Guidelines

You will be expected to conduct research for this project.

1. You must complete *Module 5: Sustainability of Ecosystems* so that you have an understanding of the complex interactions within ecosystems. As you go through the module, think about how the content relates to the issues in the Great Bear. You will incorporate this knowledge into your final report.

2. You will have to do research using material from other sources. Though the media piece contained fictional people and organizations, the issues were based on real events. There is lots of information out there related to this topic. You may want to start at the *Science 10 Web Site* (*http://www.openschool.bc.ca/courses/science/sc10/index/mod5.html*). You could also check out newspaper articles, archived news reports, etc.

Format

Your recommendations can be presented in any one of a variety of formats. You may want to write a formal report (500 words), prepare a video presentation, a podcast, or create a slideshow. Be sure to check with your teacher for acceptable formats.

Whatever format you choose, you must provide a list of your resources.

Marking Criteria

See the rubric on the next page for detailed marking criteria. (20 marks)

Marks
20

Module 5 Project Rubric

	4 - Excellent	3 - Good	2 - Satisfactory	1 - Unsatisfactory
Research and credits	Research is extensive and thorough. Materials are carefully chosen; multiple, diverse sources are used. Resources are listed without error.	Research is thorough. Several, well-selected sources are used. Resources are listed with minimal errors.	Minimal research has been done. Few sources are used. Some resources are listed.	No resources are listed.
Recommendations meet desired goals and are realistic	Several detailed recommendations are made. Recommendations are relevant and meet desired goals.	Some recommendations are made. Recommendations are mostly relevant and meet the desired goals.	Some recommendations are made but lack relevance and/or do not meet all desired goals	Few recommendations are made.
Supporting evidence	Factual evidence clearly supports all of the recommendations. Evidence given is detailed.	Factual evidence supports most of the recommendations. Evidence given is sufficient.	Recommendations are not all supported by factual evidence. Evidence given is very limited.	Factual evidence is not presented or does not connect to recommendations.
Organization	Ideas are presented logically, leads the audience to a thorough understanding of the rationale supporting the recommendations.	Most ideas are presented logically. Minor flaws in organization do not detract. Rationale is clear.	Most ideas flow from one to another. Organizational problems prevent audience from fully understanding the rationale supporting the recommendations.	Ideas presented in no particular order. Lack of organization detracts from the report/ presentation.
Overall impact	Writing is exceptionally proficient. Arguments are rational and persuasive. Position is clear and consistent.	Writing is proficient. Arguments are rational. Position is stated and is mostly maintained.	Writing is acceptable. Arguments are either limited or lack persuasiveness. Position is stated but is not maintained.	Writing does not meet expectations. Arguments are unclear or missing. Position is unclear or missing.