

Biology AMI

Biology Student,

My AMI packet for you consists of science news/research articles with analysis questions. Please read the article for the appropriate AMI day and answer the questions on the space provided or a separate sheet of paper (some articles do not leave much room for answering). Answers need to be complete. Restating is not necessary but answers should be in proper sentence form. Don't forget to put your name on your work. I don't anticipate these assignments to take you more than 20 minutes to complete. Each AMI assignment will be due the day you return from corresponding snow day. Leave the rest of your packet at home. If you need help shoot me an e-mail. I hope you enjoy your snow day (spend some time outside). 😊

Mrs. Donaldson

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- AMI Day 1:** *How Do Carbon Dioxide Levels in the Atmosphere & Photosynthesis Vary by Season and Latitude?*
- AMI Day 2:** *Invasive Species Cost the World Billions a Year*
- AMI Day 3:** Microplastics are Showing Up in Mount Everest's Snow
- AMI Day 4:** Electric Eels' Zaps Are More Powerful Than a Taser
- AMI Day 5:** The Nutrients from Sewage May Harm Coastal Ecosystems

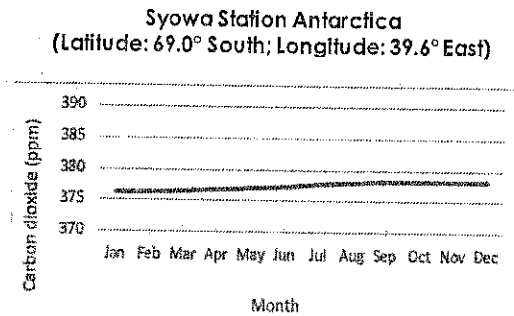
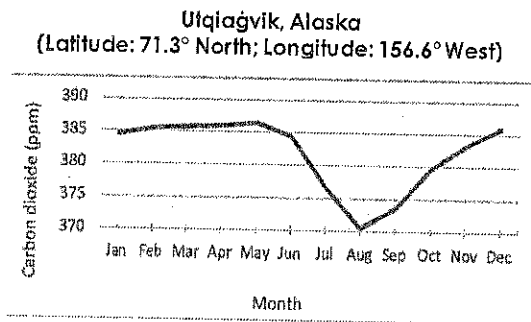
Student Handout 2: How Do Carbon Dioxide Levels in the Atmosphere and Photosynthesis Vary by Season and Latitude?

Study the figures in each section and answer the questions that follow.

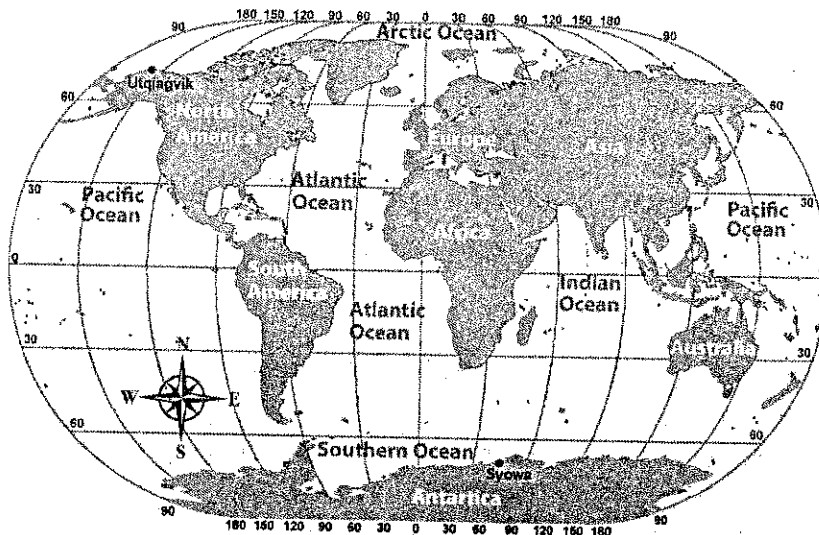
A. Seasonal Changes in Atmospheric Carbon Dioxide

These graphs show monthly carbon dioxide concentrations in the atmosphere, averaged over four years (2003–2006). The data represent Utqiagvik (formerly Barrow), Alaska, in the northern hemisphere and Syowa Station, Antarctica, in the southern hemisphere.

Monthly Average Carbon Dioxide Concentrations



Data from NOAA's Earth System Research Laboratory Global Monitoring Division. Credit: © OpenStreetMap, Environmental Systems Research Institute, Inc. (Esri). Data: USGS, NOAA.



Credit: Image via Wikimedia Commons/djexplo

1. Fill in the table based on your observations of the graphs.

	Utqiagvik, Alaska	Syowa Station, Antarctica
Highest CO ₂ (month)		
Lowest CO ₂ (month)		
Approximate range in CO ₂ levels (ppm)		

2. How do CO₂ levels change throughout the year at each location?

B. Seasonal Changes in Photosynthetic Activity

Net primary productivity (NPP) is a measure of photosynthetic activity. This table shows how NPP of plants on land and phytoplankton in the ocean changes throughout the year. Net primary productivity is measured in gigatons of carbon (GtC).

Global Net Primary Production:
Land vs. Ocean

Season	Land NPP Gigatons of Carbon (GtC)	Ocean NPP Gigatons of Carbon (GtC)
April to June	15.7	10.9
July to September	18.0	12.0
October to December	11.5	12.3
January to March	11.2	11.3

Adapted from Field, C. B., et al. (1998). Primary production of the biosphere: integrating terrestrial and oceanic components. *Science*, 281: 237-240.

1. Compare photosynthetic activity on land and in the ocean. How does the pattern of photosynthetic activity differ between the two?
2. What is the total NPP for the ocean and land combined?
Global NPP (all months) = _____

3. The ocean and land each make up approximately what percentage of the total NPP?

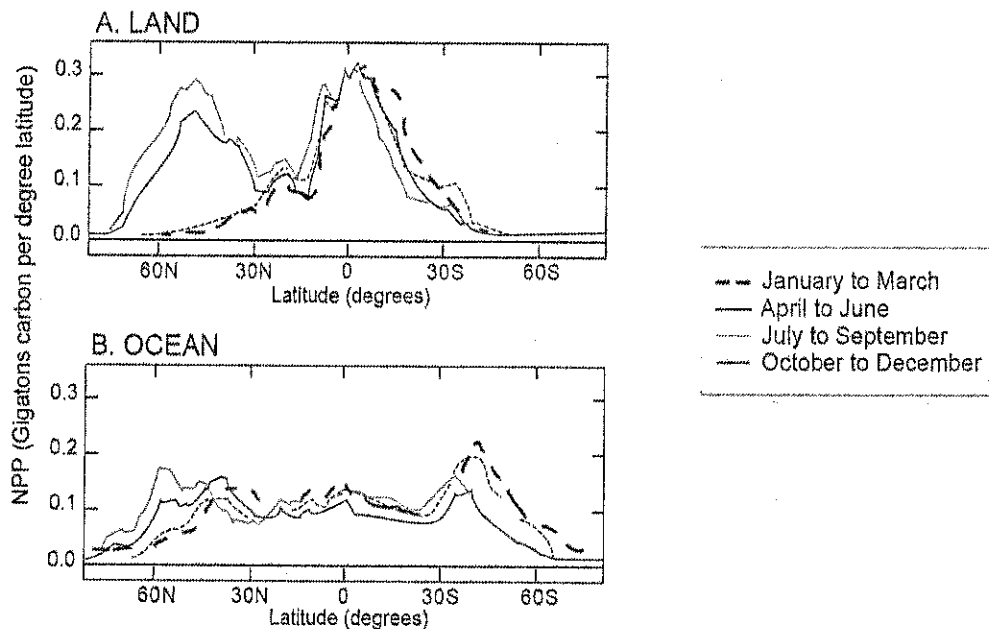
Land = _____ % global NPP

Ocean = _____ % global NPP

C. Latitudinal Variations in Photosynthetic Activity

These graphs show how net primary productivity (NPP) varies by distance from the equator, or degree latitude. 0 = equator; 90N = North Pole; 90S = South Pole (refer to the map in Part A). Note that in the graphs below, the x-axis shows north to the left and south to the right.

Latitudinal Distribution of Global NPP



Adapted from Field, C. B., et al. (1998). Primary production of the biosphere: Integrating terrestrial and oceanic components. *Science*, 281: 237–240.

- What does the x-axis represent?
 - What is the unit?
 - What do the leftmost and rightmost points of the x-axis represent?
- What does the y-axis represent? What is the unit?
- At what latitudes and time of year is the land most productive?

Latitudes: _____ Time of year: _____

4. At what latitudes and time of year is the ocean most productive?
Latitudes: _____ Time of year: _____
5. Based on graphs A and B, is land NPP or ocean NPP observed over a greater range of latitudes? Support your answer with evidence.
6. Summarize how land NPP and ocean NPP differ by season and latitude.

D. Putting It All Together

Construct an explanation for why the seasonal patterns of CO₂ levels observed at Utqiagvik, Alaska, and Antarctica are so different. Support your claim with evidence and reasoning.