Introduction: Organisms in an Ocean Ecosystem

A group of scientists is studying organisms in an ocean ecosystem. They show you three pictures of the organisms they see.

- Right whales grow to be about 15 meters (m) long. That is about the length of a tractor-trailer.
- Fish larva are young fish that just hatched from an egg. They are only a few millimeters (mm) in length, which is smaller than a sesame seed.
- Algae are plants that live in the ocean. They are smaller than the period at the end of this sentence.

Scientists’ Observations: Flow of Energy and Matter

The scientists watch the right whales eating the fish larva as they swim in the ocean. They also watch the tiny fish larva eating algae as they swim in the ocean. More fish larvae are found in areas of the ocean that have more algae.

Question 1. Which statements explain what happens when right whales eat the fish larva as they swim in the ocean? Select the three correct answers.

A. Whales get matter they need to grow.
B. Whales get energy they need to swim.
C. Energy is transferred from the whales to the fish larva as the whales eat.
D. Energy and matter are transferred from the fish larva to the whales as the whales eat.
E. Matter is transferred from the water to the whales and the fish larva as the whales eat.
**Question 2.** The scientists want you to model the flow of energy and matter through the ecosystem as fish larva eat the algae. The scientists have a diagram showing the Sun, fish larva, and algae.

Complete the model by drawing **two** arrows to show how energy flows among the Sun, the fish larva, and the algae. The arrows should point in the direction energy flows.
Question 3. The scientists add both air and water to the model. They add arrows to show the direction in which matter and energy flow among the different parts in the model. They want you to label each arrow to show if the arrow represents only the flow of energy, only the flow of matter, or the flow of both energy and matter.

Label each arrow to show what it represents by writing one of the following in each box:
- Energy Only
- Matter Only
- Both Energy and Matter
Global Seasonal Changes in Energy and Matter

The diagram below shows how the amount of algae in the ocean changes from January to June. The arrows show where sunlight is more direct during each season. Areas where the sunlight is more direct receive more sunlight. In January, the sunlight is more direct in the Southern Hemisphere. In June, the sunlight is more direct in the Northern Hemisphere.

**Global Seasonal Changes**

**January**

- Equator
- Southern Hemisphere
- Sunlight

**June**

- Northern Hemisphere
- Equator

**Key**

- Algae:
  - low
  - high

**Question 4.** Which statement explains what the diagram shows about algae?

A. Algae move toward the Northern Hemisphere throughout the year.
B. Algae move away from places where there is too much energy from the Sun.
C. Algae grow in both hemispheres at the same rate throughout the year.
D. Algae grow better in places where they have more energy from the Sun.
Seasonal Changes in Energy and Matter in the North Atlantic Ocean

The scientists made the maps below to show how the amount of algae in the North Atlantic Ocean changes from February to March to April and to May. The location of Delaware is shown on each map.

**Algae in the North Atlantic Ocean**

![Maps showing seasonal changes in algae](image)

**Key**

Algae:  
- low
- high
Question 5.

Part A
Based on the information in the four maps, when will the scientists most likely find whales near Delaware?

A. February  
B. March  
C. April  
D. May  

Part B
Which statements explain why scientists are most likely to find whales near Delaware in the month you selected in Part A?

Select the three correct answers.

A. Less sunlight is available near Delaware during that month.  
B. More energy is available for algae near Delaware during that month.  
C. More matter is stored in algae near Delaware during that month.  
D. Less energy is stored in algae near Delaware during that month.  
E. More matter is available for whales near Delaware during that month.
**Fall Migration**

Right whales migrate along the coast as the amount of energy and matter in an area changes.

The diagram below shows the location of the whales during the summer, their path as they migrate south in the fall, and their location during the winter. The whales are much bigger when they leave their summer location than when they first arrived. Their bigger size helps the whales migrate during the fall.

**Fall Migration of Right Whales**

![Fall Migration Diagram of Right Whales](image-url)
**Question 6.** Use your knowledge of energy and matter to construct an explanation of why the whales are much bigger at the end of summer than when they first arrived. Support your explanation with evidence from the diagram.