

INTERMEDIATE SCIENCE
Grade 8



Scientific Literacy Assessment
June 2011

Student Name: KEY

Homeroom: _____

Data Analysis

Read the following situation and answer all questions in the space provided.
(10 points)



Scientists are able to measure water temperatures below the surface the ocean or a lake using a device called a bathythermograph. The bathythermograph is an electronic sensor that keeps track of the various temperatures of water at different depths between the surface and the bottom of a body of water. Warm water tends to be less dense and floats on the top of the water, where it is heated by the sun. Cold water is denser and sinks to the bottom of the body of water.

Marine biologists decided to use a bathythermograph to measure the temperature of the ocean at different depths off the coast of Florida. The table below shows the data that was collected.

IVx DVy

Depth of Water (m)	Temperature (°C)
0	21
3	20
6	18
9	15
12	11
15	7
18	5



Figure 1: Bathythermograph

1. State the suitable hypothesis to be tested in this experiment. (1)

I think shallower water will be (warmer/cooler)
and deeper water will be (cooler/shallower)

2. In this experiment, identify the independent (manipulated) and dependent (responding) variables. (1)

Independent (manipulated): Depth of water

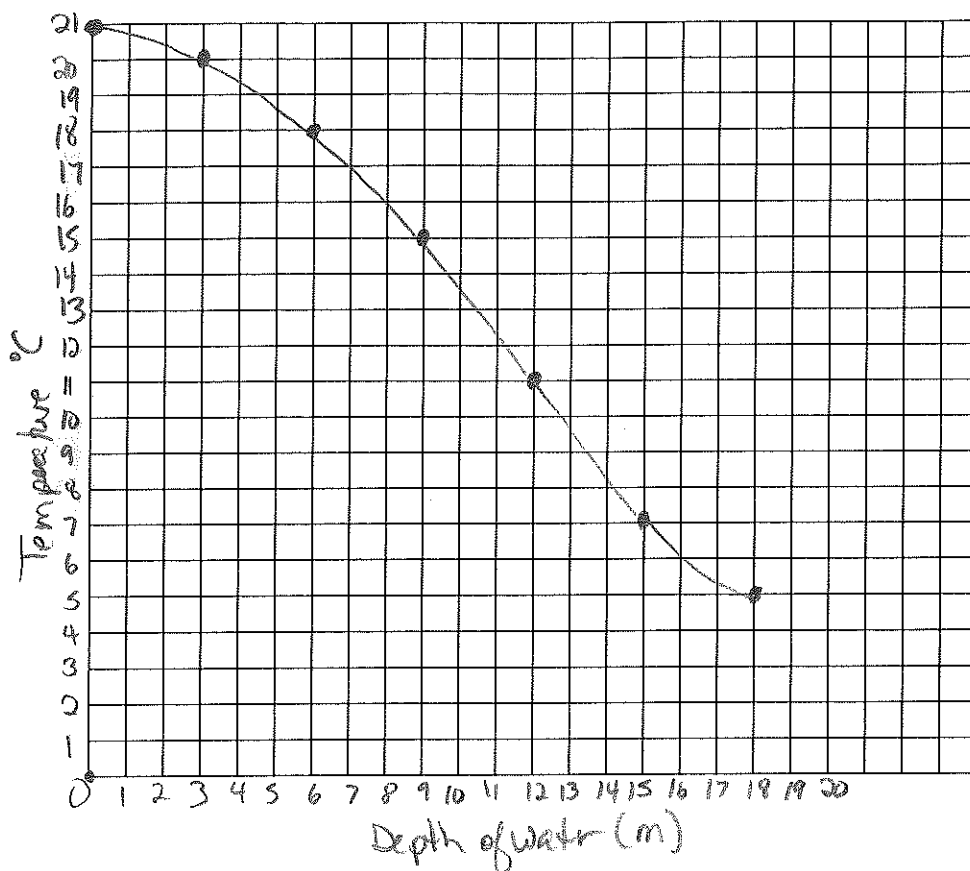
Dependent (responding): Temperature

3. State two (2) variables which have to be kept constant (controlled) in order for the results to be valid. (1)

Same body of water, same time of year,
same measuring equipment

4. Plot a fully labeled line graph of the data obtained in this experiment on the grid below. (4)

Title: Depth vs. Temperature



5. Predict the temperature of the water at a depth of 10 meters. (1)

13 or 14 meters

6. What is the depth of the water when the bathythermograph shows a temperature reading of 17 °C? (1)

7m

7. State a suitable conclusion for this experiment. (1)

The deeper the water, the colder it is,
The shallower the water, the warmer it is,

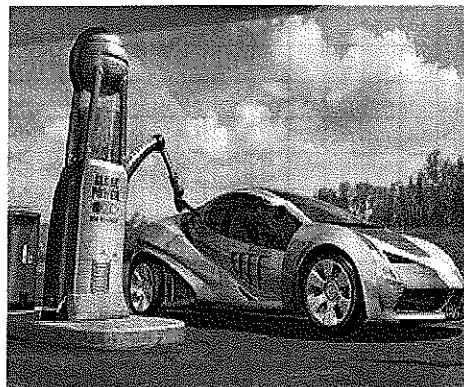
Case Study I: Algae as a Source of Hydrogen Fuel

Read the following case study and answer the questions that follow. (10 points)

As gas prices continue to soar, motorists are crying out for less expensive fuels that will allow them to keep using their cars. Scientists from around the world are conducting research that is working to chemically change **algae** to produce the next generation of renewable fuels. They are specifically looking at how hydrogen gas can be used in vehicles that would contain new hydrogen fuel cells.

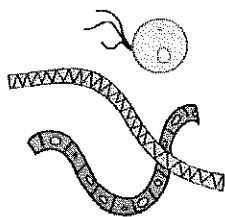
"We believe there is an important advantage in looking at the production of hydrogen by **photosynthesis** as a renewable fuel," said a senior chemist. "Right now, **ethanol** is being produced from corn, but generating ethanol from corn is a much more inefficient process."

Some types of algae contain an **enzyme** called hydrogenase that can create small amounts of hydrogen gas. Many believe this is used by nature as a way to get rid of excess chemicals that are often produced under high light conditions.



Scientists are trying to find a way to take the part of the enzyme that creates hydrogen gas and introduce it into the photosynthetic process. The result would be a large amount of hydrogen gas being produced by algae, possibly equal to the amount of oxygen gas created by photosynthesis. "Biology can do it, but making it at 5-10 percent of usable material is the problem," said a scientist.

Using algae has several benefits over corn in fuel production. Researchers say that algae can be grown almost anywhere, from deserts to rooftops. There is also no competition for food or fertile soil. Algae could also be considered easier to harvest because it has no roots or fruit and it grows in water. "If you have **terrestrial** plants like corn, you are restricted to where you could grow them," said the scientist.



Algae

The researchers point out that there is a problem in some areas of the world with crops being used for fuel competing with those being used for food because they are both using the same space. Algae can provide an alternative to this as they can be grown anywhere. Scientists are also experimenting with a "photobioreactor" which is similar to a **fermentor** that you could move to any location and allow algae to grow.

(Adopted from Science Times online: Volume 68 – Version C)

Glossary

Algae: a plant-like organism that lives in water and can make food by photosynthesis

Enzyme: a chemical that speeds up or slows down a chemical reaction

Ethanol: a type of fuel produced by some plants

Fermentor: a device that allows microorganisms to grow

Photosynthesis: a process that converts carbon dioxide and water into oxygen and sugar using energy from the sun

Terrestrial: refers to things from the land or the Earth

1. What is the name of the enzyme scientists are trying to remove from algae to create small amounts of hydrogen gas? (1)

1. C

- A. Algaecide
- B. Fermentor
- C. Hydrogenase
- D. Photosynthesis

2. What type of fuel is currently being produced from corn? (1)

2. A

- A. Ethanol
- B. Hydrogen
- C. Nitrogen
- D. Petroleum

3. Why are scientists conducting research on the use of algae as a fuel source? (1)

looking for renewable fuel source or less expensive fuel

4. What are two (2) advantages of using algae over corn as a future source of fuel? (2)

Any 2 of these answers are good.

- i. Generating ethanol from corn is very inefficient
- ii. Algae produces large amounts of Hydrogen gas
- iii. Algae can grow almost anywhere
- iv. No competition for fertile soil, easier to harvest, not restricted in where you grow it b/c no roots or fruit, it grows in water

5. What is a major concern in parts of the world with using crops as an alternative fuel source? What are scientists trying to do to solve this problem? (3)

crops for fuel vs crops for food - competition in areas where food is scarce, they are competing for growing space. Algae can be grown anywhere. Scientists are working on a "photobioreactor", similar to a fermentor that you could move anywhere + grow algae.

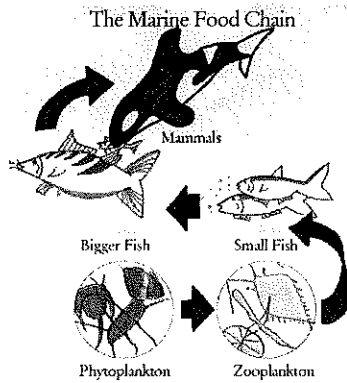
6. List two (2) alternative sources of energy that could be used to decrease our dependence on oil and gas in our daily lives. (2)

Solar, wind, tidal, hydroelectricity, nuclear etc.

Case Study II: Ocean Warming May Lead to an Increase in Sea Life

Read the following case study and answer the questions that follow. (10 points)

According to a new study, warmer ocean temperatures could mean dramatic changes in underwater **food webs** and in the amount of marine life. Until now, little has been known about how changes in temperatures might affect the total growth of all marine **consumers** (such as animals, fungi and bacteria) compared to their **prey** (including algae and plants).



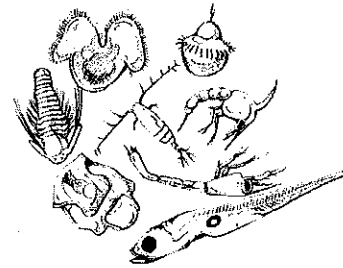
The study looked at a simple underwater **food chain** and how temperature changes affect organisms' growth. In warmer temperatures, growth happens faster, so the need for food and nutrients increases with increased water temperature.

Researchers placed tiny **zooplankton** and **phytoplankton** in small containers and **incubated** them at different temperatures. The phytoplankton were also exposed to high and low amounts of energy. The results suggest that higher temperatures could lead to an increase in the number of consumers in the ocean but a decrease in the overall **mass** of living creatures in the sea.

Scientists have said that the findings have impacts for how marine and other ecosystems might respond to global warming: "Small changes in ocean temperature, like those expected with climate change or even just a warmer summer, have different effects on marine consumers and their food supply," she said.

"This means we may be able to understand some important consequences of ocean temperature change before we go out and study temperature effects on every single species."

Ocean temperature averages about 30°C in the tropics and 2°C in the polar regions. Ocean temperatures also vary between summer and winter months. Current climate models predict ocean temperatures will rise between 2°C and 7°C in different parts of the world over the next 100 years. In fact, increases of 1°C to 4°C have already been observed. All of these types of changes would dramatically affect the food chains of the ocean, said one researcher.



Zooplankton

(Adapted from Science Times online, Volume 72, Version C)

Glossary:

Consumer: an organism that eats other plants and animals

Food Chain: a group of organisms connected together based upon their feeding habits

Food Web: all of the interactions between organisms in an ecosystem

Incubate: to keep at a specific temperature

Mass: a large amount or number

Phytoplankton: tiny plants that live in water and produce food by photosynthesis

Prey: an organism that is eaten by other plants and animals

Zooplankton: tiny animals that live in water and are consumers

1. Current climate models predict that ocean temperatures will rise by how many degrees over the next 100 years? (1)

1. D

- A. 2°C
- B. 30°C
- C. Between 1°C and 4°C
- ☒ D. Between 2°C and 7°C

2. What is the average ocean temperature in polar regions? (1)

2. B

- A. 1°C - 4°C
- ☒ B. 2°C
- C. 2°C - 7°C
- D. 30°C

3. Identify two (2) types of organisms that were involved in the study and identify the roles they play in a **food chain**. (2)

i. Zoo plankton - consumers

ii. phytoplankton - producers - produce food by photosynthesis

4. What do the results of the study suggest? (2)

Higher temps could lead to more consumers but a decrease in overall mass of living creatures in the ocean.

5. According to scientists, what are two (2) benefits associated with studying the effects of temperature on the growth of marine organisms? (2)

Can find out how ecosystems react to global warming, we can understand consequences of ocean temperature change before we go out & study every single species.

6. In your opinion, what are two (2) things an individual can do to help fight global warming and its effects on the environment? (2)

walk more, use less fossil fuels etc.