Grade 10 NTI Day #3 Biology

Assignment: Please read the following excerpt, then answer the questions below.

Science in Context

LESSON 1.2

KEY QUESTIONS

- *What attitudes and experiences generate new ideas?*
- *Why is peer review important?*
- *What is the relationship between science and society?*
- *What practices are shared by science and engineering?*

The testing of ideas is the heart of science and engineering. In their quest for understanding, scientists engage in many different activities: They ask questions, make observations, seek evidence, share ideas, and analyze data. These activities are all part of the dynamic process of science.

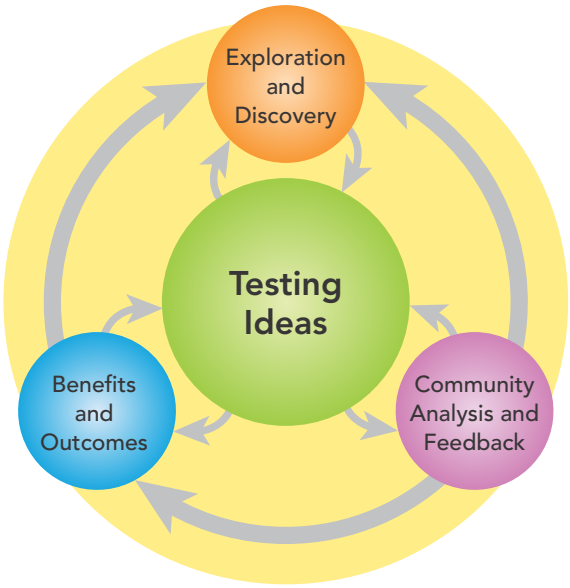
The process of science typically consists of the components shown in **Figure 1-4**. Notice that the parts of the process do not proceed in a linear fashion. Real science usually involves many activities that loop back on themselves, building up knowledge as they proceed. In fact, science is at its heart a creative endeavor. Scientists take many different paths through the process depending on the questions they are investigating and the resources available to them.

VOCABULARY

bias

READING TOOL

Before you read, study **Figure 1-4**. As you read, list examples of each of the different aspects of science in the table in your **Biology Foundations Notebook.** Then use **Figure 1-9** to add examples for engineering.



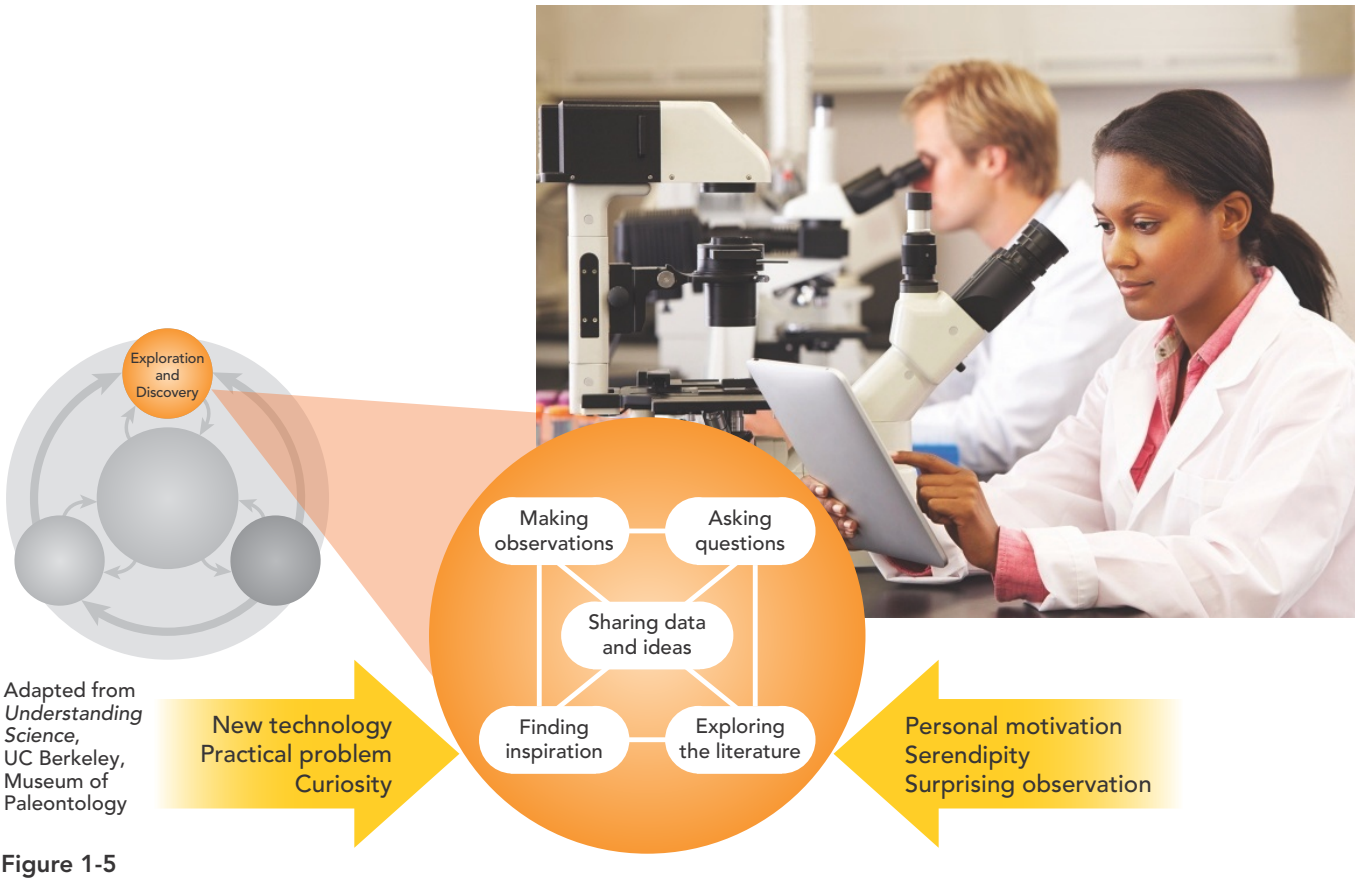
Adapted from *Understanding Science*, UC Berkeley, Museum of Paleontology

INTERACTIVITY

Figure 1-4

The Process of Science

As the arrows indicate, the different aspects of science are interconnected—making the process of science dynamic, flexible, and unpredictable.



Adapted from *Understanding Science*, UC Berkeley, Museum of Paleontology

Figure 1-5

Exploration and Discovery

Ideas in science can arise in many ways—from simple curiosity or from the need to solve a particular problem. Scientists often begin investigating by making observations, asking questions, talking with colleagues, and reading about previous experiments.

READING TOOL

Copy one of the concept maps in this lesson. Then, add specific examples to illustrate the processes it describes.

Exploration and Discovery

Usually, the testing of ideas begins with observations and questions. Those observations and questions come from a variety of different sources, as shown in **Figure 1-5**.

Scientific Attitudes Good scientists share scientific attitudes, or habits of mind, that lead them to exploration and discovery.

Curiosity, skepticism, open-mindedness, and creativity help scientists and engineers ask new questions and define new problems.

Curiosity A scientist may look at a salt marsh and ask, "What's that plant? Why is it growing here?" Previous studies can spark curiosity and lead to new questions. Engineering problems often arise from practical issues involving humans and health or environmental issues.

Skepticism Scientists and engineers should be skeptics who question existing ideas and hypotheses, and refuse to accept explanations without evidence. Scientists often design new experiments to test hypotheses proposed by other scientists. Engineers work to solve problems in the physical world using scientific thinking.

Open-Mindedness Scientists and engineers should be open-minded, meaning that they are willing to accept different ideas that may not agree with their hypotheses.

Creativity Creativity and critical thinking are essential for asking questions, defining problems, proposing hypotheses, and designing experiments that yield accurate data.

Practical Problems Ideas for scientific investigations often arise from practical problems involving humans and health or environmental issues. Salt marshes, for example, are vital nurseries for commercially important fish and shellfish. Yet salt marshes are under intense pressure from agriculture and from development. An engineer might wonder, "How would nearby construction affect the marsh and how can that impact be minimized?"

New Technology New technology often opens new ways of asking questions for both scientists and engineers. For example, portable, remote data-collecting equipment enables field researchers to monitor environmental conditions around the clock, in several different locations at once. This information allows researchers to pose and test new hypotheses.

READING CHECK **Describe** Describe a "fact" that you have heard or read that made you skeptical. Explain your reasons for doubt.

VIDEO

Listen to scientists discussing their work in extreme environments.

Community Analysis and Feedback

Scientists often collaborate in groups and communicate with other research groups. In order for research to be accepted, however, it must be officially shared with the scientific community. The communication must follow a variety of rules that ensure it is scientifically appropriate. Some of the steps that scientists use when communicating their results are shown in **Figure 1-6**.

Scientists also share their work with the general public, especially when the results or information could benefit society. This communication is less formal, and can take the form of a newspaper or magazine article, television program, or blog post.

Figure 1-6

Community Analysis and Feedback

Communication is an important part of science. Scientists review and evaluate one another's work to ensure accuracy. Results from one study may lead to new ideas and further studies.

Adapted from *Understanding Science*, UC Berkeley, Museum of Paleontology

Assignment: Science in Context

Multiple Choice (Choose the correct answer for each question)

1. **Which of the following scientific attitudes leads scientists to ask new questions and explore new ideas?**
   a) Skepticism
   b) Open-mindedness
   c) Curiosity
   d) Creativity
2. **Why is skepticism important in scientific research?**
   a) It prevents new discoveries
   b) It leads scientists to test hypotheses and demand evidence
   c) It encourages acceptance of all ideas
   d) It limits the scope of experiments
3. **What is the role of peer review in science?**
   a) To ensure that research is published quickly
   b) To provide personal opinions on research
   c) To evaluate and ensure the accuracy and validity of scientific work
   d) To generate new hypotheses based on published research
4. **Which of the following is an example of how technology can influence scientific research?**
   a) A scientist questioning the existence of gravity
   b) New data-collecting equipment allowing researchers to monitor multiple locations
   c) Engineers working on construction projects
   d) A blog post describing a personal experience with scientific discovery
5. **What is one way scientists can share their research with the general public?**
   a) By publishing in peer-reviewed journals
   b) By designing new technologies
   c) By writing a magazine article or blog post
   d) By running controlled experiments
6. **Which scientific attitude helps scientists remain open to ideas that do not support their hypotheses?**
   a) Skepticism
   b) Creativity
   c) Open-mindedness
   d) Curiosity

Short Answer

7. **In one to two sentences, explain why communication and feedback are critical components of the scientific process.**