



OPEN SCHOOL BC

Science and Technology 11 Introduction Assignment

This assignment is intended to familiarize you with the connection between science and technology. This is the first assignment in this course, so complete it with care.

Student Name _____

Student No. _____ Date _____

Address _____ Postal Code _____

Complete the following *Science and Technology 11* Assignment independently and return it to your teacher based on the instructions provided by your school. You do not need any external resources to complete this assignment.

There are three parts to this assignment:

Part A: Multiple Choice	5 marks
Part B: Identification	9 marks
Part C: Short Answers	11 marks

Contents:

9 pages

Assignment time:

1 hour

Before you start, read these important tips.

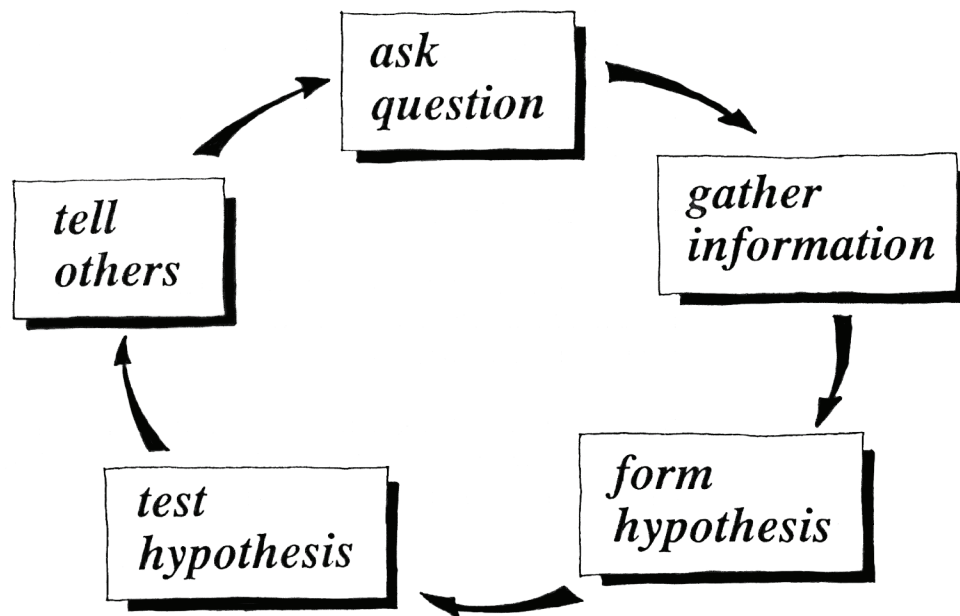
1. Read each question carefully before answering.
2. Answer all questions to the best of your ability.
3. Take your time. Check your work before handing in the assignment.
4. Write neatly and check your spelling.

Science vs. Technology

Read the information provided then answer the questions at the end. (25 marks)

For the most part, Canada's ideas about science have been inherited from the traditions of Western Europe. In the Middle Ages (around 1300) in Western Europe, it was generally believed that knowledge was something that you got from reading the works of those who had gone before you. If a monk read that worms created themselves from dirt (yes, it was an accepted theory!), he would accept it as fact, without feeling the need to find out if it was true or not.

Around 1500, however, things changed. People began to question old theories and test things out according to an organized method of scientific investigation.



The basic principle of scientific investigation is that you never know for certain that you've discovered the truth—you must always be open to new information.

The Hypothesis

The *hypothesis* is the scientist's best guess answer to the question. After collecting information on what others might have found out about the subject, the hypothesis is usually tested with an experiment.

The Experiment

In order to make certain that the results of the experiment are as accurate as possible, scientists have developed standard rules about how an experiment must be conducted. You are probably familiar with some of these rules from experiments you've done in other science courses.

All experiments follow these same general rules:

1. The procedure must consist of steps that someone else can copy exactly.
2. Only one variable (conditions that might affect the results) may be changed at one time. All other variables must be controlled or recorded.
3. All observations must be accurate, reliable, and complete.

Facts and Laws

Fact is one of the hardest little words to define. In scientific terms, we can say a fact is an accurate, reliable observation. A fact is a fact, even if it occurs only once.

If the same conditions always produce the same observations, we can construct a scientific *law*. A law is a description of the regular behaviour of the natural world.

Theories

A *scientific theory* is a general explanation for a large number of related facts and laws. A theory will stand until something comes along to prove it incorrect. Theories that have been around for a long time are called *scientific principles*.

Scientific Investigation: An Example

In the 1820s, a Swedish professor named Jakob Berzelius was the big authority on chemistry. He did a lot of work in identifying different chemicals and combinations of chemicals (called compounds). Berzelius came up with the idea that it would be impossible to make an organic (living) compound from inorganic (non-living) chemicals.

Berzelius taught a lot of people about chemistry, including a German teenager named Friedrich Wöhler. Wöhler accepted Berzelius's idea that it would be impossible to make an organic compound from inorganic chemicals. He went along many years thinking this was true. One day, however, when Wöhler was twenty-eight, he was experimenting with inorganic chemicals in his laboratory when he accidentally made urea—something he believed could only be made by animal or human kidneys.

Being a scientist, Wöhler conducted a couple more experiments to make sure there wasn't a mistake in his work. Then he shared his findings with other scientists. The other scientists found, by following Wöhler's instructions, they could also make urea. Everybody began making different kinds of organic compounds, and chemists eventually came up with a new theory—that life is based on compounds that include the chemical carbon. Wöhler made the big discovery, but his discovery wouldn't have been possible without the early work of Berzelius.

Technologies

Look around you. What products do you see? Is there paper? A computer? A pen or pencil? Is there a clock nearby? A doorknob? Each of these is a technology.

Unlike scientific investigation, there are no rules or key steps for how to invent a new technology. A new technology may be the result of years of scientific research or it may be an idea inspired by a lucky accident. For example, the microwave oven was invented after an engineer working on a radar system discovered the microwaves melted the chocolate bar in his pocket.

Accident or planned, we can say that most technologies are developed by people who are willing to think a little, and are willing to try a few different solutions to a problem.

MARKS

Questions**Part A: Multiple Choice (5 marks)**

Put the letter of the correct answer in the parentheses to the right.

1. Which of the following are theories?
 - a. The difference between organic and inorganic things is a mysterious life force.
 - b. All life is based on carbon.
 - c. Both of the above ()
2. Wöhler first made urea by accident. He was able to make urea again because:
 - a. he kept trying, and hit upon the right combination a second time.
 - b. he was following a set procedure during his experiments, so he knew exactly what he had done. ()
3. When Wöhler shared his procedures and observations with other scientists, the other scientists found that they could also make urea. This was important because:
 - a. the other scientists thought he was lying.
 - b. if the same results are obtained every time, then we know that the results are reliable. This makes it more likely that they are also accurate. ()
4. Once scientists knew Wöhler had made urea:
 - a. they began to experiment making other organic compounds from inorganic chemicals.
 - b. they could conclude that organic compounds must include carbon. ()
5. The ability to make organic compounds from inorganic chemicals was:
 - a. (a) an important scientific discovery.
 - b. (b) an important new technology. ()

MARKS

Part B: Identification (9 marks)

State whether each of the following is a scientific theory (ST) or a technology (T).

1. A wheelchair. _____
2. All information can be presented as a combination of 1's and 0's. _____
3. Human life is chemically similar to other forms of life on Earth. _____
4. An automobile. _____
5. An egg beater. _____
6. An iron nail. _____
7. Molecules move more quickly when heat is applied. _____
8. All matter is composed of atoms. _____
9. A television set. _____

MARKS

Part C: Short Answers (11 marks)

Answer each of the following questions in one or two complete sentences.

- 1. In scientific experiments, what is the difference between a theory and a hypothesis? Where do scientific facts and laws fit in? (6 marks)

- 2. When does a scientist know that she has discovered the final truth about something? (2 marks)

MARKS

3. What would you say is the main difference between scientific investigation and the typical process of invention? (3 marks)

/ 5 Part A: Multiple Choice

/ 9 Part B: Identification

/11 Part C: Short Answers

Total

