SCIENCE 710
Science Review

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LIFEPAC Test is located in the center of the booklet. Please remove before starting the unit.
Introduction

My name is John Hall. I am a student at the Christian Academy. While studying science at school, I decided to become a scientist. I am writing this log to organize and record all the data I have learned this year. I want to investigate the different sciences so that I can decide which science I want to make my career.

I plan to dedicate my life to God through science. Before each log entry I plan to reread Joshua 1:8, “…but thou shalt meditate therein day and night, that thou mayest observe to do according to all that is written therein: for then thou shalt make thy way prosperous, and then thou shalt have good success.”

I want to research different scientists at work. By learning about other scientists, I will be able to decide on a science in which to specialize. I shall study the astronomer at work, the meteorologist at work, and the medical scientist at work. Those sciences are the ones I have studied this year.

Objectives

Read these objectives. The objectives tell you what you will be able to do when you have successfully completed this LIFEPAC. When you have finished this LIFEPAC, you should be able to:

1. List the five steps in the scientific method.
2. List the metric units of length, mass, and volume.
3. List four types of graphs.
4. Write one scientific achievement for each of the following scientists: Aristotle, Ptolemy, Copernicus, Kepler, Brahe, Newton, Galileo, Fahrenheit, Celsius, Torricelli, Vesalius, and Nightingale.
5. Define these terms: constellation, myth, hemisphere, zenith, nadir, comet, meteor, and Milky Way.
6. Label a diagram of the planets and the asteroids.
7. Label a diagram of four phases of the moon.
8. Explain how the sun produces solar energy.
9. Name the two brightest stars in our sky.
10. Name the main elements of weather.
11. Explain how temperature affects weather.
12. List the different air masses.
13. Describe where each air mass is formed.
14. List the abbreviations of the air masses.
15. Name and describe the three basic cloud types.
16. Name the four classes of weather fronts and describe the weather that is associated with them.
17. Explain how the meteorologist can predict weather.
18. Explain the difference between expiration and inspiration.
19. Explain how the heart and lungs work together.
20. List the three types of cells in the blood.
21. Explain the difference between arteries, veins, and capillaries.
22. Explain the function of the skeleton.
23. Explain how the nervous system works.
24. List four functions of the digestive system.
25. Define absorption and excretion.
26. Explain the function of three endocrine glands.
1. SCIENTISTS AT WORK

Scientists search for ways to unlock the door to nature’s puzzling questions. God has given man a superior brain that serves as the key to the door. Scientists must organize their facts and record their data in an organized way. Scientists must be dedicated, for they are always learning something new. Scientists have developed medicines, the automobile, and rockets that take man to the moon. They ask “Why?” and dedicate their lives to finding answers to their questions.

SECTION OBJECTIVES

Review these objectives. When you have completed this section, you should be able to:

1. List the five steps in the scientific method.
2. List the metric units of length, mass, and volume.
3. List four types of graphs.
4. Write one scientific achievement for each of the following scientists: Aristotle, Ptolemy, Copernicus, Kepler, Brahe, Newton, Galileo, Fahrenheit, Celsius, Torricelli, Vesalius, and Nightingale.

VOCABULARY

Study these words to enhance your learning success in this section.

accurate (ak´ yur it). Correct, without error.

astronomy (u stron´ u mē). Study of stars and planets.

axis (ak´ sis). A straight line at right angles to another straight line.

ellipse (i lips). An oval.

interpret (in tėr´ prit). To explain the meaning.

meteorology (mē tē u´ rol´ u jē). Study of weather.

metric system (met´ rik sis´ tum). System of measurement used by scientists.

observation (ob zur vā´ shun). A close inspection.

research (ri sėrch). A careful search or study.

Note: All vocabulary words in this LIFEPAC appear in boldface print the first time they are used. If you are not sure of the meaning when you are reading, study the definitions given.

Pronunciation Key: hat, āge, căre, făr; let, ēqual, tĕrm; it, ĭce; hot, ăpen, ărder; ɒil; ɒut; cup, pŭt, rŭlĕ; chĭld; long; thin;
/i/ for then; /iz/ for measure; /əl/ represents /a/ in about, /e/ in taken, /ı/ in pencil, /ɒ/ in lemon, and /u/ in circus.

LOG ENTRY I-A: SCIENTIFIC METHOD

Scientists must keep accurate records of everything they observe. Each detail must be accurately recorded. Scientists often make graphs, charts, and drawings in their notebooks. The notes and charts help them to remember what they observe.

As a student of science, and a future scientist, I shall keep a detailed notebook, too. The first thing I have decided to study is the scientific method so I can approach my studies in a truly scientific way. I have discovered that the scientific method is made up of five steps: stating the problem, forming the hypothesis, conducting an experiment, interpreting data, and drawing conclusions.

Stating the problem. The first step in the scientific method is stating the problem. A problem in science is anything puzzling or unexplained. Some typical problems that early scientists stated were these: What is air made of? What causes movement in the human body? How can we travel to the moon?

The scientific method is a way to explore and to discover God's world. Before a scientist begins his exploration, he must state the problem he wishes to solve. A problem I want to solve is this question: How does water move up the stem of a plant?

Complete these sentences.

1.1 Scientists must keep accurate ___________________________.

1.2 The first step in the scientific method is _____________________________.

1.3 A problem should be stated in _____________________.

1.4 A problem in science is anything that is _____________________.

Complete this activity

1.5 State any scientific problem you would like to solve.
   Write it here. ________________________________________________________
   ________________________________________________________
   ________________________________________________________

Forming the hypothesis. A hypothesis is a scientific guess. This guess is based on past knowledge and observations the scientist has made. The hypothesis is a reasonable, or educated, guess that could solve the scientist's problem. I know that God has given man a circulatory system that carries food to every cell of the body. My hypothesis is that God has given His plants a special pipeline that carries water from the roots to every cell in the plant.
Conducting an experiment. A scientist must have evidence to support or to deny his hypothesis. To obtain this evidence, a scientist must test his hypothesis. The test of a hypothesis is called an experiment. An experiment produces results that are compared to the hypothesis to determine whether the hypothesis is correct.

Problem → Hypothesis → Experiment → Results

An experiment that takes place in the laboratory involves observation. Experiments that take place in the library involve research.

I shall conduct my experiment in a laboratory. To test my hypothesis, I shall put celery in half a glass of water colored with red food coloring.

Write true or false.

1.6  __________ A hypothesis is a scientific guess that answers the scientist’s question or problem.

1.7  __________ Scientists may have more than one hypothesis.

1.8  __________ Scientists do not have to formulate a hypothesis when using the scientific method.

1.9  __________ A hypothesis is a question.
Try this investigation to see if your experiment proves John’s hypothesis.

These supplies are needed:
- stalk of celery
- half a glass of water
- teaspoon
- sharp knife
- red food coloring

Follow these directions and answer these questions. Put a check in the box when each step is completed.

☐ 1. Mix one teaspoon of red food coloring into the water.
☐ 2. Cut the end off the stalk of celery. The stalk should then be about 4” to 6” long.
☐ 3. Put the cut end of the celery into the glass of colored water.
☐ 4. Wait 1 day and take the celery out of the water.
☐ 5. Observe the cut end of the celery.
☐ 6. Cut a cross section of the celery and observe that section.

1.10 Which parts of the stem have the most food coloring?

1.11 Did the cross section of the celery look the same as the bottom of the stalk?
Interpreting data. The written results of experiments are called data. Accuracy is very important when recording data. The big question after I record the data is how do I interpret the data. What does all the information mean? When the scientist has interpreted or explained his data, he is ready to draw a conclusion.

When I took the celery out of the glass of colored water, I saw several dark red spots on the surface of the cross section. The cross section was identical to the bottom of the celery. Here is my diagram.

My interpretation of this data is that the dark red dots on the celery are part of the water-carrying pipeline of this plant.

Drawing conclusions. After the scientist has collected the data and interpreted it, he is ready to draw a conclusion. A conclusion is the final decision on whether the hypothesis is correct. Before a scientist states the conclusion, he may want to go to the library to research the experiments and conclusions of other scientists. He may also perform the experiment several times, recording and comparing data each time.

I performed the same experiment with a radish and a carrot. My data agreed with my experiment with the celery. I went to the library and researched how water moves up the stems of plants. I learned that plants have long strands called xylem that carry water. The xylem is made of hollow cells. These cells form a pipeline from the roots to the leaves of plants. The dark red spots on the celery are xylem. My conclusion is that my hypothesis is correct. God has given His plants a special pipeline that carries water from the roots to every cell in the plant.

I plan to use the scientific method in all of my science studies.

END OF LOG I-A

John
Complete these sentences.

1.13 The test of a hypothesis is called a(n) __________________________ .
1.14 Experiments that take place in the library involve ________________________ .
1.15 The written results of experiments are called ______________ .
1.16 The final decision on whether or not the hypothesis is correct is called the ________________ .
1.17 A scientist must gather evidence to support or deny his ____________ .

Complete this activity.

1.18 List in order the five steps in the scientific method.
   a. ______________________________________________________________________
   b. ______________________________________________________________________
   c. ______________________________________________________________________
   d. ______________________________________________________________________
   e. ______________________________________________________________________

LOG ENTRY I-B: SCIENTIFIC MEASUREMENTS

The Apostle Paul wrote to the Philippians (Philippians 3:16 and 17), “Nevertheless, whereto we have already attained, let us walk by the same rule, let us mind the same thing. Brethren, be followers together of me, and mark them which walk so as ye have us for an example.” Man cannot measure his need for spiritual guidance, but he can measure the material things that God has given him.

Scientists must measure everything they do. They use the metric system to measure length, mass, and volume. Scientists use graphs and charts to measure their experiments and to make them understandable.

I must review Science LIFEPAC 702 and brush up on measurement.

**Metric system.** The **metric system** is the system of measurement used by scientists. The metric system originated in France in 1670 and has been the basic system used in most of Europe since then.

The modern metric system is known as the International System of Units. The name International System of Units with the international abbreviation SI was given to the system by the General Conference on Weights and Measures in 1960. In 1965 Great Britain began using metrics. The United States has still not completely converted to the metric system.

In the metric (SI) system the standard unit of length is the meter. The meter is a little longer than a yard. The meter is divided into 100 equal parts called centimeters, or 1,000 equal parts called millimeters. One thousand meters equals one kilometer. The prefix centi- means one-hundredth, milli- means one-thousandth, and kilo- means one-thousand. These prefixes are used for all units of measurement in the metric system.
The standard unit of volume is the liter. Volume is the amount of space that matter takes up. The liter is subdivided into 100 centiliters and 1,000 milliliters. A milliliter and a cubic centimeter are the same. Therefore, volume can be measured in cubic centimeters or in milliliters.

The standard unit of mass is the kilogram. The kilogram is divided into 1,000 grams and 1,000,000 milligrams. One thousand grams equals one kilogram. Scientists measure the mass of an object rather than the weight. The mass of an object remains the same, but the weight of an object changes. Weight depends on gravity. If I were on the moon, I would not weigh the same as I do on earth. Mass is the measure of the amount of matter. It is a property of matter and does not change.

This container has 150 mL in it.
Match these items.

1.19  _____ system of measurement used by scientists a. kilometer b. centi-

1.20  _____ amount of space that matter takes up c. kilo-

1.21  _____ measure of the amount of matter d. metric system e. millimeter f. liter

1.22  _____ one-thousandth of a kilogram g. volume

1.23  _____ one-hundredth h. gram

1.24  _____ one thousand meters i. kilogram

1.25  _____ one-thousandth of a meter j. mass

1.26  _____ one thousand k. centigram

1.27  _____ standard unit of volume l. cubic meter

1.28  _____ standard unit of mass

Complete this activity.

1.29  Measure this line with a metric ruler and write the measurement in centimeters.

Define these words.

1.30  mass ________________________________________________________________

________________________________________________________________________

1.31  volume ______________________________________________________________

________________________________________________________________________

1.32  metric system _________________________________________________________

________________________________________________________________________
Complete these sentences.

1.33 The standard unit of length in the metric system is the _________________.
1.34 The prefix for one-thousandth is _________________.
1.35 One-hundredth of a meter is a _________________.
1.36 One-thousandth of a liter is a _________________.
1.37 One-hundredth of a gram is a _________________.
1.38 One thousand grams is a _________________.

Graphs. When I was doing research on scientific experiments in the library, I learned that one of the best ways to record data was to chart it on a graph. A graph is a drawing that shows a table of related numbers. A graph organizes data so that the data is easy to understand. Graphs and charts are used to present information, to show relationships, to catch the reader’s eye, and to make data easily understood.

Four kinds of graphs are used by scientists to record data. The bar graph uses the height of the column to catch the reader’s eye and presents information in an easily understood way. I decided to use a bar graph to chart the hair colors of students in my class.

![Bar Graph](image)

**Students Classified by Hair Color in Mrs. Cobb’s Class**
### SELF TEST 1

**Match these items** (each answer, 2 points).

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.01</td>
<td>______ develop<em>geocentric theory</em></td>
<td>a. Torricelli</td>
<td></td>
</tr>
<tr>
<td>1.02</td>
<td>______ introduced heliocentric theory</td>
<td>b. Copernicus</td>
<td></td>
</tr>
<tr>
<td>1.03</td>
<td>______ founded nursing profession</td>
<td>c. Kepler</td>
<td></td>
</tr>
<tr>
<td>1.04</td>
<td>______ invented barometer</td>
<td>d. Nightingale</td>
<td></td>
</tr>
<tr>
<td>1.05</td>
<td>______ considered “Father of Modern Science.”</td>
<td>e. Galileo</td>
<td></td>
</tr>
<tr>
<td>1.06</td>
<td>______ discovered law of universal gravitation</td>
<td>g. Celsius</td>
<td></td>
</tr>
<tr>
<td>1.07</td>
<td>______ examined the inner workings of the human body</td>
<td>i. Newton</td>
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<tr>
<td>1.08</td>
<td>______ developed temperature scale</td>
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</tbody>
</table>

**Write true or false** (each answer, 1 point).

<p>| | | | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1.09</td>
<td>______ Meters and centimeters are units of length in the metric system.</td>
<td></td>
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<tr>
<td>1.10</td>
<td>______ Mass is a measure of weight.</td>
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<tr>
<td>1.11</td>
<td>______ Long distances are usually measured in kilometers.</td>
<td></td>
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<tr>
<td>1.12</td>
<td>______ The weight of an object never changes.</td>
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<tr>
<td>1.13</td>
<td>______ In the geocentric theory the earth is the center of the universe.</td>
<td></td>
<td></td>
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<tr>
<td>1.14</td>
<td>______ The gravitational pull of the sun keeps the planets in orbit.</td>
<td></td>
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<tr>
<td>1.15</td>
<td>______ The barometer measures the temperature of the air.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.16</td>
<td>______ Florence Nightingale believed that God had called upon her to relieve the suffering of poor people.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Write the letter of the correct choice (each answer, 2 points).

1.017 The number of centimeters in a meter is _______.
   a. 10  b. 100  c. 1000  d. 1

1.018 The liter is used to measure _______.
   a. weight  b. mass  c. volume  d. length

1.019 The mass of an object is measured in _______.
   a. liters  b. meters  c. degrees  d. kilograms

1.020 In science anything puzzling or unexplained is a scientific _______.
   a. problem  b. experiment  c. hypothesis  d. conclusion

1.021 A scientific guess is a(n) _______.
   a. problem  b. experiment  c. hypothesis  d. conclusion

1.022 After conducting an experiment, a scientist must first _______.
   a. state the problem  b. interpret data  
   c. draw conclusions  d. form a hypothesis

Complete these lists (each answer, 3 points).

1.023 List in order the five steps in the scientific method.
   a. __________________________________________
   b. __________________________________________
   c. __________________________________________
   d. __________________________________________
   e. __________________________________________

1.024 List the four types of graphs.
   a. __________________________________________
   b. __________________________________________
   c. __________________________________________
   d. __________________________________________