

## Chapter 1: Biology and You



### Learning Targets

- How can someone practice scientific thought?
- How do ethics apply to science?
- What is the difference between a theory and a hypothesis?
- Why do scientists use SI units? Provide examples of length, mass, volume.
- What are the seven characteristics that all living things share?

### Inquiry Lab: Make a Prediction

CONTROL (-)

Prediction for Dish #1: \_\_\_\_\_

Measureable evidence that will support your prediction: # OF COLONIES OR LENGTH / WIDTH OF GROWTH

EXPERIMENTAL (+)

Prediction for Dish #1: \_\_\_\_\_

Measureable evidence that will support your prediction: # OF COLONIES OR LENGTH / WIDTH OF GROWTH

How could you proceed if you do not get the results you predict? \_\_\_\_\_

### Section 1: The Nature of Science (p. 7-9)

1. Scientific thought involves making OBSERVATIONS, using EVIDENCE to draw conclusions, being SKEPTICAL about ideas, and being open to CHANGE when new discoveries are made.
2. People once thought that STRESS caused stomach ulcers. Researchers have now found the BACTERIA named *Helicobacter pylori* causes ulcers.
3. Through an ongoing cycle of CHALLENGE and DISCOVERY, scientific knowledge grows.
4. Science is governed by TRUTHS that are valid everywhere in the universe. These truths are called UNIVERSAL LAWS.
5. Because scientific experiments and discovery can have serious ETHICAL implications, scientific investigations require ethical BEHAVIOR.
6. Give an example of a scientific experiment that would not be ethical. ANSWERS VARY.  
CAN DISCUSS ANIMAL USE FOR DRUG TRIALS ETC.

7. An understanding of science can help you take better CARE of your HEALTH, be a wiser CONSUMER, and become a better-informed CITIZEN.

8. What is one positive choice you have made using scientific thought? ANSWERS VERY; TYPE OF FOOD TO BUY, PHONE TO BUY, TOOTHPASTE TO USE, ETC.  
Write a letter to a 6<sup>th</sup> grader at Lee Eaton explaining why learning science is important. Give examples of when they might need to use scientific thought in their everyday lives. Due: \_\_\_\_\_

### 50 Things List & Word Root Reference Sheet

#### Section 2: Science Methods (p. 10-13)

1. Match the numbered statements below with the scientific process.

1 Observation    2 Hypothesis    3 Experiment    4 Conclusion

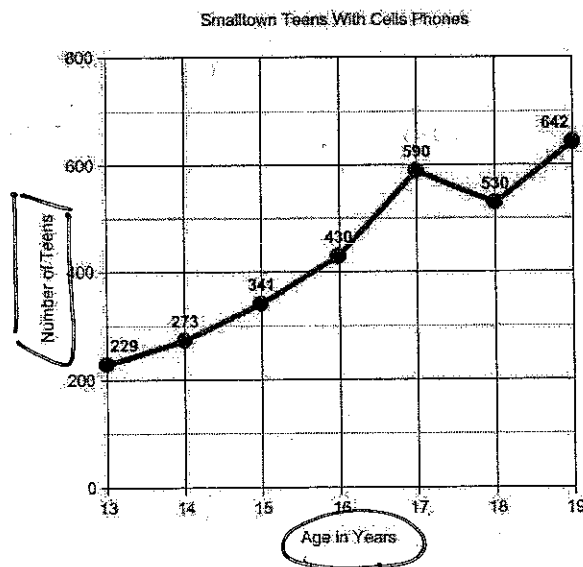
(1) Scientist Charles Paine noticed that the Canada geese population around Chicago was decreasing. Paine thought there could be three possible explanations for this. (2) The geese could be getting eaten by predators, the adults could be infertile, or the geese were migrating out of the area. (3) Paine put tracking collars on the adult geese to see if they were being eaten by predators. This was not the case. His colleague Stan Gehrt told him that the coyote population in Chicago was on the rise and he had seen the coyotes eating the geese eggs. (4) These scientists worked together to communicate their results to the Max McGraw Wildlife Foundation.

2. A controlled experiment is a procedure that tests ONE FACTOR (called a variable) at a time and that uses a

CONTROL group and an EXPERIMENTAL group. A control group serves as a standard of COMPARISON.  
(DISH W/ NO BACTERIA)    (DISH TOUCHED)

3. The single factor the scientist changes is called the INDEPENDENT variable. The factor that changes in response to the independent variable is the DEPENDENT variable.

4. Observe the graph below. Put a circle around the independent variable and a box around the dependent variable.



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\* RELATE TO  
BACTERIA IN  
AGAR DISH.  
# OF BACTERIA  
→ I. VARIABLE  
TIME  
→ D. VARIABLE

5. A theory is a system of ideas that explains many related OBSERVATIONS and is supported by a large body of EVIDENCE acquired through scientific investigation.

6. List three examples of scientific theories: QUANTUM THEORY, CELL THEORY, THEORY OF EVOLUTION

7. Refer to Figure 5. Scientists build theories from QUESTIONS, PREDICTIONS, HYPOTHESES and EXPERIMENTAL RESULTS.

Section 3: Tools and Techniques (p. 14-16)

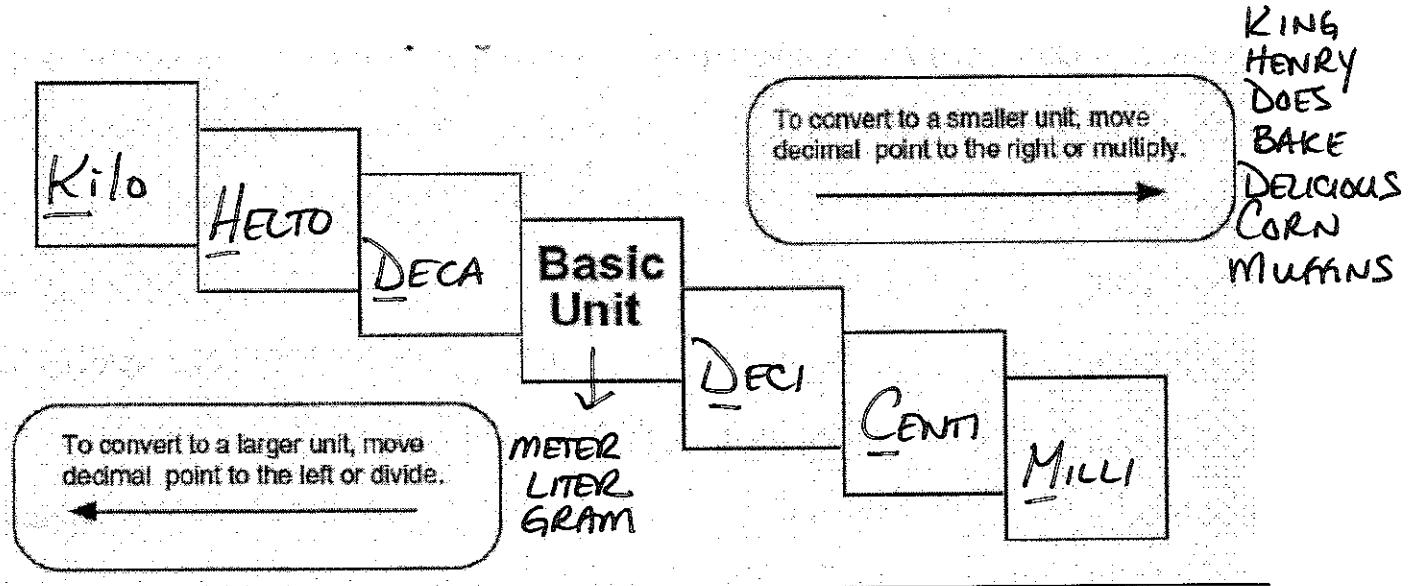
1. Scientists use the International System of Units (SI) because they need to share a COMMON measurement system.

2. This is not in the book... The four most common measurements made in this biology class are mass, volume, length, and temperature. See if you can match the measurement with its description.

- |   |                            |
|---|----------------------------|
| a. the amount of matter in an object            | <u>c.</u> temperature (°C) |
| b. the distance of an object or between objects | <u>a.</u> mass (g)         |
| c. the degree or intensity of heat present      | <u>b.</u> length (m)       |
| d. the amount of space an object takes up       | <u>d.</u> volume (L)       |

3. Below is a diagram used to understand metric prefixes. See if you can fill in the boxes with the correct prefix.

Word Bank: Deca Centi Milli Hecto Kilo Deci



Metric Conversation Practice

6 grams = 6,000 milligrams

K H D B d c m      6.000 → 6,000.

micrometers = .005 meters

K H D B d c m      .005 → .005

2 liters = 2,000 milliliters

K H D B d c m      2.000 → 2,000.

4. In a LIGHT microscope, light passes through one or more lenses to produce an enlarged image of an object.
5. An ELECTRON microscope forms an image of an object by using a beam of electrons to magnify extremely small objects.
6. Give an example of why sterile techniques are important in biology. BACTERIA CAN GROW ANYWHERE  
 ↓  
 RELATE TO STERILE CONDITIONS OF CONTROL PLANT
7. Give an example of a new technology that has enhanced scientific studies. GPS - TRACKS ANIMAL POPULATIONS

Microscope Lab

Section 4: What is Biology? (p. 17-19)

1. Define Biology: THE SCIENTIFIC STUDY OF LIVING ORGANISMS AND THEIR INTERACTIONS WITH THE ENVIRONMENT; STUDY OF LIFE  
 (-LOGY) (BIO) EVOLUTIONARY THEORY
2. List 4 examples of fields of biology. BIOCHEMISTRY, CELL BIOLOGY, GENETICS, THEORY
3. Choose one field of biology that seems most interesting to you and explain what specifically is studied. \_\_\_\_\_

ANSWERS VERY

4. Describe and/or give an example for each of the seven properties of life.

Cellular Organization: THE BASIC STRUCTURE OF ALL LIVING ORGANISMS IS THE CELL; UNICELLULAR OR MULTICELLULAR

Homeostasis: ALL LIVING THINGS MAINTAIN STABLE INTERNAL CONDITIONS; EX: FOOD IN - WASTE OUT

Metabolism: LIVING THINGS CARRY OUT CHEMICAL REACTIONS IN ORDER TO OBTAIN ENERGY; EX: RESPIRATION ENERGY  
 FOOD →

Responsiveness: ALL LIVING THINGS RESPOND TO THEIR EXTERNAL ENVIRONMENT; EX: PLANTS BEND TOWARD LIGHT

Reproduction: MOST LIVING THINGS REPRODUCE TO MAKE MORE OF THEIR OWN KIND.

Heredity: ORGANISMS PASS THEIR TRAITS FROM PARENT TO OFFSPRING

Growth: ALL LIVING ORGANISMS GROW AND CHANGE (DEVELOPE)