Name _____ Class _____ Date _____

1.1 What Is Science?

Lesson Objectives

- State the goals of science.
- Describe the steps used in scientific methodology.

Lesson Summary

What Science Is and Is Not **Science** is an organized way of gathering and analyzing evidence about the natural world. The goals of science are to provide natural explanations for events in the natural world and to use those explanations to make useful predictions. Science is different from other human works in the following ways:

- Science deals only with the natural world.
- Scientists collect and organize information about the natural world in an orderly way.
- Scientists propose explanations that are based on evidence, not belief.
- They test those explanations with more evidence.

Scientific Methodology: The Heart of Science Methodology for scientific investigation involves:

- Making an **observation**. Observation involves the act of noticing and describing events or processes in a careful, orderly way. Scientists use their observations to make inferences. An **inference** is a logical interpretation based on what scientists already know.
- Suggesting hypotheses. A **hypothesis** is a scientific explanation for a set of observations that can be tested in ways that support or reject it.
- Testing the hypothesis. Testing a hypothesis often involves designing an experiment. Whenever possible, a hypothesis should be tested by a **controlled experiment**—an experiment in which only one variable (the **independent variable**, or manipulated variable) is changed. The variable that can change in response to the independent variable is called the **dependent variable**, or responding variable. The **control group** is exposed to the same conditions as the experimental group except for one independent variable.
- Collecting, recording, and analyzing **data**, or information gathered during the experiment.
- Drawing conclusions based on data.

What Science Is and Is Not

1. What is science?
Science is an organized way of gathering and analyzing evidence about the natural world.

2. What are the goals of science?
The goals are to investigate and understand nature to explain events in nature and use those explanations to make predictions.

Name _____ Class _____ Date _____

Scientific Methodology: The Heart of Science

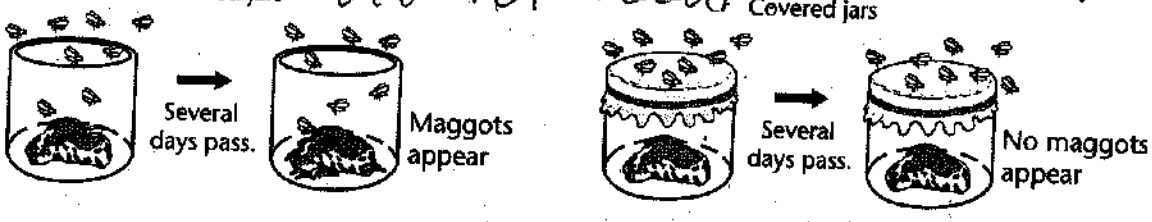
Questions 3–10 refer to spontaneous generation, the idea that life can arise from nonliving matter. Spontaneous generation was accepted by many in the scientific community up until the mid-nineteenth century. A series of simple experiments tested the validity of this idea.

3. Evidence used to support spontaneous generation was the observation that foods over time become covered in maggots or fungal and bacterial growth. The inference behind spontaneous generation is that there is no "parent" organism. Write this inference as a hypothesis using an if–then sentence that suggests a way of testing it.

If an organism appears on food with no visible connection to a parent, then it arose spontaneously from the food.

4. In 1668, Francesco Redi proposed a different hypothesis to explain the specific example of maggots that appear on spoiled food. He had observed that maggots appear on meat a few days after flies have been seen on the food. He inferred that the flies had left behind eggs too small to see. Redi's experiment is shown below. What conclusion can you draw from Redi's experiment?

Maggots form only when flies come in contact with the meat, therefore spontaneous generation of flies did not occur

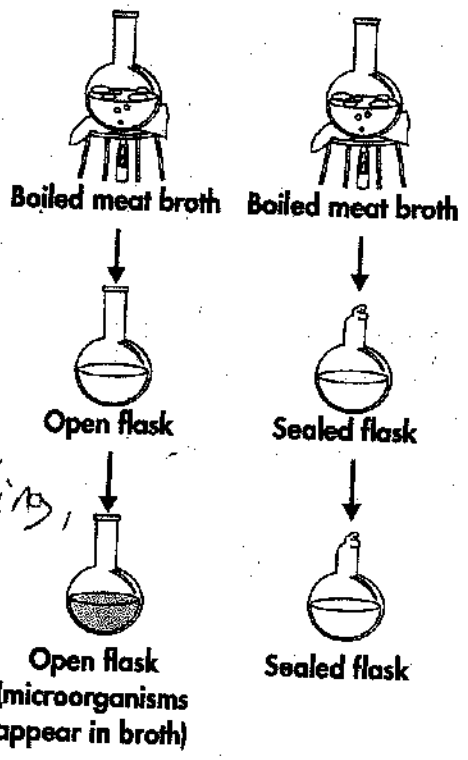


5. In the late 1700s, Lazzaro Spallanzani designed a different experiment to show that life did not arise spontaneously from food. He inferred that some foods spoil because of growing populations of microorganisms. Fill in the information requested below.

Independent variable:
Boiled Meat Broth

Dependent variable:
Exposure to Air

Controlled variables (identify three):
Same food source, same boiling, same type of flask, same time

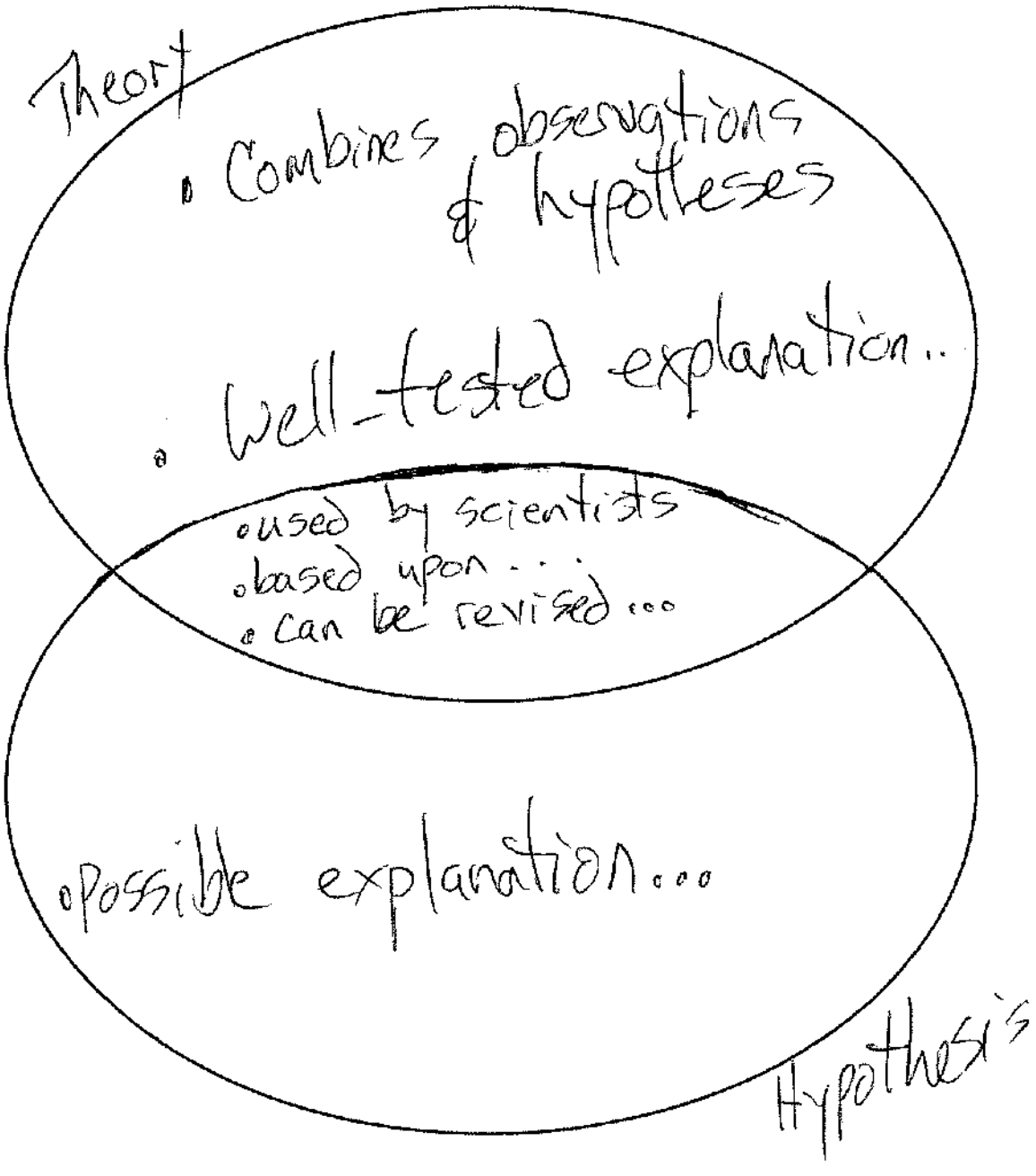


Biology JD 2017

A Theory is the best explanation of many related observations. Theories allow scientists to make accurate predictions. A hypothesis is an idea that can be tested.

Write phrases from the box below that describe a hypothesis in the top part of the Venn diagram. Write phrases that describe a theory in the bottom part. Write phrases that relate to both in the center portion.

*Used by scientists (1)	*Can be revised with new information
*Well-tested explanation of observation	*Based on observations and inferences
*Possible explanation that can be tested	*Combines observations and hypotheses



Name _____ Period ____

Label each statement as a fact, law, or theory.

1.) Plants need water and carbon dioxide to survive. F

2.) Force = mass x acceleration _____

3.) Parts of the Earth's crust slowly drift atop a liquid core. F

4.) Equal volumes of gases, at the same temperature and pressure, contain the same number of molecules. L

5.) You are students at West Linn High School. F

6.) For many phenomena, 80% of consequences stem from 20% of the causes. Also known as the 80-20 rule. L

7.) Mammals have body hair and are warm blooded. F

8.) The orbits of planets in the solar system closely follow a simple geometric rule. L

9.) Vitamin C in large doses not only wards off colds, but also heart disease and cancer. F

10.) Oregon is a temperate rainforest biome. F

11.) About 15 billion years ago, a tremendous explosion started the expansion of the universe. T

12.) The change in voltage (V) between the ends of a conductor (R) and the current (I) flowing through R are proportional at a given temperature.

$$\frac{V}{I} = R$$ L

13.) Oregon has an average of 40.5 inches of rainfall per year. F

14.) Dinosaurs once roamed the Earth. F

15.) Dinosaurs became extinct because a giant asteroid crashed on the Earth and altered its climate so that most life could not survive. T

(6)

16.) All organisms are composed of similar units of organization, called cells. T

17.) 1 foot = 12 inches. F

18.) Heritable traits that affect the capacity of individual organisms to survive and reproduce causes populations to change over time. T

19.) The average global temperature has risen 0.6 ± 0.2°C since the late 19th century, and most of the warming observed over the last 50 years is attributable to human activities, most prominently the emission of greenhouse gases such as carbon dioxide (CO_2). T

20.) A line joining a planet and its star sweeps out equal areas during equal intervals of time. L