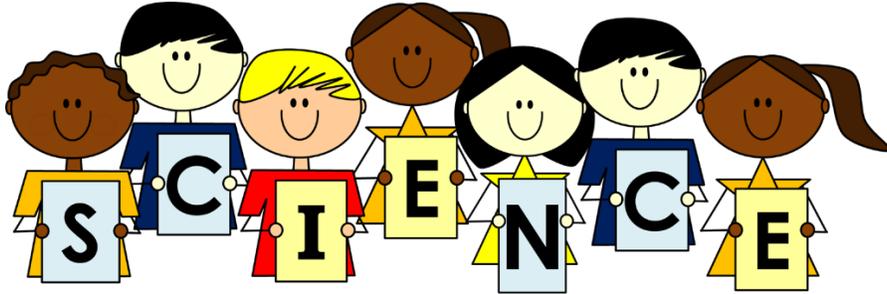


# Nature of Science and the Scientific Method

## Guided Notes – Student Edition

Science is a broad subject encompassing the living world, the \_\_\_\_\_ world, physical phenomena, \_\_\_\_\_ earth and space. The word science comes from the Latin word “**scientia**” or “**sciens**” which means “\_\_\_\_\_”.



### What is Science?

Science is the \_\_\_\_\_ study of the nature and manner of an object. It uses key skills, such as:

- observing,
- \_\_\_\_\_,
- experimentation,
- measuring,
- \_\_\_\_\_ and
- reporting

to work out why things happen in the way that they do.



The Science Laboratory

# Nature of Science and the Scientific Method

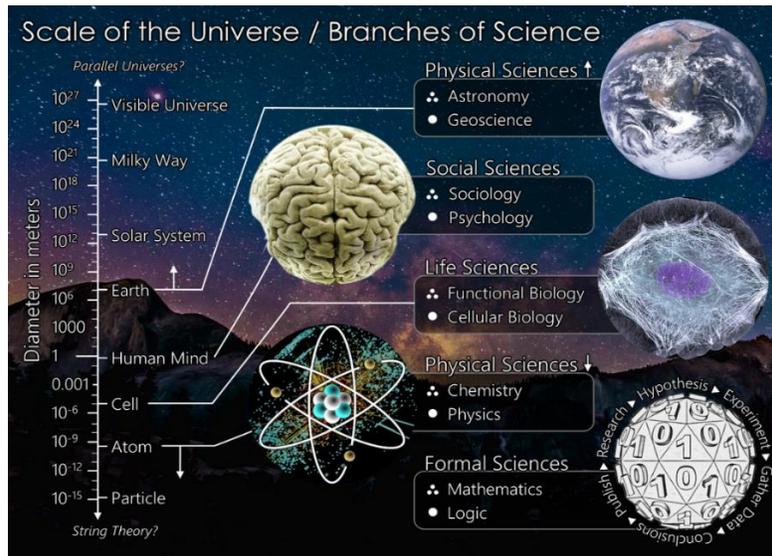
## Guided Notes – Student Edition

There are four main branches of science.

- 1. Physical Science:** These are mainly concerned with the study of \_\_\_\_\_ objects such as planets, molecules, gravity and forces etc. Physical science is divided up into:
  - Astronomy (space)
  - \_\_\_\_\_ (physical properties and composition of Earth)
  - Chemistry (the composition of substances and how they behave)
  - \_\_\_\_\_ (the principles that govern matter)
- 2. Social Sciences:** These sciences are mainly concerned with the study of human \_\_\_\_\_ and their relationship with society. Areas within social science include:
  - Anthropology (human behavior and development)
  - Sociology (human society)
  - Geology (\_\_\_\_\_)
  - Philosophy (the pursuit of knowledge)
  - Economics (consumerism, goods and services)
- 3. Biological (or Life) Sciences:** This science involves the study of \_\_\_\_\_ organisms at all levels of organization.
  - Functional Biology (how a living structure works)
  - Cellular Biology (cells)
  - Botany (\_\_\_\_\_)
  - Zoology (\_\_\_\_\_)
  - Ecology (the environment)
  - Paleontology (prehistoric life)
- 4. Formal Sciences:** These sciences include the study of \_\_\_\_\_ systems and abstract concepts. These include:
  - \_\_\_\_\_
  - Logic

# Nature of Science and the Scientific Method

## Guided Notes – Student Edition



### What is the Nature of Science?

The nature of science describes the special characteristics, \_\_\_\_\_, and assumptions that scientific knowledge is based on and how that knowledge is developed. There are five main features that describe the nature of Science; these are:

1. **Science is \_\_\_\_\_**: This means that scientific ideas are constantly being changed, remodeled and upgraded to reflect what we currently understand about a scientific theory.
2. **Science is based on \_\_\_\_\_ evidence**: This means that scientific knowledge is based on \_\_\_\_\_ findings which have been derived from observations made of the natural world.
3. **Science is inferential, imaginative and \_\_\_\_\_**: There is not just one way to do science, and no ‘universally accepted scientific method’. Therefore, scientists often must problem solve and tackle their investigation from multiple perspectives. Scientists must also be able to look at the \_\_\_\_\_ they have collected and form a \_\_\_\_\_ based on what they have observed, this sometimes takes requires some “out of the box” thinking.
4. **Science is \_\_\_\_\_ and based on \_\_\_\_\_**: This means that science relies heavily on observation, evidence, peer review and rational argument.
5. **Science is linked to many \_\_\_\_\_ and \_\_\_\_\_**. People from different cultures and different societies have contributed to current scientific knowledge. Therefore, it reflects many social and cultural traditions and or viewpoints.

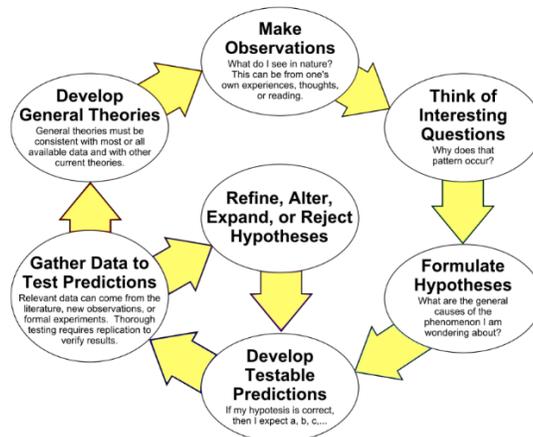
# Nature of Science and the Scientific Method

## Guided Notes – Student Edition

### What is the Scientific Method?

The scientific method is an efficient and organized \_\_\_\_\_ to test ideas systematically. It is an experimental step-by-step process for an investigation to collect \_\_\_\_\_ and reach a \_\_\_\_\_.

The Scientific Method as an Ongoing Process



### Steps in Scientific Method

The scientific method is an ongoing process that includes six main steps. Each step is related to the others and follows in a \_\_\_\_\_. These steps can be used for any scientific \_\_\_\_\_ and are as follows:

#### 1. Observation

Observing is uses your senses to collect data about an object or event. This data may qualitative (\_\_\_\_\_) or quantitative (\_\_\_\_\_).

#### 2. Questioning

All scientific investigations begin with an \_\_\_\_\_ question. Sometimes, the question may be written as an aim, which clarifies what you are trying to find out. More often than not, the answer to the question or aim may then lead to more even more questions being asked, leading to further \_\_\_\_\_.

#### 3. Hypothesis

A hypothesis is a \_\_\_\_\_ that is based on observations and the scientific \_\_\_\_\_ that you already have. This information may come through \_\_\_\_\_ or as a result of prior knowledge from lessons.

# Nature of Science and the Scientific Method

## Guided Notes – Student Edition

A hypothesis must include two variables. The first is the \_\_\_\_\_ variable, which outlines the factor that you plan to \_\_\_\_\_. This variable will have a range of values included. For high school science investigations this should be at least three values, but could be as many as five. For example, if the independent variable is the temperature, the range of values may be 10°C, 20°C, 30°C, 40°C and 50°C.

The other variable which must be stated in the hypothesis is the \_\_\_\_\_ variable. This is the variable which is \_\_\_\_\_ as a result of changing the independent variable. For example, if the independent variable is the temperature, the dependent variable may be the activity level (or reaction rate) of an enzyme.

A hypothesis will describe the relationship between the independent and dependent variables.

### 4. Experiment

Once a hypothesis has been formulated, a \_\_\_\_\_ must be designed and then carried out to collect data and determine whether the \_\_\_\_\_ is correct. The experiment must take into consideration other factors which may \_\_\_\_\_ the results of the investigation. These considerations are called \_\_\_\_\_ variables and must be described carefully in the method.

The method must also include \_\_\_\_\_ for each value of the independent variable. This allows you to demonstrate that the method is \_\_\_\_\_ and the results you have obtained are not just a “one-off”.

### 5. Interpretation

Once all data has been collected, it must be interpreted and \_\_\_\_\_. This is usually in the form of charts, tables, \_\_\_\_\_ and sometimes, calculations. Interpreting the data then allows a conclusion to be reached.

### 6. Evaluation

The evaluation is the \_\_\_\_\_ step in the investigative process. It ties together, the observations and data from the \_\_\_\_\_ as well as any \_\_\_\_\_ and \_\_\_\_\_ that have also be used. The purpose of the evaluation is to critique the findings of the investigation. Often, this critique involves discussion of the \_\_\_\_\_ of the data and any issues that needed to be overcome to ensure that the experiment was a \_\_\_\_\_ test.