



Handout2 – 12th grade Bio – Unit 1: Applied physics

<b>General Objective</b>	1. Demonstrate comprehension of written texts related to the scientific method
<b>Specific objectives</b>	1.1. Reflect about the way in which the student himself/herself reads 1.2. Identify reading strategies to increase and facilitate comprehension 1.3. Apply reading strategies in a text related to the scientific method 1.4. Expand students' vocabulary through the use of their vocabulary log
<b>Contents</b>	Reading strategies – Skimming and Scanning Scientific Method Question, Hypothesis, Theory, Law
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❖ **General instructions**

- This first unit's objective is to develop and improve your reading comprehension skills so that you can move forward to the next unit.
- If you have any doubts, write a mail to your corresponding teacher.
- Use <https://www.wordreference.com/>; <https://dictionary.cambridge.org/dictionary/english/>; <https://www.oxfordlearnersdictionaries.com/us/> to solve vocabulary doubts.
- Avoid** using **Google translator** for **complete** sentences. **REMEMBER** that **YOU** are the one who **should do** that mental process.
- Do your best and take care 😊

**I. REVIEW → SCIENTIFIC METHOD**

**Instructions** → In the following box, diagram your own example of the scientific method with all its steps.



## II. READING STRATEGIES – SKIMMING AND SCANNING

**Instructions** → In this part, there are 2 reading comprehension strategies.

READ through each one of them.

LOOK UP every word you don't know. **AVOID TRANSLATING THE WHOLE TEXT.**

### HOW

For you to scan a text you have to:

1. **Read** what you're asked to do or to **answer**
2. **Underline/highlight** key words in the **question**
3. **Go** to the **text** and **scan** it to **find** the **key** words (or **synonyms**) you selected in the **questions**
4. That's **where** you probably will **find** the info to **answer**

Aim → Speed  
Read quickly

**DO NOT START BY**  
**READING** the whole text

Focus → Specific details/  
Detailed info

### SCANNING

### EXAMPLES

This technique is to **quickly** solve a reading task, it **prevents** you from reading everything and makes you **focus** on the **info** you need. However, you use it every day.

- When you look for a **friend's number** on your contacts list
- When you look for **your name** on a long list
- When you want to find a specific number or data on a long text

### SKIMMING

### HOW

For you to skim a text you have to:

1. **Read** what you're asked to do or to **answer**. (**whole text vs. paragraph**)
2. **If** → **Main idea** of the **whole text**:  
Read the **title**. **Look** at the images. Read **1<sup>st</sup>** and **last** sentence of **each paragraph**. Read **last paragraph** completely
3. **If** → **Main idea** of a **paragraph**: Read heading (if). Read **all** the paragraph, pay special attention to the **1<sup>st</sup> line** (1<sup>st</sup> line = **topic sentence**, which contains **most** of the info that the paragraph will be about). **Cross out** details. Underline key info.
4. **Write** a main idea as follows:  
**COMPLETE SENTENCE** →  
SUBJECT + VERB + COMPLEMENT

Focus → General info/  
Main ideas

**HAVE to READ** the **whole** text or part of the text to get the info you need

Aim → Selection of info. Details vs Main idea

### EXAMPLES

You also skim different sources of info in your daily life.

- When you tell someone what a **book** was **about**.
  - When you **tell** a friend an **episode** of a series both watch
  - When you **watch** a match and give your opinion of the **match itself**.
- In each case, you **do not tell every little thing** that happened, just the **most important** info

#### Tips for skimming

**Details** usually are: specific numbers, examples, data, rephrasing, explanations, etc. They change depending on the context.

**Main ideas** can be **clearly** stated or **inferred**. If they are clearly stated, they usually are at the beginning and at the end of the paragraph

**Avoid starting** a main idea by writing "the text is about", "the author says", "the text says". **MAIN IDEA = TOPIC + CENTRAL POINT**

**Do not worry if it's difficult for you at first. In handout 3, we will cover this content in a more detailed way.**



# SCANNING

→ **Example.**

Question → What is **paramount** about the **scientific process**?

1\*\* There are **2 key words highlighted** in the question. They both **determine** the **info** I have to **look** for in the **text**\*\*

2\*\* **After** selecting the key words in the question, I **go** to the **text** and look for them or for synonyms\*\*

The word "science" is derived from the Latin word *scientia*, which is knowledge based on demonstrable and reproducible data, according to the Merriam-Webster Dictionary. True to this definition, science aims for measurable results through testing and analysis. Science is based on fact, not opinion or preferences. The process of science is designed to challenge ideas through research. One important aspect of the scientific process is that it is focuses only on the natural world, according to the University of California. Anything that is considered supernatural does not fit into the definition of science.

3\*\* You can see that I **circle** the words **important** and **scientific process**, and I **underline** a piece of **information** next to those words\*\*

4\*\* Now that I've **found** the **key words** I selected first, I **read** that piece of info and **see** if it serves as a **possible** answer

5\*\* In this case, **there's** my answer since the word "paramount" is a synonym of "important" and the underlined info is the actual important aspect.

6\*\* I **write** the **answer** to the question

Question: What is **paramount** about the **scientific process**?

Answer: The key characteristic of the scientific process is that it solely concentrates on the natural world.

# SKIMMING

→ **Example.**

Question → What is the **main idea** of **paragraph** N°1?

1\*\* There are **2 key words highlighted** in the question. They both **determine** that I need to **skim** the paragraph. I'm not being asked for specific info so I can't use the scanning technique\*\*

2\*\* After that, I **read** the corresponding paragraph

The scientific method and science in general can be frustrating. A theory is almost never proven, though a few theories do become scientific laws. One example would be the laws of conservation of energy, which is the first law of thermodynamics. Dr. Linda Boland, a neurobiologist and chairperson of the biology department at the University of Richmond, Virginia, told Live Science that this is her favorite scientific law. "This is one that guides much of my research on cellular electrical activity and it states that energy cannot be created nor destroyed, only changed in form. This law continually reminds me of the many forms of energy," she said.

3\*\* Read the **1<sup>st</sup> sentence**: "The scientific method and science in general can be frustrating" By reading this 1<sup>st</sup> sentence I can get the **TOPIC** of the paragraph: **Science**

4\*\* I need to **continue reading** the paragraph and start **crossing out details** and **highlighting KEY** info

The scientific method and **science** in general can be **frustrating**. A theory is **almost never** proven, though a few theories do become scientific laws. ~~One example would be the laws of conservation of energy, which is the first law of thermodynamics. Dr. Linda Boland, a neurobiologist and chairperson of the biology department at the University of Richmond, Virginia, told Live Science that this is her favorite scientific law. "This is one that guides much of my research on cellular electrical activity and it states that energy cannot be created nor destroyed, only changed in form. This law continually reminds me of the many forms of energy," she said.~~

5\*\* The paragraph should look like the one above. The **highlighted** words are **key words**: "science" is the **topic** and the others are the words that form the central point of the text (frustrating, almost, never, proven). The **crossed out sentences** are **examples** ("one example would be" indicates exemplification) and a **fragment of an interview** ("Dr. Linda Boland..." is the beginning of that fragment and it only serves as a minor supporting detail since the text is not about scientists' favorite laws ).

6\*\* Now I have everything I need to write my main idea. If I have **doubts** about it, I **ask** myself "What does the **author** want me to **know** about the **topic**? What is the author **teaching** me?" In this case, the author wants to state what is his/her appreciation of science and why.

7\*\* Finally, I **write** the main idea. **MAIN IDEA = TOPIC + CENTRAL POINT**. Remember to **avoid** starting with "the author says, the text says, the main idea is, paragraph 1 is about" **You start with the topic = Science**.

Science is likely to be discouraging since theories are rarely proven.

(Main idea of that paragraph)



### III. READING COMPREHENSION EXERCISE

**Instructions:** Answer the question of the following text applying the scanning and skimming strategies (and the ones from Handout1).

I. Vocabulary exercise → Use context to get the meaning of and define the following words

- a) Reliable: \_\_\_\_\_
- b) Minimize: \_\_\_\_\_
- c) Several: \_\_\_\_\_
- d) Agree: \_\_\_\_\_
- e) Discarded: \_\_\_\_\_
- f) Validity: \_\_\_\_\_

II. Classify the words above into the following categories. MIND THE CONTEXT

Nouns	Adjectives	Verbs

III. Complete the following chart

Scientific method	Aim	Steps	Mistakes in applying it

IV. Reading comprehension strategies – Skimming & Scanning

1. Why the predictive power is key in the scientific method?
2. Explain the main idea of paragraph N° 3
3. What happen when a theory is found to be in disagreement?
4. What is the problem with our “common sense” and “logic”?
5. Why do you have to handle data equally?

#### Introduction to the Scientific Method

1. The scientific method is the process by which scientists, collectively and over time, endeavor to construct an accurate (that is, **reliable**, consistent and non-arbitrary) representation of the world.

Recognizing that personal and cultural beliefs influence both our perceptions and our interpretations of natural phenomena, we aim through the use of standard procedures and criteria to **minimize** those influences when developing a theory. As a famous scientist once said, "Smart people (like smart lawyers) can come up with very good explanations for mistaken points of view." In summary, the scientific method attempts to minimize the influence of bias or prejudice in the experimenter when testing an hypothesis or a theory.



## I. The scientific method has four steps

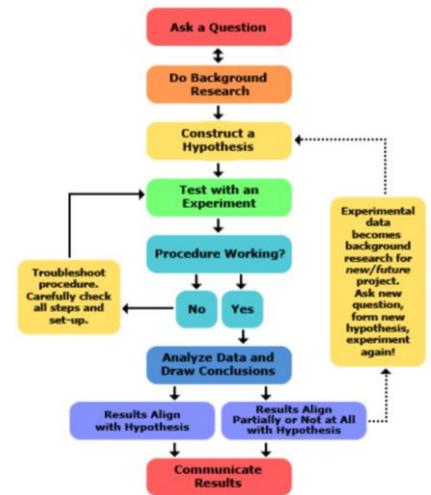
2. 1. Observation and description of a phenomenon or group of phenomena.

Formulation of a hypothesis to explain the phenomena.

Use of the hypothesis to predict the existence of other phenomena, or to predict quantitatively the results of new observations.

Performance of experimental tests of the predictions by **several** independent experimenters and properly performed experiments.

3. If the experiments bear out the hypothesis, it may come to be regarded as a theory or law of nature. If the experiments do not bear out the hypothesis, it must be rejected or modified. What is key in the description of the scientific method just given is the predictive power (the ability to get more out of the theory than you put in) of the hypothesis or theory, as tested by experiment. It is often said in science that theories can never be proved, only disproved. There is always the possibility that a new observation or a new experiment will conflict with a long-standing theory.



## II. Testing hypotheses

4. As just stated, experimental tests may lead either to the confirmation of the hypothesis, or to the ruling out of the hypothesis. The scientific method requires that an hypothesis be ruled out or modified if its predictions are clearly and repeatedly incompatible with experimental tests. Further, no matter how elegant a theory is, its predictions must **agree** with experimental results if we are to believe that it is a valid description of nature. Note that the necessity of experiment also implies that a theory must be testable. Theories which cannot be tested, because, for instance, they have no observable ramifications (such as, a particle whose characteristics make it unobservable), do not qualify as scientific theories.

5. If the predictions of a long-standing theory are found to be in disagreement with new experimental results, the theory may be **discarded** as a description of reality, but it may continue to be applicable within a limited range of measurable parameters.

## III. Common Mistakes in Applying the Scientific Method

6. As stated earlier, the scientific method attempts to minimize the influence of the scientist's bias on the outcome of an experiment. That is, when testing an hypothesis or a theory, the scientist may have a preference for one outcome or another, and it is important that this preference not bias the results or their interpretation. The most fundamental error is to mistake the hypothesis for an explanation of a phenomenon, without performing experimental tests. Sometimes "common sense" and "logic" tempt us into believing that no test is needed. Another common mistake is to ignore or rule out data which do not support the hypothesis. Ideally, the experimenter is open to the possibility that the hypothesis is correct or incorrect. Sometimes, however, a scientist may have a strong belief that the hypothesis is true (or false), or feels internal or external pressure to get a specific result. In that case, there may be a psychological tendency to find "something wrong", such as systematic effects, with data which do not support the scientist's expectations, while data which do agree with those expectations may not be checked as carefully. The lesson is that all data must be handled in the same way.