Pakistan School
Kingdom of Bahrain

PAKISTAN SCHOOL, KINGDOM OF BAHRAIN.

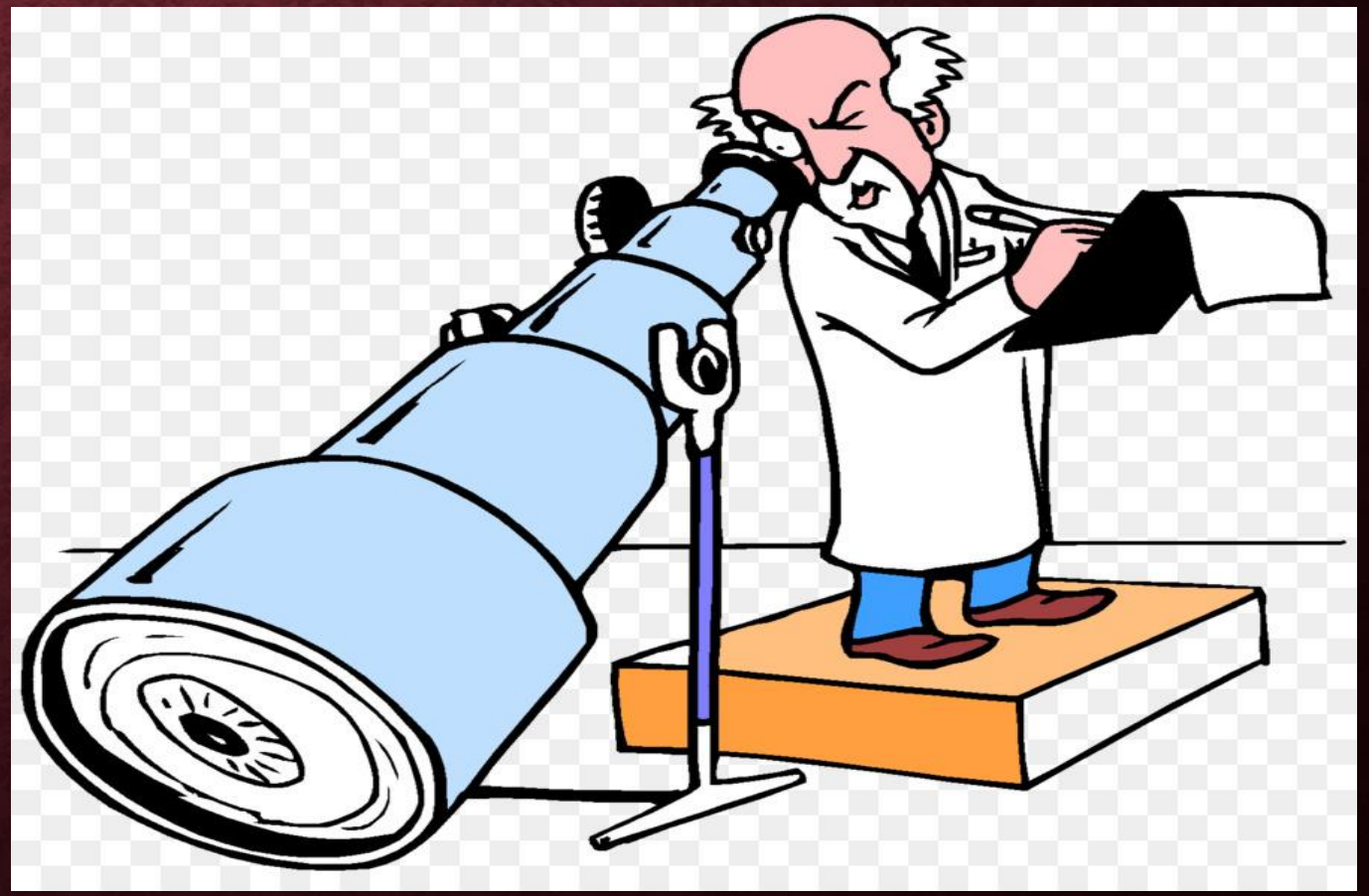
Chapter : 2

Solving a Biological Problem.

RULES OF THE CLASS

1) Be on time for all your classes.
2) Respect all the participants of the class.
3) Do not create any disturbance.
4) Pay attention to your teacher.
5) Raise hand if you have a question.
6) Enter into the class with your actual name and CPR number.

ENGAGING STARTER



Objectives:

At the end of this lesson students will be able to:

- Define biological method
- Identify the steps of biological method
- Analyze the first three steps

BIOLOGICAL METHOD

Biologists recognize some biological problem and go for its solution.

The scientific method in which biological problems are solved, is termed as BIOLOGICAL METHOD.

It provides data for public use

make an observation

ask a question

make a hypothesis

I think...

conduct your experiment

draw conclusions

I learned that...

report your results

SOLVING A BIOLOGICAL PROBLEM:

Following steps are utilized by a biologist to solve a biological problem:

1. Recognition of biological problem.
2. Observations.
3. Hypothesis formulation.
4. Deductions.
5. Experimentation.
6. Summarization of results (create tables, graphs etc.)
7. Reporting the results.

1. RECOGNITION OF BIOLOGICAL PROBLEM:

A biological problem is a question related to living organisms that may be asked by someone, comes in the biologist's mind by himself or arises due to some change in the environment.

e.g. Some unknown respiratory disorder started to occur in a group of people in Wuhan, China.

2. OBSERVATIONS:

First recall the previous observations made and if necessary make new ones.

- The data measured, collected, perceived, noticed or recorded during an experiment.

-Observations are made using the five senses of a human being i.e; vision(eyes), hearing(ears), smell(nose), taste(tongue) and touch(skin).

- Observations also means reading and studying what other have done in the past.

TYPES OF OBSERVATIONS:

There are 2 types of observations.

A. Qualitative

Qualitative observation uses the 5 major sensory organs and their functioning – sight, smell, touch, taste and hearing. This is non-measureable (doesn't involve measurements or numbers but instead characteristics).

EXAMPLES OF QUALITATIVE OBSERVATION:

1. The flower has white petals. (sight)
2. The nectar of the flower is sweet. (taste)
3. It has soft petals. (touch)

WHY IS IT LESS ACCURATE ?

Converting Qualitative observations into Quantitative data

- Example: Your big, dead fish is smelly, but how can this smell be measured?
- How would someone else know how smelly the fish actually is?
- To solve this problem scientists would make a scale for "**smelliness**"
- What about using **a scale from 0-5**, with a **5 as Nauseating** and a **0 for no smell at** all.
- ***This would allow people to compare how smelly your fish is compared to others!***

B. Quantitative (more accurate) :

Quantitative observations are made with instruments such as rulers, balances, graduated cylinders, beakers, and thermometers. These results are measurable, invariable and can be recorded in numbers and deals in quantifiable variables, things that you can use numbers to express.

EXAMPLES OF QUANTITATIVE OBSERVATION:

1. The rose plant is 1.5 meters tall.
2. Average body temperature of human body is 37°C.
3. Bilal's weight is 70 kg.

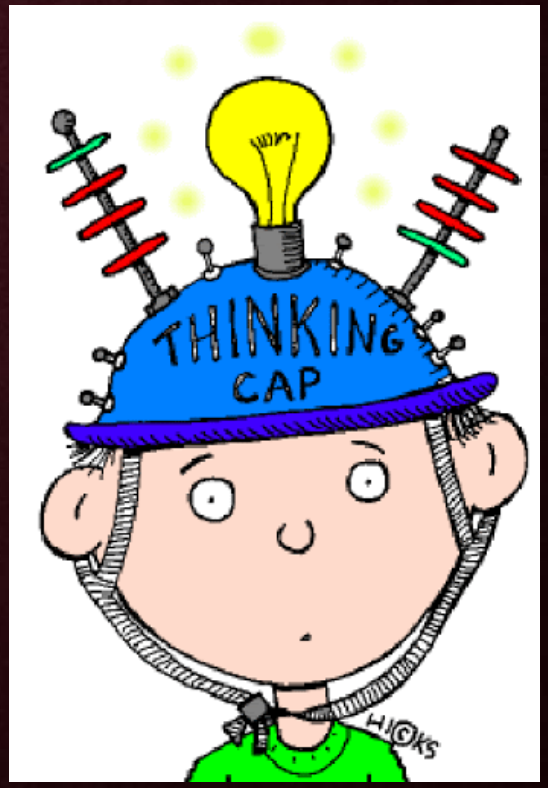
COMPARISON

Qualitative Observations	Quantitative observations
1. The freezing point of water is colder than the boiling point.	1. The freezing point of water is 0° C and the boiling point is 100° C.
2. A liter of water is heavier than a liter of ethanol.	2. A liter of water weighs 1000 grams and a liter of ethanol weighs 789 grams.

Qualitative Data	Quantitative Data
Overview: • Deals with descriptions. • Data can be observed but not measured. • Colors, textures, smells, tastes, appearance, beauty, etc. • Qualitative → Quality	**Overview:** • Deals with numbers. • Data which can be measured. • Length, height, area, volume, weight, speed, time, temperature, humidity, sound levels, cost, members, ages, etc. • Quantitative → Quantity

3. FORMULATION OF HYPOTHESIS:

- Observations should be organized into data form and related to or constructed into a question or statement that can be **true** or **false** until proven by experimentation.
- This tentative (possible) explanation of observations is called a **hypothesis.**
- Careful thinking, creative thinking and reasoning are used to formulate the hypothesis.



CHARACTERISTICS OF A HYPOTHESIS:

Should be:

- A general statement.
- A tentative idea.
- Agree with available observations.
- As simple as possible.
- Testable and potentially falsifiable (should have the characteristic of being false).

EXAMPLE:

Observation: Patients with the unknown respiratory disorder showed the symptoms like those of common flu.

It led to the formulation of **HYPOTHESIS**.

- **Flu virus is the cause of this respiratory disorder.**

PLENARY:

1. Which one of these is NOT a characteristic of a hypothesis?

a. Must be consistent with all available data b. Must be testable

c. Must be correct d. Must make predictions.

2. At which point is a biologist most likely to use reasoning ?

a. While taking observations b. During hypothesis formulation c. During data organization d. None of the above

3. A hypothesis must be testable to be scientifically valid. Being testable means that

_____

a. Some observation could prove the hypothesis incorrect

b. Only a controlled experiment can indicate whether the hypothesis is correct or incorrect

c. The hypothesis is proven wrong

d. The opposite of hypothesis is tested and proven wrong

4. If a test shows that some people have *Plasmodium* in their blood but they do not show any symptoms of malaria, what hypothesis would you formulate to answer this problem ?

ALLAH HAFIZ

TAKE CARE

Teacher : Nusrat Idrees