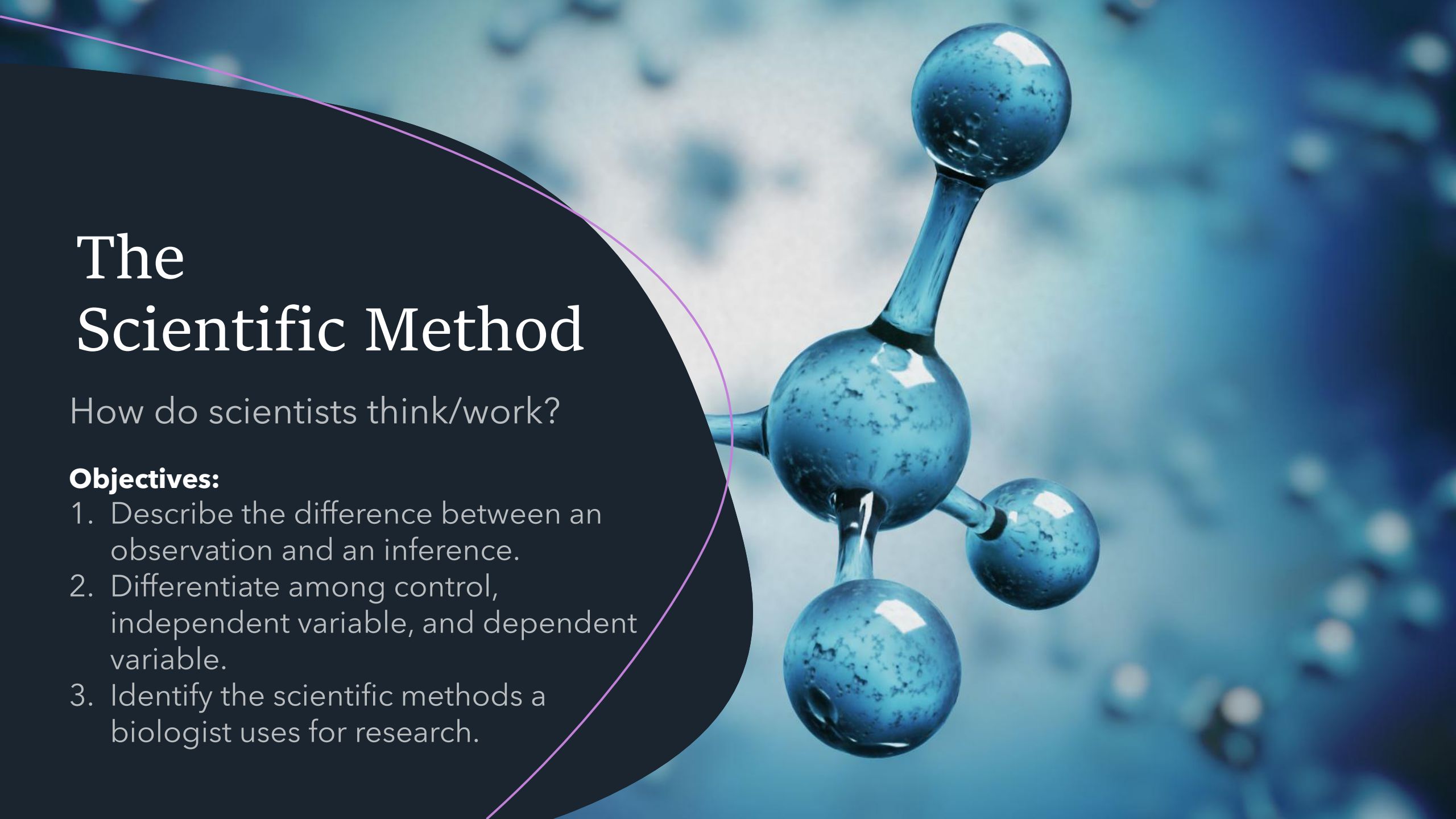
# The Scientific Method

How do scientists think/work?

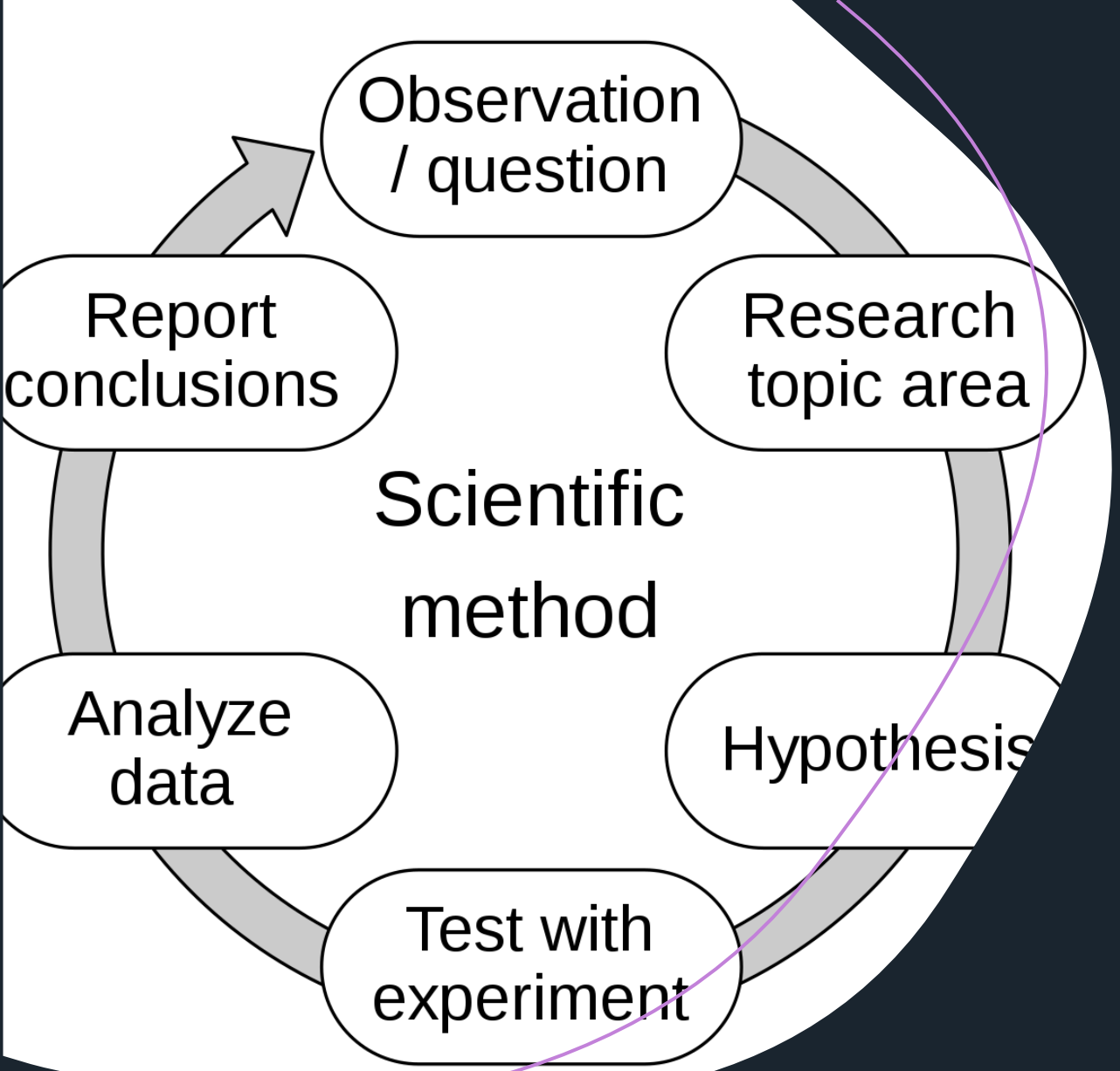
**Objectives:**

1. Describe the difference between an observation and an inference.
2. Differentiate among control, independent variable, and dependent variable.
3. Identify the scientific methods a biologist uses for research.



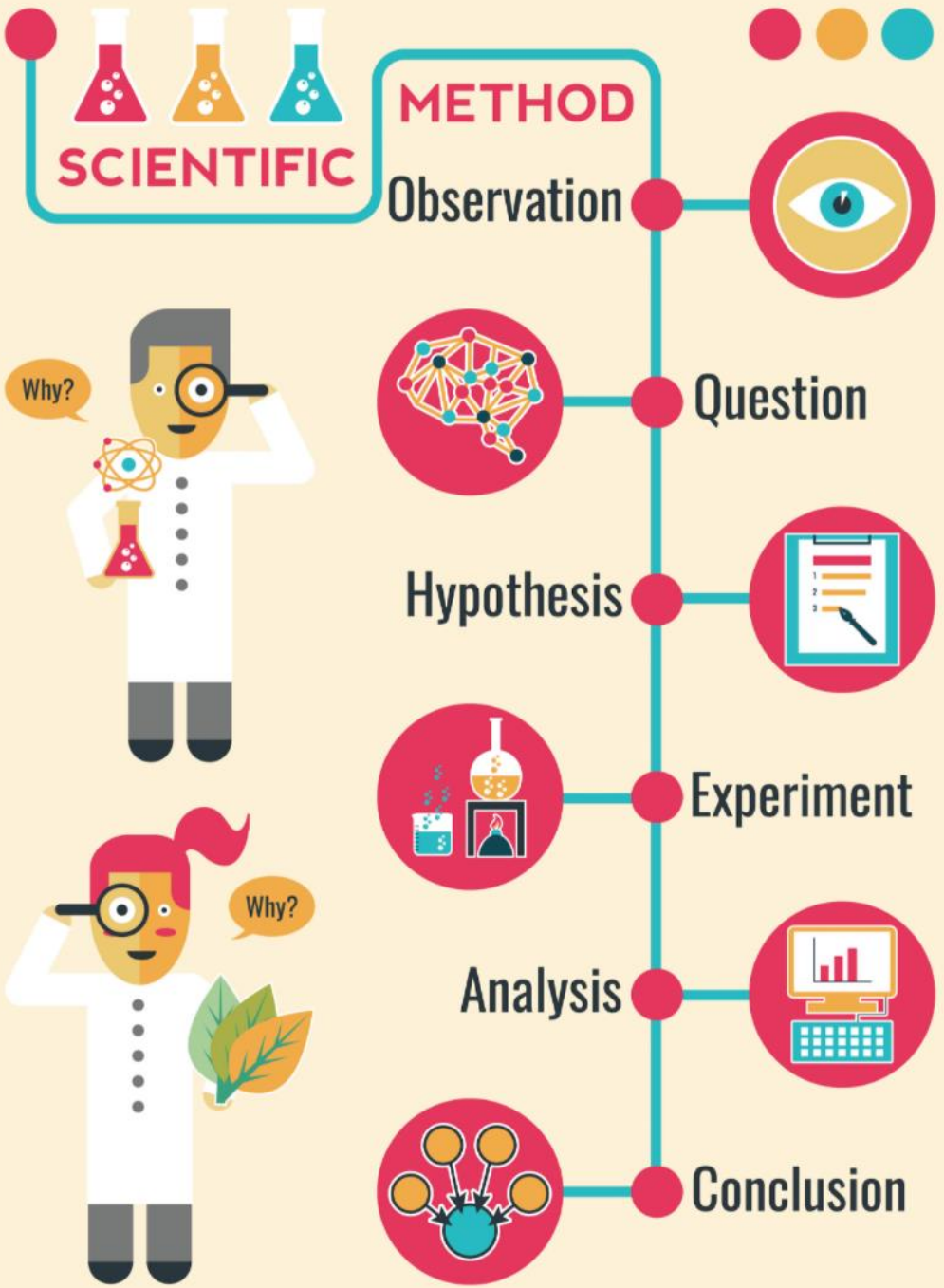
# Check out the meaning/definition of these words:

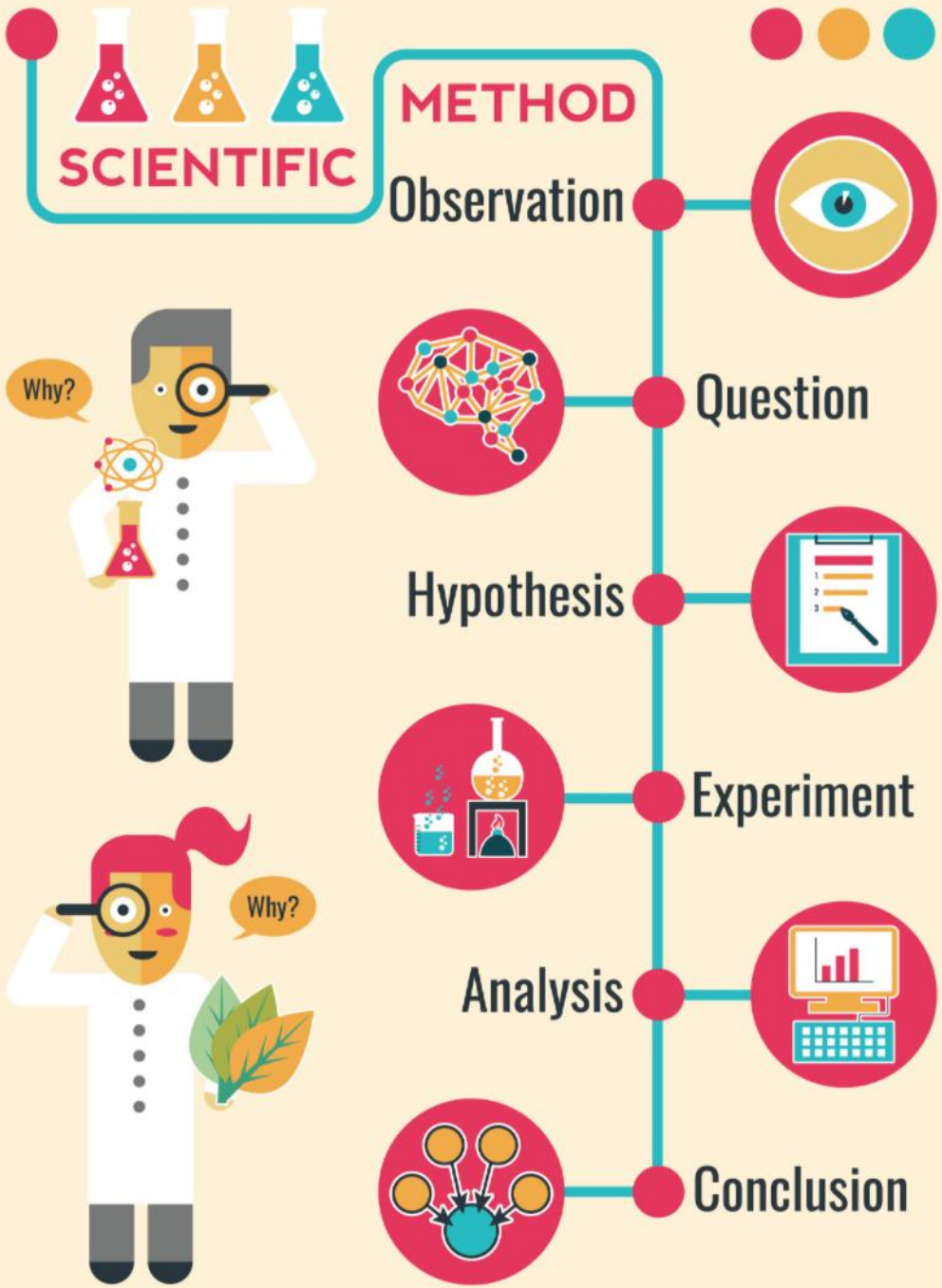
- Observation
- Inference
- Hypothesis
- Variables
  - Independent variable
  - Dependent variable
  - Controlled variable
- Control
- Operational definition




# The Scientific Method

- A very formal procedure scientists use to evaluate their predictions or hypotheses.
- The scientific method includes a step-by-step formula for researchers to follow.


SCIENTIFIC METHOD
Observation
Question
Hypothesis
Experiment
Analysis
Conclusion
Why?
Why?




# Observation & Question

- Are there any problems around you that you have noticed?
- Do not stop asking questions!
- The KEY to science is to **STAY CURIOUS!!!**

## Observation:

The pot of plant on my windowpane died.

## Question:

Why did my plant die?

# Inference VS Hypothesis

- Inference
  - Using observation and background knowledge to reach a logical conclusion
- Hypothesis
  - Using research and background knowledge to make a guess about something that has NOT yet happened.
  - An educated guess based on evidence/information, not what you think.

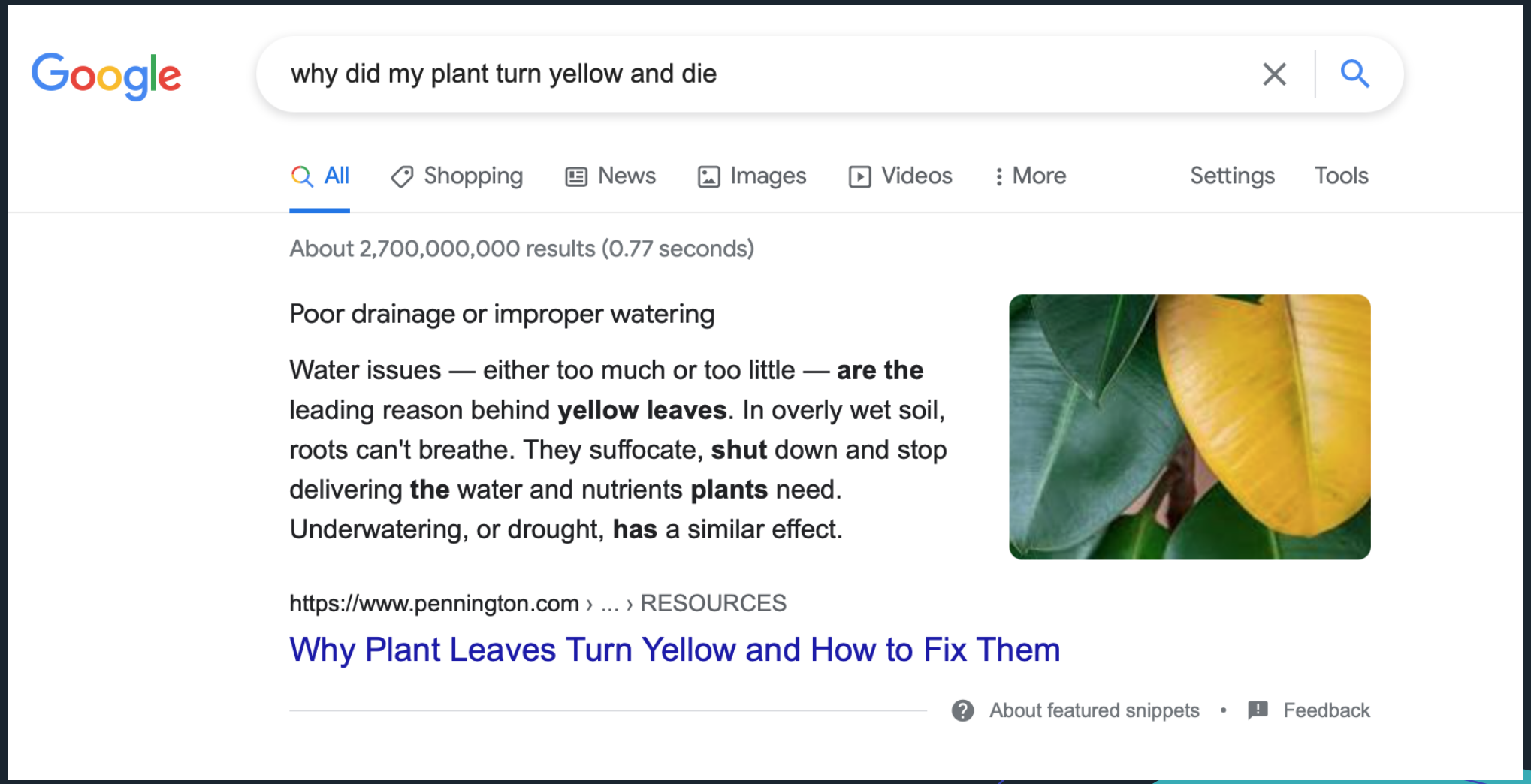
# Inference:

I had forgotten to water my plants last week as I was busy with assignments. I think it died due to the lack of water.

# Research

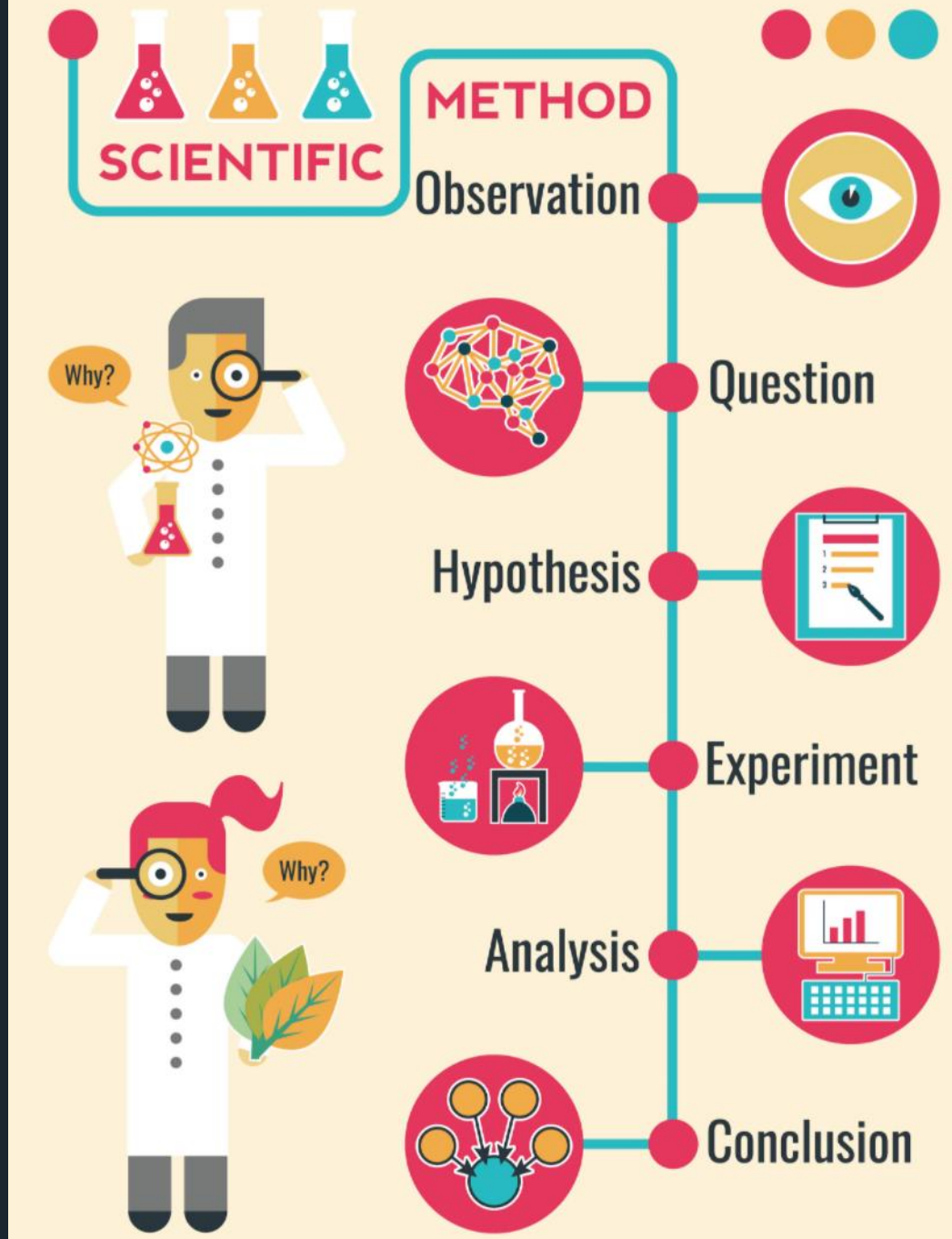
- Look for evidences and possible explanations

# Research


Google
why did my plant turn yellow and die
All
Shopping
News
Images
Videos
More
Settings
Tools
About 2,700,000,000 results (0.77 seconds)
Poor drainage or improper watering
Water issues — either too much or too little — are the leading reason behind yellow leaves. In overly wet soil, roots can't breathe. They suffocate, shut down and stop delivering the water and nutrients plants need. Underwatering, or drought, has a similar effect.
https://www.pennington.com › ... › RESOURCES
Why Plant Leaves Turn Yellow and How to Fix Them
About featured snippets
Feedback

# Hypothesis

- proposed explanation made based on limited evidence as a starting point for further investigation.
- an educated guess or prediction that is specific



# Hypothesis:

Plants need the right amount of water to survive better.

# Operational definition

- An observable and measurable condition that is precise and does not allow space for guessing.

# Hypothesis:

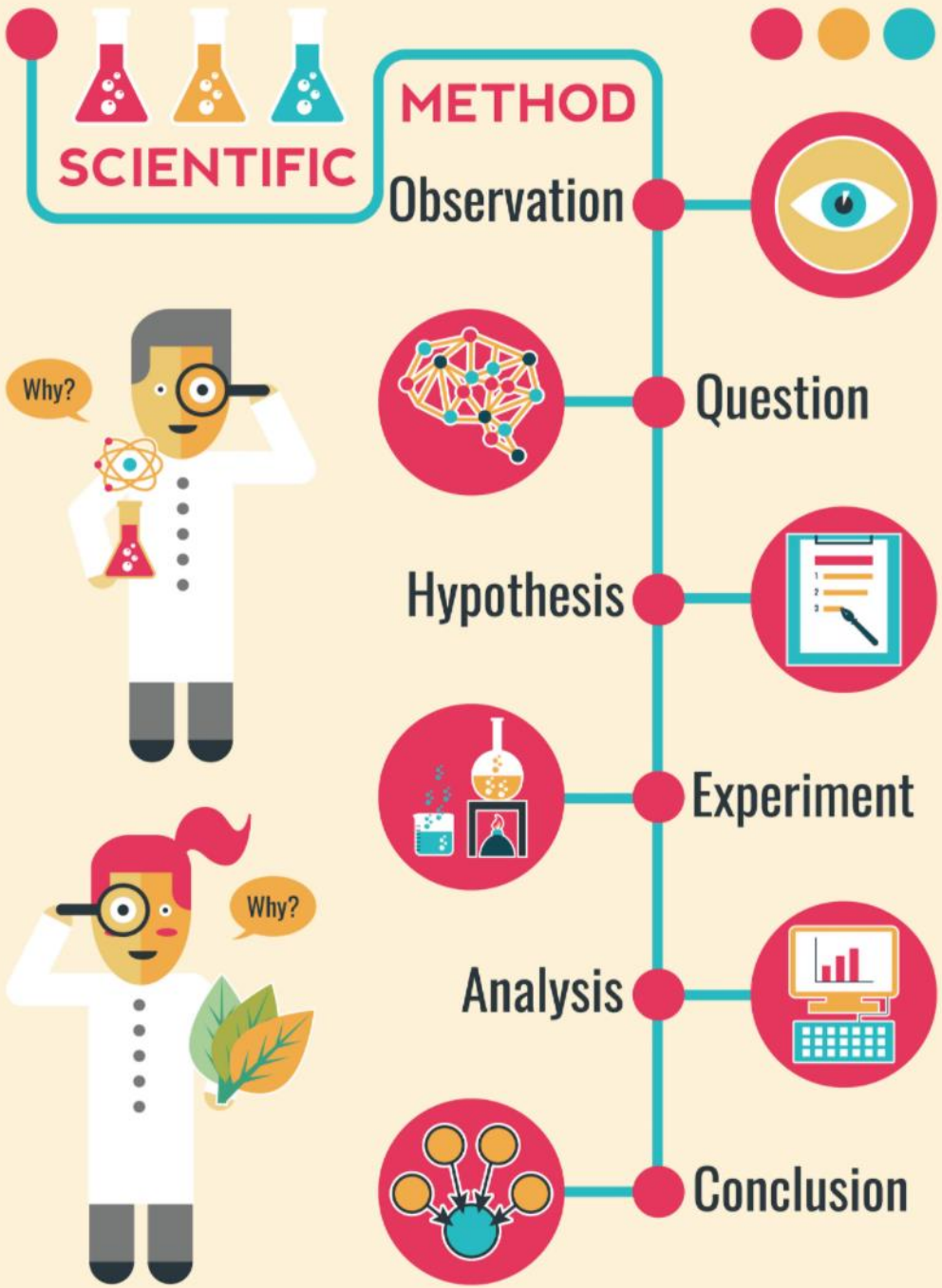
Plants need the right amount of water to survive better.

# Hypothesis:

Plants need the right amount of water to survive better.

# Hypothesis:

Plants need the right amount of water to grow taller with green leaves.




# Plan experiment

Variable:

something measurable in your experiment

# Plants need the right amount of water to grow taller with green leaves.

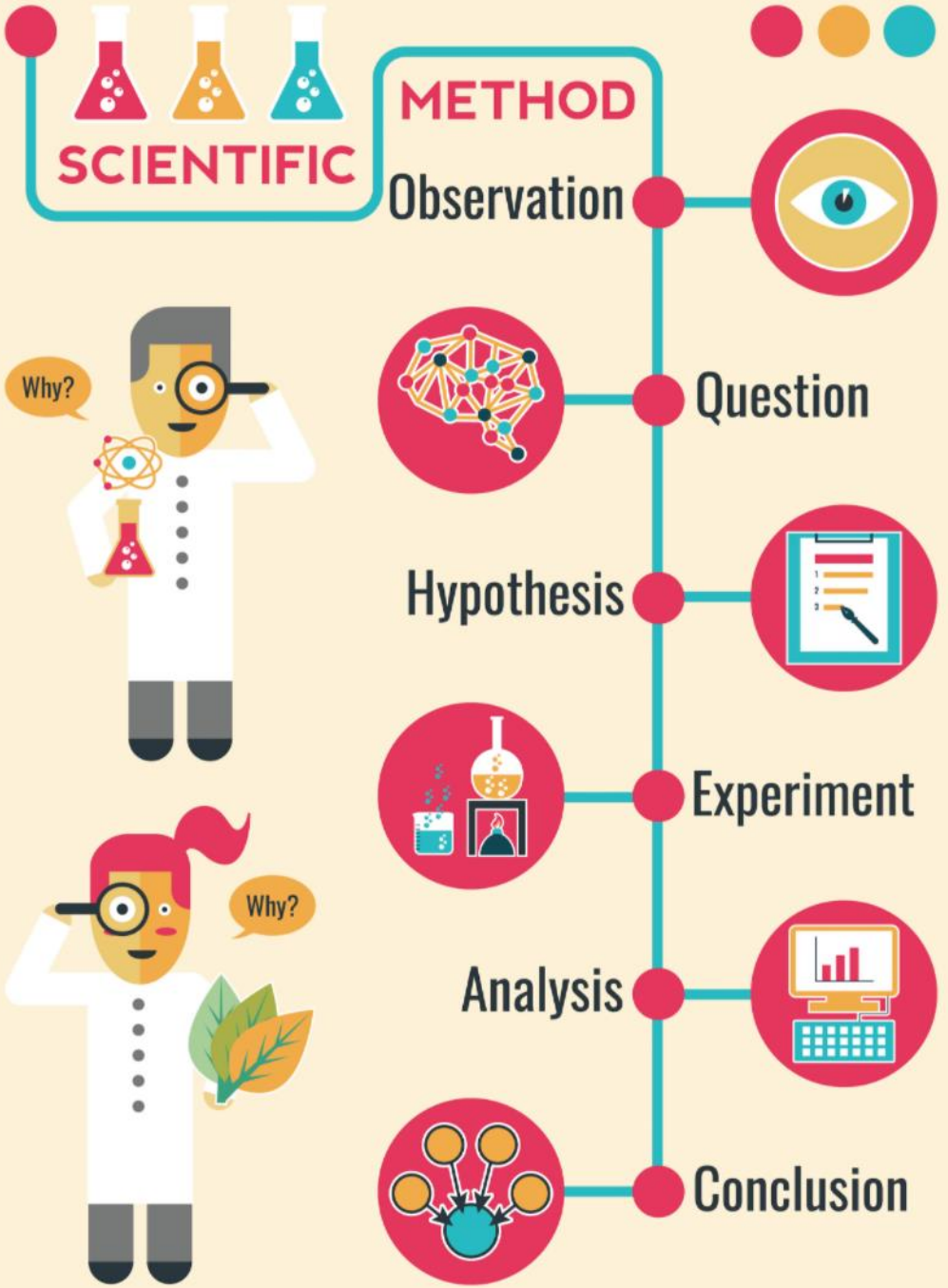
- Independent variable:
- Dependent variable:
- Controlled/constant variable:
- Control:

# Plants need the right amount of water to grow taller with green leaves.

- Independent variable:
  - the amount of water (1, 3, 5 cups every 3 days)
- Dependent variable:
  - the height/size of the plant with color of leaves
- Controlled/constant variable:
  - Amount of sunlight, room temperature, size of pot, type of plant
- Control:
  - A normal healthy plant

# Analysis

- Explain what possibly happened based on the outcome of your experiment.
- Analysis of the results of an experiment will lead to the hypothesis being accepted or rejected

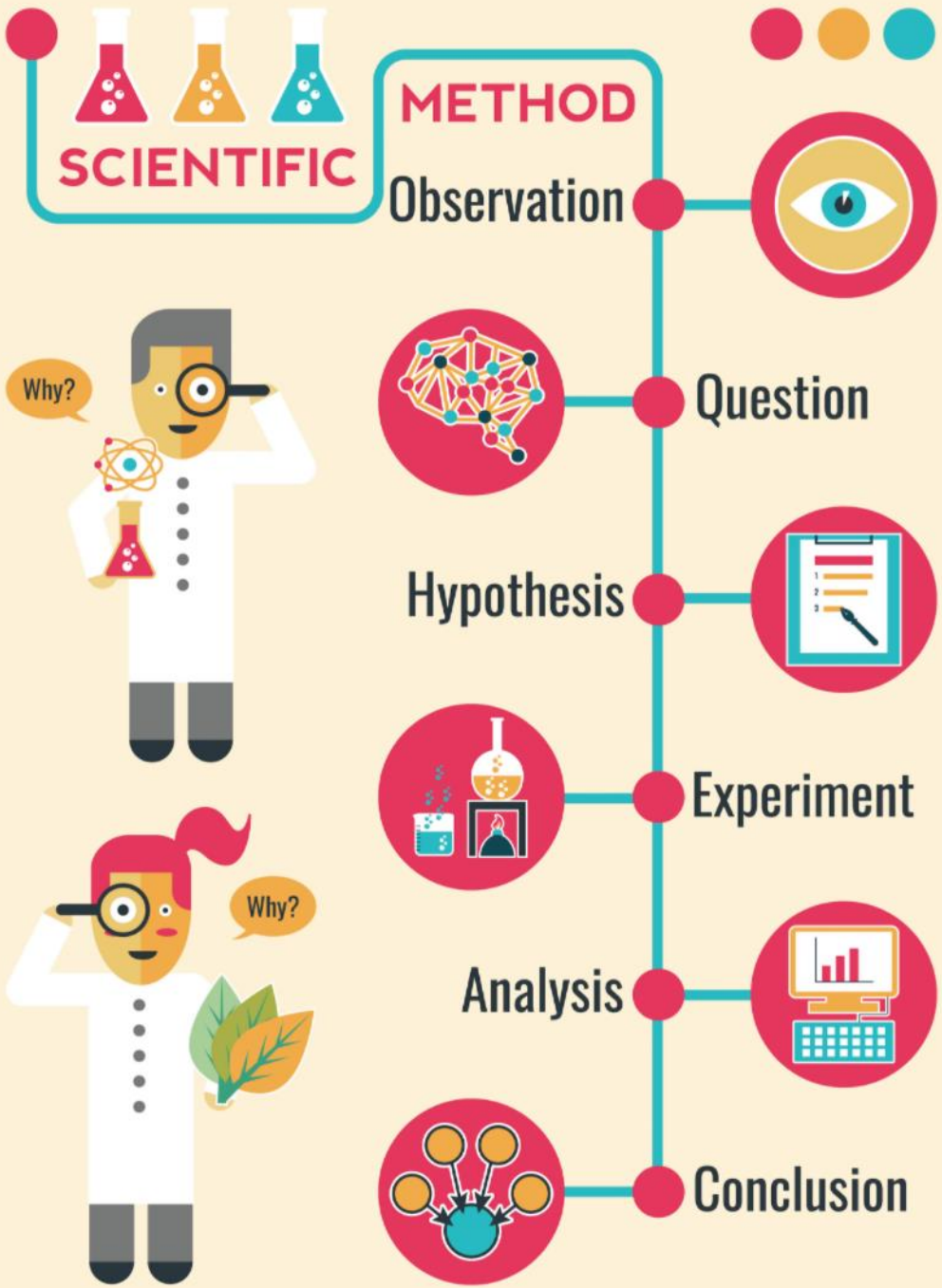


# Results


1 cup

3 cups

5 cups




# Conclusion

- summarize how your results support or contradict your original hypothesis
    - Hypothesis accepted or rejected?
    - Why?

# Conclusion


Hypothesis accepted.

Plants need the right amount of water to survive. Providing too much or too little water will lead to their deaths.

In this experiment, the right amount of water was 3 cups of water every 3 days.