CHOOSE THE RIGHT CAPTION

Below are six figures and six captions. Each caption matches one of the figures. Choose the caption that best describes each figure. Write the correct caption on the line provided.

Choose from these captions:

Identify the problem	Make careful observations
Gather information	Record the data
State a hypothesis	Analyze the data
Test the hypothesis	State a conclusion

Figure A

1. Record the data

Figure B

2. State a hypothesis

Figure C

3. Gather Info.

Figure D

4. Analyze the Data

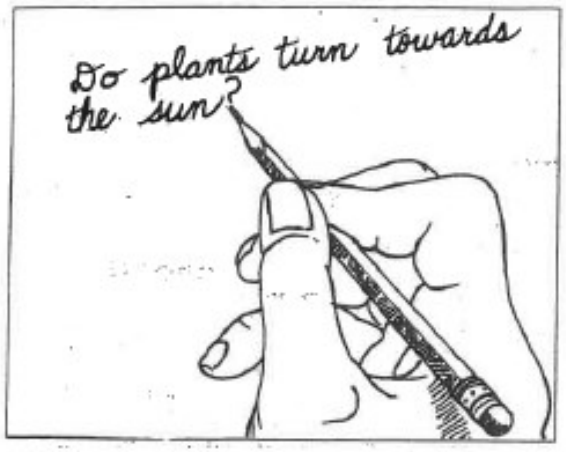

Figure E

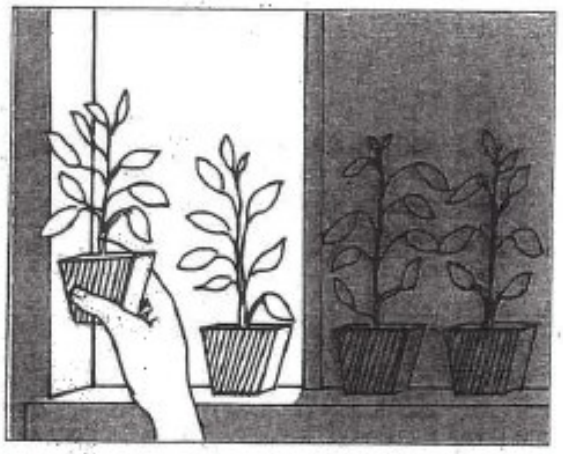

Figure F

5. Identify the Problem

6. Test the hypothesis

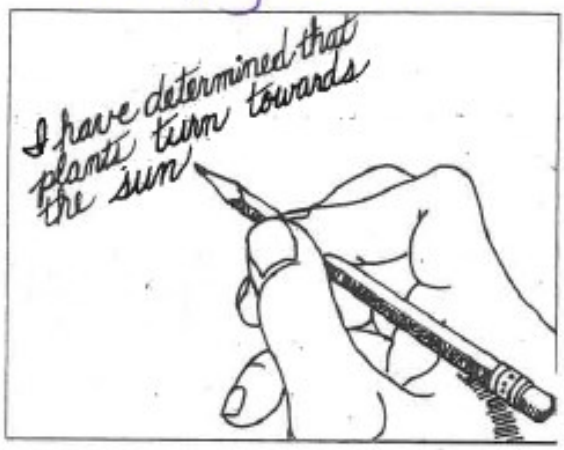

Figure G

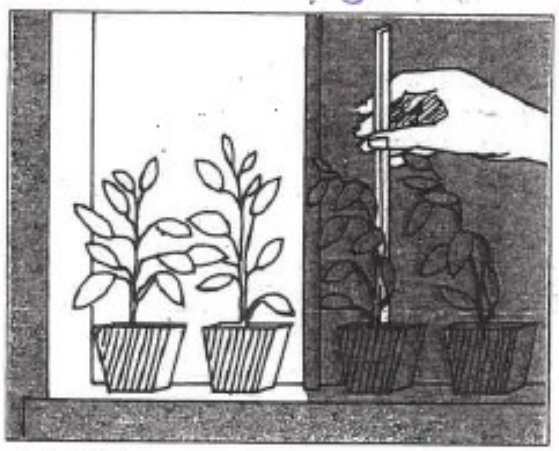

Figure H

7. State a conclusion

8. Make observations

MATCHING

Match each term in Column A with its description in Column B. Write the correct letter in the space provided.

Column A		Column B
c	1. analyze	a) explains the data
d	2. scientific method	b) suggested solution
a	3. conclusion	c) test the hypothesis
b	4. hypothesis	d) guide for solving problems
c	5. experiment	e) figure out the meaning

Scientific Method Name _____

SpongeBob and his Bikini Bottom pals have been busy doing a little research. Read the description for each experiment and answer the questions.

1 - Patty Power

Mr. Krabs wants to make Bikini Bottoms a nicer place to live. He has created a new sauce that he thinks will reduce the production of body gas associated with eating crabby patties from the Krusty Krab. He recruits 100 customers with a history of gas problems. He has 50 of them (Group A) eat crabby patties with the new sauce. The other 50 (Group B) eat crabby patties with sauce that looks just like new sauce but is really just mixture of mayonnaise and food coloring. Both groups were told that they were getting the sauce that would reduce gas production. Two hours after eating the crabby patties, 30 customers in group A reported having fewer gas problems and 8 customers in group B reported having fewer gas problems.

Which people are in the control group? ***Group B***

What is the independent variable? **New sauce**

What is the dependent variable? **Amount of gas**

What should Mr. Krabs' conclusion be?
The new sauce appears to work as it reduced the amount of gas produced in 60% of the people tested.

Why do you think 10 people in group B reported feeling better?
They thought they were getting the new sauce as a result thought that they didn't have as much gas. (Placebo effect)

2 – Slimotosis

Sponge Bob notices that his pal Gary is suffering from slimotosis, which occurs when the shell develops a nasty slime and gives off a horrible odor. His friend Patrick tells him that rubbing seaweed on the shell is the perfect cure, while Sandy says that drinking Dr. Kelp will be a better cure. Sponge Bob decides to test this cure by rubbing Gary with seaweed for 1 week and having him drink Dr. Kelp. After a week of treatment, the slime is gone and Gary's shell smells better.

What was the initial observation? **Slimotosis on Gary's shell**

What is the independent variable? **Cures (Seaweed and Dr. Kelp)**

What is the dependent variable? **Slime and odor**

What should Sponge Bob's conclusion be? **Although Gary's symptoms have disappeared, it is not known which cure was the one that worked. He should redo the experiment and include a control group as well as two other testing groups for each of the proposed cures.**

Identify the Controls and Variables

Name: _____

Smithers thinks that a special juice will increase the productivity of workers. He creates two groups of 50 workers each and assigns each group the same task (in this case, they're supposed to staple a set of papers). Group A is given the special juice to drink while they work. Group B is not given the special juice. After an hour, Smithers counts how many stacks of papers each group has made. Group A made 1,587 stacks, Group B made 2,113 stacks.

Identify the:

1. Control Group → Group B
2. Independent Variable Special Juice
3. Dependent Variable Productivity
4. What should Smithers' conclusion be? The juice didn't increase productivity
5. How could this experiment be improved? More People / Varying Amts of juice.

Homer notices that his shower is covered in a strange green slime. His friend Barney tells him that coconut juice will get rid of the green slime. Homer decides to check this this out by spraying half of the shower with coconut juice. He sprays the other half of the shower with water. After 3 days of "treatment" there is no change in the appearance of the green slime on either side of the shower.

6. What was the initial observation? Green slime covering shower.

Identify the-

7. Control Group - The watered part
8. Independent Variable - Coconut juice.
9. Dependent Variable - if it cleans the shower.
10. What should Homer's conclusion be? It doesn't work

Practice Problem

You want to determine the effect of a certain fertilizer on the growth of orchids grown in a greenhouse. Materials that are available to you include: greenhouse, 100 orchid plants, water, fertilizer, and soil. You want to know if the orchids will grow best with a weak concentration of fertilizer, a medium concentration of fertilizer, or a high concentration of fertilizer. How will you design an experiment to test different concentrations of this fertilizer?

A. State your hypothesis:

Possible answer**: I predict that the orchids will grow best with a medium concentration of fertilizer.**

B. How will you set up a controlled experiment?

1. The 100 plants will be divided into 4 groups as follows:

Group 1: 25 plants will receive plain water
Group 2: 25 plants will receive a weak concentration of fertilizer
Group 3: 25 plants will receive a medium concentration of fertilizer
Group 4: 25 plants will receive a high concentration of fertilizer

2. The plants will be watered daily. Over a period of a month, the plants will be measured to see which ones grew the tallest.

C. What is the control group in this experiment?

The control group consists of the 25 plants that are receiving plain water.

D. What is the experimental group in this experiment?

The 75 plants that are receiving various concentrations of fertilizer

E. What variables must be kept constant in this experiment?

All plants receive

- the same amount of **fluid** each day
- grown in **pots** of equal size
- grown at the same **temperature**
- receive the same **amount of sunlight**

F. What variable is being changed in this experiment?

The variable being changed (independent variable) is the amount of fertilizer.

G. After one month of measuring the orchids, the following data is obtained:

Group 1 (**Control** Group): Grew to an average height of **15 cm.**
Group 2 (**Weak** concentration): Grew to an average height of **35 cm**.
Group 3 (**Medium** concentration): Grew to an average height of **28 cm**.
Group 4 (**High** concentration): Grew to an average height of **10 cm**.

Is your hypothesis supported or not supported by these results? I hypothesized that the orchids would grow best with a medium concentration of fertilizer. The results do not support this. The results do not support my hypothesis.

What is your conclusion based on these results? **Orchids grow best with a weak concentration of fertilizer. At medium to high concentrations, plant growth is inhibited.**

V. Analysis Questions:

A. Why is it important to have a large sample size in any experiment?
It is important to test a large sample in order to get a true picture of the results of the experiment. If the sample size is too small, an inaccurate conclusion may be reached. Results obtained by testing a large number of individuals would be much more accurate than if only a few individuals had been tested.

B. Why is it important to repeat the experiment many times?
Experiments should be repeated to see if the same results are obtained each time. This gives validity to the test results.

C. What is the importance of the control?
The control shows what will happen when the experimental factor is omitted. Without the control, there would be no basis for comparison and you would not know how the experimental factor affected the results.

D. How is a theory different than a hypothesis?
A hypothesis is an "educated guess" that is testable through observations and experimentation. A theory is a broad statement of what is believed to be true based on many experiments and considerable amounts of data.

E. Why is it so important that a scientist accurately describes the procedure used in the experiment?
It allows other scientists to repeat the experiment and verify the results.

F. What is the difference between the independent and the dependent variables in an experiment?
The independent variable is the variable that is deliberately changed by the scientist. The dependent variable is the one observed during the experiment. The dependent variable is the data we collect during the experiment.

G. In a "controlled experiment", why must all of the variables, except one, be kept constant throughout the experiment?
If several variables were changed at the same time, the scientist would not know which variable was responsible for the observed results.