Chemistry
Ms. Ye

Name _____
Date _____ Block _____

Do Now: Solve the following problems using the unit conversion method. Show work!

The following equivalence statements may be helpful:

1 inch = 2.54 cm *1 foot = 12 inches* *1 mile = 5280 feet*
1 yard = 3 feet *1 gallon = 3.785 Liters*

1) 2.5 L → gallons

Given: **Conversion Factor:** **Final Answer:**

$X \frac{\quad}{\quad} =$

2) 0.5000 miles → feet

$X \frac{\quad}{\quad} =$

3) 18 hours → seconds

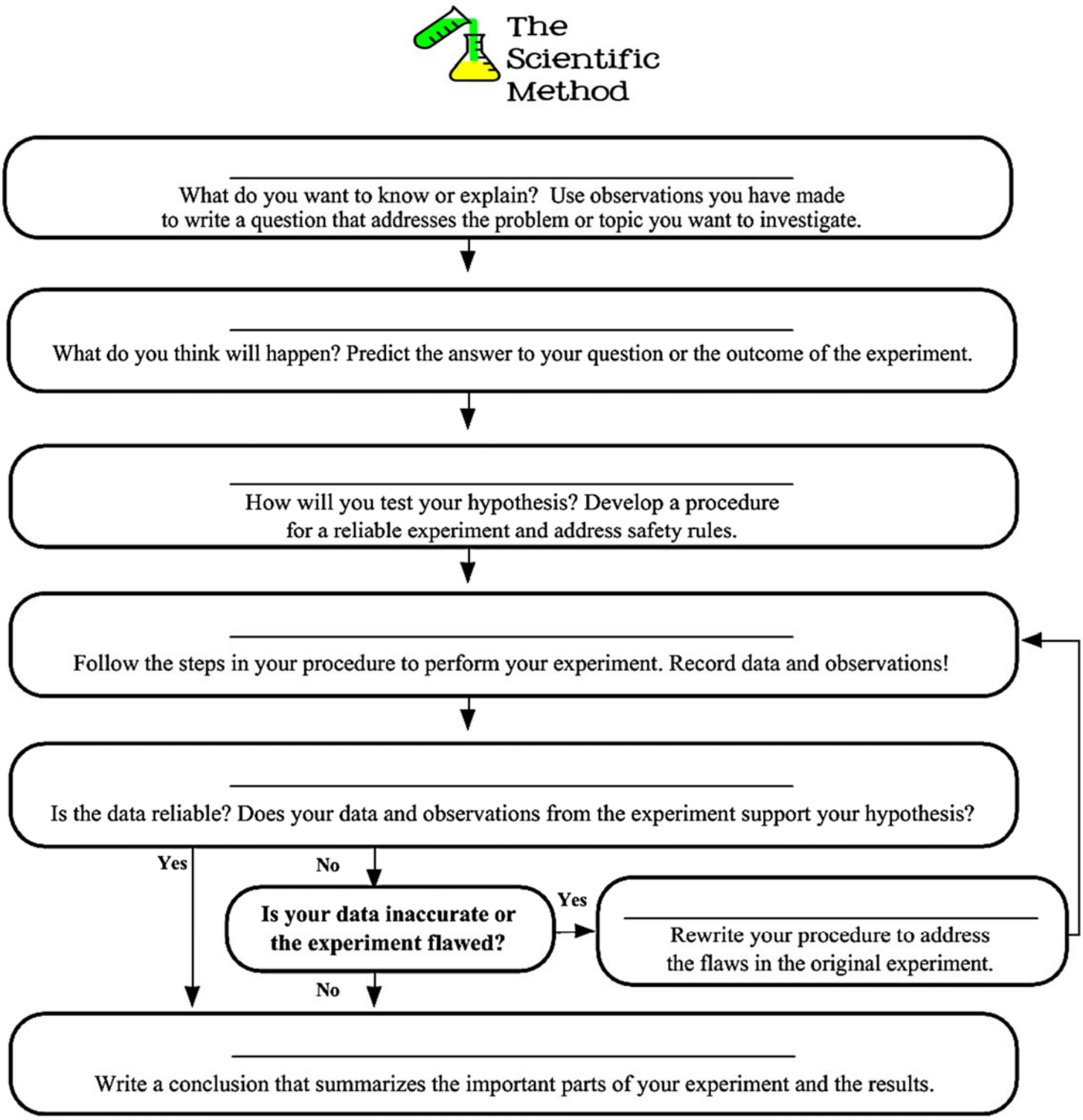
$X \frac{\quad}{\quad} X \frac{\quad}{\quad} =$

4) 10.5 seconds → minutes

5) 12,583 seconds → days

6) 36.7 miles → yards

Scientific Method and Experimental Design



Video Notes: bit.ly/1LXJcB1

- The scientific method is a process that is meant to produce _____

  _____ to answer a _____ _____

- Simplified example of how you might apply the scientific method to your life:

Example from video	**Step in Scientific Method**
Woke up and couldn't find cell phone	
Think about the last time you had your phone	
Phone could be in the pants you wore yesterday	
Check your pants from yesterday	
Did not find cell phone in your pants	
Think about what else you did yesterday	
Cell phone might be in backpack	
Check backpack	
Find cell phone	
Tell friends the good news	

More details:

- A hypothesis is a _____ and may be in "if/then" form.
  - Ex: If gummy bears are placed in water for 24 hrs, then they will swell to over twice their original size.

- Experiments may collect two types of data/observations:

  1. _____ (smell, color, appearance, etc)
     Ex: soft, yellow, shiny

  2. _____ (numerical information)
     Ex: 25 cm, 2.3 grams

- Every experiment has two types of variables:

  1. _____: The thing **I** (the scientist) change

  2. _____: The thing I measure/am looking for in the experiment.

  - Example from Gummy Bear Experiment:

Independent Variable	**Dependent Variable**
Placement in Water (I the scientist have control over that)	Size of Gummy Bear (I do not have control over how big the gummy bears will get. This is something I measure.

- And two groups:
  1. _____: has one independent variable altered

  2. _____: all other groups are compared to this (this is the "normal" group)

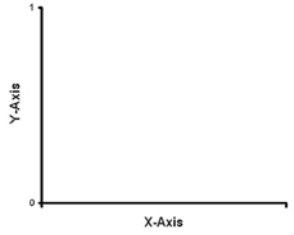
  - Example from Gummy Bear Experiment:

Experimental Group	**Control Group**
Bears in Water (these bears had one thing changed to them)	Dry Bears (these are how gummy bears normally are)

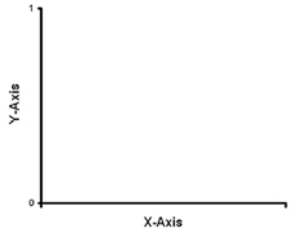
Additional Information:

- Because you only change one variable at a time during an experiment, all experiments also have **constants** = _____

- **Patterns in Data**: When appropriate, data can be plotted as a scatterplot and a trend (pattern or relationship) may be observed between the two variables
  - **Direct Relationship**=
    as one variable _____,
    the other variable _____



  - **Inverse Relationship**=
    as one variable _____,
    the other variable _____



- A **laW** tells us _____; often has a formula
  - Ex: law of gravity, $F_g = G\frac{m_1 m_2}{r^2}$ $P_1V_1 = P_2V_2$ Boyles law
- A **theorY** tells us _____
  - Ex: atomic theory, cell theory
- *A theory _____ a law!*

~~~~~~

Scenario 1:

1. In 1-2 sentences, summarize the purpose of this experiment.

2. What was Mr. Krabs' hypothesis?

3. What is the independent variable? Explain.

4. What is the dependent variable? Explain.

5. Which people are in the control group? Explain.

6. Were there any variables that were held constant for both groups?

7. What should Mr. Krabs' conclusion be?

8. Why do you think 8 people in group B reported feeling better?
~~~~~~

Scenario 2:

1. In 1-2 sentences, summarize the purpose of this experiment.

2. What was Patrick's hypothesis?

3. What is the independent variable? Explain.

4. What is the dependent variable? Explain.

5. Which fish are in the control group? Explain.

6. Were there any constants for this experiment?

7. Look at the results in the charts. What should Patrick's conclusion be?

Reaction Timer Activity **Name _____**
Chemistry **Date _____ Block _____**

Instructions: You are interested in testing factors that affect how far a ruler will drop before one person can grab it as another person drops the ruler through his or her fingers (we will call this Reaction "Time".) For time's sake, you will select one factor to test-- meaning you will have one experimental condition and one control condition. Each person in your group will serve as one trial in each condition (so you should have at least three trials in each condition).

1. You have a variety of materials available to you at your lab station. You definitely need a ruler, but everything else is up to you. (I can think of several factors that wouldn't require any additional equipment from the stations, but feel free to use what is there if you want.) Quickly decide which factor you want to test and write it here:

2. Create a hypothesis about how that factor will affect reaction time and record it here:

3. Write a short but detailed procedure about how you will test this factor. Remember to also include a control condition and multiple trials under each condition!

Procedure:

-
-
-
-
-
-

Show your teacher your condition, hypothesis, and procedure. You **MUST get this checked before you continue!**

4. Run your experiment and record your data in the tables below.

Data:

Condition: _____

Trial #	Reaction "Time"
1	
2	
3	
Average	

Condition: _____

Trial #	Reaction "Time"
1	
2	
3	
Average	

Make sure to show your work for finding the average!

Remember to include units on your reaction time measurements!

Questions:

1. Briefly identify the following for your experiment
   A. Independent Variable

   B. Dependent Variable

   C. Constants (at least three)

   D. Which trial would you consider the "control" group? Why?

2. List at least one source of error that might have affected your results in this experiment. Specifically explain how this would affect your results. (Note: “human error” and “it would have messed up or changed our results” are not specific enough answers!)

3. Based on your group’s results, what, if anything, can you conclude about how your tested factor affects reaction time? Please support your response using the data you collected.

4. How could you have improved or extended your experiment to better understand how your factor affects reaction time?

5. List at least three other factors that could affect reaction time that you could test with a similar experiment. (Hint: If you need help thinking of factors, think about what might distract your or make it easier or harder to grab the ruler quickly.)

Scenarios to Print

Scenario 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 2 crabby patties with 3 squirts of the new sauce on each patty. The other 50 (Group B) eat 2 crabby patties with 3 squirts of sauce on each patty that looks just like new sauce but is really just a 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.

Scenario 2: Microwave Miracle

Patrick believes that fish that eat food exposed to microwaves will become smarter and would be able to swim through a maze faster. He decides to perform an experiment by placing fish food in a microwave for 20 seconds. He has the fish swim through a maze and records the time it takes for each one to make it to the end. He feeds the special food to 10 fish and gives regular food to 10 others. He tries to make sure the fish eat the same amount of food no matter which kind of food they're being fed. After 1 week, he has the fish swim through the maze again and records the times for each.

Special Food Group
(Time in minutes/seconds)

Fish	Before	After
1	1:06	1:00
2	1:54	1:20
3	2:04	1:57
4	2:15	2:20
5	1:27	1:20
6	1:45	1:40
7	1:00	1:15
8	1:28	1:26
9	1:09	1:00
10	2:00	1:43

Regular Food Group
(Time in minutes/seconds)

Fish	Before	After
1	1:09	1:08
2	1:45	1:30
3	2:00	2:05
4	1:30	1:23
5	1:28	1:24
6	2:09	2:00
7	1:25	1:19
8	1:00	1:15
9	2:04	1:57
10	1:34	1:30