Diffusion and Osmosis Lab

AP LAB 4

Part 1: Surface Area and Cell Size

- Which do you think has a greater influence on the rate of diffusion in a cell – surface area or volume?
- You will calculate surface are-to-volume ratios and determine the depth and rate of diffusion of acid through an indicator agar.

NOTE:

- The agar you are using is not made with phenolphthalein; it is made with Bromothymol Blue (BTB).
- BTB is BLUE in basic environments and turns YELLOW in acid.
- The acid you will use is vinegar.

Part 1: “Diffusion Cubes”

- Only use enough Vinegar (Acid) to submerge/cover your cubes…don’t be wasteful.
- Wear gloves!!!! Agar is growing mold ☹

Part 2: Dialysis Tubing Models

1. Read through the lab sheet silently.
2. Then glue it into your lab notebook.
3. Look up when you are ready.

Part 2: Dialysis Tubing Models

- Your group will draw 4 solution combinations.
- You choose which solution to put inside bag vs. outside.
- Leave some space at the top for water diffusion.
- Weigh it before you submerge into solution.
- Follow the posted directions for how to use the electronic balances.

How to use an electronic balance

1. Make sure it is ON and nothing on the scale.
2. Place EMPTY petri dish on scale.
3. Once the numbers settle, hit “ZERO” or “TARE.”
    1. This will subtract the weight of the empty weigh dish.
4. Place object to be massed (filled dialysis tube).
5. Record weight in grams.
6. Leave the petri dish for the next person.

Data Collection – Individual Group Data

Cell condition	Initial Mass (g)	Final Mass (g)	Prediction: Gain or Lose Mass?	Actual % change in Mass
Sucrose In / Dextrose Out				

Record % change in mass to 10ths place.

Ex: -4.2 or +0.6

Class Data Table

Record % change in mass to 10ths place.

Ex: -4.2 or +0.6

Cell Condition	% change in Mass
1. Water In / Sucrose Out	
2. Sucrose In / Water Out	
3. Water In / Dextrose Out	
4. Dextrose In / Water Out	
5. Water In / Albumin Out	
6. Albumin In / Water Out	
7. Water In / Salt Out	
8. Salt In / Water Out	
9. Sucrose In / Dextrose Out	
10. Dextrose In / Sucrose Out	
11. Sucrose In / Albumin Out	
12. Albumin In / Sucrose Out	
13. Sucrose In / Salt Out	
14. Salt In / Sucrose Out	
15. Dextrose In / Albumin Out	
16. Albumin In / Dextrose Out	
17. Dextrose In / Salt Out	
18. Salt In / Dextrose Out	
19. Albumin In / Salt Out	
20. Salt in / Albumin Out	

Conclusions?

- Use **-iCRT** to calculate the osmotic potential of each solution. This will help you in Analysis question 2.
- Dextrose:
- Sucrose:
- Salt:
- Egg White (ovalbumin): (relative to others)

Part 3: Using a Vegetable (sweet potato) to determine Water Potential

- Design your own procedure/experiment to test
- 6 diff. colored solutions = 6 diff. molarities of sucrose (0.0M, 0.2M, 0.4M, 0.6M, 0.8M, 1.0M)
- Use potatoes to figure it out by seeing how much osmosis and diffusion occurs…leave over night
- Use ~equal sized potato pieces for each solution sample
- Measure the initial, final and % change in mass
- Perform the "squishiness" test

% Change in Mass – Individual Group Data

- Final – Initial / Initial x 100 =

Solution Color	Initial Mass (g)	Final Mass (g)	% Change in Mass	Molarity
Red				
Orange				
Yellow				
Green				
Blue				
Purple				

% Change in Mass – 1st block Class Data

Solution Color	AVERAGE % Change in Mass	Molarity
Red	-31.7	
Orange	15.1	
Yellow	-29.9	
Green	-27.9	
Blue	4.3	
Purple	-16.7	

Hint: Look at your Squishiness Scale.

Sort them from most squishy to least

Then, sort data from greatest % mass lost to least % mass lost

% Change in Mass – Class Data 4th block

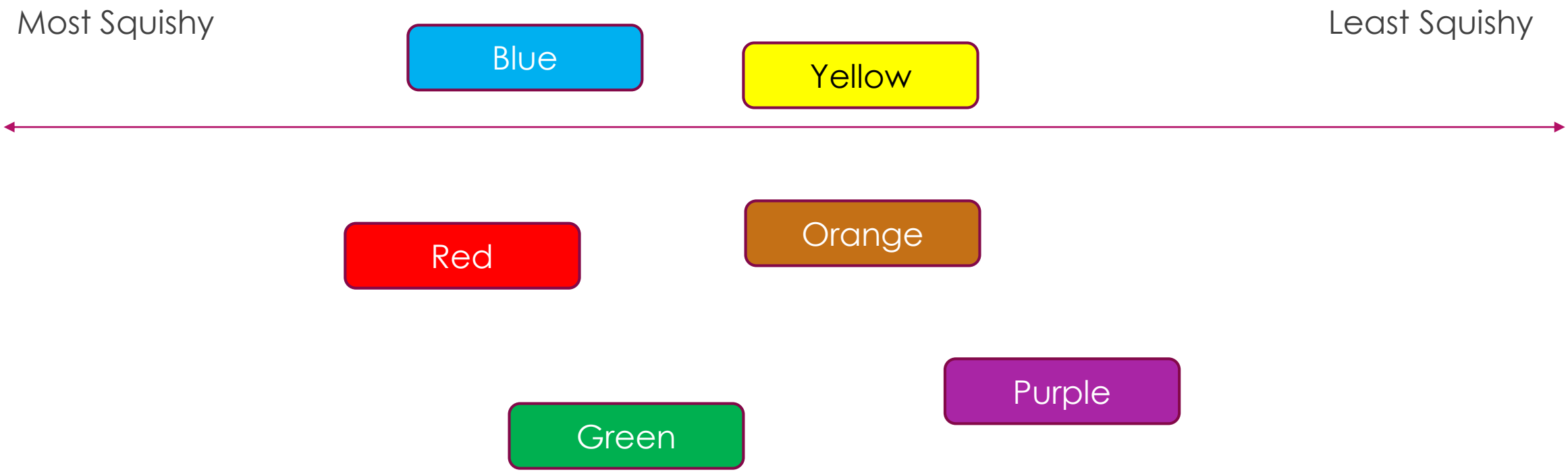
Solution Color	AVERAGE % Change in Mass	Molarity
Red	-28.2	
Orange	17.7	
Yellow	-22.6	
Green	-18.2	
Blue	8.8	
Purple	-9.2	

Hint: Look at your Squishiness Scale.

Sort them from most squishy to least

Then, sort data from greatest % mass lost to least % mass lost

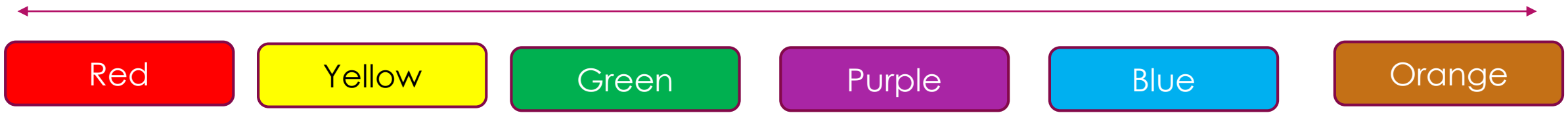
Squishiness Scale – DRAW UNDER DATA TABLE sort them out!



Squishiness Scale – DRAW UNDER DATA TABLE!

Most Squishy

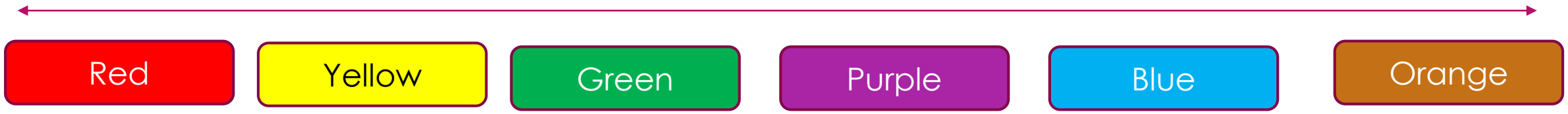
Least Squishy



Use the Squishiness Scale to predict Molarity

Most Squishy

Least Squishy



Lost the most water

Most *Hypertonic* Solution

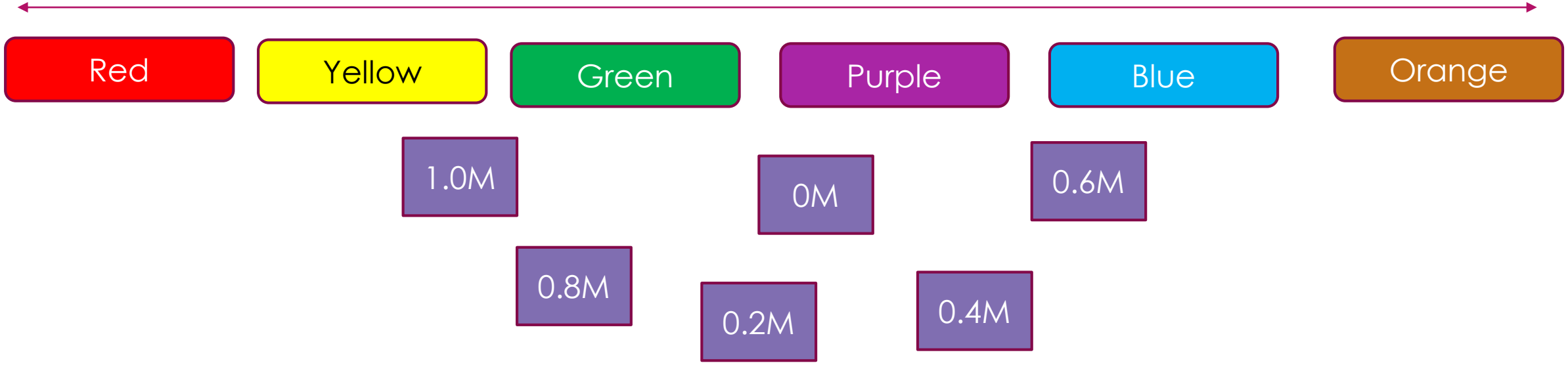
Gained the most water

Most *Hypotonic* Solution

Use the Squishiness Scale to predict Molarity

Most Squishy

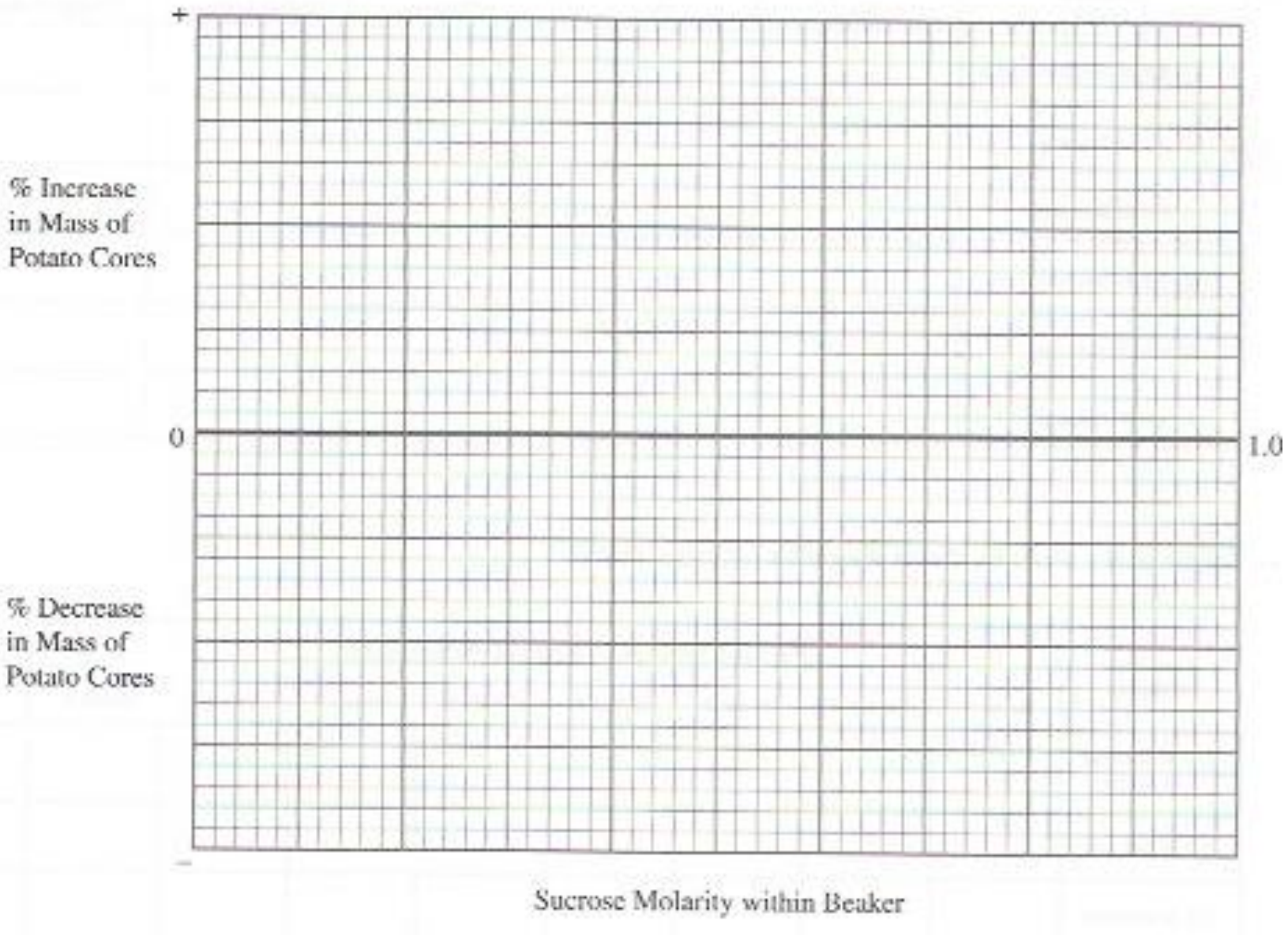
Least Squishy



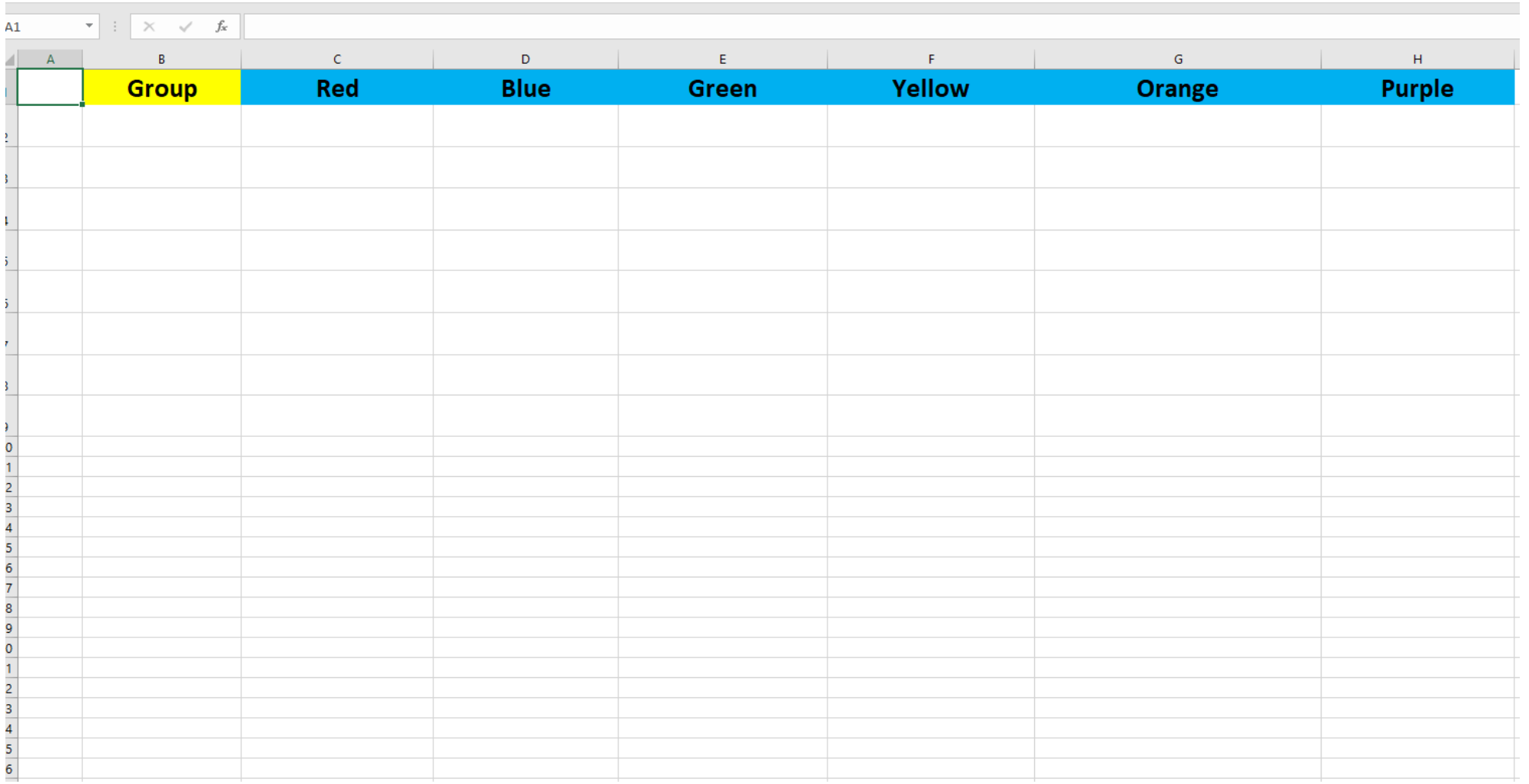
% Change in Mass – Did you Get it?

Solution Color	AVERAGE % Change in Mass	Molarity
Red	-31.7	**1.0 M**
Orange	15.1	**0.0 M**
Yellow	-29.9	**0.8 M**
Green	-27.9	**0.6 M**
Blue	4.3	**0.2 M**
Purple	-16.7	**0.4 M**

Graph 1.2: Percent Change in Mass of Potato Cores at Different Molarities of Sucrose



1. Plot all data points.
2. Draw line of best fit
3. X-intercept = **molar concentration of potato cell**
4. Use water potential equation ($Y = -iCRT$) to calculate Y of potato cell


A1
A
B
C
D
E
F
G
H
Group
Red
Blue
Green
Yellow
Orange
Purple