Name: _____ Period: _____

PHOTOSYNTHESIS LAB, Part 1 (procedure and data gathering)

Procedure

Almost everything you need to know for the set up of this lab you can get from watching https://www.youtube.com/watch?v=ZnY9_wMZZWI

What's below is for reference

1. Each group is going to set up three or four cups, each with 10 spinach disks. Use the hole puncher to punch these out. Avoid the leaf veins.
2. A solution of sodium bicarbonate (baking soda) with a tiny bit of detergent has been prepared for you in a beaker. Pour 100 mL of this solution into each of your clear plastic cups. Make sure there are no bubbles.
3. Remove the plunger from a large clean syringe. Place 10 leaf disks into the body of the syringe. Be sure the leaf disks are near the tip of the syringe as you reinsert the plunger so you don't damage the disks.
4. Insert the tip of the syringe into the beaker of baking soda solution and draw liquid into the syringe. The leaf disks should be floating at this time.
5. Hold the syringe tip upward and expel the air by depressing the plunger carefully. Stop before solution comes out the tip.
6. Seal the tip of the syringe using the thumb of your left hand and hold tightly. Pull back on the plunger creating a partial vacuum within the syringe. If you have a good seal it should be hard to pull on the plunger and you should see bubbles coming from the edge of the leaf disks. Hold for a count of ten.
7. Simultaneously, release your index finger and the plunger. Some of the leaf disks should start to sink. Tap the side of the tube or shake gently to break any bubbles on the edges of the disks.
8. Repeat steps 6 and 7 until all the disks sink. Don't overdo it, because that'll damage the leaf tissue.
9. Remove the plunger from the syringe and pour the solution containing the disks into one of the plastic cups. There should be 10 disks per cup. Make sure they sink to the bottom. Cover with a piece of paper so that they don't start to photosynthesize.

We'll have four experimental light treatments: 1) Red light, 2) green light, 3) blue light, and 4) white light. Your group will be assigned three of these four treatments.

10. Check your cups every minute for 10-20 minutes. At each time check, count how many leaf disks are floating at the top of solution in each cup.

PREDICTION: Based on what I know about PSN, I predict that:

DATA ANALYSIS

SAMPLE DATA

Minutes	# Floating disks
1	0
2	0
3	0
4	0
5	0
6	0
7	1
8	1
9	1
10	1
11	4
12	7
13	8
14	10

How do we analyze these data? Averaging wouldn't make sense. The best data point is to find the point in time where 50% of the disks are floating. In the data set to the left, that's at about 11.5 minutes. Why 11.5? Notice that at 11 minutes there were 4 disks floating, and at 12 minutes there were 7. That means that somewhere between 11 and 12 minutes, half of the disks (5 of the 10 disks) had risen to the top. This term is referred to as the ET_{50} (which stands for *Effective Time*, 50%)

The ET_{50} has a problem though. The higher the rate of photosynthesis, the *lower* the ET_{50} (because more disks will float in less time). Therefore, what we're going to figure out for each trial is the *inverse* of the ET_{50}., or $1/ ET_{50}$. You'll convert your fraction into a decimal value. In the case above, 1/11.5 is 0.087

Data table 1

Light treatment (circle 1): red, green, blue, white

Time (Min.)	# of Disks Floating
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
$1/ ET_{50}$.	

Data table 2

Light treatment (circle 1): red, green, blue, white

Time (Min.)	# of Disks Floating
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
$1/ ET_{50}$.	

Data table 3

Light treatment (circle 1): red, green, blue, white

Time (Min.)	# of Disks Floating
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
$1/ ET_{50}$.	

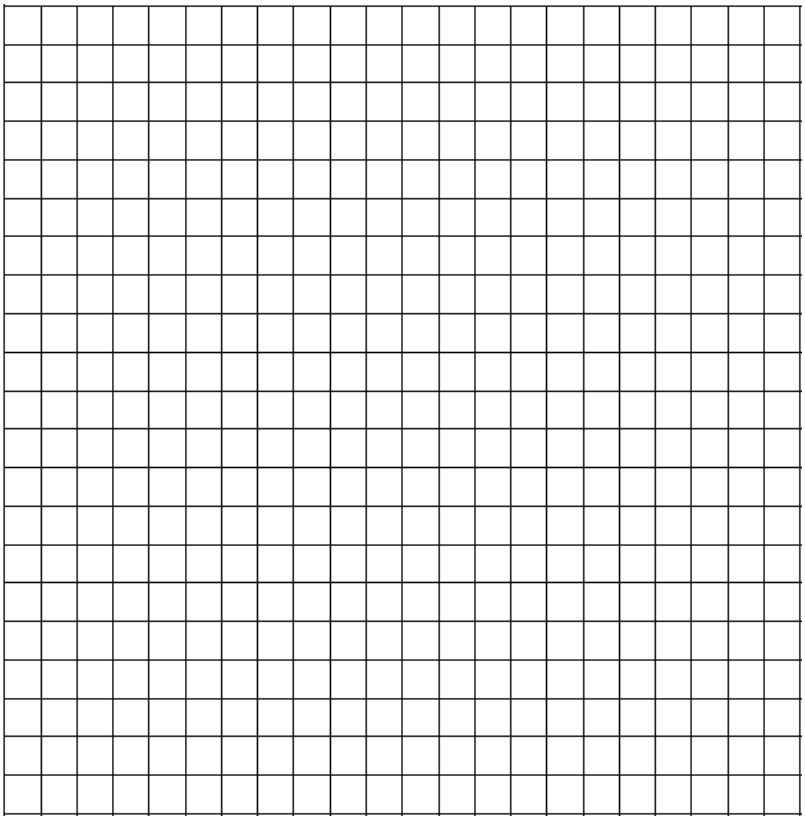
Data table 4	
Light treatment (circle 1): red, green, blue, white	
Time (Min.)	# of Disks Floating
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
$1/ ET_{50}$.	

After gathering your data, reassemble your lab kit, and post your data on the Google sheet for your class. After calculating standard error, graph the data above (four bars, with error bars above each one).

$1/E_{50}$ Class Means

	Red	Green	Blue	White
Mean of $1/E_{50}$				
Stan. Dev.				
Standard Error (for error bars)				

Title: _____



Formula for standard deviation	Formula for standard error
$s = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}}$	$SE = \frac{s}{\sqrt{n}}$

CONCLUSION: Explain what happened in this lab, and why results do or don't make sense. Include in your explanation appropriate references to the following concepts: the light reactions; absorption spectrum; action spectrum, oxygen production.