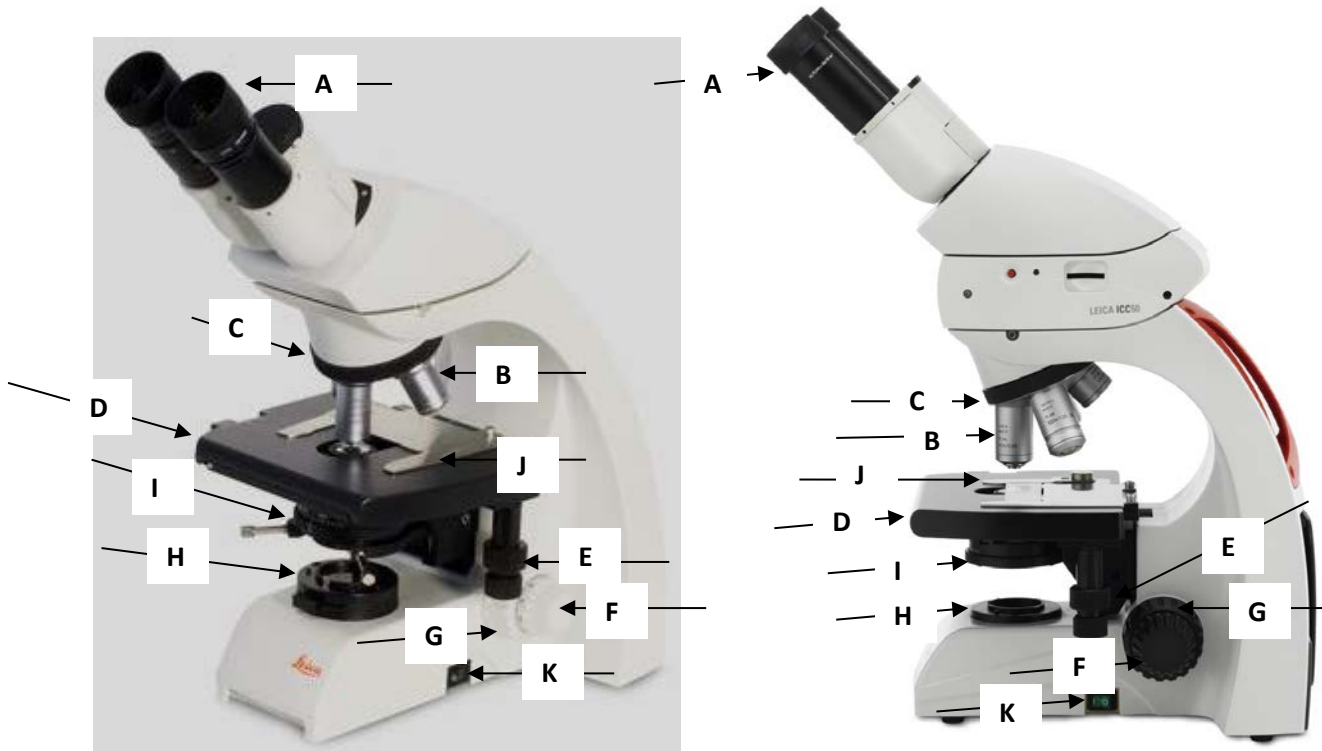


Montgomery College – Rockville Campus – BIOL 150

Lab Review Guide for Exam 1

Please note that questions in this document are a guide to prepare for Lab Exam 1. None of the questions are going to be copied and pasted on your exam by your instructor. Please print a copy and bring it with you to any of the review sessions you're planning on attending. Use it even if you cannot make to any of the sessions offered this semester.

Microscopy (1B)



Leica DM750 on YouTube: <https://www.youtube.com/watch?v=YFtjnE6t9xY>
https://youtu.be/lo2aC_m2vvyo

Letter	Name	Function
A		
B		
C		
D		
E		
F		
G		
H		
I		
J		
K		

- Q.1. Why do you think that the microscope is a very important instrument for studying biological specimens?
- Q.2. What changes do you expect to observe (size of the image, intensity of light, field of view, depth, resolution, etc.) as you go from *lower to higher* magnification?
- Q.3. Compare the advantages and disadvantages of observing a specimen at total magnifications of 40X and 400X.

Organic Molecules of Life (2)

- Q.7. What are the four major classes of organic molecules produced by living organisms?
- Q.8. What is a monosaccharide? Why are all monosaccharides and most disaccharides reducing sugars?
- Q.9. What is meant by the term reduction? What is a reducing agent?
- Q.10. What is meant by the term oxidation? What is an oxidizing agent?
- Q.11. Both Benedict's and Barfoed's solutions are made from the same ingredient. Why are their reaction capabilities different?
- Q.12. Suppose you have performed Benedict's assay with glucose. Which molecule/ion has become oxidized? Which one has become reduced?
- Q.13. In solution, chain and ring forms of glucose molecule exist in equilibrium. Explain this statement.

Q.14. Both fructose and glucose are reducing sugars. When these two simple sugars become chemically bonded, a disaccharide, sucrose, is formed. Why is sucrose not a reducing disaccharide?

Q.15. What are the monosaccharides and reducing disaccharides that you assayed in lab?

Q.16. What is the difference between reducing disaccharide and non-reducing disaccharides?

Q.17. Write three names of polysaccharides and their function in cells.

Q.18. If you completely hydrolyze a starch molecule, what would you produce?

In questions 19-23, select your answers from the list below

- a) sucrose
- b) maltose
- c) starch
- d) glucose
- e) egg albumin

Q.19. This substance gives a negative Benedict's assay, a negative Barfoed's assay, a positive iodine assay and a negative Biuret assay.

Answer _____

Q.20. This substance gives a positive Benedict's assay, a positive Barfoed's assay, a negative iodine assay, and a negative Biuret assay.

Answer _____

Q.21. This substance gives a positive Benedict's assay, a negative Barfoed's assay, a negative iodine assay, and a negative Biuret assay.

Answer _____

Q.22. This substance is positive in Biuret assay and negative in all other assays.

Answer _____

Q.23. All the assays (Benedict's, Barfoed's, iodine, and Biuret) on the substance were negative.

Answer _____

Q.24. Benedict's assay tests for _____.

- a. A positive reaction for Benedict's assay produces _____ color.
- b. Barfoed's assay distinguishes between _____.

Q.25. A protein solution can be identified by performing the _____ assay.

The solution turns _____ if the assay is positive.

This color forms because of the presence of _____ in proteins

Scientific method (1A & 1D)

A group of scientists working for Company Y want to test a new chemical that they believe will act as a sunscreen and prevent sunburn. The same amount of lotion is applied to each person in the same size area and the test subject's arm is exposed to direct sunlight. The amount of redness is measured every 5 min for a total of 30 min.

For each person tested, 3 different lotions are applied to the test subject's arm:

- I. a lotion with the new sunscreen chemical called **SunX**
- II. a lotion with a different active sunscreen chemical that the company currently sells successfully called **Sun Kissed**
- III. a lotion that has all the same ingredients as the sunscreens, except it has no active sunscreen chemical

27. What question is being asked in the experiment above?

28. What hypothesis is being tested in the experiment described above? **Read entire description above carefully!**

A. A hypothesis must be testable and falsifiable. Is the hypothesis you wrote above testable? **Explain.**

B. Is the hypothesis you wrote above falsifiable? **Explain.**

29. What is the prediction based on this hypothesis? (Remember a prediction is written as an "If..., then...." statement.)

30. A. What is the independent variable in this experiment? **Why?**

B. What is the dependent variable in this experiment? **Why?**

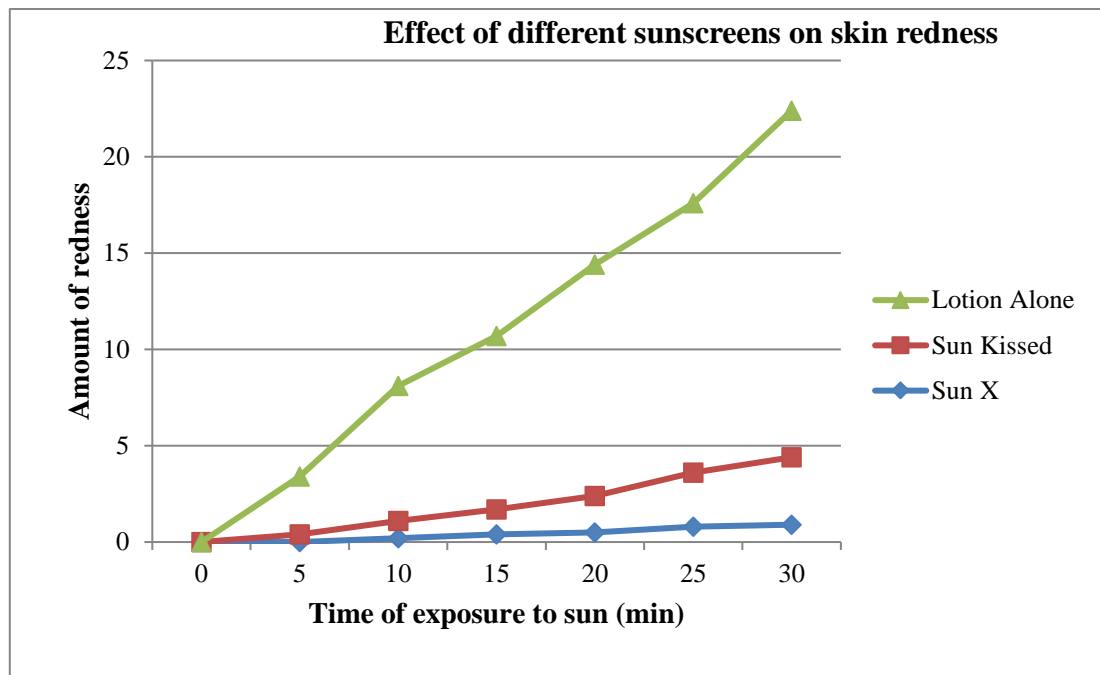
31. A. For this experiment, which group of patients is the experimental group (1, 2 or 3)? **WHY?**

B. Which group of patients is the negative control (I, II or III)? **WHY?**

C. Which group of patients is the positive control (I, II or III)? **WHY?**

32. Based on the graph, is Sun X a more effective sunscreen than Sun Kissed? **Explain** how you came to your conclusion.

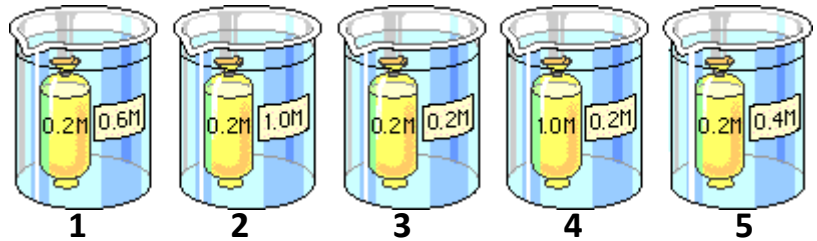
Titles of graph and axes should allow the reader to quickly understand what information is in the graph. Write a “good” title for this graph.



Osmosis and diffusion (4B)

Study the set of five beakers shown here to answer questions 1 – 3:

33. Which beaker(s) contain(s) a solution that is hypertonic to the bag?



1. Beaker 3
2. Beakers 2 and 4
3. Beakers 1, 2, and 5
4. Beaker 4
5. Beakers 3 and 4

34. Which bag would you predict to show the least change in mass at the end of the experiment?

1. The bag in Beaker 1
2. The bag in Beaker 2
3. The bag in Beaker 3
4. The bag in Beaker 4
5. The bag in Beaker 5

35. Arrange the beakers in order of the mass of the bags inside them after the experiment has run for **30 minutes**. List the bag that loses the most mass.

1. 1, 2, 3, 4, 5
2. 1, 5, 2, 3, 4
3. 4, 3, 2, 5, 1
4. 3, 2, 1, 4, 5
5. 2, 1, 5, 3, 4

36. A dialysis bag (permeable to water but not to sucrose) is filled with a sucrose solution and placed in a beaker containing 30% sucrose solution. The bag's initial weight was 15 g, and after 15 minutes it weighed 17g. Calculate the percent change in weight of the dialysis bag. After 45 minutes, the same bag weighed 20g. What is the cumulative percent change in weight of the bag at that point?

37. Assume that you have a 20 M glycerol stock solution. You need to make 5 different solutions for your experiment: 0 M or no glycerol, 2.5 M glycerol, 5 M glycerol, 7.5 M glycerol and 10 M glycerol. In each experiment you will need to make 50 ml of the diluted solution. Show your calculations for each solution:

Final concentration of solution	Amount of 20 M glycerol stock solution	Amount of water	Final volume of the solution
0 M glycerol			50 ml
5 M glycerol			50 ml
10 M glycerol			50 ml

Table 1:The potato plugs were weighed (in grams) at 20 minute intervals and their mass recorded in the table below.

	0 minutes	20 minutes	40 minutes	60 minutes
0.0M glucose	5.3	5.5	5.7	5.8
0.2M glucose	5.7	5.7	5.8	5.8
0.4M glucose	5.5	5.0	4.8	4.6
0.6M glucose	5.6	5.0	4.7	4.4

Table 2: Calculate the cumulative percent change for each time point and fill in Table 2.

	0 minutes	20 minutes	40 minutes	60 minutes
0.0M glucose				
0.2M glucose				
0.4M glucose				
0.6M glucose				

38. *Why do you have to calculate cumulative percent change?*

Using the attached piece of graph paper plot the **cumulative percent change in weight of potato cores over time** for each solution.

- a) What is the dependent variable? _____percent change in mass_____
- b) What is the independent variable? _____time_____
- c) Is the independent variable quantitative? _____yes_____
- d) Is the independent variable continuous? _____yes_____
- e) What kind of graph would be best to use? Circle one below.

Bar Graph

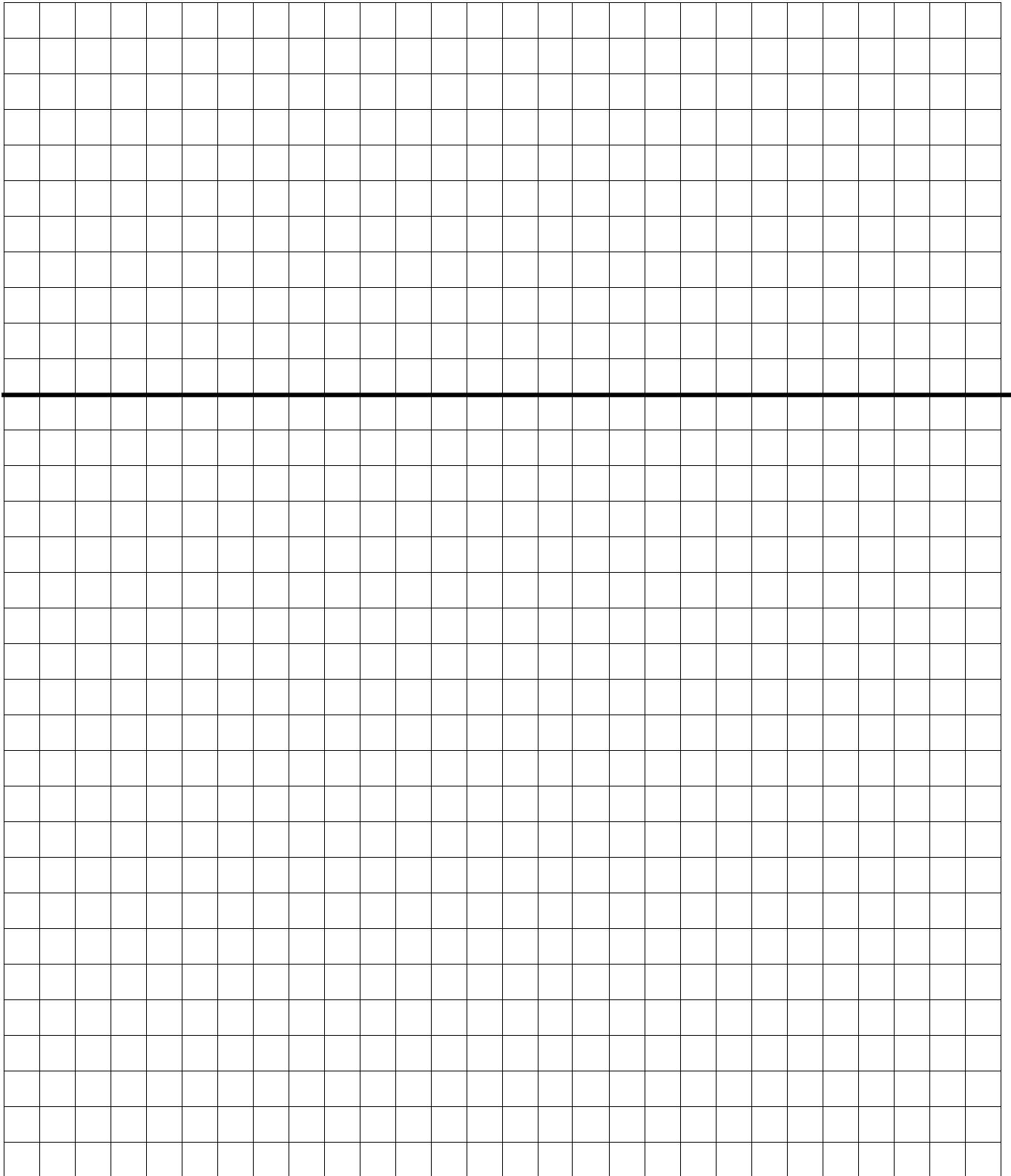
Line Graph

f) Explain your choice of graph

Use the TAILS checklist and graph all 3 lines on the following piece of graph paper.

- Title
- Axes
- Intervals

- Labels
- Scale



Next, calculate the rate of percent change for each glucose concentration by calculating the slope of each line on your graph. Include the units with your rate calculations. Fill out Table 4

NOTE: Please use cumulative percent change for each concentration @ t20 as Y₁ and @t60 as Y₂. Use the time points 20 (X₁) and 60 (X₂) cumulative percent change in mass to calculate the slope of the line.

$$\text{Slope} = \frac{Y_2 - Y_1(\text{gm})}{X_2 - X_1(\text{min})} = \text{rate of percent change in mass}$$

Table 4:Rate of Percent Change in Mass

Concentration	Rate of Change (gms/min)
0.0M glucose	
0.2M glucose	
0.4M glucose	
0.6M glucose	

Using the graph paper attached, plot the **rate of change (gms/min) versus glucose concentrations (M)**. Draw the line of best fit through your points.

39. ***What can you tell from this graph that you couldn't tell from the previous graph?***

- a) What is the dependent variable? _____
- b) What is the independent variable? _____
- c) Is the independent variable quantitative? _____yes_____
- d) Is the independent variable continuous? _____yes_____
- e) What kind of graph would be best to use? Circle one below.

Bar Graph

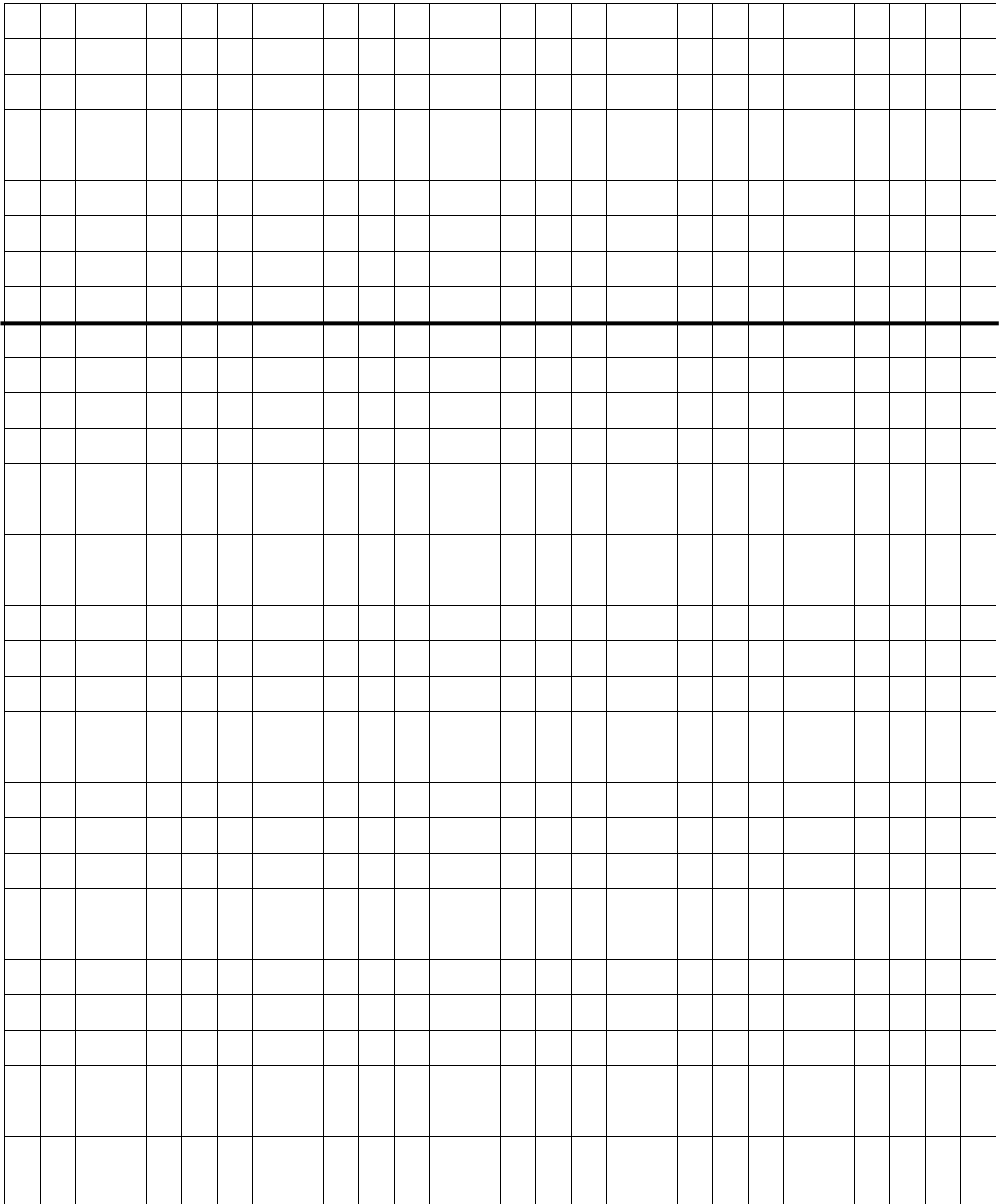
Line Graph

- f) Explain your choice of graph

Use the TAILS checklist and graph all 3 lines on the following piece of graph paper.

- Title
- Axes
- Intervals

- Labels
- Scale



Cellular respiration (5A)

http://www.phschool.com/atschool/phbio/active_art/cellular_respiration/

Q.40. What is aerobic respiration? Where does it take place? How many ATPs are produced by aerobic respiration?

Q. 41. What is fermentation? Where does it take place? What is the advantage of fermentation? What is the disadvantage of it? What is the difference between complete cellular respiration and fermentation?

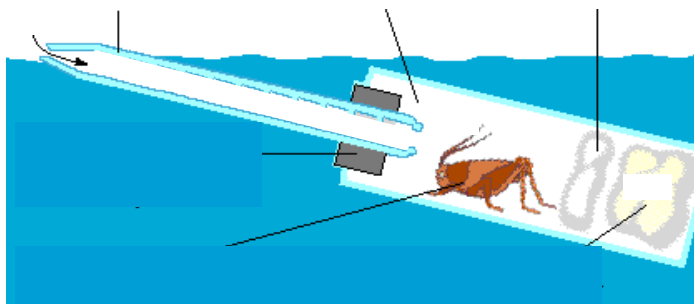
Q.42. Complete the summary equation for cellular respiration : Carbon dioxide, oxygen, water, glucose, energy(ATP & heat)

_____Glucose_____ + _____O₂_____ + _____-----> _____CO₂_____ + _____H₂O_____ + _____ATP_____

Q.43. In the cellular respiration experiment, you determined metabolic rate by measuring:

- the volume of O₂ produced over time
- the amount of glucose consumed over time
- the volume of O₂ consumed over time
- the volume of CO₂ consumed over time

Q. 44 Why was the respirometer submerged into water? Why did water move *into* the respirometer? What is the role of KOH in this experiment?



http://www.phschool.com/science/biology_place/labbench/lab5/images/crkresp2.gif

Q. 45. Explain the effect of germination (versus non germination) on pea respiration. How do seeds stay alive without leaves and chloroplast?

Q.46. Calculate the metabolic rate of 10 crickets that weighed 2.5 gm and consumed 2 ml of oxygen in 6 min.

Q.47. What is the relationship between the body size and metabolic rate?

Q. 48. If respiration of **25gm cold blooded reptile and 25 gm warm blooded mammal** at 10⁰C were compared, what results would you expect? Explain

An experiment to measure the rate of respiration in crickets and mice at 10 °C and 25 °C was performed using a respirometer, an apparatus that measures changes in gas volume. Respiration was measured in mL of O₂ consumed per gram of organism over several five-minute trials and the following data were obtained.

Temperature	Average respiration (mL O ₂ /g/min)	
	Cricket	Mouse
10 ⁰ C	0.0013	0.0518
25 ⁰ C	0.0038	0.0231

Q. 49. According to the data, the crickets at 25°C have greater oxygen consumption per gram of tissue than do the crickets at 10°C. This trend in oxygen consumption is the opposite of that in the mice. The difference in trends in oxygen consumption among crickets and mice is due to their

- (A) relative size
- (B) mode of nutrition
- (C) mode of internal temperature regulation
- (D) mode of ATP production

Q.50. What is the relationship of metabolism with surrounding temperature in ectothermic and homeothermic animals? Explain your answer.

Photosynthesis (6)

Q.51. What is photosynthesis and which *organ* of the plant carries out photosynthesis? Name the *organelles* where (i) complete cellular respiration and (ii) photosynthesis occur? What are the products of photosynthesis?

Q.52. Complete the summary equation for Photosynthesis : Carbon dioxide, oxygen, water, sugar, energy(light), chlorohyll

_____ + _____ + _____ -----> _____ + _____ + _____

Q.53. How many pigments did you find in plant leaf extract? Where are the pigments located in What are they?

Q. 54. Plant pigments absorb mostly light of _____, _____, and _____ colors. Plants perform highest photosynthesis by using wavelengths of _____ color light because it is absorbed _____ and wavelengths of this color contain highest _____ among all other wavelengths of visible light spectrum.

Q. 55. Discuss the importance of photosynthesis in the sustenance of life on planet Earth. Why is chlorophyll green? What the absorption spectra tell us about chlorophyll pigment?

Link for the spectrophotometer used in our lab: <https://www.youtube.com/watch?v=kVC3D0pYkR4>

How the spectrophotometer works: <https://www.youtube.com/watch?v=naaLjuzYME0>

Q.56. What are the factors that affect differential movement of pigments by paper chromatography? Paper chromatography was done on a chloroplast extract using acetone as a solvent. At the end of the chromatography it was found that the solvent traveled 20 cm from the origin and a pigment molecule traveled 17 cm from the origin. Calculate the R_f value of the pigment molecule.

Q57. What did we measure to calculate the rate of photosynthesis? Why did we use NaHCO₃ in the experimental set up?

Q 58. Following data was collected in your last lab to determine the *effect of light intensity on the rate of photosynthesis*. Calculate the rate of photosynthesis and plot a graph with the data (identify the dependent and independent variables and don't forget TAILS)

Wattage	Total Time Elapsed	Amount of Oxygen Produced	Rate of photosynthesis (ml of O ₂ /hr)
50	30 min	0.1 ml	
100	15 min	0.1 ml	
200	7 min	0.1 ml	
300	8 min	0.1 ml	

