

Name _____ Date _____

Prelab Writeup

Laboratory I: Diffusion and Osmosis

Read lab pages 1-4 and 8-10 and 17 to answer these questions.

1. What are the two things we will be doing in this lab? _____

2. Define diffusion. _____

3. What happens in equilibrium? _____

4. Define osmosis. _____

5. What is water potential? _____

6. Define dialysis and explain what determines if a substance can pass through the membrane. _____

7. Do you expect glucose to move out of the dialysis tubing? _____ Why or why not? _____

How will you test this? _____

8. Do you expect starch to move out of the bag? _____ Why or why not? _____

How will you test this? _____

9. Do you expect water to move into or out of the bag? _____ Explain. _____

How can you test this? _____

10. Do you expect IKI (Lugol's iodine) to move into the bag? _____

Why? _____

How will you be able to tell? _____

12. Explain what it means when two solutions are isotonic and discuss the net direction of water flow. _____

13. Discuss the difference between hypotonic and hypertonic solutions and discuss the net direction of water flow. _____

14. In figure 1.1, identify the hypotonic solution _____, the hypertonic solution _____; and the net direction of initial water flow _____.
15. A dialysis bag contains a sucrose solution of 0.6 M. The beaker into which it is placed has a concentration of 0.3M. Is the dialysis bag hypotonic or hypertonic to the beaker solution? _____ In which direction is the water expected to go? _____
16. What solution would the beaker need to contain in order for there to be no net movement of water between the 0.6M bag and the beaker? _____
17. How will you determine if water has flowed into or out of the bags in part B of your experiment? _____
18. What does water potential measure? _____
19. What are the 2 components that influence water potential? _____
20. If a potato core is placed into pure water, which do you expect will be the net direction of water flow? _____
21. Discuss the difference between plant and animal cell response when placed into hypotonic solutions. _____

22. How does water movement relate to pressure? _____

- Give an example illustrating this. _____
23. Does increasing pressure, increase or decrease the water potential number? _____
24. Does increasing solute concentration, increase or decrease the water potential number? _____
25. Will water go from an area of -3 water potential to one of 0 water potential or vice versa? _____ Explain. _____
26. If we add enough solute to the outside solution what will happen to the potato cells in our experiment? _____
27. Define plasmolysis. _____
28. What do you expect will happen to our onion cell when we place it in a salt solution? _____
Explain. _____

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Prelab Write-up for *Laboratory 2: Enzyme Catalysis*

Read pages 19 - 23 in your lab manual and use your textbook to help you answer the following.

1. Give an overview of what we will be doing in this lab. _____

2. Use your text and explain what it means to be a catalyst. _____

3. Explain what this equation means: $E + S \rightarrow ES \rightarrow E + P$ _____

4. Identify the enzyme, substrate and products in our experiment. _____
5. Explain how salt might affect an enzyme. _____

6. Explain how pH might affect an enzyme. _____

7. Explain how temperature affects enzymes. _____

8. Explain how activators and inhibitors affect enzymes. _____

9. Describe catalase. _____

10. Explain why catalase is so essential that it would be found in cells of all aerobic organisms.

11. What does the curved line in the graph on page 21 indicate?

12. Why is the initial reaction rate usually faster than the rate as the reaction proceeds?

13. What is the formula for determining the initial rate of reaction?

14. Explain in words what this means.

15. In our experiment what will we measure to determine the rate of reaction?

16. What happens when sulfuric acid is added to a solution of catalase and hydrogen peroxide?

17. Why does this happen?

18. Potassium permanganate is a bright pink in color. What happens to that substance when it is added to hydrogen peroxide and sulfuric acid?

19. If additional potassium permanganate is added and it does not break down and turn colorless, what does that tell us about the amount of hydrogen peroxide still present in the solution?

20. If I need to add 50 drops of potassium permanganate to solution A and 10 drops of potassium permanganate to solution B before both of them turn pink, which solution must contain the most hydrogen peroxide?

21. If catalase is added to hydrogen peroxide how will it be apparent that a reaction is taking place?

22. What causes the bubbling?

23. What do you expect might happen to catalase when it is boiled?

24. Name some substances that would be expected to contain catalase.

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Prelab Writeup for *Laboratory 3: Mitosis and Meiosis*

Use your text and read pages 29 -33, 35-39, and 40-44 in your lab manual to help you answer these questions.

1. Name 4 basic things we will do in this lab. _____

2. Name 4 reasons why cells undergo mitosis? _____

3. Why do cells undergo meiosis? _____
4. Explain the importance of meristems to plants. _____
5. Using a prepared slide of a root, where would you expect to see the most cells undergoing division? _____
6. Why is the whitefish blastula good to use in cell division studies? _____

7. What do you expect to see in cells in interphase? _____
8. How will you know that cells are in prophase? _____

9. What do cells look like in metaphase? _____
10. What do they look like in anaphase? _____
11. How can you tell if cells are undergoing telophase? _____
12. How is cytokinesis different in plants and animal cells? _____

13. If you count 90 cells and 30 of them are in prophase, what is the % of cells in prophase? _____

14. If that particular cell takes 60 minutes to undergo mitosis then how much time do you expect that it would spend in prophase? _____

15. If you found 5 cells out of 100 cells undergoing metaphase, then what is the % of cells in metaphase? _____

16. If that cell type usually takes 120 minutes to undergo mitosis, then how long do you think it must take to undergo metaphase? _____

17. Use your textbook to find 2 things that are different between cell division in plant and animal cells. _____

18. Meiosis increases genetic variation in a population. Each diploid cell undergoing meiosis can produce 2^n different chromosomal combinations where n is the haploid or monoploid number. If you have a diploid cell with only 8 chromosomes, how many different chromosome combinations are possible even without crossover? (Be sure to write the formula and show your work) _____

19. Humans have a haploid number of 23. What is the theoretical number of chromosome combinations possible each time one of our cells undergoes meiosis? _____

No wonder we do not look exactly like our brothers or sisters!

20. What is the first big difference between meiosis and mitosis? _____

21. How will we simulate crossing over in meiosis. _____

22. What is the second significant difference between mitosis and meiosis? _____

23. Name the third difference between the two processes. _____


24. What is *Sordaria fimicola*? _____

25. Draw the life cycle of *Sordaria fimicola* at the bottom of this sheet and explain in words what is happening there.

26. Tell if each combination of spores described below is indicative of a crossed over or noncrossed over state:

a.  This (did / did not) cross over.

b.  This (did / did not) cross over.

c.  This (did / did not) cross over.

27. If two genes cross over 20 % of the time, then how many map units must separate the two genes? _____

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Prelab Writeup for *Laboratory 4 : Plant Pigments and Photosynthesis*

Read pages 45- 49 in your lab book to help you answer the following questions.

1. What are the two main activities that we will perform in this lab? _____

2. What is paper chromatography? _____

3. Explain how chromatography works. _____

4. Name the pigment that we would expect to see near the solvent front and explain why it moves so quickly. _____

5. Which pigment would be nearer to the middle and why? _____

6. Which pigments will be nearest to the bottom and why? _____

7. What is the purpose of the chlorophyll a molecule in the plant? _____

8. What is the role of the other pigments? _____

9. Write the formula for determining the reference front of a pigment. _____

10. Which has more energy, short or long electromagnetic waves? _____

11. In an intact leaf, relate the steps that usually occur once light is absorbed by the pigments.

12. If DPIP is a blue color has light been absorbed by the chlorophyll or not?

13. What color will DPIP appear to be if photosynthesis is taking place?

14. Which instrument will we use to measure the transmittance of light so that we can measure the amount of photosynthesis occurring?

15. Do we expect to see more or less transmittance of light if photosynthesis is actually occurring?

16. We will use 4 test tubes in this experiment. What is the purpose of tube 1?

Tube 2?

Tube 3?

Tube 4?

17. What is the purpose of the water flask?

18. Where will we hold the cuvettes (test tubes) and why do you think this is necessary?

19. How will we prevent light from entering one of our cuvettes?

20. Which cuvette do you expect to end up with the lighter color, the one that has boiled chloroplasts or the one with unboiled chloroplasts? Explain.

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Prelab Writeup for *Laboratory 5: Cell Respiration*

Use your text and pages 54-57 in your lab manual to answer the following:

1. What is the difference between a germinating and a nongerminating pea seed? _____

2. Which do you expect to use more energy? Explain. _____

3. What is cellular respiration? _____

4. Write the equation for cellular respiration. _____

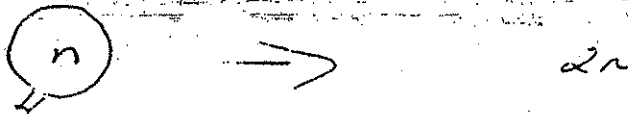
5. Explain in words what this means. _____

6. Name 3 ways that you could measure cellular respiration. _____

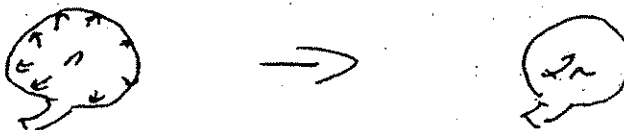
7. How will we measure cellular respiration in our lab? _____

One of the easiest ways to understand the gas laws on page 43 is to picture what would happen to the gas in a balloon under the various conditions. So I will ask you to draw what you expect to happen in these states.

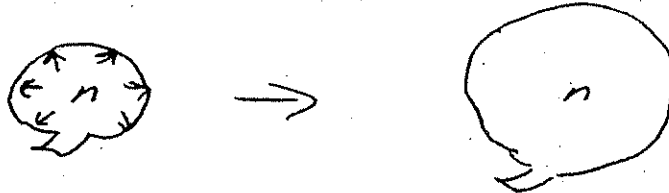
8. Read concept 1 on page 55 and then show me what would happen to the size of my balloon if temperature and pressure are kept constant (stay the same) and the number of molecules of gas in the balloon is doubled.



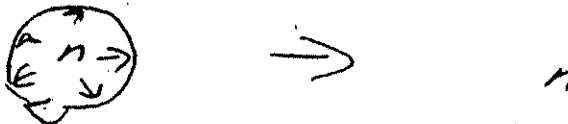
9. Illustrating concept 2, I have drawn two balloons of the same size since the volume and the temperature will be kept constant. I have used arrows to illustrate the amount of pressure. Again, the second balloon contains double the number of molecules. Using arrows of representative size, indicate what has happened to the pressure in the second balloon.



10. Illustrating concept 3, I have drawn 2 balloons of different sizes. Both contain the same number of molecules and are in the same temperature. Indicate by the size of the arrows what happens to the pressure in the second balloon.



11. Illustrating concept 4, I have drawn one balloon with a certain number of molecules. This number of molecules will not change but I am going to raise the temperature of the molecules in the second balloon. Indicate what will happen to the balloon over time.



12. I have drawn a tube with water on one end and air in the other. If I decrease the pressure of the air on the right in which direction will the water flow? Indicate this with a right or left pointing arrow.



13. In our experiment what will happen to the carbon dioxide produced during cellular respiration?

14. Therefore, if the volume of gas in the respirometer decreases, what does this tell us about the amount of oxygen in the tube?

15. Why will we be using vials with glass beads only?

16. Do you expect there to be more respiration in the set ups at room temperature or at 10 degrees Celsius? Explain

17. Do you expect there to be more respiration in the set ups with beads alone or with peas? Explain.

18. Do you expect there to be more respiration in the vials with the germinating or the nongerminating peas? Explain.

19. Draw a respirometer.

1

2

3

Blank

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Prelab Write up for *Laboratory 6: Molecular Biology*

Please use pages 64 - 65 and pages 68- 70 to help you answer these questions.

1. In this very expensive, state-of-the-art lab, we will be investigating some basic principles of genetic engineering. What are the two things that we will be doing? _____

2. Give some facts of interest about the organism *Escherichia coli*. Include what it is, where it is normally found in nature, how it is grown and how it is used. _____

3. How does the length of the DNA of *E. coli* compare to that of a human? _____

4. Give 4 facts of interest about plasmids. _____

5. Name the 3 ways in which genes can be transferred between bacteria. _____

6. What happens in conjugation? _____

7. What happens in transduction? _____

8. What is transformation? _____

9. What happens once the cells are competent? _____

In our lab we will be using cells that are already competent and we will introduce a plasmid containing resistance to ampicillin and ability to metabolize galactose and turn the product pGAL blue. Thus, cells which are transformed will be able to live on ampicillin and not be destroyed by that antibiotic and on the specially pGAL treated plate, they will turn blue. We will determine how many cells were actually transformed by counting the blue colonies growing on petri dishes of agar treated with ampicillin and pGAL.

10. What is used to cut both the plasmid DNA and the DNA of interest so that it may be combined and then inserted into the host? _____

11. After the "sticky ends" combine what is the enzyme which is used to seal them and keep them together? _____

12. If cells are found growing on the ampicillin treated plate, what will this tell us about them? _____

13. What color will *our* transformed cells be? _____

14. A specific system of nomenclature is used in identifying restriction enzymes. Tell what each of the following represents:

a. The first letter _____

b. The next two letters _____

c. The fourth letter _____

d. Roman numerals _____

15. Explain what the nomenclature EcoRI tells you about this particular restriction enzyme. _____

16. What is the advantage to using endonucleases (restriction enzymes) which cut DNA such that it leaves sticky ends? _____

17. Cleavage by Hae III produces (sticky / blunt) ends.

18. Cleavage by EcoRI produces (sticky / blunt) ends.

In our electrophoresis experiment we will use DNA from the bacteriophage named lambda. We will use one sample of DNA which has not been cut and so is one relatively large piece of DNA, we will use one which has been cut with restriction enzymes and so is composed of several smaller segments of DNA, and we will use one sample of fragments of known sizes so that we can use it as a comparison to determine the length of the fragments in our unknown sample.

19. What will we use to stain our gel so that we can visualize the DNA bands? _____
20. Which two restriction endonucleases were used to digest the bacteriophage lambda DNA? _____
21. Name the process used to separate fragments of DNA. _____
22. When a molecule is put into an electrical field, name several factors which influence how quickly it moves. _____

23. What is the charge of the DNA molecule? _____
Why? _____
24. Would you expect the DNA to move toward the positive or the negative pole? _____
25. What type of gel will we use? _____
26. Which molecule will move fastest through the gel, one of 100 nucleotides or one of 1000 nucleotides? _____
27. The (100 / 1000) nucleotide band would be found closest to the positive pole.
28. The (100 / 1000) nucleotide band would be found closest to the negative pole.

Blank

6-4

17

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Prelab Write-up for *Laboratory 7: Genetics of Drosophila*

Please read pages 78 - 89 in your laboratory manual to help you answer these questions.

1. Give an overview of this lab.

2. Give the science name for the common fruit fly.

3. List 7 features which make *Drosophila* a fine candidate for genetic studies.

4. Give the expected length of the *Drosophila* life cycle at room temperature.

5. Describe each stage:

Egg:

Larva

Pupa

Adult

6. Draw and label the life cycle of *Drosophila melanogaster*.

7. What does it mean to be a monohybrid cross? _____

8. What does it mean to be a dihybrid cross? _____

9. What does it mean to be a sex linked cross? _____

10. Mutations are normally found in which characteristics? _____

11. What will we use to immobilize flies? _____

12. Explain how we will distinguish the male from the female flies. _____

13. What is the purpose of the chi square test? _____

14. The ratio of green to white albino seedlings would be 3:1 or 75% to 25%. Given this information complete Table 7.3 and 7.4 in your lab book. What were your two figures for the last column in Table 7.3? _____ What were your three figures in the last column in Table 7.4? _____

15. What is the null hypothesis? _____

16. How many degrees of freedom are there in a dihybrid cross? _____

17. Give reasons why the statistics from this cross of tobacco plants was not found to be valid. _____

18. What kind of inheritance must the intermediate wing length be? _____

19. Give the figures that you got in the last column of Table 7.8. _____

20. Explain why you would reject or accept the null hypothesis for this cross. _____

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Prelab Writeup for Laboratory 8: Population Genetics and Evolution

Please read pages 90 - 92 and answer the questions that follow. You may also need to use the text and/or your notes.

1. What will we be exploring in this lab? _____

2. Name the two men who came up with a mathematical representation for evolution.

3. Give the 2 mathematical formulas used in genetics and evolution studies.

4. Explain what each of these represents:

p _____
q _____
 p^2 _____
 $2pq$ _____
 q^2 _____

5. If you have a population in which the frequency of the dominant allele is 30%, what is the frequency of the recessive allele? _____ The frequency of pure dominant individuals? _____ The frequency of pure recessive individuals? _____ The frequency of hybrids? _____
Please show your work here.

6. If you have a population in which 36% of your individuals are recessive, what is the frequency of the recessive allele? _____ The frequency of the dominant allele? _____ The frequency of pure dominant individuals? _____ The frequency of pure recessive individuals? _____ The frequency of hybrids? _____
Please show your work here.

7. Name 5 conditions under which a population will not change.

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

8. Why is the Hardy-Weinberg formulation useful?

9. In this lab we will examine the allele frequency of which gene locus?

10. What is PTC?

11. What are the possible genotypes of someone who can taste PTC?

12. What is the genotype of a nontaster?

13. Will we find the p or the q first? _____ Why? _____

14. In the North American population as a whole what is the % of people who are tasters

15. What is the % of people who are nontasters?

16. In part B of this lab we will each assume a genotype and will "mate" and produce offspring randomly. What is the genotype that each person assumes at first?

17. What is the genotypic frequency of the a gene in the original population?

18. What is the genotypic frequency of the A gene in the original population?

Name _____ Date _____

Pre-lab Write-up for *Laboratory 9: Transpiration*

This will take about an hour to complete. Please leave yourself sufficient time.

Please read page 8 & 9, and pages 99- 100, and pages 106 - 108 in your lab manual. You may also need your textbook to help you answer these questions.

1. What are the two things that we will be doing in this lab? _____

2. What is transpiration? _____

3. What is guttation? _____

4. What is water potential? _____

5. Name some forces that contribute to water potential. _____

6. Explain the direction of water movement in terms of water potential. _____

7. Name 4 forces which contribute to water movement. _____

8. Describe the overall process of water movement in a plant. _____

9. Explain the details of water movement. _____

10. Which has more water potential, a 0.6 molar solution or a 0.4 molar solution? Explain.

11. If these two solutions were separated by a membrane permeable to water but not to the solutes, in which direction would the water flow?

12. What is cohesion?

13. What is adhesion?

14. Define tension.

15. What might you notice about the diameter of a plant on a hot, sunny day? Explain.

16. Which materials are transported through the stomates of a plant and in which direction do they generally travel?

17. Name several environmental factors which affect transpiration rate in a plant.

In this lab we will determine the rate of transpiration under several different environmental conditions. At the end of the lab it will be necessary to weigh the leaves so that we can determine the ml of water loss per square meter. Please be sure to remind me to have you weigh your leaves.

18. After reading through the procedure on page 106 and 107 please summarize what we are going to do for this section of the lab.

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Prelab Writeup for *Laboratory 10: Physiology of the Circulatory System*

Use your text and pages 109- 114 and pages 120 - 123 to answer the following questions.

1. What are the two types of measurements that we will take on ourselves in this lab?

2. Which animal will we use to determine the effect of temperature change on the heart rate of an ectothermic organism?

3. What is the function of the circulatory system?

4. Name the 5 vessels of the circulatory system.

5. Describe the job of the right side of the heart.

6. Describe the job of the left side of the heart.

7. Name the changes which occur in the body to compensate for increased activity.

8. Name the two factors which determine the arterial blood pressure.

9. Which instrument is used to measure arterial blood pressure?

10. Describe this apparatus.

12. In your own words, explain what causes the sounds of Karotkoff.

13. Name and simply describe the 5 phases of the sounds of Karotkoff. _____

14. Using the chart on page 111, indicate which of these sounds will be the loudest.

15. Which of these sounds will be used to measure systolic pressure? _____

16. Which of these sounds will be used to measure the diastolic pressure? _____

17. Using the chart on page 112, indicate the general trend of blood pressure readings as a person ages. _____

18. Indicate the blood pressure which would be considered normal for you according to the chart on page 112. _____

19. What do the systolic and diastolic pressures measure? (you may need to use your text for this answer.) _____

20. What does pulse rate measure? _____

21. What is stroke volume? _____

22. Why is an individual in good physical condition better able to sustain physical activity than one in poor condition? _____

23. What happens to maximum pulse rate as an individual ages? _____

24. Use your text to explain the difference between ectothermic and endothermic organisms. _____

25. Indicate if the following are endothermic or ectothermic.

frogs _____	mice _____
insects _____	people _____
lizards _____	birds _____

26. What happens to ectotherms as their body temperature is raised from 5 degrees Celsius to 35 degrees Celsius?

27. In general, what usually happens when the temperature of an ectothermic organism is raised 10 degrees?

28. In this lab with Daphnia, what do you expect will be the independent variable?

29. What will the dependent variable be?

30. We will be counting the heartbeats of the Daphnia. According to the picture on page 122, where is the heart of this organism?

31. Describe the Daphnia.

Blank
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Pre-Lab Write-Up for Lab 11: Animal Behavior

1. Name the two aspects of animal behavior which we will be studying in this laboratory.

2. Define ethology. _____
3. Define behavior and then differentiate learned from innate behavior. _____

4. Name the behavior that places an animal in its most favorable environment. _____
5. Differentiate taxis from kinesis and give an example of each. _____

6. Define agonistic behavior and give an example of this. _____

7. Describe the realm of mating behaviors. _____

8. Give several names for the terrestrial isopod. _____
9. Classify this animal. _____

10. Explain what we will do with these pillbugs in the first procedure. _____

11. Describe a choice chamber. _____

12. Explain what we will do to study kinesis in pillbugs. _____

13. Identify our independent and dependent variable in this experiment. _____

14. State several other variables that we might test in similar experiments. _____

15. Describe how you would go about testing one of these. _____

16. What are the materials needed for successful completion of exercise 11B? _____

17. Name and describe the six phases of courtship behavior found in *Drosophila melanogaster*. _____

18. Name and describe 6 behaviors found in males. _____

19. Name and describe the 4 behaviors found in females. _____

20. Explain what we will do to study mating behavior in the *Drosophila melanogaster*. _____

Name _____

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Prelab Write-up

Laboratory 12: Dissolved Oxygen and Aquatic Primary Productivity

Read lab 12 pages 136 - 141 and answer these questions.

1. What will we be doing in Exercise 12A? _____

2. What will we do in exercise 12B? _____

3. Contrast the amount of oxygen in the air vs. that found dissolved in water. _____

4. Underline the correct answer in each of these statements.

The concentration of oxygen is generally (directly/inversely) proportional to temperature.

The concentration of oxygen is usually (directly/inversely) proportional to salinity.

The concentration of oxygen is usually (directly/inversely) proportional to currents.

Photosynthesis (increases/decreases) the amount of dissolved oxygen.

Respiration (increases/decreases) the amount of dissolved oxygen.

5. What is primary productivity? _____

6. Would you expect primary productivity to be greatest at 10 or 100 ft. in a pond? Explain. _____

7. If pond water is placed in a bottle in the light for an hour what would you expect to happen to the amount of dissolved oxygen? Why? _____

8. If pond water is placed in the dark for an hour what would you expect to happen to the amount of dissolved oxygen? Why? _____

9. How is net productivity measured? _____

10. How is gross productivity measured? _____

11. If we know how many mg of oxygen there are in each liter of water how can we convert that to ml per L? _____

12. On page 140 the directions mention that one bottle should be covered in aluminum foil. Why? _____

13. What is the purpose of changing the number of screens on the bottles? _____

14. In which bottle would you expect to have the most DO? _____

15. Explain your reasoning in question 14. _____

