# Lab 5: Exploring Membrane Transport in Animals and Simulated Cells Response Form

1. Prediction #1. What effect will drug X (i.e., ethanol, caffeine) have on the pulse rate in blackworms? Explain the rational for your prediction.
2. Prediction #2. How will drug concentration influence the change in pulse rate? Explain the rational for your prediction.
3. Complete table 5.1

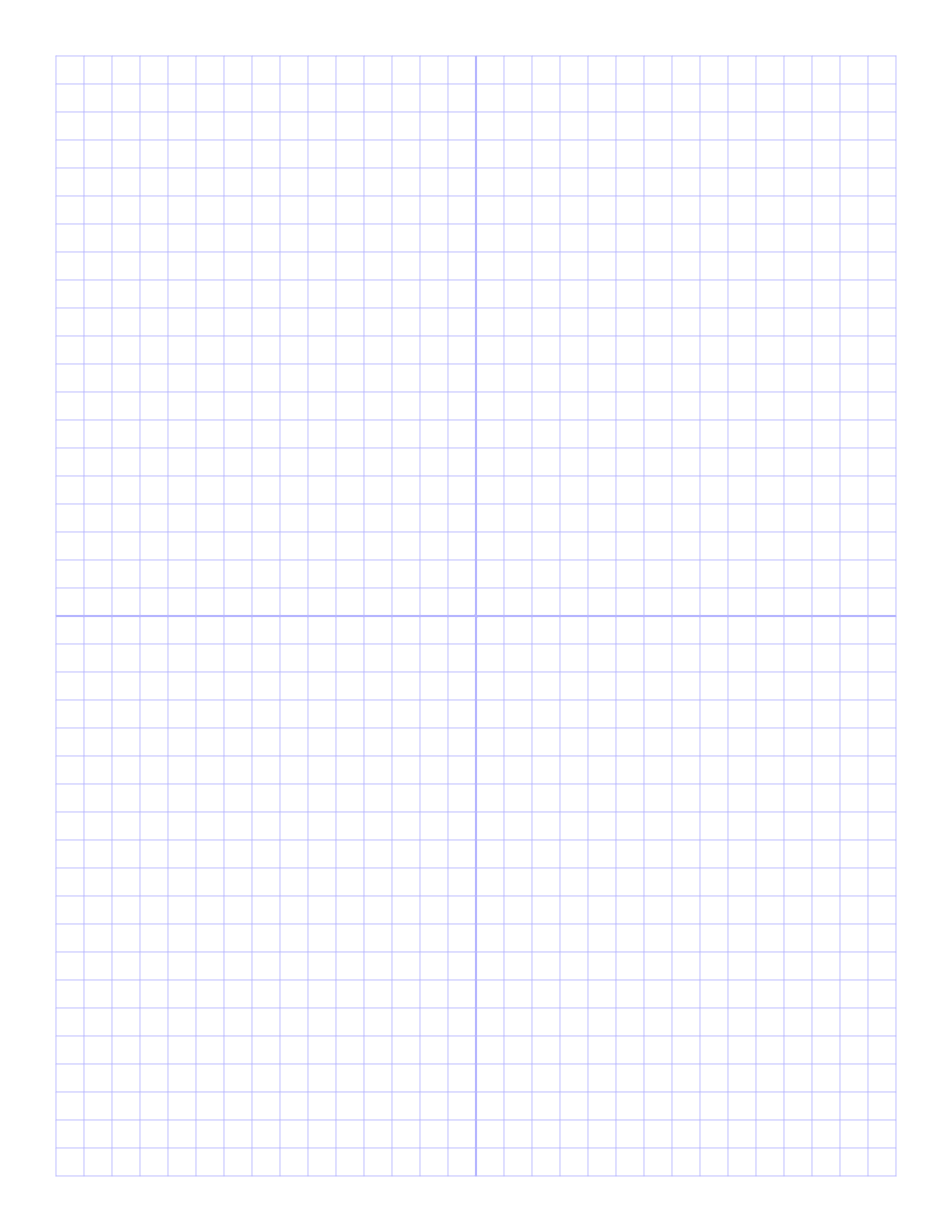
**Table 5.1. Dorsal blood vessel pulsation per minute in *L. variegatus*.**

|  |  |
| --- | --- |
| Trial # | Pulse / minute |
| Trial 1 |  |
| Trial 2 |  |
| Trial 3 |  |
| Trial 4 |  |
| Trial 5 |  |
| Group Average |  |
| Standard Deviation |  |
| Class Average |  |

Record any behavioral changes exhibited by your worm in **Table 5.2**.

**Table 5.2: Observable behaviors of *L. variegatus* in spring water versus the test solution.**

|  |  |
| --- | --- |
| Spring Water |  |
| Test Solution |  |

1. Amount of time it took for the pulse rate to change from baseline to abnormal =
2. Plot the change in pulse rate using a line graph by placing pulse rate on the y-axis and time interval on the x-axis.  
   
3. Change of pulse rate for the in-class data under different treatments

|  |  |  |
| --- | --- | --- |
| Treatment | Change in pulse rate values | Average |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

### Summary Questions

1. Which drug produced the fastest pulse relapse time? Why?
2. Did drug concentration impact the pulse rate relapse time? Explain.
3. Did these experiments have a control group? If yes, describe the control. If not, design an appropriate control for this experiment.
4. What does the change in pulse rate data represent in terms of diffusion?
5. Did you observe a change in pulse rate at different concentrations?
6. How could these experiments be improved?
7. What other chemicals might affect pulse rate?
8. What other factors influence the rate of diffusion that could potentially impact the pulse rate of L. variegatus?
9. Design an experiment that investigates another factor that influences the rate of diffusion and pulse rate in black worms.
10. Did the data support your predictions? Why or why not?
11. Which chemical had the fastest rate of diffusion?

## Alternate Procedure for Online Courses

### Part A: Observing Diffusion in Simulated Cells

#### Questions

1. Where is the starch concentration higher? [cup / bag].
2. Where is the iodine concentration higher? [cup / bag].
3. Regarding iodine, which is hypertonic? [cup / bag]. Explain your reasoning.
4. Regarding starch, which is hypertonic? [cup / bag]. Explain your reasoning.

**Predictions**

1. If the bag is permeable to starch, then starch should move [into bag / out of bag / no change]
2. If the bag is permeable to iodine, then iodine should move [into bag / out of bag / no change]
3. If the bag is permeable to iodine, then after 15 minutes the color of its contents will appear [orange / purple / no change]  
   1. If the bag is permeable to iodine, then after 15 minutes the color of the solution in the cup outside the bag will appear [orange / purple / no change]
4. If the bag is permeable to starch, then after 15 minutes the color of its contents will appear [orange / purple / no change]  
   1. If the bag is permeable to starch, then after 15 minutes the color of the solution in the cup outside the bag will appear [orange / purple / no change]

#### Post-Observation Analysis

**Table 5.3: Color change observations at the beginning and end of membrane transport.**

|  |  |  |
| --- | --- | --- |
|  | Starting color | Color after 15 minutes |
| Solution in cup |  |  |
| Solution in bag |  |  |

1. Based on your observations, which substance moved?
2. What evidence can you use to support this claim?
3. The cellophane bag was permeable to which substance(s)?
4. Explain how the bag is a model for a cell.
5. Sketch the cup and bag. Use arrows to illustrate how diffusion occurred.
6. What would happen if you did an experiment in which the iodine solution was placed in the bag and the starch solution was placed in the beaker? Use as much detail as possible in your explanation.
7. Research the difference between the structure and size of the particles used in this investigation. Provide an explanation for why some substances can cross the cell membrane while others cannot.
8. What do the results of this investigation indicate about passive transport in living organisms?

### Part B: Design an Experiment to Investigate Passive Transport in Simulated Cells

#### Research Question:

#### Write Your Hypotheses:

#### 

#### Experimental Design:

#### Procedure:

#### Results:

**Table 5.4: Timed detection results (positive or negative) for what can be detected in the cup OUTSIDE the cellophane bag.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Independent Variable [Dilution (circle one): 1X 5X 10X 20X] or [Temperature]  Trials #1-3 | | | | | |
| Time | Glucose | Starch | Glucose | Starch | Glucose | Starch |
| 0-Start |  |  |  |  |  |  |
| 1 |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |
| 7 |  |  |  |  |  |  |
| 8 |  |  |  |  |  |  |
| 9 |  |  |  |  |  |  |
| 10 |  |  |  |  |  |  |

**Table 5.5: Detection results (positive or negative) for what can be detected inside the cellophane bag at the completion of the experiment (after 10 minutes)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Independent Variable [Dilution] or [Temperature] | | | | | |
| Time | Glucose | Starch | Glucose | Starch | Glucose | Starch |
| 10-End |  |  |  |  |  |  |

#### Lab Report

Write a brief account of your experiment, including a statement of your experimental question, your control group, sample size, experimental group replications, and a table of results of which compounds moved. In the introduction/background section of your lab report, explain what happens during simple diffusion and discuss two factors that influence the rate of diffusion. Write 1-2 paragraphs about the experimental results to your question, how the results related to your hypotheses, and what the results might mean for a cell and its survival. Graph the average time it took for each substance to be detected or provide data specific to your chosen method.