

**PART A - BROWNIAN MOTION**

1. Make a few observations regarding Brownian motion:
2. If the slide were heated or chilled, what would happen to molecular movement? **Explain** why.

**PART B – DIFFUSION RATE OF  $KmNO_4$**

3. Fill in the following Data Table 1 . Create an Excel graph showing the change in absorbance versus time. In the figure caption describe the change in rate of diffusion of  $KMNO_4$  into the water in the figure caption.

Time	0 min	5 min	10 min	15 min	25 min	35 min	45 min	55 min	65 min	75 min
Abs <sub>540</sub>										

**PART C – DIFFUSION OF A LIQUID INTO A SEMI-SOLID**

Fill in Data Table 2 below with the class data: The Effects of Temperature on Diffusion Rates.

Time (min)	Methylene Blue			Methyl Red			Methyl Violet			$KMnO_4$		
	0°C	23°C	37°C	0°C	23°C	37°C	0°C	23°C	37°C	0°C	23°C	37°C
0												
15												
30												
45												
60												
75												
90												

4. Which dye diffused more rapidly?
5. Using Excel, graph the final extent of diffusion for each dye versus temperature on the same graph. Below this figure, type a short interpretation of the results from the graph and draw some conclusions.

**PART D – OSMOSIS**

Fill in Data Table 3: The Effects of Sugar Concentration on Osmotic Rate.

Time (min)	% Solution		% Solution	
	Fluid Level	Cumulative Rise (ml)	Fluid Level	Cumulative Rise (ml)
0		-----		-----
15				
30				
45				
60				
75				
90				
105				
120				

6. Using Excel, graph the cumulative rise in the level of fluid in the osmometer against the time for both concentrations.
7. Where is the concentration of water higher, inside or outside the osmometer?
8. Which bag gained water more rapidly? **EXPLAIN** why.

**PART E – PLASMOLYSIS**

9. Make large sketches of a normal and a plasmolyzed *Elodea* cells to show the difference in their respective appearances.

Elodea cell (Normal)

Elodea cells (Plasmolyzed)

10. Using the principles of osmosis, account for the changes you observed when the *Elodea* cells were placed into the salt water environment. Explain why the cells did not burst when you placed deionized water on them.

**PART F – ANIMAL CELL PERMEABILITY**

Complete Data Table 4: Results of the RBC permeability in hypotonic to hypertonic solutions and drawings.

	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5
<b>Tonicity</b>					
<b>Time</b>					
<b>RBC Sketch</b>					

11. Explain the results shown on Data Table 4. Which solution was: hypertonic, isotonic and hypotonic?

**PART G – DIALYSIS THROUGH NON-LIVING MEMBRANES**

Fill in Data Table 5: Results of the dialysis/osmosis experiment with an artificial membrane. Use (+) for the presence or (-) absence of a substance.

Substance	Outside Bag		Inside Bag	
	Before	After	Before	After
NaCl				
Glucose				
Protein				
Starch				

12. Weight of the bag before: \_\_\_\_\_

13. Weight of the bag after: \_\_\_\_\_

14. Based upon your data from Data Table 5, which substances were able to pass through the membrane? **Explain the direction of movement and why they were able to pass through the artificial membrane.**

15. Discuss the dialysis experiment above and how it relates to individuals that undergo dialysis.

16. Cite the evidence whether osmosis occurred in this experiment.

**PART H: WHY DON'T CELLS GROW TOO LARGE**

Complete Data Table 6: The Effects of Cell Size and Diffusion of "Nutrients"

Cell	Colored Portion Before "Feeding"			Colored Portion After "Feeding"			Percent of Cell "Fed"
	Diameter	Length	Volume	Diameter	Length	Volume	

Percent of cell fed =  $\frac{v_o - v_u}{v_o} \times 100$       Where:  $v_o$  = volume of cell  
 $v_u$  = volume of unfed portion

17. What is the hypothesis that is being tested in this experiment?

18. Discuss the relationship between cell size and the rate of diffusion into the cubes.

19. Explain which cell size and surface-area to volume ratio best meet the diffusion needs of living cells?

20. Explain why prokaryotic cells are approximately ten times smaller than eukaryotic cells.