BIO 131 PAL
Week 2 – Problem Set 1

PHYSIOLOGICAL VARIABLES

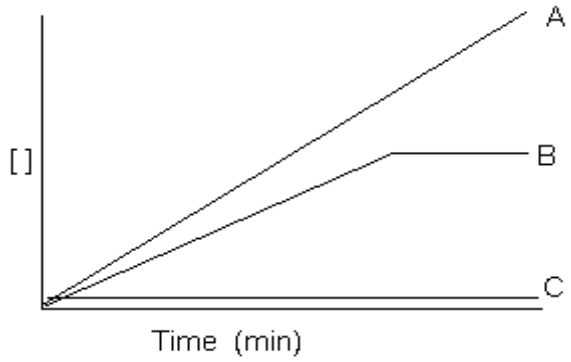
edits to be made → add negative feedback loop and cellular communication

1. You are going to measure body temperature in a group of athletes over an exercise period. What would be the independent variable in this situation? What would be the dependent variable? What would be some appropriate controls?

2. Glucose is transported into cells from the extracellular fluid. Construct a graph using the following data and label the axes. Summarize these results in the legend. Identify and distinguish between the independent and dependent variables.

Extracellular concentration of glucose (mM)	Intracellular concentration of glucose (mM)
150	100
140	101
130	100
120	91
110	83
100	75
90	61
80	52

4. The following graph shows the diffusion rate of 3 substances across a cell membrane (from outside to inside). The Y-axis is concentration inside the cell.



A. Can you tell if these molecules are fat or water-soluble based on their movement patterns?

B. What can you say about the concentration difference across the membrane for each one?

C. Come up with a good reason why line B levels off.

5. In the space below draw a large rectangle to represent total body volume. Now draw lines to partition the box into the different body compartments.
A) Label these as ICF, ECF, interstitial fluid, plasma.
B) Then show how the following ions are distributed between ICF and ECF (use large letters for high concentration, and small letters for low concentration): Na+, K+, Cl-, Ca++.
C) Labe cell membrane

1. Negative feedback loop

    a. Much of the regulation of homeostasis in our bodies is achieved by negative feedback loops. In your own words, what is a negative feedback loop, and what is its result?

    b. A typical negative feedback loop usually includes seven distinct parts (although, at times, parts may be merged). Organize the parts below in the correct order for a negative feedback loop to occur.
        i. Integrating Signal
        ii. Target
        iii. Stimulus
        iv. Response
        v. Input Signal

vi. Sensor
vii. Output signal

c. Being creative, we can think of examples of negative feedback loops in our everyday lives. Consider the following scenarios/situations; how are they similar to a negative feedback loop? Are any parts missing?
    i. A thermostat that controls a room temperature at 74˚ F on a cold winter night and temperature drops.
    ii. A highway patrol officer at a speed check station at which a person is speeding.
    iii. Fire sprinklers and alarm systems in a building where a fire begins.

BONUS:

6. Think about which factors might influence how easily a particle can cross the cell membrane.