Name _____
Mrs. Slomnicki
AP Biology

Summer Assignment- Graphs and Experimental Analysis

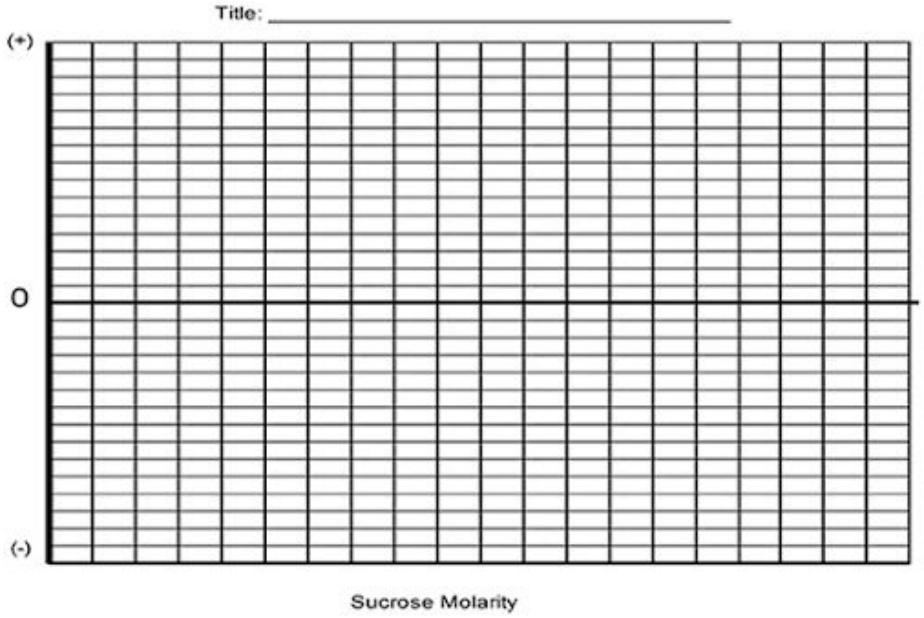
These questions are modified from actual AP free response questions to include only questions that your background in in biology, chemistry, and math have prepared you to be able to answer.

Question 1:

An experiment was conducted involving the movement of water into and out of potato cells. First, the initial mass of six groups of potato cores were measured. The potato cores were placed in sucrose solutions of various molarities. The masses of the cores were measured again after 24 hours. Percent changes in mass were calculated. The results are shown below.

Molarity of Sucrose in Beaker	Percent Change in Mass
0.0 *M*	18.0
0.2	5.0
0.4	-8.0
0.6	-16.0
0.8	-23.5
1.0	-24.0

a) Graph these data on the axes provided.



b) At approximately what molarity of sucrose would there be a zero percent change in mass? **Explain** how you got this answer.

c) The positive percent change of mass was an indication that water osmosed into the potato cores. The negative percent change of mass indicates water osmosing out of the potato cores. **Explain** what it means if there is a zero percent change in mass and why this is occuring.

d) Percent change in mass can be calculated by the following formula:

$$\frac{\text{Final mass} - \text{Initial mass}}{\text{Initial mass}} \times 100$$

A new set of potato cores was tested. The initial mass of the cores was 5.45 g. The cores were then placed in a beaker filled with an unknown molarity. After 24 hours, the cores were massed again and the final mass was 5.63 g.

Calculate the percent change in mass. (Show your work)

e) **Predict** what would happen to typical animal cells placed in 0.0 M and 1.0 M sucrose solutions, and **explain** your prediction.

Question 2:

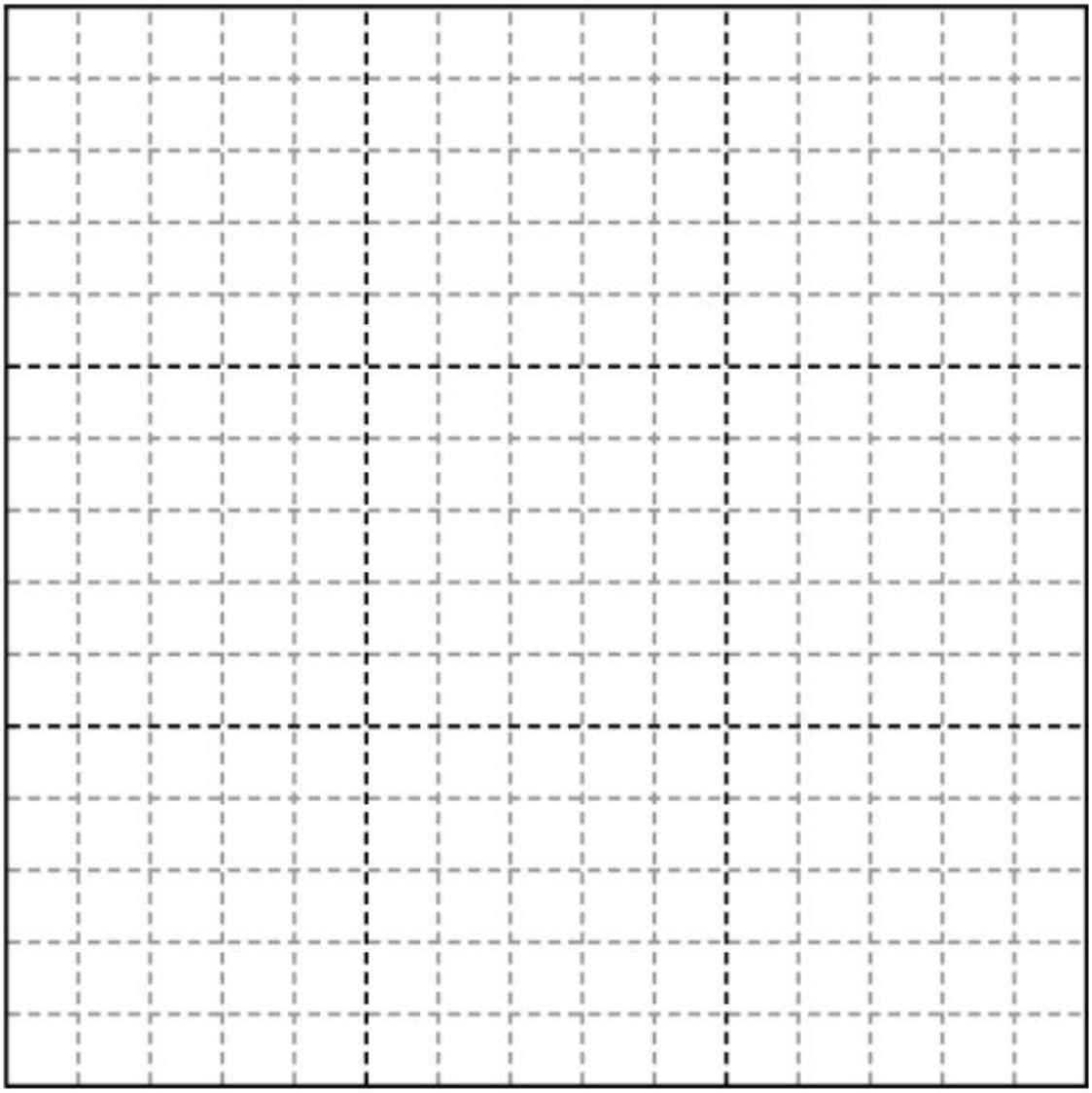
Paramecia are single-celled aquatic eukaryotes that can survive in a wide range of salinities. Paramecia use contractile vacuoles to help maintain homeostasis under these varying salt conditions. The contractile vacuoles fill with fluid and then contract to remove the fluid from the paramecia.

Scientists wished to determine the effect of salinity on contractile vacuole activity. They maintained different groups of paramecia in water of different salinities for one month. They then measured the average amount of fluid ejected from the contractile vacuoles in each group of paramecia each time the vacuoles contracted (Table 1).

Table 1. Contractile Fluid Output by Paramecia Adapted to Different Salinities

Salinity of Maintenance Water (milliosmoles of solute/kg)	Average Fluid Output of Contractile Vacuole (picoliters/minute)
10 (freshwater)	1.3
250	0.25
750	0.1
1000	0.05

a) Use the template to **construct** an appropriately labeled graph that represents the data in Table 1.



b) **Describe** how increasing salinity affects the amount of fluid ejected each time a contractile vacuole contracts.

Question 3:

At the start of mitosis, sister chromatids (the two sides of chromosomes) are held together by a complex of proteins. Separase is an enzyme that cleaves the complex, enabling the chromatids to separate during mitosis. Separase is overexpressed in many cancer cells, and scientists hypothesized that they might be able to slow or stop the growth of cancer cells by blocking the activity of separase. The scientists found a compound they named Sepin-1 that appears to effectively cleave and thus inactivate purified separase protein *in vitro* (in a test tube).

To test whether Sepin-1 inhibits the growth of cancer cells, the scientists added increasing concentrations of Sepin-1 to many different types of cancer cell lines growing in culture. A representative sample of the data they obtained is shown in Figure 1. The scientists also proposed to examine whether there is a relationship between the sensitivity of different types of cancer cells to Sepin-1, as measured by the concentration of Sepin-1 that caused 50% of the cells to die, and the relative concentration of separase in the different cell lines. A representative sample of the data is shown in Table 1.

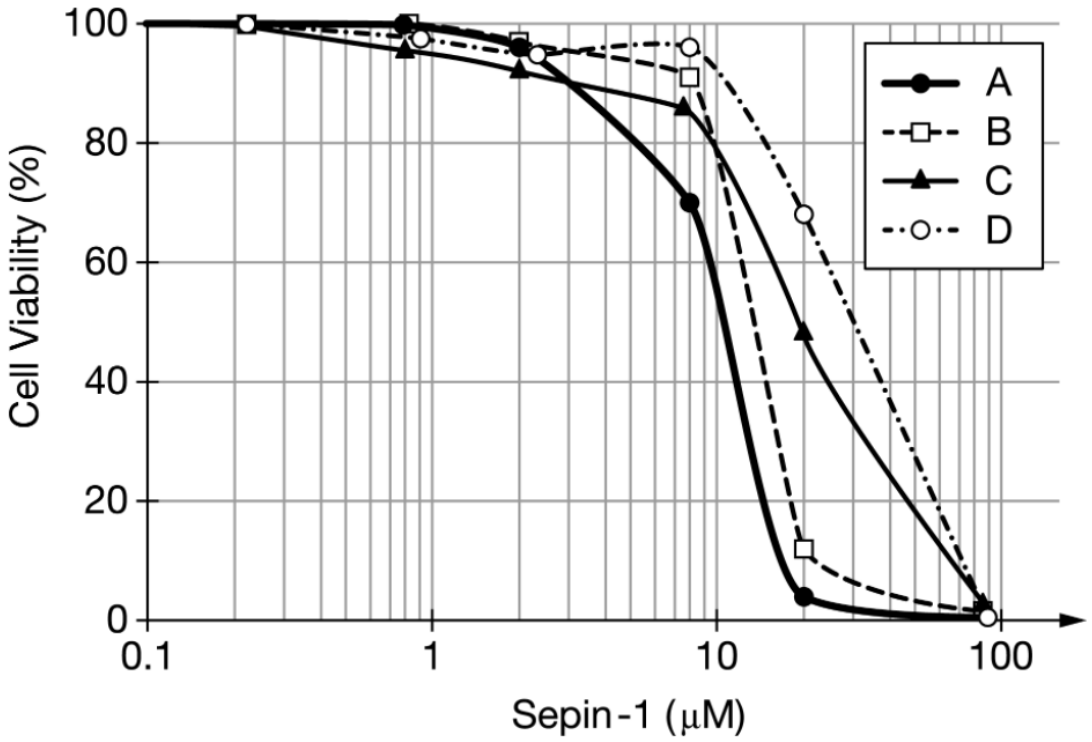


Figure 1. The viability of representative cancer cell lines in the presence of Sepin-1

Table 1. Relationship between sensitivity to Sepin-1 and cellular concentration of separase

Cell Line	Concentration of Sepin-1 that Caused 50% Cell Death (μM)	Relative Concentration of Separase
E	1.0	0.9
F	3.0	0.38
G	5.0	0.34
H	5.0	0.18
J	10.0	0.25
K	17.0	0.2
L	35.0	0.3
M	53.0	0.15
N	62.0	0.17

(a) **Identify** an independent variable in the experiment graphed in Figure 1.

(b) Based on the data in Table 1, **describe** the general relationship between the sensitivity of cells to Sepin-1 and the concentration of separase in the cells.

(Hint: Your answer should begin with, "As the concentration of separase increases…")