FRQ - Take Home Portion of the Exam

A group of students designed an experiment to measure transpiration rates in a particular species of plant. Plants were divided into four groups and were exposed to the following conditions.

Group I	Room conditions (light, low humidity, 20°C, and little air movement.)
Group II	Room conditions with increased humidity.
Group III	Room conditions with increased air movement (fan).
Group IV	Room conditions with greater light intensity.

The cumulative water loss due to transpiration of water from each plant was measured at 10-minute intervals for 30 minutes. Water loss was expressed as milliliters (mL). The data for all plants in Group I (*room conditions*) were averaged. The average cumulative water loss by the plants in Group I is presented in the table below.

Average Cumulative Water Loss by the Plants in Group I	
Time (minutes)	Average Cumulative Water Loss (mL)
0	0
10	3.5
20	7.7
30	10.6

(a) **Identify** the independent variable in this experiment. **[1]**

(b) **Identify** the dependent variable in this experiment. **[1]**

(c) **Identify** two controlled variables or constants in this experiment. **[2]**

(d) Using the template on the next page, **construct** and **label** a line graph using the data for Group I. **[10]**

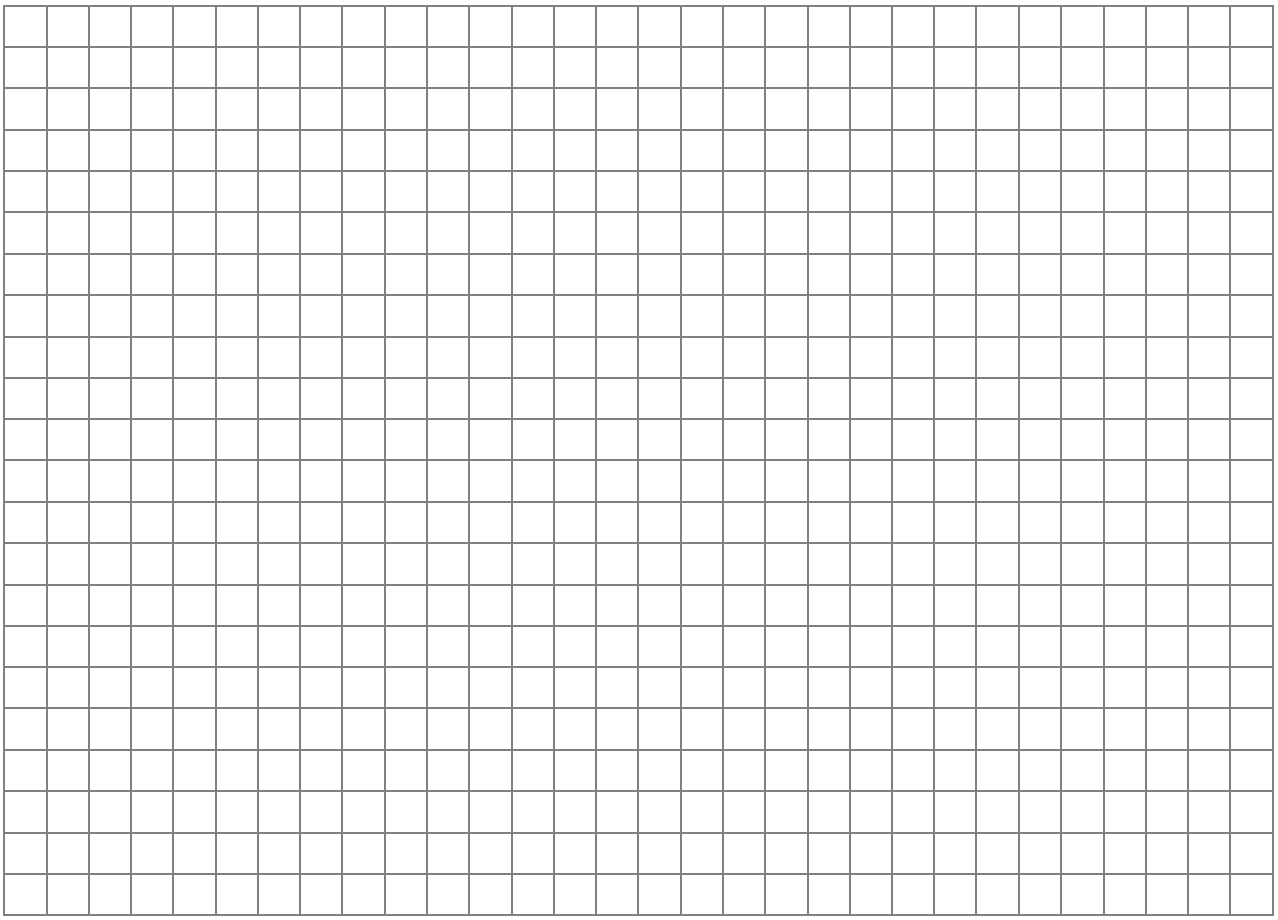
(e) Using the same set of axes, **draw** and **label** three additional lines representing the results that you would predict for Groups II, III, and IV. **Explain** your predictions in terms of water potential. **[6]**

(f) **Calculate** the rate of water loss for Group I for the time period **5 – 15** minutes. **[2]**
(*Round your answer to the nearest hundredth*)

$$\text{Rate of Water Loss} = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$$

(g) **Describe** the mechanisms responsible for the opening and closing of stomata. **[8]**
active transport - K+ pump - diffusion - osmosis - water potential - solute potential - turgid - flaccid

Average Cumulative Water Loss by the Plants



Time (minutes)