Name: Key

Water Potential of Living Tissue

1. Carrot sticks, 20 mm in length, were placed in eight different test tubes containing different concentrations of sucrose. The table below shows the change in mass of each of the potato cores after incubating in the sucrose solutions for 60 min.

Sucrose Conc. (M)	Δwt (mg)	Solute Potential
0.00	46	0 bars
0.05	30	-1.2 bars
0.15	19	-3.7 bars
0.25	12	-6.2 bars
0.30	4	-7.4 bars
0.40	-15	-9.9 bars
0.45	-30	-11.1 bars
0.50	-48	-12.4 bars.

Based on this data, answer the following:

a. Use the graph paper provided to plot the change in weight versus the molarity of sucrose.

b. Calculate the solute potential of each solution (Ψ_s of a solution, S, is equal to –iCRT where:

i = Ionization constant (for sucrose this is 1.0 because sucrose does not ionize in water)
C= concentration of sucrose (mol / L)
R= gas constant = 0.0831 L bars/ °K mol
T= Temperature in K (298 °K at room temp)

$-1(.05\ mol/L)(.0831\ L\ bars/mol\ K)(298) = -1.2\ bars$

↑ For .05M

c. Use your graph to determine at which molarity the carrot cells are at equilibrium with their surroundings. Use that molarity to determine the solute potential of the carrot cells.

Solute concentration for carrots Equilibrium using the graph = .29M

Ψ_p at equilibrium = 0 bars

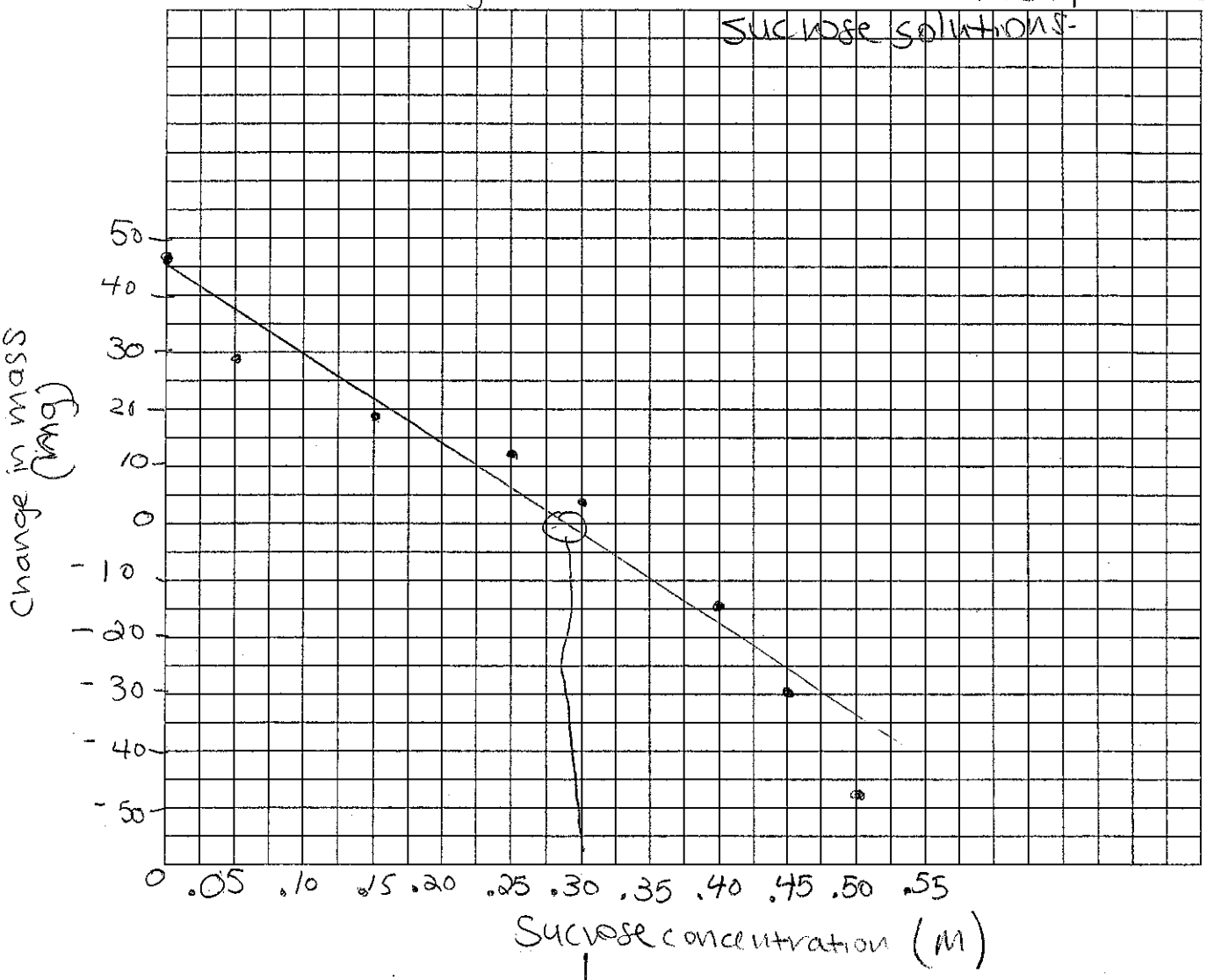
$\Psi = \Psi_p + \Psi_s$

$\Psi_s = -1(.29\ mol/L)(.0831\ L\ bars/°K\ mol)(298°K)$

$\Psi_s = -7.2$ bars

$\Psi = -7.2$ bars

Change in mass of carrots soaked in various sucrose solutions-



Equilibrium!

at

.29 M