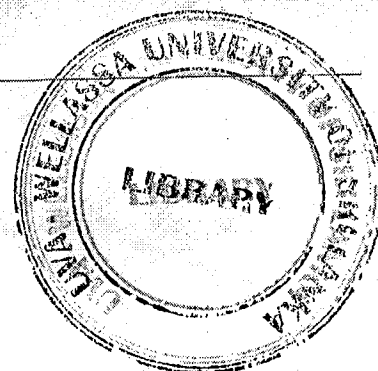


Uva Wellassa University, Sri Lanka
End Semester Examination – January 2010
SCT 211-2 Cell and Physiology



Time: Two (02) hours



Part B

5. A group of plant physiologists in California University was interested to do a research on the behavior of NADP – Malate Dehydrogenase enzyme of *Brassica napus* plant (NADP – Malate Dehydrogenase enzyme converts oxaloacetate to malate). Therefore, they arranged a certain experiment to detect the response of that enzyme to various compounds. Part of this experiment is as follows.

Matured leaves from 20 days old *Brassica napus* plants which grown under greenhouse conditions, were obtained and initial enzyme concentration was detected. Then, three different solutions (PbSO₄ solution, Compound X and NaCl solution) were injected in to three *Brassica napus* plants separately. After 2 hours, the concentrations of the enzyme were detected separately and the results were tabulated as follows.

Solution injected	Initial enzyme concentration(mM)	Final enzyme concentration(mM)
PbSO ₄	40	12
Compound X	40	65
NaCl	40	40

(A). Explain the physiological background of the above results.

(10marks)

(B). What is the specific cell type which NADP- Malate Dehydrogenase enzyme is found in C4 cycle?

(2 marks)

(C). Draw the energy graph for enzyme catalytic activity.

(3 marks)

6. Experimental procedure that was followed by a group of students to find out Ψ_s of a plant cell is as follows.

Rhoeo lower epidermal peel cell was isolated (Ψ_s is unknown) and put in to X moldm⁻³ NaCl solution ($i=2$). At the equilibrium the cell was transferred in to a certain solution (con. 0.1 moldm⁻³, $i= 1$) and kept until it reached to incipient plasmolysis stage. At the incipient plasmolysis stage (assume that at the incipient plasmolysis stage, cell was in equilibrium with the solution) the cell was taken out from the solution and put again in to pure water container. (Note : At the X moldm⁻³ solution Ψ_p of the cell = +0.125MPa)

$$\Psi_s = -miRT \quad (R=8.314 \text{ cm}^3 \cdot \text{MPa} \cdot \text{K}^{-1} \cdot \text{mol}^{-1}, \text{ temperature} = 25^\circ\text{C})$$

(A). Calculate the concentration of the solution (con. X) and Ψ_s of the cell.

(12 marks)

(B). What is the water potential (ψ_w) of the cell after putting in to pure water container?

(3 marks)



(C). A certain biology student cultivated several *Panicum maximum* (grass plants) in plastic pots near the green house for his final year research. One day he observed that there was a burning at the tip of grass leaves.

Explain the physiological background of this phenomenon. (5 marks)

7. (A). What are the differences between phloem translocation and xylem transportation?

(3 marks)

(B). Phloem sap is in positive hydrostatic pressure whereas xylem sap is in negative hydrostatic pressure. Prove this statement by giving suitable examples.

(2 marks)

(C). Explain the pressure flow hypothesis of phloem translocation. (use suitable diagrams)

(10 marks)