## Impact Problem

 Describe how non-electolyte (A) across biological membrane (lipid bilayer) is transported in following conditions. Develop the quantitative expression wherever possible.
 Specific conditions:

 A thickness of a lipid bilayer : L
 [A] (0) = [A]<sub>o</sub> on the outer surface of membrane
 [A] (L) = 0 at the other surface
 Steady state assumption (∂[A]/∂x=0)
 D : diffusion coefficient

1-1) Define a diffusion equation of interest in this case and solve it as function of membrance thickness (x)

1-2) Calculate flux J through the membrane

1-3) Calculate flux J through the membrane when the concentration of A on the surface of a membrane is not equal to the concentration of A measured in the bulk solution. Assume that there exists constant ratio between them  $(K_D)$ .

1-4) In many cases, this flux previously mentioned is underestimated, indicating that the membrane is more permeable than expected with the existence of protein carrier (C). calculate the flux with following condition (AC = A + C, K = {[A][C]/[AC]}).

2. In photodynamic therapy (PDT), laser radiation, which is usually delivered to diseased tissue through a fiber optic cable, is absorbed by a drug which, in its first excited triplet state  ${}^{3}P$ , photosensitizes the formation of an excited singlet state of O<sub>2</sub>,  ${}^{1}O_{2}$ . The  ${}^{1}O_{2}$  molecules are very reactive and destroy cellular components and it is thought that cell membranes are the primary celluar targets. Indentify the four steps of photochemical cycle leading to the shrinkage of diseased tissue. What is the essential criteria for a potential PDT drug?

3. What is surface plasmon resonance(SPR) ? How the phenomena of SPR can be applied for biosensor analysis? Show the experimental arrangement for the observation of surface Plasmon resonance.