Impact problem – solutions

1.

1-1) $D\frac{d^2[A]}{dx^2}=0$

1-2) $J=D\frac{[A]_0}{l}$

1-3) $K_D=\frac{[A]_0}{[A]_S}$ $J=DK_D\frac{[A]_S}{l}$

1-4) $[AC]=\frac{[A][C]_0}{[A]+K}$ $J=\frac{DK_D[C]_0}{l}\frac{[A]}{[A]+K}=J_{\max}\frac{[A]}{[A]+K}$

2.

Absorption : **P + hv → P^***

Intersystem crossing : **P^* → ^3P**

Photosensitization : **^3P + $^3O_2$ → P + $^1O_2$**

Oxidation reactions : **$^1O_2$ + reactants → products**

The criteria of PDT :

- The drug must be soluble in tissue fluids, so it can be transported to the diseased organ through blood and secreted from the body through urine.
- The therapy should result in very few side effects.
- The drug must have unique photochemical properties (It must be activated photochemically at wave lengths that are not adsorbed by blood and skin).
- The quantum yield of triplet formation and of $^1O_2$ formation must be high, so many drug molecules can be activated and many oxidation reactions can occur during a short period of laser irradiation.

3. SPR- the absorption of energy from an incident beam of electromagnetic radiation by surface plasmons.

The mobility of delocalized valence electrons accounts for the electrical conductivity of metals and these mobile electrons form a plasma, a dense gas of charged particles. Bombardment of the plasma by light or an electron beam can cause transient changes in the distribution of electrons, with some regions becoming slightly more dens than others. Coulomb repulsion in the regions of high density causes electrons to move away from each other, so lowering their density. The resulting oscillations in electron density, called plasmons, can be excited both in the bulk and on the surface of a metal. Plasmons in the bulk may be visualized as waves that propagate through

the solid. A surface Plasmon also propagates away from the surface, but the amplitude of the wave, also called an evanescent wave, decreases sharply with distance from the surface.