



# ***Biophysics***

## **second lecture**

### **Diffusion and directed transport (part 2)**

#### **Second stage**

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# 1- Diffusion and directed transport

## 1-1 Forces and Flows

A detailed derivation of the laws governing the thermodynamic and kinetic properties of biophysical systems was presented by Katchalsky and Curran (1975). In covering the salient points of this area. Biophysical systems are not static: they are subject to various forces, and respond to those forces with movement. Thus, there is a direct link between force and flow. In the relation between current I, resistance R, conductance C and voltage V:

$$I = \frac{V}{R} = CV \dots\dots\dots(2.1)$$

The voltage is the force, and the current is the flow. An equation applies to the flow of blood F, the blood pressure P and the resistance R:

$$F = \frac{P}{R} \dots\dots\dots(2.2)$$

Each of these relates a flow to a particular driving force. Newton defined the relation of force, mass and acceleration for an object in a vacuum with no friction

$$f = ma \dots\dots\dots(2.3)$$

conditions that do not apply to physiological systems. When friction is also considered, the relation becomes :

$$F = ma + fv \dots\dots\dots(2.4)$$

with the force f having both acceleration and velocity components. When the acceleration is damped out or the mass is so small as to make main significant,