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B.Sc HONS Part - III Paper - VI

Topic :- Permeability of Plasma-membrane.

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Q. Write an essay on permeability of plasma-membrane.

Ans. Cells are in constant need of certain substances to regulate various vital activities. These substances are oxygen, mineral salts and nutrients. Besides intake of these substances, excretion of waste products such as ammonia, CO_2 and other metabolities is also needed. For exchange of these materials plasma membrane acts as a gate way and regulates the flow of materials in and out of the cell. This property of membrane is known as permeability.

All processes involved in the exchange of materials are categorised primarily into following three main types-1. Passive transport 2. Active transport 3. Cytosis.

1. Passive Transport : The passage of molecules through the membrane from a high concentration to a low concentration region is called passive

ransport. Transfer of molecules takes place along the concentration gradient and no energy is required.

(a) Simple Diffusion : Transport of metabolites across the membrane along the concentration gradient and without the use of a carrier molecule is called G:mple diffusion.

(b) Facilitated Diffusion : Transportation of molecules across the plasma nembrane in response to a concentration gradient by a carrier is known as acilitated diffusion. It is stereo specific i.e. only one of the two possible isomers (L or D) is transported.

2. Active Transport : It appears to be of two general types–

(a) Primary Active Transport : It is directly related with chemical energy (ATP) or electric energy (Electron flow). Examples of primary active transport re Na^+, K^+ translocating ATPase in mammals and proton translocating ATP se of bacteria .

The existance of sodium and potassium pumps has been demonstrated in many eukaryotic cells. Na^+ is pumped out of the cell by the sodium pump and K^+ is pumped into the cell by a coupled process. The two pumps apparently operate stimultaneously, and in the absence of either Na^+ or K^+ movement of both Na^+ and K^+ stops.

(b) Secondary Active Transport : It depends upon chemiosmotic energy examples of secondary active transport are the glucose transport system of the intestinal epithelium of mammals and the lactose permease system in E. coli.

The free surface of the intestinal epithelium has numerous microvilli which are formed by projections of the brush border membrane. Primary active transport results in the Na^+ being pumped out of the coli and K^+ being pumped into the cell. The electrochemical sodium ion gradient can be then utilized for secondary active transport of glucose into the cell against the concentration gradient. Thus there is glucose Na^+ cotransport catalysed by a glucose carrier. Such sodium dependent transport has been observed for various amino acid and sugars in different vertebrates and for amino acids in bacteria.

The sodium pump maintains a higher concentration of Na^+ outside the cells than on the inner side. This results in a tendency for Na^+ to enter the cell. This it does in the form of a carrier-sugar or carrier-amine acid complex.