Q. WRITE THE DIFFERENCES BETWEEN OXIDATIVE PHOSPHORYLATION AND PHOTOPHOSPHORYLATION

Answer:

Oxidative phosphorylation	Photophosphorylation
Occurs during respiration.	Occurs during photosynthesis.
Occurs inside mitochondria.	Occurs inside chloroplast.
Pigment systems are not involved.	Pigment systems (PS-I and PS-II) are involved.
ATP is produced from ADP and inorganic phosphate by utilising energy released during electron transport.	Sunlight is the external energy source for photophosphorylation.
Molecular O_2 is required for terminal oxidation.	Molecular O_2 is not required for photophosphorylation.
ATP molecules produced are released into the cytoplasm and these energy molecules are used to carry out various metabolic reactions of the cell.	ATP molecules produced are used to fix CO_2 to carbohydrates in dark reaction.

Q. Mechanism of Active Uptake.

Answer: The active ion transport may be (1) primary and (2) secondary.

(i) Primary Active Transport:

The primary active transport is coupled directly to a source of energy other than electrochemical potential gradient, such as ATP hydrolysis, an oxidation reduction reaction, etc. The membrane proteins that carry out primary active transport are called pumps. Most pumps transport ions. Ion pumps are further characterized as either electro genic or electro neutral.

In general, electro genic transport refers to ion transport involving the net movement of charge across the membrane. In contrast, electro neutral transport, as the name implies, involve no net movement of charge. For example, the Na^+/K^+ -ATPase of animal cells pumps three Na^+ ions out of every two K^+ ions in, resulting in a net outward movement of one positive charge.

(ii) Secondary Active Transport:

Secondary active transport uses the energy stored in electrochemical-potential gradient. Protons are extruded from the cytosol by electro genic H^+ ATPase operating in the plasma membrane and tonoplast. Consequently, a membrane potential and a pH gradient are created at the expense of ATP hydrolysis.

This gradient of electrochemical potential for H^+, the proton motive force represents stored free energy in the form of H^+ gradient.

Q. Classification of enzymes (ACCORDING TO IUBMB).

Answer: According to the type of reactions that the enzymes catalyze, enzymes are classified into seven categories, which are oxidoreductases, transferases, hydrolases, lyases, isomerases, ligases, and translocases. Oxidoreductases, transferases and hydrolases are the most abundant forms of enzymes. Individual enzyme classes are further classified systematically based on the chemical name of the substrate and its reaction mechanism.

Enzyme class	Reaction type	Description
Oxidoreductases	$A_{red} + B_{ox} \rightleftharpoons A_{ox} + B_{red}$	Catalyze redox reaction and can be categorized into oxidase and reductase.

Transferases	$A\text{-}B + C \longrightarrow A + B\text{-}C$	Catalyze the transfer or exchange of certain groups among some substrates
Hydrolases	$A\text{-}B + H_2O \longrightarrow A\text{-}H + B\text{-}OH$	Accelerate the hydrolysis of substrates
Lyases	$A\text{-}B \rightleftharpoons A + B$ (reverse reaction: synthase)	Promote the removal of a group from the substrate to leave a double bond reaction or catalyze its reverse reaction
Isomerases	$A\text{-}B\text{-}C \rightleftharpoons A\text{-}C\text{-}B$	Facilitate the conversion of isoisomers, geometric isomers or optical isomers.
Ligases	$A + B + ATP \longrightarrow A\text{-}B + ADP + P_i$	Catalyze the synthesis of two molecular substrates into one molecular compound with the release energy
Translocases		Catalyze the movement of ions or molecules across membranes or their separation within membranes

Q. STRUCTURE OF B-FORM AND Z FORM OF DNA

Answer: **B-form DNA**

- B-DNA is the Watson–Crick form of the double helix that most people are familiar with.
- They proposed two strands of DNA — each in a right-hand helix — wound around the same axis. The two strands are held together by H-bonding between the bases (in anti-conformation).
- The two strands of the duplex are antiparallel and plectonemically coiled. The nucleotides arrayed in a 5′ to 3′ orientation on one strand align with complementary nucleotides in the 3′ to 5′ orientation of the opposite strand.

- Bases fit in the double helical model if pyrimidine on one strand is always paired with purine on the other. From Chargaff's rules, the two strands will pair A with T and G with C. This pairs a keto base with an amino base, a purine with a pyrimidine. Two H-bonds can form between A and T, and three can form between G and C.
- These are the complementary base pairs. The base-pairing scheme immediately suggests a way to replicate and copy the genetic information.
- 34 nm between bp, 3.4 nm per turn, about 10 bp per turn
- 9 nm (about 2.0 nm or 20 Angstroms) in diameter.
- 34^o helix pitch; -6^o base-pair tilt; 36^o twist angle

Z-form DNA

- Z-DNA is a radically different duplex structure, with the two strands coiling in left-handed helices and a pronounced zig-zag (hence the name) pattern in the phosphodiester backbone.
- Z-DNA can form when the DNA is in an alternating purine-pyrimidine sequence such as GCGCGC, and indeed the G and C nucleotides are in different conformations, leading to the zig-zag pattern.
- The big difference is at the G nucleotide.
- It has the sugar in the C3' endoconformation (like A-form nucleic acid, and in contrast to B-form DNA) and the guanine base is in the synconformation.
- This places the guanine back over the sugar ring, in contrast to the usual anticonformation seen in A- and B-form nucleic acid. Note that having the base in the anticonformation places it in the position where it can readily form H-bonds with the complementary base on the opposite strand.

- The duplex in Z-DNA has to accomodate the distortion of this G nucleotide in the synconformation. The cytosine in the adjacent nucleotide of Z-DNA is in the "normal" C2' endo, anticonformation.
- Discovered by Rich, Nordheim &Wang in 1984.
- It has antiparallel strands as B-DNA.
- It is long and thin as compared to B-DNA.
- 12 bp per turn; 0.45 nm axial rise; 45^{o} helix pitch; 7^{o} base-pair tilt
- -30^{o} twist angle; 1.8 nm helix diameter

Q. Differences between B-DNA and Z-DNA

Features	B-Form	Z-Form
helix sense	Right Handed	Left Handed
base pairs per turn	10	12
vertical rise per bp	3.4 Å	19 Å
rotation per bp	+36°	-30°
helical diameter	19 Å	19 Å