1. Abscissic acid, phenolic compounds.

2. 14

3. Ψ_p will be zero or very low.

4. Carbonic anhydrase catalyses the formation o carbonic acid bicarbonate ions in our RBCs.

$$CO_2 + H_2O \xrightleftharpoons[\text{anhydrase}]{\text{carbonic}} H_2CO_3$$

$$H_2CO_3 \xrightleftharpoons[\text{anhydrase}]{\text{carbonic}} H^+ + HCO_3^-$$

5. Micturition is the act of voiding urine (release of urine) from the urinary bladder.

6. (a) Cortisol (b) Aldosterone

7. (a) Volume of air inspired or expired during a normal respiration. It is approx. 500 mL., i.e., a healthy man can inspire or expire approximately 6000 to 8000 mL of air per minute.

(b) Additional volume of air, a person can expire by a forcible expiration. This averages 1000 mL to 1100 mL.

8. Differences:

Bone	Cartilage
- It is a solid, rigid and strong connective tissue.	- It is a solid, semirigid and flexible connective tissue.
- Osteocytes occur singly in a lacuna.	- Chondrocytes occur in clusters of 2 or 3 in each lacuna.
- Matrix is impregnated with salts of calcium and phosphorus.	- No calcium and phosphorus salts are present in the matrix.
- Haversian systems are present	- Haversian systems are absent.
- Matrix is in the form of concentric lamellae.	- Matrix does not show any concentric lamellae.

9. The 'bakane' (foolish seedling) a disease of rice seedlings, was caused by a fungal pathogen *Gibberalla fujikuroi*. E. Kurosawa reported the appearance of symptoms of the disease in uninfected rice seedlings when they were treated with sterile filtrates of the fungus. The active substances were later identified as gibberellic acid.

10. During aerobic respiration, O_2 is consumed and CO_2 is released. The ratio of the volume of CO_2 evolved to the volume of O_2 consumed in respiration is called the respiratory quotient (RQ) or respiratory ratio.

$$RQ = \frac{\text{volume of } CO_2 \text{ evolved}}{\text{volume of } O_2 \text{ consumed}}.$$

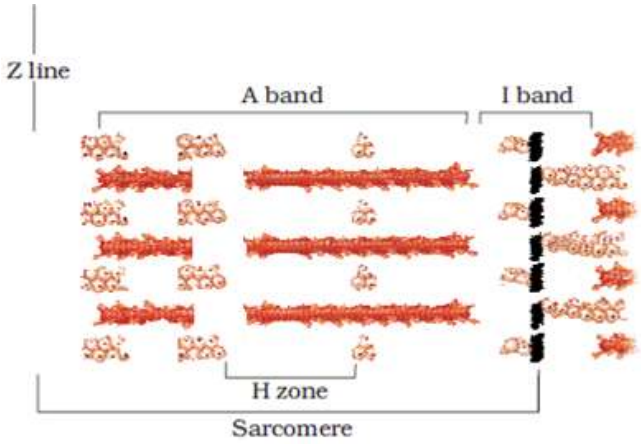
11. **Mass flow hypothesis:**

- The sucrose is moved from the Mesophyll cells into the companion cells and then into sieve tubes by active transport.
- This loading of sucrose into the sieve tubes at the sources, creates a hypertonic condition in the phloem; so water enters the sieve tubes by osmosis from the adjacent cells.
- The osmotic pressure developed in the phloem moves the solution to the regions of lower pressure.
- The sugars are removed actively from the phloem in the sink.
- Now the water potential increases in the phloem and hence water moves out of phloem cells into xylem.

12. Malfunctioning of kidneys can lead to accumulation of urea in blood, a condition called uremia, which is highly harmful and may lead to kidney failure. In such patients, urea can be removed by a process called haemodialysis. Blood drained from a convenient artery is pumped into a dialysing unit after adding an anticoagulant like heparin. The unit contains a coiled cellophane tube surrounded by a fluid (dialysing fluid) having the same composition as that of plasma except the nitrogenous wastes. The porous cellophane membrane of the tube allows the passage of molecules based on concentration gradient. As nitrogenous wastes are absent in the dialysing

fluid, these substances freely move out, thereby clearing the blood. The cleared blood is pumped back to the body through a vein after adding anti-heparin to it. This method is a boon for thousands of uremic patients all over the world.

13.



14. Systemic circulation :

Systemic circulation refers to the flow of oxygenated blood from the left ventricle to all parts of the body except lungs and the flow of deoxygenated blood from all parts (except lungs) of the body to the right atrium.

The main purpose of this part of circulation i s:

- To supply oxygen and nutrients to all body parts and
- To remove carbon dioxide and other metabolic wastes from the body tissues.

Ventricles are the pumping chambers and they have to exert more pressure for pumping the blood to various parts; hence they are more muscular.

The atria are the receiving chambers and they have to pump the blood only to the respective ventricles; so they have a less muscular wall.

15. Cytokinins have specific effects on cytokinesis and were discovered as kinetin (a modified form of adenine, a purine) from the autoclaved herring sperm DNA. Kinetin does not occur naturally in plants. Search for natural substances with cytokinin-like activities led to the isolation of zeatin, several naturally occurring cytokinins and some synthetic compounds with cell division promoting activity, have been identified. Natural cytokinins are synthesised in regions where rapid cell division occurs, for example, root apices, developing shoot buds, young fruits etc. It helps to produce new leaves, chloroplasts in leaves, lateral shoot growth and adventitious shoot formation. Cytokinins help overcome the apical dominance. They promote nutrient mobilisation which helps in the delay of leaf senescenece.

16. The reactions of Glycolysis occur in the cytoplasm of the cell.

Steps in Glycolysis :

- Glucose is phosphorylated in the presence of ATP, catalysed hexokinase.
- Glucose 6 – phosphate is changed into its isomer, fructose 6 – phosphate, catalysed by phosphohexose isomerase.
- Fructose 6 – phosphate is phosphorylated in the presence of ATP, to form fructose 1; 6 – biphosphate; this reaction is catalysed by enzyme phosphofructokinase.
- Fructose 1, 6 – biphosphate is split into two molecules of triose phosphates – one molecule of 3 – phosphoglyceraldehyde and one of dihydroxyacetone phosphate' these two are interconvertible.
- 3 – phosphoglyceraldehyde is oxidised into 1, 3 – biphosphoglycerate, with the reduction of NAD to NADH.
- Phosphoglycerate kinase catalyses the formation of 3 – phosphoglycerate from 1, 3 – biphosphoglycerate; one molecule of ATP is produced directly during this reaction.
- 3 – phosphoglycerate is converted into 2 – phosphoglycerate and then into phosphoenol pyruvate (PEP).

- PEP is converted into pyruvate along with the formation of one molecule of ATP directly; this reaction is catalysed by Pyruvic kinase.
- The end products of Glycolysis are two molecules each of ATP, NADH and Pyruvic acid.

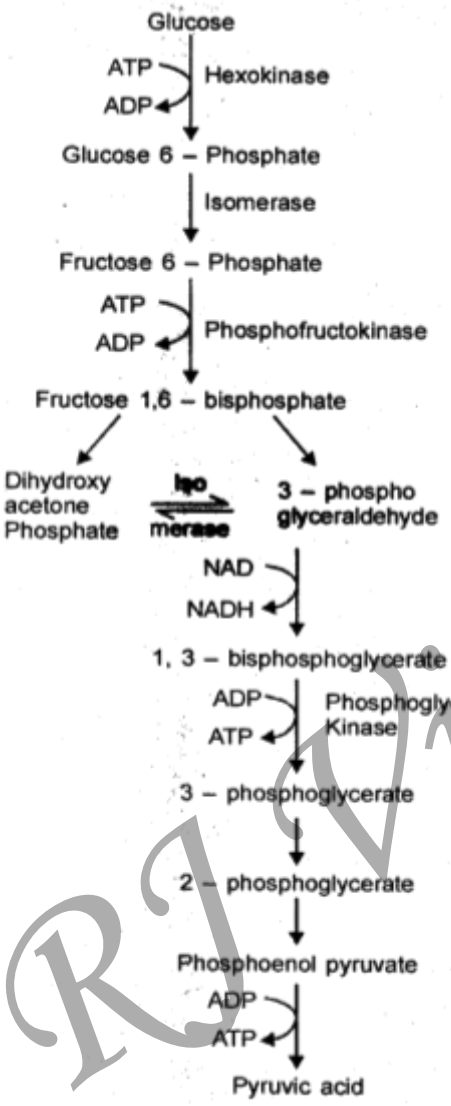


Fig. Steps of glycolysis

Or

Non – cyclic photophosphorylation:

- When P_{680} (PS II) acquires sufficient quantum of energy, it emits electrons.
- These electrons with high potential energy move down an electron transport chain, consisting of plastquinone (PQ), cytochrome complex and plastocyanin (PC) to P_{700} (PS I).
- P_{700} transfers the electrons to ferredoxin.
- Ferredoxin in turn transfers them to NADP, reducing it to NADPH using the protons from water.
- Some amount of energy from PS II is used to split water into $2H^+$, $2e^-$ and oxygen.
- Oxygen is liberated as a by product.
- The electrons replace the electrons lost by P_{680}.
- The protons accumulate inside the Thylakoid membranes creating proton gradient.
- Energy liberated by the protons when they diffuse across the Thylakoid membrane following the H^+ gradient, is used for the formation of ATP.
- ATP, NADPH and oxygen are produced in non – cyclic photophosphorylation.
- It occurs in the apprised regions of grana Thylakoids and involves both photosystem I and II.
- This process is called non – cyclic because the electrons lost by PS II do not come back to it, but are replaced by the electrons generated from water.

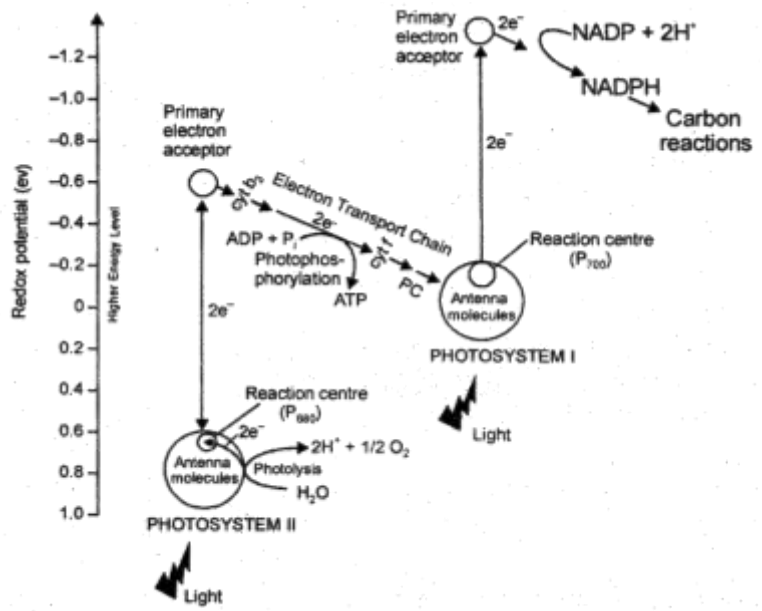


Fig. Non-cyclic photophosphorylation

17. Role of different regions of a nephrons in urine formation:

(i) Malpighian corpuscles:

- The first step of urine formation, i.e., ultra filtration, occurs from the blood in glomerular capillaries into the lumen of Bowman's capsule.

(ii) Proximal convoluted tubule

- In this segment, nearly 70 – 80% of the electrolytes and water are reabsorbed.
- PCT helps in maintaining pH and ionic balance of body fluids, by selective secretion by hydrogen ions, ammonia and potassium ions into the filtrate and by absorbing bicarbonate ions.

(iii) Henle's loop

- This segment play an important role in maintaining high osmolarity of medullary interstitial fluid.
- The descending limb is permeable to water but impermeable to solutes; so the filtrate becomes hypertonic.
- The ascending limb is impermeable to water but permeable to solutes; so the filtrate becomes hypotonic.

(iv) Distal convoluted tubule

- Reabsorption of Na+ and water takes place in this segment.
- DCT also reabsorbs HCO_3^- ions and secretes NH_3^+, hydrogen and K^+ ions into the filtrate.

(v) Collecting duct

- Large amounts of water is reabsorbed from this region.
- It also allows the transport of small amounts of urea into the m Medullary interstitium.
- It maintains the pH and ionic balance of body fluids.

Or

Regulation of respiratory rhythm :

- The respiratory rhythm is under the neural control.
- Respiratory rhythm centre is located in the brain.
- The penumotaxoic centre present in the brain functions as the 'switch off' point for regulation by altering the duration of inspiration; it can alter the respiratory rate.
- A chemo sensitive area adjacent to the rhythm centre is highly sensitive to carbon dioxide and hydrogen ions.
- An increase in the concentration of these two substances activates the centre which in turn sends signals to the rhythm centre, to make necessary adjustments in the respiratory process.
- Receptors associated with aortic arch and carotid artery also are sensitive to carbon dioxide and H^+ ions; they also send signals to the respiratory rhythm centre.
- Oxygen plays only an insignificant role in the regulation of respiratory rhythm.

18.