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Inorganic Chemistry - II

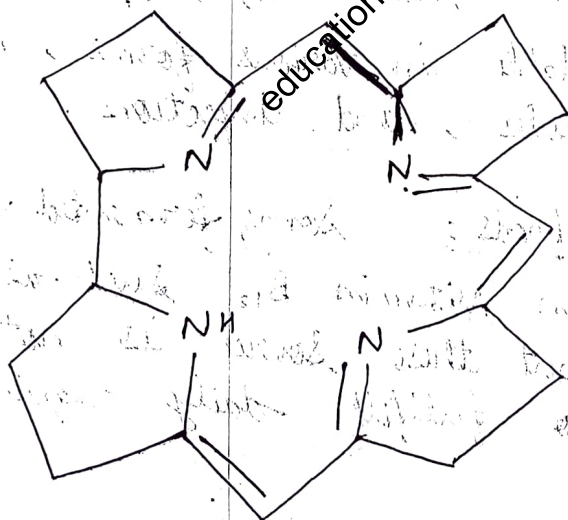
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CYCLE TEST - ISection - B

11) Write the structure of Corrin ring.

① The Corrin ring is a heterocyclic organic compound that forms the core structure of several important biomolecules, including Vitamin B₁₂ and heme group found in hemoglobin.

② It is a macrocycle with 4 Pyrrole rings linked together by methine bridges, and has a central Cobalt ion coordinated by four Nitrogen atoms in the Pyrrole rings.

Structure of Corrin ring12) What are the source of vitamin B₁₂?

Vitamin B₁₂, also known as Cobalamin, is an essential nutrient that plays a key role in many physiological processes, including Red Blood Cell formation, neurological function and DNA Synthesis.

Some Sources of Vitamin B₁₂

- ① Animal Products: The Primary dietary source of vitamin B₁₂ is animal-derived foods, such as meat (especially liver and kidney), Poultry, fish, eggs and dairy products.
- ② Fortified foods: Many Cereals, Plant-based milk alternatives, and other processed foods are fortified with vitamin B₁₂ to help people who follow a vegetarian or vegan diet to meet their daily needs.
- ③ Supplements: Vitamin B₁₂ supplements are widely available in various forms, including tablets, capsules, and injections.
- ④ Fermented foods: Some fermented foods also contain vitamin B₁₂ such as sauerkraut but these source is not sufficient to fulfill daily requirement.

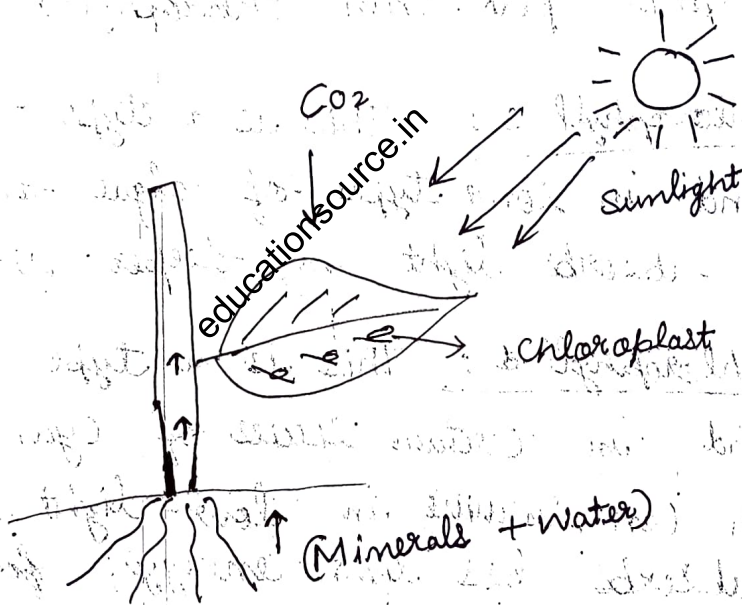
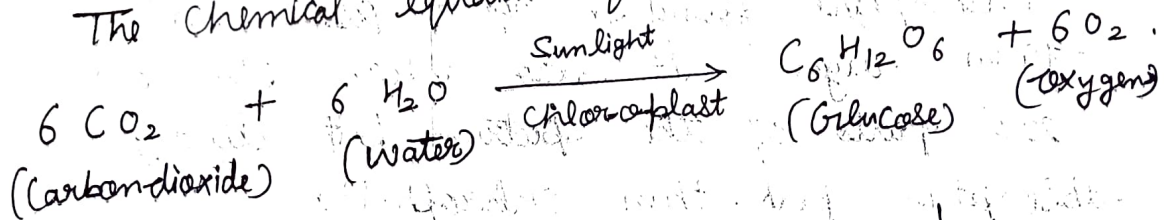
13) What is Photosynthesis?

Photosynthesis is the process by which green plants, algae, and some bacteria convert light energy from the sun into chemical energy in the form of organic compounds such as glucose, and release oxygen as a byproduct.

This process is called Photosynthesis. The raw materials used in the process are:-

- ① Carbon dioxide gas.
- ② Water and Minerals
- ③ ~~Before~~ Chloroplast
- ④ Sunlight.

The chemical equation for Photosynthesis is:



14) Write the types of chlorophyll.

Chlorophyll is a green pigment found in the chloroplasts of plants and algae that plays a key role in the process of photosynthesis. There are several types of chlorophyll that differ in their molecular structure and absorption spectra:

① Chlorophyll a: This is the primary type of Chlorophyll found in most plants and algae. Which absorbs light most efficiently in the blue and red parts of the spectrum.

② Chlorophyll b: This is a secondary type of Chlorophyll found in higher plants and green algae. It also absorbs blue and red parts of the spectrum but slightly absorption peak than Chlorophyll a.

③ Chlorophyll c: This is a type of Chlorophyll found in some types of algae and diatoms. It absorbs light in deeper water.

④ Chlorophyll d: This is a type of Chlorophyll found in certain species of cyanobacteria, which can survive in low-light environments. It absorbs less light energy.

⑤

15) Define Copper Containing Protein.

Copper-Containing proteins are a group of proteins that require copper ions for their biological activity. Copper is an essential trace element that plays important roles in various physiological processes, including energy metabolism, iron transport, and the synthesis of connective tissues and pigments.

16) Explain Na/K ion pump

- ① The Sodium - Potassium pump also known as the Na^+/K^+ pump, is a Protein complex found in the cell membrane of most animal cells.
- ② It is responsible for maintaining the Concentration gradient of Sodium and potassium ions across the cell membrane.
- ③ The Pump works by actively transporting three Sodium ions (Na^+) out of the cell for every two potassium ions (K^+) it brings into cell.
- ④ This Process requires the hydrolysis of ATP, which provides the energy needed to move the ions against their Concentration gradient.
- ⑤ The Sodium - Potassium Pump plays a crucial role in many Physiological Processes, including nerve conduction, muscle contraction, and the maintenance of osmotic balance.
- ⑥ By Pumping Sodium ions out of the cell, the pump helps to maintain a low intercellular Concentration of Sodium, which is essential for the generation of action Potentials in neuron and muscle cells.
- ⑦ The Pumps also helps to maintain a high interocellular Concentration of Potassium, which is necessary for these cells to maintain their resting potential.

17) Discuss Myoglobin.

- ① Myoglobin is a protein found in muscle tissue that plays an important role in the storage and transport of oxygen.
- ② It is a globular protein that has a compact structure, consisting of a single polypeptide chain with a heme group attached to it.
- ③ The heme group is a complex molecule that contains iron, which binds to oxygen molecules. When myoglobin binds with oxygen, it
- ④ when myoglobin binds with oxygen, it forms a bright red pigment, giving muscle tissue its characteristic red color.
- ⑤ Myoglobin has a higher affinity for oxygen than hemoglobin, the protein responsible for oxygen transport in the blood.
- ⑥ The Myoglobin store oxygen in muscle tissue, providing a reserve of oxygen that can be used during periods of high demand, such as during exercise.
- ⑦ The concentration of myoglobin in muscle tissue varies depending on the species and the type of muscle.

⑧ In humans, myoglobin is most abundant in skeletal muscle fibres.

⑨ Measurement of myoglobin levels in the blood can be used as a diagnostic tool for a range of conditions, including heart attack, muscular dystrophy.

18) What is non heme protein.

① Non-heme proteins are proteins that do not contain a heme group, a complex molecule that contains iron, which is responsible for binding to oxygen and other molecules.

② Non-heme proteins have a variety of functions in the body, ranging from enzymatic reactions to structural support.

③ For example, the enzyme lactase, which breaks down lactose in milk, is a non-heme protein. Another example is collagen, a fibrous protein that provides structural support to connective tissue, such as tendons and ligaments.

④ Dietary sources of non-heme proteins include plant-based foods, such as legumes, nuts, seeds, whole grains and vegetables.

⑤ Non-heme proteins can be an important source of protein for individuals following a vegetarian or vegan diet, as these diets may not provide enough heme iron from animal source.

19) write note on cytochrome oxidase.

- ① cytochrome oxidase, also known as Complex IV, is a critical enzyme complex found in the inner membrane of the mitochondria.
- ② It plays an important role in the electron transport chain, the process by which cells generate ATP, the energy currency of the body.
- ③ Cytochrome oxidase is composed of several subunits, including two heme groups and two copper ions, which together facilitate the transfer of electrons from cytochrome to molecular oxygen.
- ④ The energy released during this reaction is used to pump protons (hydrogen ions) from the mitochondrial matrix into the intermembrane space.
- ⑤ The enzyme complex is responsible for converting ADP to ATP.
- ⑥ Cytochrome oxidase deficiency can lead to symptoms including muscle weakness, exercise intolerance, neurological abnormalities.

20) Write about Superoxide biological function. (3)

- ① Superoxide is a reactive oxygen species that is produced in cells as a byproduct of normal cellular metabolism.
- ② The high levels of Superoxide can be harmful to cells and tissues, it also plays important biological functions in the body.
- ③ Superoxide is involved in the immune response, where it is produced by immune cells, which help to kill invading microorganisms.
- ④ Superoxide is involved in the regulation of vascular tone.
- ⑤ Superoxide also plays a role in signaling pathways within cells, where it can act as a second messenger to regulate various cellular processes.

Section - D

21) Explain Structure and biological function Vitamin B_{12} .

Vitamin B_{12} , also known as Cobalamin, is a water-soluble vitamin that plays important roles in DNA synthesis, red blood cell formation, and nerve function. It is a complex molecule that contains a cobalt ion at its center and is synthesized by certain bacteria and archaea.

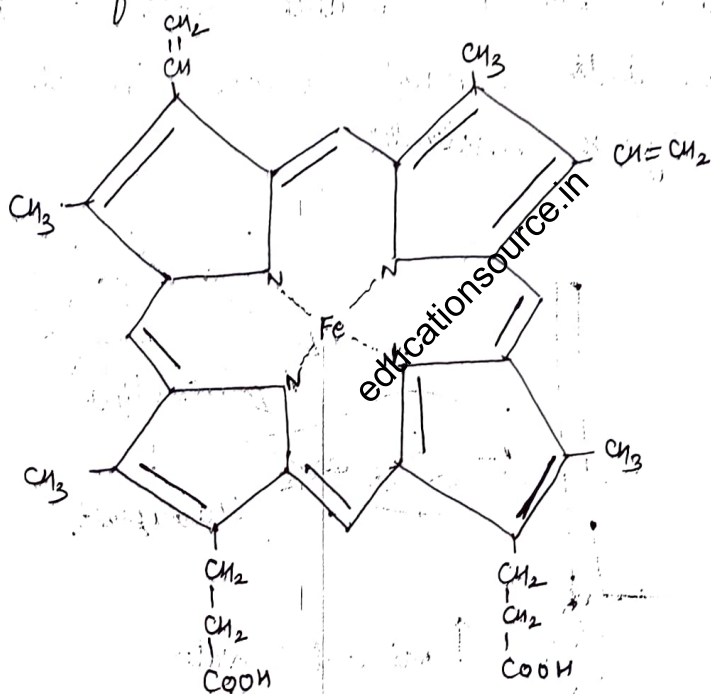
Vitamin B₁₂ Plays important biological functions in the body including:-

- ① DNA Synthesis: Vitamin B₁₂ is required for the synthesis of DNA, the genetic material found in all cells. It is necessary for the production of Nucleotides, the building blocks of DNA.
- ② Red blood cell formation: Vitamin B₁₂ is involved in the synthesis of Red Blood cells, which transport oxygen throughout the body.
- ③ Nerve function: Vitamin B₁₂ is essential for the proper functioning of the Nervous System. It synthesizes the fatty substance which surrounds to protect nerve cells.
- ④ Homocysteine metabolism: The Homocysteine, an amino acid which is harmful to the body, the Vitamin B₁₂ convert homocysteine

convert into methionine, it is another amino acid that is less harmful to the body.

22) Explain the structure of hemoglobin.

Hemoglobin is a protein found in red blood cells that is responsible for transporting oxygen from the lungs to the tissues and Carbon-dioxide from the tissues to the lungs.

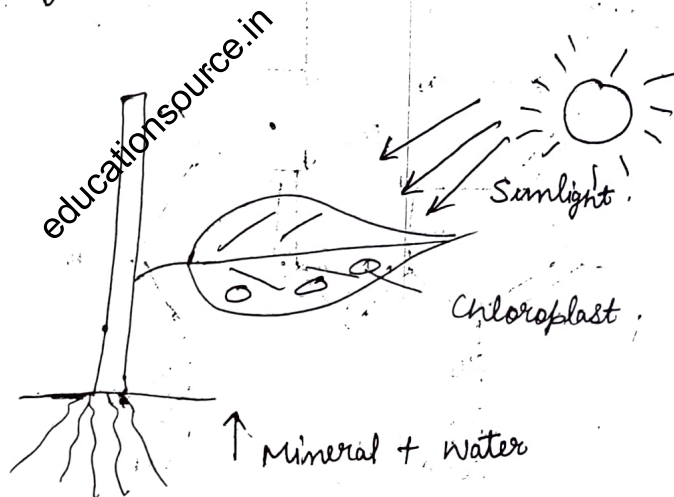


- ① The overall structure of hemoglobin is composed of four protein subunits that come together to form a larger functional unit.
- ② Each subunit of hemoglobin contains a heme group, which is a complex molecule consisting of a porphyrin ring with a central iron ion.
- ③ The iron ion is able to bind to oxygen molecules, which allows hemoglobin to transport oxygen throughout the body.

- ④ The structure of hemoglobin is also stabilized by a variety of chemical interactions, including hydrogen bonds, salt bridges between the subunits.

23) Discuss the Primary Process of Photosynthesis I and II.

Photosynthesis is the process by which plants, algae and some bacteria convert light energy from the sun into chemical energy in the form of organic molecules.



There are two primary processes of photosynthesis, known as Photosynthesis I and Photosynthesis II, which work together to produce the energy needed for plant growth and survival.

Photosynthesis I :

- ① Photosynthesis I, also known as PSI, is the first stage of the light-dependent reactions of photosynthesis.

② PSI takes place in the thylakoid membranes of Chloroplasts and uses light energy to produce ATP and NADPH which are energy-rich molecules that are used in the next stage of photosynthesis.

③ During PSI, photons of light are absorbed by chlorophyll, it is transferred to the reaction center, where it excites an electron to a higher energy state.

④ The energy from the electron transfer is used to pump protons across the thylakoid membrane, generating a proton gradient that is used to produce ATP.

Photosynthesis II :-

① Photosynthesis II, also known as PSII, is the second stage of the light-dependent reactions of photosynthesis.

② PSII takes place in the thylakoid membranes of Chloroplasts and uses light energy to produce ATP and oxygen.

