Ayaz Sir's CBSE Coaching

Class 10 State Board

Life Processes In Living Organism Part I.

(Along with this refers Classroom notes and diagram)

The basic function performed by living organism to maintain their life on earth is called as Life Processes. Some of the activity that living organism performed are Nutrition, respiration, Excretion , Reproduction etc.

Respiration :

Respiration is an oxidative process in which complex organic food matrial is broken down into simple one with the release of energy.

$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + 38\ ATP$

Types of Respiration :

1.**Aerobic Respiration :**

The respiration which occurs in presence of oxygen is called as aerobic respiration.
e.g Higher plants and Animals.
Here 1 Glucose molecule gives 38 ATP molecule.

2.**Anaerobic Respiration :**

The respiration which occurs in absence of oxygen is called as Anaerobic respiration.
e.g Micro organism
Here 1 Glucose molecule gives 2 ATP molecule.

Mechanism of aerobic Respiration

It can be studied under three headings :

1.Glycolysis :

The process of conversion of 1 glucose molecule to 2 pyruvic acid(Pyruvate) acid molecule is called as glycolysis. Along with pyruvic acid , ATP,$NADH_2$ and water is also formed. Molecules of Pyruvic acids are then converted to Acetyl Co-A .Two molecules of $NADH_2$ and Two molecules of CO_2 are also released here.

2.Tri Carboxylic acid cycle :

It is also called as TCA cycle or Kreb's cycle. In this step both molecules of Acetyl Co-A enters mitochondria where it completely oxidized in number of steps and forms CO_2, H_2O, $NADH_2$ and $FADH_2$

3.Electron Transport System

In this step $NADH_2$ and $FADH_2$ undergoes electron chain and forms energy rich molecules ATP. One molecule of $NADH_2$ gives 3 ATP and one molecule of $FADH_2$ gives 2 ATP . Besides ATP water molecules are also formed.

The complete reaction of respiration is

$$\mathbf{C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + 38\ ATP}$$

Note : $NADH_2$ and $FADH_2$ are Co-enzymes

NADH2: Nicotinamide Adenine Dinucleotide Phosphate

FADH2: Flavin Adenine Dinucleotide Phosphate

ATP :

It stands for Adenosine Tri Phosphate. These are energy rich molecules and energy is stored in the bonds by which phosphate group are attached. Each ATP molecule is composed of Adenine, Ribose sugar and Phosphate group. When adenine and ribose sugar combines together it forms adenosine and when 3 phosphate group gets attached to it , it forms ATP. When bond between phosphate group gets broken , it releases energy.

Energy Production in Microorganism Through Anaerobic Respiration

Micro organism like bacteria respires anaerobically. Anaerobic respiration involved two steps

1.Glycolysis :

The process of conversion of 1 glucose molecule to 2 pyruvic acid(Pyruvate) acid molecule is called as glycolysis. Along with pyruvic acid , ATP,$NADH_2$ and water is also formed.

2.Fermentation :

Fermentation is an anaerobic process in which complex organic food material is broken down into simple one with the help of micro organism.

The pyruvic acid forms in glycolysis is now converted to different componebts like organic acids, alcohol etc by way of fermentation.

If the end product of fermentation is Alcohol then it is called as alcoholic fermentation and if end product is lactic acid then it is called as lactic acid fermentation.

Seeds perform anaerobic respiration if the soil is submerged under water during germination.

Similarly our muscle cell also perform anaerobic respiration while performing exercise .Due to this , less amount of energy is produced in our body and lactic acid accumulates due to which we feel tired.

$C_6H_{12}O_6$ —Yeast→ 2 Ethyl alcohol + $2CO_2$ + 2 ATP

$C_6H_{12}O_6$ —Lactobacillus→ Lactic acid + 2 ATP

$C_6H_{12}O_6$ —Muscles→ Lactic acid + 2 ATP

Energy from different food components

- Carbohydrates are the basic source of energy. In humans carbohydrates are stored in liver in the form of glycogen.
- Fats or lipids are emergency source of energy. They acts as reserve food .The fats are stored in the body in the form of fatty acids in adipose tissues. 1gm of fat gives 9 Kcal of energy.
- Proteins are the building block of body. It is essential for cell divison, enzyme formation , hormone formation etc. In extreme cases proteins are also used as energy and 1 gm of protein gives 4 Kcal of energy.
- Vitamins are a group of heterogenous compounds which are essential for proper functioning of various processes in body. It is divided as , Fat soluble vitamins (A,D,E and K) and Water soluble vitamin (B and C). The coenzymes like $NADH_2$ and $FADH_2$ are produced by Vitamin B_2 and B_5.
- We also needs various minerals in elemental form. Some are required in smaller quantity(micro nutrient- Zn,Mn, Cu etc) and some are needed in larger quantity(macro quantity-Na, K, Cl, Ca, Fe etc.)
- About 65 to 70 % of body is water. Each cell contains 70 % water. Blood plasma contains 90% water in it. Various physiological activity of our body needs water, hence water is essential nutrient.

Cell Division

Cell is the structural and functional unit of living organism. Cells increases in number by the process of cell division. There are two kinds of cell division i.e mitosis and meiosis. Mitosis occurs in normal body cell or somatic cell where as meiosis occurs in germinal cells or reproductive cells.

Before any kind of cell division cell double its chromosome content.

Mitosis

Mitosis is a kind of cell division in which one cell gives rise to two cells with same chromosome number. Mitosis is completed in two steps i.e Karyokinesis and Cytokinesis. Karyokinesis involves four steps…

1.Prophase

- In prophase degeneration of nuclear membrane and nucleolus occurs.
- Condensation of chromatin fibres occurs and it gets converted to chromosomes.
- Each chromosomes shows two sister chromatids
- Centrioles duplicate and start to move towards opposite poles.

2.Metaphase

- In metaphase nuclear membrane and nucleolus completely disappears.
- All chromosomes arranged themselves at equatorial position.
- Centriole reaches to opposite pole
- Spindle fibre are formed between centriole and centromere of chromosome.

3.Anaphase

- Spindle fibres start to shrink and exerts pressure on centromere
- Due to pressure centromere gets split into two and sister chromatids move away from each other
- Separated chromatids are called as sister chromatids
- Chromosomes being pulled appears like bunch of banana.
- Thus, each set of chromosome reach at two opposite poles of cell.

4.Telophase

- The sister chromatids which reaches to opposite pole now starts decondensation and gets converted to chromatin fibres.
- Spindle fibres completely disappear
- Nuclear membrane and nucleolus starts to appear

In cytokinesis , the cytoplasm divides and two new cells are formed

Meiosis

Meiosis is a kind of cell division in which one cell gives rise to four cell with half chromosome number. Meiosis is completed in two steps i.e Meiosis I and Meiosis II

Meiosis = Meiosis I (Reduction Division) + Meiosis II (Mitosis)

Meiosis I is a reduction division in which one cell gives rise to two cell with half chromosome number. Here four phases occurs like

Prophase I

It can be studied in five steps

1.Leptotene

It is the first stage of prophase I where chromatin fibres starts condensation and gets converted to chromosomes. Nuclear membrane and nucleolus starts to disappear. Centrioles starts duplication.

2.Zygotene

In zygotene the non sister chromatids overlaps with each other

The point of overlapping is called chaisma or chaismata

3.Pachytene

The non sister chromatids gets broken at the point of overlapping and exchange of genetic segments occurs between them. This is called as Crossing over.

Crossing over brings variations in character

4.Diplotene

In this chromatid segments move away from each other

5.Dikinesis

Here centriole reaches to opposite pole

Nuclear membrane and nucleolus gets completely disappears

Metaphase I

- All chromosome pair arranged themselves at equatorial position.
- Centriole reaches to opposite pole
- Spindle fibre are formed between centriole and centromere of chromosome.

Anaphase I

- Spindle fibres start to shrink and pulls centromere towards it
- Chromosomes being pulled appears like bunch of banana.
- Thus, each set of chromosome reach at two opposite poles of cell.

Telophase I

- The chromosomes which reaches to opposite pole now starts decondensation and gets converted to chromatin fibres.
- Two cells with half chromosome number is formed.

Meiosis II

It is just like mitosis. Here the two cell formed undergoes mitosis and at last gives four daughter cells. Here the cells formed are not genetically identical, because they shows crossing over in their formation.