



Q1(A))

- (1) mitosis
- (2) Centromere
- (3) Metaphase

(B))

- (1) false
- (2) anaerobic

Q2(A))

- (1) i. Acetyl-Co-A formed during glycolysis process enters the Krebs's cycle and is converted to the first stable product called citric acid(citrate) in the presence of an enzyme called citrate synthase.
ii. Due to this, the Krebs's cycle is called the citric acid cycle or tricarboxylic acid cycle because the structure of citric acid contains 3 carboxylic acid groups.
iii. Hence Krebs's cycle is also called as citric acid cycle.
- (2) i. In case of aerobic cellular respiration, glucose is completely oxidized and produces 38 ATP molecules.
ii. In presence of oxygen, three processes namely, glycolysis, Krebs cycle and electron transport chain reaction, take place but in absence of oxygen, only glycolysis can occur.
iii. Such glycolysis which takes place in absence of oxygen produces alcohol and only two molecules of ATP. Hence, leads to less supply of energy to the body.
iv. Therefore, oxygen is necessary for complete oxidation of glucose.

(B))

- (1) (i) A nutrient found in food (as meat, milk, eggs, and beans) that is made up of many amino acids joined together, is a necessary part of the diet, and is essential for normal cell structure and function is called protein.
(ii) Substance that provides nourishment essential for the maintenance of life and for growth is called Nutrients. They are components of foods. Examples are carbohydrates, proteins, lipids, vitamins etc.

(2) Aerobic respiration:

- i. Aerobic respiration is breakdown of glucose in the presence of oxygen and carbon dioxide, water are formed as products along with energy.
- ii. Glucose is completely oxidized.
- iii. 38 molecules of ATP are formed.

Anaerobic respiration:

- i. Anaerobic respiration is the breakdown of glucose in the absence of oxygen and lactic acid is formed as product along with less amount of energy.
- ii. Glucose is incompletely oxidized.
- iii. 2 molecules of ATP are formed.

Q3)

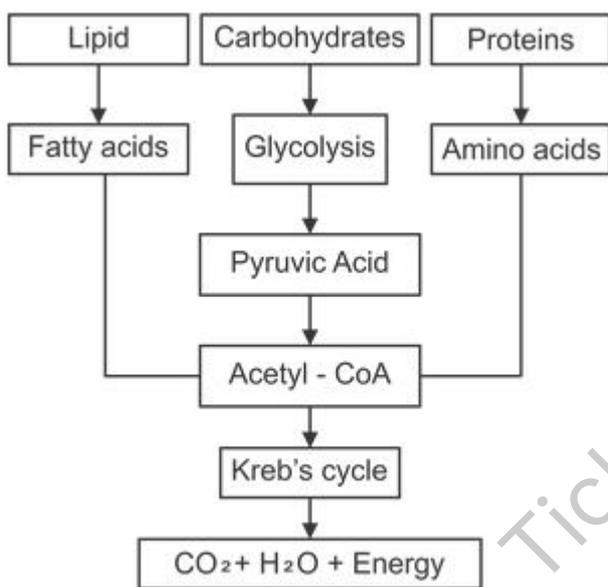
- (1) i. ATP (Adenosine Triphosphate) is energy-rich molecule and the energy is stored in the bonds by which phosphate groups are attached to each other.
ii. These molecules are stored in the cells as per need.
iii. Chemically, ATP is triphosphate molecule formed from adenosine ribonucleoside.

- iv. It contains a nitrogenous compound-adenine, pentose sugar-ribose and three phosphate groups.
- v. As per the need, energy is derived by breaking the phosphate bond of ATP, hence ATP is called as 'energy currency' of the cell
- (2) i. Some organisms cannot live in presence of oxygen, hence they have to perform anaerobic respiration for energy production.
- ii. Yeast, seeds submerged in water, our muscle cells while exercising.
- iii. Glycolysis and fermentation are two steps of anaerobic respiration.

(3) Release of energy from the assimilated food is called **respiration**. Inhalation and exhalation is called **breathing**. When **inhalation** is done, air enters the lungs. The oxygen from this air enters the blood while carbon dioxide from the blood exits from the blood. Through exhalation, CO_2 is given out. This gaseous exchange occurs through **alveolar** membrane. This is called external respiration. The RBC's carry oxygen to every cell. Here inside the **mitochondria** tissue respiration or **internal** respiration takes place. The oxygen is used for production of energy. By oxidation of food nutrients, energy is released in the form of **ATP**.

Q4)

(1) Corrected flow-chart



Process of obtaining the energy

- i. **Carbohydrates:** Carbohydrates like glucose are oxidized to pyruvic acid. Pyruvic acid is converted to acetylco-enzyme-A which is oxidized through Krebs's cycle. The molecules of NADH_2 produced during this are oxidized through electron transfer chain reaction and finally energy is obtained.
- ii. **Proteins:** Proteins are digested to amino acids and amino acids are converted into acetyl-co-enzyme-A. Acetyl-co-enzyme-A is oxidized through Krebs's cycle. The molecules of NADH_2 produced during this are oxidized through electron transfer chain reaction and finally energy is obtained.
- iii. **Lipids:** Lipids are converted to fatty acids and fatty acids to acetyl-coenzyme- A. Acetyl-co-enzyme-A is oxidized through Krebs's cycle. The molecules of NADH_2 produced during this are oxidized through electron transfer chain reaction and finally energy is obtained.
- (2) Somatic cells and stem cells divide by mitosis. Mitosis is completed through two main steps. Those two steps are karyokinesis (nuclear division) and cytokinesis (cytoplasmic division). Karyokinesis is completed through four steps:

- i. Prophase:- In prophase, condensation of basically thin thread like chromes starts. Due to this, they become short and thick and they start to appear along with their pairs of sister chromatids. Centrioles duplicate and each centriole moves to opposite poles of cells. Nuclear membrane and nucleolus start to disappear.
- ii. Metaphase: - Nuclear membrane completely disappears in metaphase. Chromosomes complete their condensation and become clearly visible along with their sister chromatids. All chromosomes are arranged

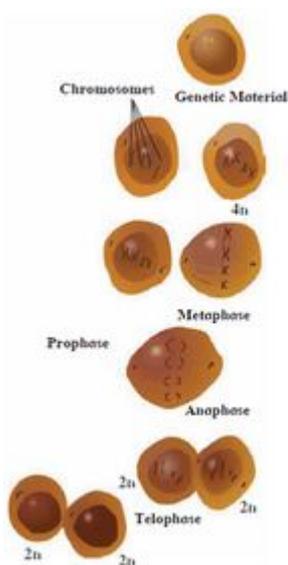
parallel to equatorial plane (central plane) of the cell. Special type of flexible protein fibres (spindle fibers) are formed between centromere of each chromosome and both centrioles.

iii. Anaphase: - In anaphase, centromeres split and thereby sister chromatids of each chromosome separate and they are pulled apart in opposite directions with the help of spindle fibers. Separated sisters are called as daughter chromosomes. Chromosomes being pulled appear like bunch of bananas. In this way, each sets of chromosomes reach at two opposite poles of the cell.

iv. Telophase: - The chromosomes which have reached at opposite poles of the cell now start to decondense due to which they again became thread – like thin and invisible. Nuclear membrane is formed around each sets of chromosomes reached at poles. Thus, two daughter nuclei are formed in a cell. Nucleolus also appears in each daughter nucleus. Spindle fibers completely disappear.

In this way, karyokinesis completes and cytokinesis begins.

The cytoplasm divides by cytokinesis and two new cells are formed which are called as daughter cells. In this process, a notch is formed at the equatorial plane of cell which deepens gradually and thereby two new cells are formed. However, in case of a plant cells, instead of the notch, a cell plate is formed exactly along the midline of the cell and thus cytokinesis is completed. Mitosis is essential for growth of the body. Besides, it is necessary for restoration of emaciated body, wound healing, formation of blood cells, etc.



All the Best