

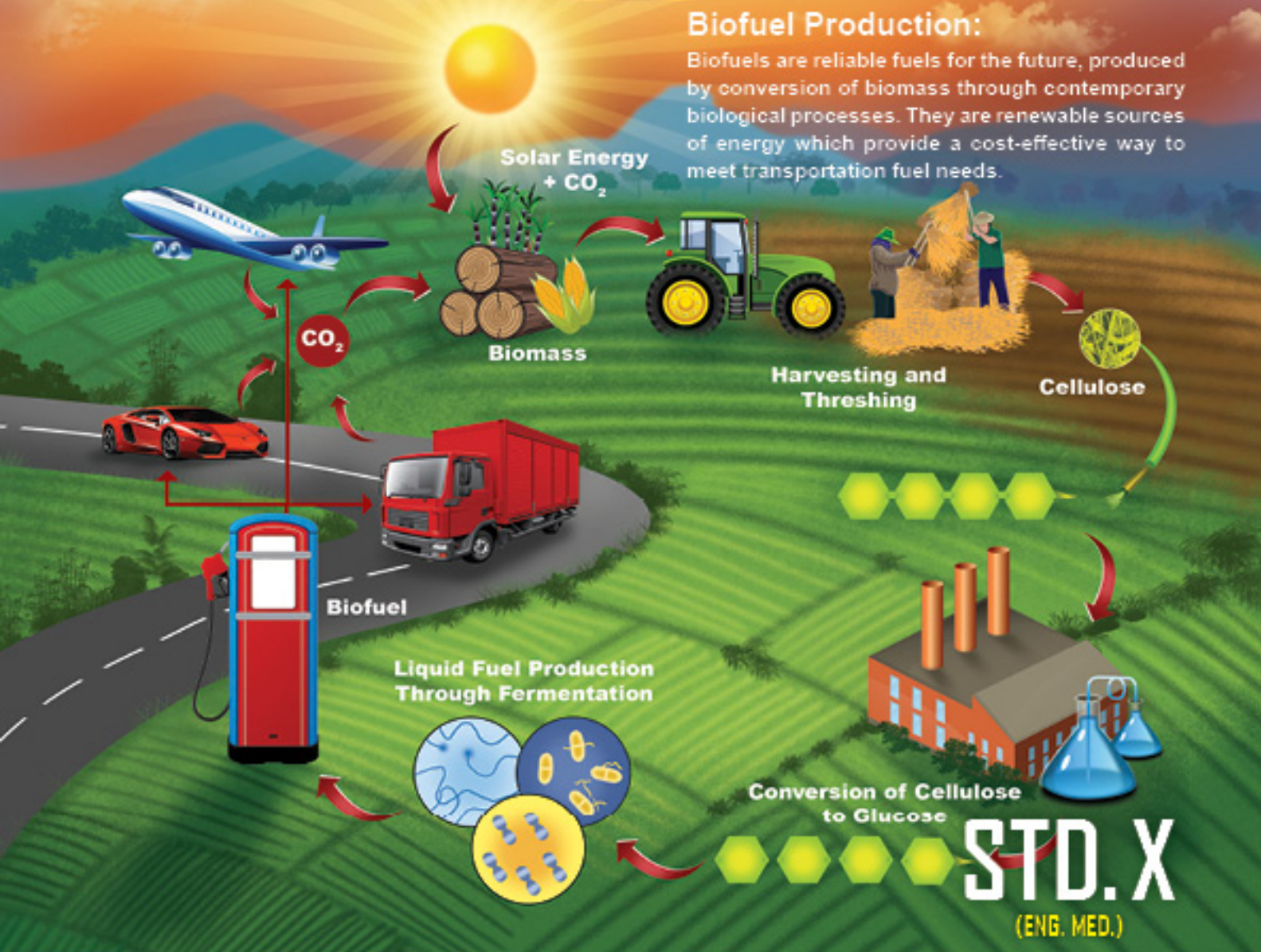


## SCIENCE AND TECHNOLOGY PART-2

BASED ON NEW SYLLABUS

### Biofuel Production:

Biofuels are reliable fuels for the future, produced by conversion of biomass through contemporary biological processes. They are renewable sources of energy which provide a cost-effective way to meet transportation fuel needs.



# 2

## Life Processes in Living Organisms Part - 1

### Fill in the blanks

#### 1. Complete the following statements.

[1 Mark each]

- Energy obtained from carbohydrates is \_\_\_\_\_ per gram of carbohydrate.
- Energy is obtained in the form of \_\_\_\_\_ molecules by the body.
- Oxidation of glucose is a type of \_\_\_\_\_ respiration.
- Electron transfer chain operates only in the \_\_\_\_\_.
- Seeds perform \_\_\_\_\_ respiration in soil, if submerged underwater during germination.
- Excess carbohydrates are stored in the liver and muscles in the form of \_\_\_\_\_.
- Proteins of animal origin are called \_\_\_\_\_ proteins.
- Plants produce amino acids from minerals by \_\_\_\_\_ synthesis, thus forming different proteins.
- Excess of lipids are stored in \_\_\_\_\_ tissue in the body.
- Each cell contains approximately \_\_\_\_\_ % water by weight.
- Gamete production and spore formation occurs by \_\_\_\_\_.

#### Answers:

- |                        |                      |
|------------------------|----------------------|
| i. 4 Kcal              | ii. ATP              |
| iii. cellular          | iv. mitochondria     |
| v. anaerobic           | vi. glycogen         |
| vii. first-class       | viii. <i>de novo</i> |
| ix. adipose connective | x. 70%               |
| xi. meiosis            |                      |

#### 2. Select the appropriate options and complete the following paragraph. [3 Marks]

(four, Meiosis-I, similar, two, Meiosis-II, sister chromatids, homologous, haploid, diploid, dissimilar)

Cell division by meiosis is completed through \_\_\_\_\_ stages. Recombination during meiosis occurs between \_\_\_\_\_ chromosomes. \_\_\_\_\_ resembles the process of mitosis. During meiosis-I, two \_\_\_\_\_ daughter cells are formed, whereas during

meiosis-II, \_\_\_\_\_ haploid cells are formed. All daughter cells formed through meiosis are genetically \_\_\_\_\_ with respect to parent cells due to genetic recombination.

#### Answer:

Cell division by meiosis is completed through **two** stages. Recombination during meiosis occurs between **homologous** chromosomes. **Meiosis-II** resembles the process of mitosis. During meiosis-I, two **haploid** daughter cells are formed, whereas during meiosis-II, **four** haploid cells are formed. All daughter cells formed through meiosis are genetically **dissimilar** with respect to parent cells due to genetic recombination.

### Choose the correct alternative [1 Mark each]

- Which of the following molecules is NOT produced during glycolysis?  
(A) NADH<sub>2</sub> (B) ATP  
(C) FADH<sub>2</sub> (D) H<sub>2</sub>O
- Which of the following is NOT a step of anaerobic respiration?  
(A) Glycolysis (B) Fermentation  
(C) TCA (D) Both (A) and (C)
- Amino acids are obtained after digestion of  
(A) carbohydrates (B) proteins  
(C) lipids (D) nucleic acids
- Which of the following is a protein present in bones?  
(A) Myosin (B) Melanin  
(C) Hemoglobin (D) Ossein
- Which of the following vitamins is essential for the synthesis of NADH<sub>2</sub>?  
(A) Vitamin B<sub>5</sub> (B) Vitamin C  
(C) Vitamin B<sub>2</sub> (D) Vitamin K
- ◆ 6. Decomposition is a type of  
(A) aerobic respiration  
(B) anaerobic respiration  
(C) exothermic reaction  
(D) none of these
- Which of the following cells can be produced by mitosis?  
(A) Somatic cells  
(B) Gametes  
(C) Stem cells  
(D) Both (A) and (C)



8. Spindle fibers attach to which part of the chromosome?  
(A) q-arm (B) p-arm  
(C) Centromere (D) Centriole
9. Which of the following is the first phase of karyokinesis?  
(A) Anaphase (B) Telophase  
(C) Metaphase (D) Prophase
- ◆ 10. During metaphase this change occurs in the chromosomes  
(A) get coil shape  
(B) arranged parallel to the equatorial plane  
(C) get destroyed due to breaking  
(D) get folded
- ◆ 11. In this stage of mitosis, the daughter chromosomes appear like bunch of bananas.  
(A) Prophase (B) Metaphase  
(C) Anaphase (D) Telophase
12. Cell plate formation occurs during  
(A) karyokinesis in animal cells  
(B) cytokinesis in plant cells  
(C) karyokinesis in plant cells  
(D) cytokinesis in animal cells
- ◆ 13. How many times will a cell have to divide mitotically to form 128 cells?  
(A) 7 (B) 14  
(C) 28 (D) 32
14. Which of the following is NOT a part of mitosis?  
(A) Anaphase (B) Diplotene  
(C) Prophase (D) Cytokinesis
- ◆ 15. A diploid cell means  
(A)  $n$  (B)  $2n$   
(C)  $3n$  (D)  $4n$
- ◆ 16. Suppose, you have been supplied with onion root to observe steps in cell division. If you want to count the number of chromosomes, which step will you observe?  
(A) Prophase (B) Metaphase  
(C) Anaphase (D) Telophase
17. Which of the following is the correct observation while viewing onion roots tips cells in the metaphase of the cell cycle?  
(A) Cytokinesis begins  
(B) Chromosomes are arranged parallel to equatorial plane of the cell  
(C) Chromosomes are pulled apart to opposite poles  
(D) Spindle fibers disappear completely
18. Identify the phase of mitosis in which onion root tips stained with iodine show daughter chromatids.  
(A) Metaphase (B) Prophase  
(C) Anaphase (D) All of the above

**Answers:**

- |         |         |         |
|---------|---------|---------|
| 1. (C)  | 2. (C)  | 3. (B)  |
| 4. (D)  | 5. (A)  | 6. (B)  |
| 7. (D)  | 8. (C)  | 9. (D)  |
| 10. (B) | 11. (C) | 12. (B) |
| 13. (A) | 14. (B) | 15. (B) |
| 16. (B) | 17. (B) | 18. (C) |

[Note: 5. Nicotinamide is a form of vitamin  $B_3$  which is essential for the synthesis of  $NADH_2$ .]

**Name the following****[1 Mark each]**

- Nutrient obtained from milk and sweet potatoes.
- Energy currency of the cell
- Other name for glycolysis
- Product of pyruvic acid fermentation in erythrocytes and muscle cells.
- Common step of aerobic and anaerobic respiration.
- Protein present in skin
- Flexible muscular protein
- Process of conversion of excess of proteins into useful substances like glucose.
- Most abundant protein found in nature.
- Molecules formed from fatty acids and essential for producing plasma membrane.
- The property of living organisms that helps in growth and restoration of emaciated body of multicellular organisms.
- Type of cells in which meiosis takes place.
- Step of nuclear division in mitosis.
- Process by which four haploid cells are formed from one diploid cell.

**Answers:**

- Carbohydrate
- ATP
- Embden-Meyerhof-Parnas pathway (EMP pathway)
- Lactic acid
- Glycolysis
- Melanin/ Keratin
- Actin/ Myosin
- Gluconeogenesis
- RUBISCO
- Phospholipids
- Cell division
- Germ cells
- Karyokinesis
- Meiosis



**Right or Wrong.**

**If wrong, write the correct sentence**  
[1 Mark each]

1. A molecule of glucose is completely oxidized in aerobic respiration.
2. Muscle cells perform aerobic respiration while exercising.
3. Substances formed by specific chemical bonds between fatty acids and alcohol are called proteins.
4. 4 Kcal of energy is obtained per gram of lipid.
5. Blood plasma contains 90% of water.
6. Meiosis takes place in both somatic cells and germ cells.

**Answers:**

1. Right.
2. Wrong.  
Muscle cells perform anaerobic respiration while exercising.
3. Wrong.  
Substances formed by specific chemical bonds between fatty acids and alcohol are called lipids.
4. Wrong.  
9 Kcal of energy is obtained per gram of lipid.
5. Right.
6. Wrong.  
Meiosis takes place in germ cells.

**Complete the analogy** [1 Mark each]

1. TCA cycle : Mitochondria :: Glycolysis : \_\_\_\_\_
2. Fermentation in yeast : Alcohol :: Fermentation in erythrocytes : \_\_\_\_\_
3. Lipids : Fatty acids and glycerol :: Proteins : \_\_\_\_\_
4. Blood : Hemoglobin :: \_\_\_\_\_ : Myosin
5. Production of insulin : Amino acids :: Covering around axon of nerve cells : \_\_\_\_\_.
6. Nicotinamide : NADH<sub>2</sub> :: Riboflavin : \_\_\_\_\_

**Answers:**

1. Cytoplasm  
The TCA cycle takes place in the mitochondria, whereas, glycolysis takes place in the cytoplasm.
2. Lactic acid  
Alcohol is produced by fermentation in yeast, whereas lactic acid is produced by fermentation in erythrocytes.
3. Amino acids  
Lipids are broken down into fatty acids and glycerol, whereas proteins are broken down into amino acids.

4. Muscles  
Haemoglobin is a protein present in blood, whereas, myosin is the protein present in muscles.
5. Fatty acids  
Amino acids are used for the production of proteins like insulin, whereas fatty acids are present in the covering around axon of nerve cells.
6. FADH<sub>2</sub>  
Nicotinamide is necessary for the formation of NADH<sub>2</sub>, whereas, riboflavin is necessary for the formation of FADH<sub>2</sub>.

**Match the following** [1 Mark each]

1.

	Column I		Column II
i.	Glycolysis	a.	Conversion of Pyruvic acid to acetyl-CoA
ii.	Gluconeogenesis	b.	Production of pyruvic acid
		c.	Conversion of proteins into glucose
		d.	Production of lactic acid

2.

	Column I		Column II
i.	Mitosis	a.	Genetic recombination
ii.	Meiosis	b.	Formation of fatty acids from lipids
		c.	Growth of body

**Answers:**

1. (i – b), (ii – c)
2. (i – c), (ii – a)

**Answer the following**

1. **What are the various systems of the human body?** [1 Mark]

**Ans:** The various systems of the human body are the digestive, respiratory, circulatory, excretory, reproductive and nervous system.

2. **What are the main sources of energy in the human body?** [1 Mark]

**Ans:** Carbohydrates, fats and lipids are the main sources of energy in the human body.

3. **Which cell organelle is responsible for harvesting cellular energy in human body?** [1 Mark]

**Ans:** The mitochondrion is responsible for harvesting cellular energy in human body.

4. **What are autotrophs?** [1 Mark]

**Ans:** Organisms like green plants that prepare their own food are known as autotrophs.



5. Give four examples of nutrients obtained by consumption of plant materials. [2 Marks]

Ans: Examples of nutrients obtained by consumption of plant material are carbohydrates, fats, proteins, vitamins and minerals. [Any four examples]

6. Give examples of food materials that are a source of carbohydrates. [2 Marks]

Ans: Milk, fruits, jaggery, cane sugar, vegetables, potatoes, sweet potatoes, sweetmeats and cereals (wheat, maize, ragi, jowar, millet, rice, etc.) [Any four examples]

7. What is the difference between body level and cellular level of respiration? [1 Mark]

Ans: In respiration occurring at body level, oxygen and carbon dioxide are exchanged between the body and surroundings, whereas, during cellular respiration, foodstuffs are oxidized for production of energy.

8. What are the two methods of cellular respiration? [1 Mark]

Ans: The two methods of cellular respiration are aerobic and anaerobic respiration.

\*9. Explain glycolysis in detail. [3 Marks]

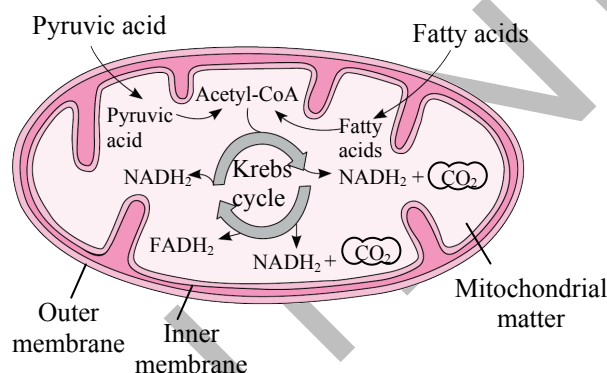
Ans: i. Glycolysis is the first step of aerobic/anaerobic respiration and occurs in the cytoplasm of the cell.  
ii. In this process, a molecule of glucose is oxidized in a stepwise manner to form two molecules each of pyruvic acid, ATP,  $\text{NADH}_2$  and water.  
iii. Pyruvic acid formed during this process is converted into acetyl-coenzyme A with the release of two molecules each of  $\text{NADH}_2$  and  $\text{CO}_2$ . This acetyl-coenzyme A then enters the Krebs cycle.

\*10. Explain Krebs cycle with reaction.

Ans: i. Tricarboxylic acid cycle or Krebs cycle is the second step of aerobic respiration.  
ii. It occurs in the mitochondria.  
iii. Two molecules of acetyl Co-A produced from pyruvic acid (formed by glycolysis), enter the mitochondria.  
iv. The acetyl group of this molecule is completely oxidized through the cyclic process.  
v. The products formed during the tricarboxylic acid cycle are  $\text{CO}_2$ , CoA, ATP,  $\text{NADH}_2$  and  $\text{FADH}_2$ .  
vi. Net reaction of Krebs cycle:  
$$\text{Acetyl-CoA} + 3\text{NAD}^+ + \text{FAD} + \text{GDP} + \text{P}_i + 3\text{H}_2\text{O} \rightarrow 2\text{CO}_2 + \text{CoA}^* + 3(\text{NADH} + \text{H}^+) + \text{FADH}_2 + \text{GTP}$$

[Note: During Krebs cycle,  $\text{NAD}^+$  (Nicotinamide adenine dinucleotide) is converted to form  $\text{NADH}_2$ ,  $\text{FAD}$  (Flavin adenine dinucleotide) is converted to form  $\text{FADH}_2$  and  $\text{GDP}$  (guanosine diphosphate) is converted into  $\text{GTP}$  (guanosine triphosphate), i.e. equivalent to one ATP.

\*CoA formed is recycled for acetylation of another molecule of pyruvate]



Mitochondrion and Krebs cycle

11. Explain how ATP is formed through the electron transport chain. [3 Marks]

Ans: i. The  $\text{NADH}_2$  and  $\text{FADH}_2$  molecules formed during glycolysis and tricarboxylic acid cycle, participate in the electron transport chain, which occurs in the mitochondria.  
ii. Each molecule of  $\text{NADH}_2$ , yields 3 molecules of ATP.  
iii. Also, each molecule of  $\text{FADH}_2$ , yields 2 molecules of ATP.

12. Mention any four molecules synthesized during aerobic respiration. [2 Marks]

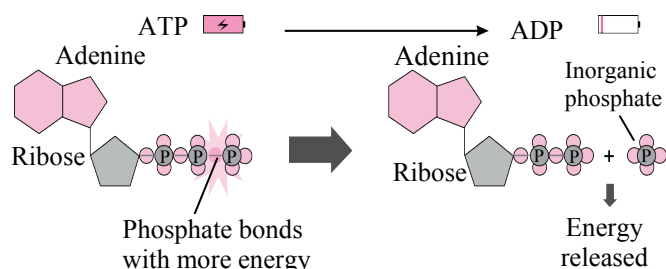
Ans: ATP (Adenosine triphosphate),  $\text{FADH}_2$  (Flavin adenine dinucleotide),  $\text{NADH}_2$  (Nicotinamide adenine dinucleotide),  $\text{CO}_2$  and  $\text{H}_2\text{O}$ . [Any four molecules]

13. What is ATP composed of? [1 Mark]

Ans: ATP is composed of a nitrogenous compound (adenine), pentose sugar (ribose) and three phosphate groups.

14. Explain the importance of ATP in a cell with a diagram. [5 Marks]

Ans: i. ATP (Adenosine triphosphate) is an energy-rich molecule.  
ii. Energy is stored in the bonds that join phosphate groups in ATP.  
iii. ATP is stored in a cell as per the energy requirements of the cells.  
iv. As per the energy need, phosphate bonds of ATP are broken and energy is derived.  
v. For these reasons, ATP is known as the energy currency of the cell.

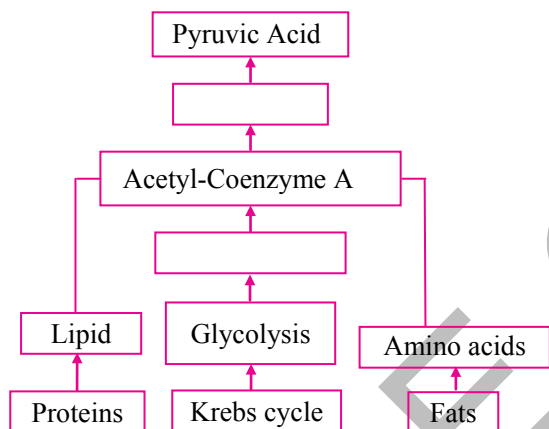


**ATP : Energy Currency**

15. What is the first source of energy utilised by the body? [1 Mark]

Ans: Carbohydrates are the first source of energy utilised by the body.

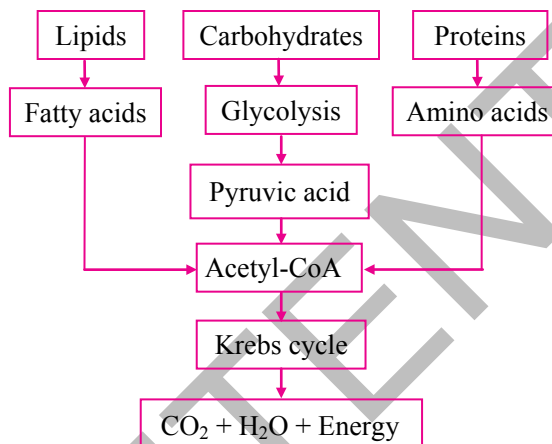
\*16. How energy is formed from oxidation of carbohydrates, fats and proteins? Correct the diagram given below. [5 Marks]



- Ans: i. Carbohydrates are used as the first source of energy. Oxidation of carbohydrates like glucose, yields two molecules each of pyruvic acid, ATP, NADH<sub>2</sub> and water.
- ii. In conditions of insufficient carbohydrates like fasting and hunger, lipids and proteins are used for energy production. Lipids are converted to fatty acids, whereas proteins are broken down into amino acids.
- iii. These simpler molecules formed are then converted into acetyl-CoA.
- iv. Acetyl group of acetyl-CoA is completely oxidized in the mitochondria through the Krebs cycle to produce CO<sub>2</sub>, H<sub>2</sub>O, NADH<sub>2</sub>, and FADH<sub>2</sub>.
- v. Molecules of NADH<sub>2</sub> and FADH<sub>2</sub> formed participate in electron transfer chain and synthesize energy in the form of ATP. 38 ATP are generated at the end of aerobic respiration.

Thus CO<sub>2</sub>, H<sub>2</sub>O and energy are formed at the end of aerobic respiration.

The correct diagram of the process of energy production through aerobic respiration of carbohydrates, proteins and fats is as follows:



[Note: ATP, NADH<sub>2</sub> and FADH<sub>2</sub> are the energy rich molecules synthesized during Krebs cycle.]

17. What is fermentation? [1 Mark]

OR

◆ Which type of respiration involves the process of fermentation? [1 Mark]

Ans: Fermentation is the process of conversion of pyruvic acid into organic acids or alcohols by anaerobic respiration.

**Good to know**

Mature mammalian red blood cells contain neither nucleus nor mitochondria. As a result they follow anaerobic respiration.



◆ 18. Why we get tired on quick exercise?

- Ans: i. While exercising the muscle cells perform anaerobic respiration.
- ii. During anaerobic respiration in muscle cells, lactic acid accumulates in the body.
- iii. Lactic acid accumulation is a result of the process of fermentation during which glucose is broken down by anaerobic respiration, forming organic acids.
- iv. Also, the production of ATP is comparatively less during anaerobic respiration.

Hence, a person may get tired on quick exercise.



◆19. How does the process of respiration occur in living organisms?

- Ans:** i. The process of respiration involves cellular breakdown of food to release energy in the form of ATP.
- ii. It may occur in the presence of oxygen (aerobic respiration) or in the absence of oxygen (anaerobic respiration).
- iii. Aerobic respiration occurs via three steps namely glycolysis, Krebs cycle and Electron Transfer Chain.
- iv. Anaerobic respiration occurs via glycolysis and fermentation.

20. What is the fate of excess amino acids present in the body? [1 Mark]

- Ans:** Excess amino acids are not stored in the body and are broken down into ammonia that is eliminated from the body.

21. What are the products of digestion of lipids? [1 Mark]

- Ans:** Digestion of lipids results in the formation of fatty acids and glycerol.

22. Give four examples of hormones produced by using fatty acids. [2 Marks]

- Ans:** Progesterone, estrogen, testosterone and aldosterone are hormones produced from fatty acids.

23. Write a short note on vitamins. [2 Marks]

- Ans:** i. Vitamins are a group of heterogeneous compounds which are essential for the proper operation of various life processes.
- ii. There are six types of vitamins, i.e. vitamin A, B, C, D, E and K.
- iii. Vitamins A, D, E and K are fat-soluble vitamins, whereas, vitamins B and C are water-soluble.
- iv. Vitamins like riboflavin (vitamin B<sub>2</sub>) and nicotinamide (vitamin B<sub>3</sub>) are used for the synthesis of FADH<sub>2</sub> and NADH<sub>2</sub> respectively.

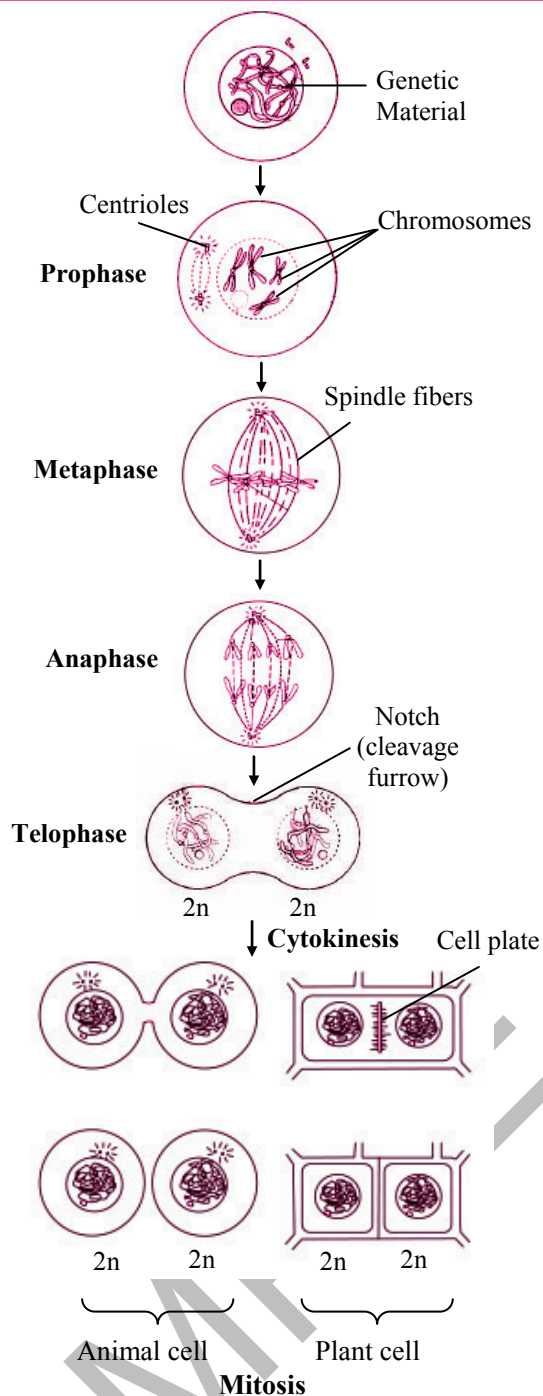
[Note: Nicotinamide is a form of vitamin B<sub>3</sub> which is essential for synthesis of NADH<sub>2</sub>.]

24. What is cell division? Mention the two types of cell division. [2 Marks]

- Ans:** i. Cell division is the property of cells of living organisms due to which a new organism is formed from an existing one, or a multicellular organism grows up.
- ii. Two types of cell division are mitosis and meiosis.

\*25. With the help of suitable diagrams, explain mitosis in detail.

- Ans:** i. Mitosis is the process of cell division occurring in somatic cells and stem cells. It is essential for the growth of the body, restoration of emaciated (weak and ill) body, wound healing, formation of blood cells, etc.
- ii. It is completed through two main steps namely, karyokinesis (nuclear division) and cytokinesis (cytoplasmic division).
- iii. Karyokinesis occurs via four steps, i.e. prophase, metaphase, anaphase and telophase.
- a. **Prophase:** During this phase thread like chromosomes condense. The centrioles duplicate and move to the opposite poles of the cells. The nuclear membrane and nucleolus start disappearing.
- b. **Metaphase:** During metaphase, the nuclear membrane completely disappears. Chromosomes complete condensation and become clearly visible along with sister chromatids. The chromosomes arrange parallel to the equatorial plane of the cell. Spindle fibers are formed between the centromere of each chromosome and both the centrioles respectively.
- c. **Anaphase:** The centromeres split and the sister chromatids are pulled apart in opposite directions with the help of spindle fibers. The separated sister chromatids (daughter chromosomes) reach two opposite poles of the cell.
- d. **Telophase:** Daughter chromosomes begin to decondense and the nuclear membrane is reformed around each set of chromosomes present at the poles. This results in the formation of two daughter nuclei. The nucleolus reappears in each daughter nucleus and the spindle fibers disappear completely.
- iv. With the end of karyokinesis, cytokinesis begins and as a result two new daughter cells are formed.
- v. During cytokinesis, a notch (cleavage furrow) forms at the equatorial plane that gradually deepens to form two separate cells. A cell plate is formed in the center of the cell instead of a notch in case of plant cells.



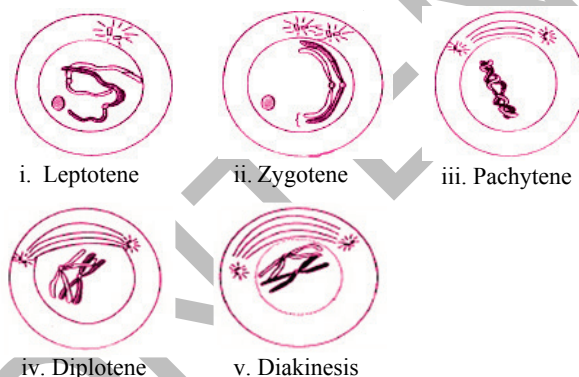
**\*26. With the help of suitable diagrams, explain the five stages of prophase-I of meiosis.**

**[5 Marks]**

**Ans:** Prophase-I of meiosis is longer and more complex as compared to mitotic prophase and is subdivided into following five phases:

- i. During the leptotene stage, compaction of chromosomes occurs and chromosomes become more visible.
- ii. During zygotene stage, pairing of homologous chromosomes (synapsis) occurs, this is accompanied by bivalent or tetrad formation.

- iii. In the pachytene stage, recombination/crossing over, i.e. exchange of genetic material takes place between non-sister chromatids of homologous chromosomes.
- iv. During diplotene stage, the bivalents separate from each other except at the sites of crossovers (chiasmata).
- v. During diakinesis, chromosomes are completely condensed and assembly of meiotic spindle occurs. The nucleolus and nuclear envelope start disappearing.



**Prophase-I of meiosis**

**\*27. Fill in the blanks and explain the statements.**

- i. After complete oxidation of a glucose molecule, \_\_\_\_\_ number of ATP molecules are formed.
- ii. At the end of glycolysis, \_\_\_\_\_ molecules are obtained.
- iii. Genetic recombination occurs in \_\_\_\_\_ phase of prophase of meiosis-I.
- iv. All chromosomes are arranged parallel to equatorial plane of cell in \_\_\_\_\_ phase of mitosis.
- v. For formation of plasma membrane, \_\_\_\_\_ molecules are necessary.
- vi. Our muscle cells perform \_\_\_\_\_ type of respiration during exercise.

- Ans:**
- i. After complete oxidation of a glucose molecule, **38** number of ATP molecules are formed.
  - a. Complete oxidation of glucose occurs via aerobic respiration and involves three steps, namely, glycolysis, Krebs cycle and electron transfer chain.
  - b. During glycolysis, 2 ATP molecules and 2 NADH<sub>2</sub> molecules are generated.
  - c. During Krebs cycle, 2 ATP molecules are generated along with NADH<sub>2</sub> and FADH<sub>2</sub> molecules. The NADH<sub>2</sub> and FADH<sub>2</sub> molecules generated through glycolysis and Krebs cycle, undergo terminal oxidation through the electron transfer chain.





- d. The 10 NADH<sub>2</sub> molecules generated yield 3 ATP molecules each, i.e. a total of 30 ATP.
- e. The 2 FADH<sub>2</sub> molecules generated, yield 2 ATP molecules each, i.e. a total of 4 ATP.
- f. These 34 ATP molecules generated through the electron transfer chain, along with 2 molecules each of ATP, generated through glycolysis and Krebs cycle, form a net total of 38 ATP molecules.

Therefore, the total number of ATP molecules generated through complete oxidation of glucose are 38.

- ii. At the end of glycolysis, **pyruvic acid** molecules are obtained.

**Ans:** Glycolysis is the process of oxidation of a glucose molecule in a step wise manner to produce two molecules of pyruvic acid along with production of ATP, NADH<sub>2</sub> and water.

- iii. Genetic recombination occurs in **pachytene** phase of prophase of meiosis-I.

**Ans:** Refer Answer the following: Q.26.(iii)

- iv. All chromosomes are arranged parallel to equatorial plane of cell in **metaphase** of mitosis.

**Ans:** Refer Answer the following: Q.25.(iii-b)

- v. For formation of plasma membrane, **phospholipid** molecules are necessary.

**Ans:** Phospholipids are molecules formed from fatty acids. They form the basic structure of cell membrane and are essential for the functional ability of a cell.

- vi. Our muscle cells perform **anaerobic** type of respiration during exercise.

**Ans:** In the absence of sufficient amount of oxygen, cells may switch to anaerobic mode of respiration. During exercise, there is a shortage of oxygen for energy production, in muscle cells due to which they perform anaerobic respiration.

**\*28. Write definitions.**

- i. **Nutrition**  
ii. **Nutrients**  
iii. **Proteins**  
iv. **Cellular respiration**  
v. **Aerobic respiration**  
vi. **Glycolysis**

**Ans:** i. **Nutrition:**  
Nutrition is the intake of nutrients essential for proper growth, development and various life processes of an organism.

- ii. **Nutrients:**  
Nutrients are substances which provide energy required for survival and growth of an organism.

iii. **Proteins:**

Proteins are macromolecules formed by bonding together many amino acids.

iv. **Cellular respiration:**

Cellular respiration is a type of respiration in which foodstuffs are oxidized for production of energy.

v. **Aerobic respiration:**

Aerobic respiration is the process of producing cellular energy in the presence of oxygen.

vi. **Glycolysis:**

Refer Answer the following: Q.27.(ii)

**\*29. How all the life processes contribute to the growth and development of the body?**

**Ans:** i. Various life processes like nutrition, digestion, respiration, excretion, circulation and control and co-ordination are essential for the growth and development of the body.

- ii. Essential nutrients like carbohydrates, proteins, fats etc. are obtained through **digestion** of food and are transported to the various cells of the body through blood **circulation**.

iii. Oxygen inspired also enters the blood and is transferred to the various parts of the body, where it is utilized for cellular **respiration** by oxidation of food to generate energy for various life processes.

iv. Harmful metabolic waste generated is eliminated from the body by the process of **excretion**.

v. All these various life processes along with movement and locomotion are controlled and co-ordinated by the **nervous system and endocrine system**.



**Reading between the lines**

- **Nutrition** is the process through which essential nutrients like carbohydrates, proteins, fats, vitamins, minerals, fibers, etc., are taken up by the body for proper functioning of the cells.
- **Digestion** is the process of breakdown of food into simpler and absorbable substances. Food is digested in alimentary canal with the help of various enzymes and digestive juices. For example, carbohydrates are broken down into simple sugar like glucose, proteins into amino acid and fats into glycerol and fatty acids. Amino acids are used for the synthesis of various important molecules like insulin, trypsin, ossein, melanin, etc., in various organs or cells of the body.



*Fatty acids produced are used for the production of hormones like progesterone, estrogen, etc., and also for essential molecules like phospholipids that make up the cell membrane.*

- **Respiration** is a process by which foodstuffs are oxidized releasing energy in the form of ATP (energy currency). As per the need, energy is derived from ATP and made available for various life processes.
- **Excretion** is the process of removal of harmful metabolic wastes from the body of an organism. Excretion is one of the important life processes in living organisms, because if waste products accumulate in the body, they may become toxic and slow down vital metabolic reactions.
- In humans, transportation of oxygen, nutrients, hormones and other substances is carried out by a well-defined **circulatory system**.
- Living organisms show different types of movements, which may occur as a result of growth or in response to a change in the environment. Such movements require proper co-ordination. In humans **control and co-ordination** is carried out by nervous system and endocrine system.
- **Cell division** can also be considered as an important property of all living cells by which new unicellular organisms are formed. Multicellular organisms grow and restore the emaciated body. Cell division is also crucial for wound healing, formation of red blood cells, etc.

### Give reasons

[2 Marks each]

#### \*1. Krebs cycle is also known as citric acid cycle.

- Ans:**
- i. Acetyl-CoA (2 carbon compound) enters the mitochondria to combine with oxaloacetic acid (4 carbon compound) and form a six-carbon compound i.e., citric acid.
  - ii. Since, citric acid is the first stable compound formed, Krebs cycle is also called citric acid cycle.

#### \*2. Oxygen is necessary for complete oxidation of glucose.

- Ans:**
- i. A molecule of glucose is completely oxidized in aerobic respiration (i.e. in the presence of oxygen) to form CO<sub>2</sub>, H<sub>2</sub>O and energy (38 ATP), via. three steps namely glycolysis, Krebs cycle and electron transfer chain.

- ii. However, in anaerobic respiration (i.e. in absence of oxygen), glucose is incompletely oxidized via. glycolysis and fermentation, resulting in the formation of organic acids or alcohols and lesser amount of energy is obtained.

Hence, oxygen is necessary for complete oxidation of glucose.

#### \*3. Sometimes, higher plants and animals too perform anaerobic respiration.

- Ans:**
- i. Respiration is an energy yielding process and takes place by the oxidation of foodstuffs.
  - ii. Higher plants and animals require oxygen in order to respire aerobically.
  - iii. However, in conditions where oxygen is depleted, these organisms perform anaerobic respiration to obtain energy.
  - iv. Glucose is incompletely oxidized and a comparatively lesser amount of energy is obtained through anaerobic respiration.

Therefore, sometimes, higher plants and animals too perform anaerobic respiration.

#### 4. Water is an essential nutrient.

- Ans:**
- i. Our body consists of about 65-70% water. Cells and blood plasma contain 70% and 90% water respectively.
  - ii. Water acts as a universal solvent as it provides medium for many metabolic reactions.
  - iii. It also helps in transportation of dissolved nutrients to various parts of the body.
  - iv. When there is a little loss of water from the body, functioning of the cell and thereby whole body gets disturbed.

Hence, water is an essential nutrient.

#### \*5. Fibers are one of the important nutrients.

- Ans:**
- i. Fibers cannot be digested by humans, yet they are essential nutrients.
  - ii. Fibers are important as they promote movement of materials through the digestive system and thus aid in digestion of foodstuff.
  - iii. They also help in egestion of undigested substances from the body.
  - iv. Vegetables, fruits, cereals, etc. are sources of essential nutrients like fibers.

#### \*6. Cell division is one of the important properties of cells and organisms.

- Ans:**
- i. Cell division is the property due to which a new organism (unicellular) is formed from an existing one.



- ii. In case of multicellular organisms, the growth of the organisms is dependent on cell division.
- iii. It is also essential for restoration of emaciated body.
- iv. Cell division is an important aspect of wound healing, formation of blood cells, and other such important life processes.

Hence, cell division is one of the important properties of cells and organisms.

**Distinguish between****[2 Marks each]****\*1. Glycolysis and TCA cycle****Ans:**

	Glycolysis	TCA cycle
i.	It occurs in the cytoplasm.	It occurs in the mitochondria.
ii.	It is common to both aerobic and anaerobic respiration.	It occurs only during aerobic respiration.
iii.	No carbon dioxide is released.	Carbon dioxide is released.
iv.	It results in the formation of two molecules each of pyruvic acid, ATP, NADH <sub>2</sub> and H <sub>2</sub> O.	It results in the formation of CO <sub>2</sub> , CoA*, ATP, NADH <sub>2</sub> and FADH <sub>2</sub> .
v.	It is the first step of aerobic/ anaerobic respiration.	It is the second step of aerobic respiration.
vi.	It is a linear pathway.	It is a cyclic pathway.

[Any four points]

[\* Note: CoA formed is recycled for acetylation of another molecule of pyruvate]

**\*2. Aerobic and anaerobic respiration.****Ans:**

	Aerobic respiration	Anaerobic respiration
i.	It occurs in the presence of oxygen.	It occurs in the absence of oxygen.
ii.	It occurs via. three steps, namely, glycolysis, TCA cycle and electron transfer chain.	It occurs via. two steps, namely, glycolysis and fermentation.
iii.	The end products are CO <sub>2</sub> , H <sub>2</sub> O and energy.	The end products are organic acids or alcohol and energy.

iv.	More amount of energy is generated.	Less amount of energy is generated.
v.	Complete oxidation of glucose takes place.	Incomplete oxidation of glucose takes place.
vi.	It takes place in higher plants, animals and certain aerobic microbes.	It takes place in yeast, muscle cells, erythrocytes and some anaerobic microbes.

[Any four points]

**Good to know**

Anaerobic respiration occurs in cytoplasm of the cell and gives net gain of 2 ATP per molecule of glucose.

**3. Telophase and prophase****Ans:**

	Telophase	Prophase
i.	It is the last phase of karyokinesis.	It is the first phase of karyokinesis.
ii.	Chromosomes decondense during telophase.	Condensation of chromosomes starts during prophase.
iii.	Nuclear membrane is formed around each set of chromosomes at the pole.	Nuclear membrane starts to disappear.
iv.	Nucleolus appears in each daughter nucleus.	Nucleolus starts to disappear.
v.	Chromosomes are present at the opposite poles of the cell.	Chromosomes are randomly arranged in the cell.

[Any four points]

**\*4. Mitosis and meiosis****Ans:**

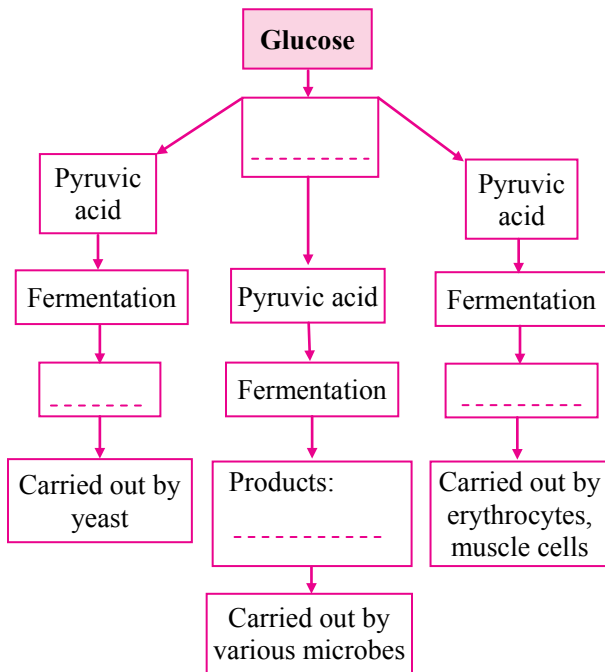
	Mitosis	Meiosis
i.	This type of cell division occurs in somatic cells and stem cells.	This type of cell division occurs only in germ cells.
ii.	Genetic recombination does not take place.	Genetic recombination takes place between homologous chromosomes.
iii.	A diploid cell produces two diploid daughter cells after mitosis.	A diploid cell produces four haploid cells after meiosis.
iv.	It takes place during restoration and formation of new cells.	It takes place during gamete production and spore formation.

[Note: Mitosis also takes place in germ cells.]

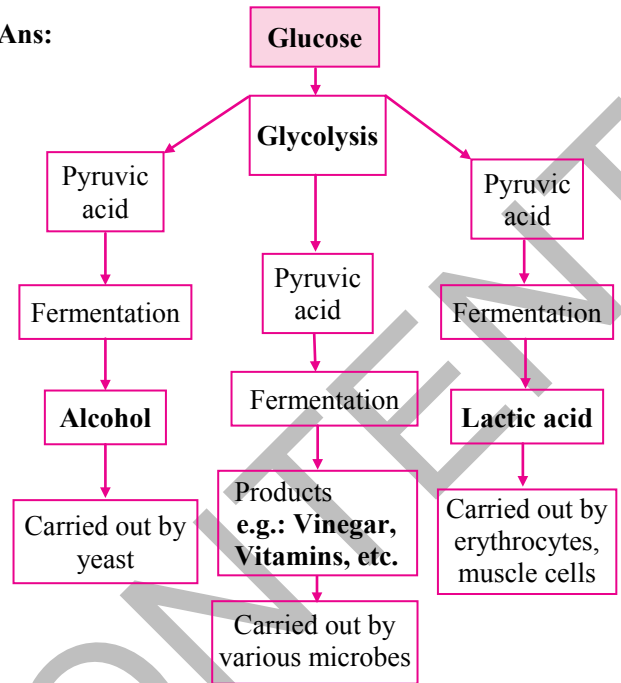


**Complete the given chart/table**

1. Complete the following chart. [2 Marks]



Ans:



2. Complete the following chart by filling the names of proteins or respective cell types/organs in which they are produced. [3 Marks]

	Cell type/ Organ	Protein
i.	_____	Insulin and trypsin
ii.	Cells	Various proteins of cell membrane and various enzymes
iii.	Pituitary glands	_____
iv.	_____	Actin and myosin
v.	_____	Hemoglobin and antibodies
vi.	_____	Melanin and keratin
vii.	Bones	_____

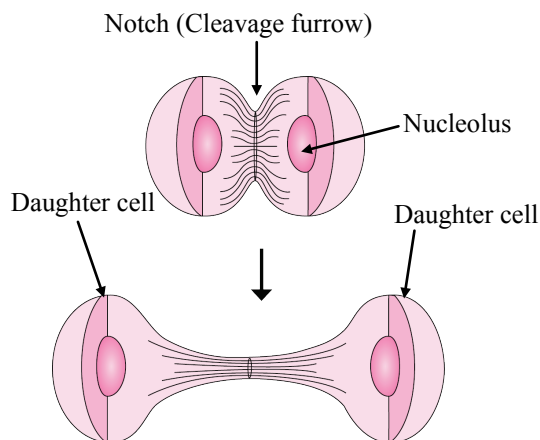
Ans:

	Cell type/ Organ	Protein
i.	<b>Pancreas</b>	Insulin and trypsin
ii.	Cells	Various proteins of cell membrane and various enzymes
iii.	Pituitary glands	<b>Hormones</b>
iv.	<b>Muscles</b>	Actin and myosin
v.	<b>Blood</b>	Hemoglobin and antibodies
vi.	<b>Skin</b>	Melanin and keratin
vii.	Bones	<b>Ossein</b>



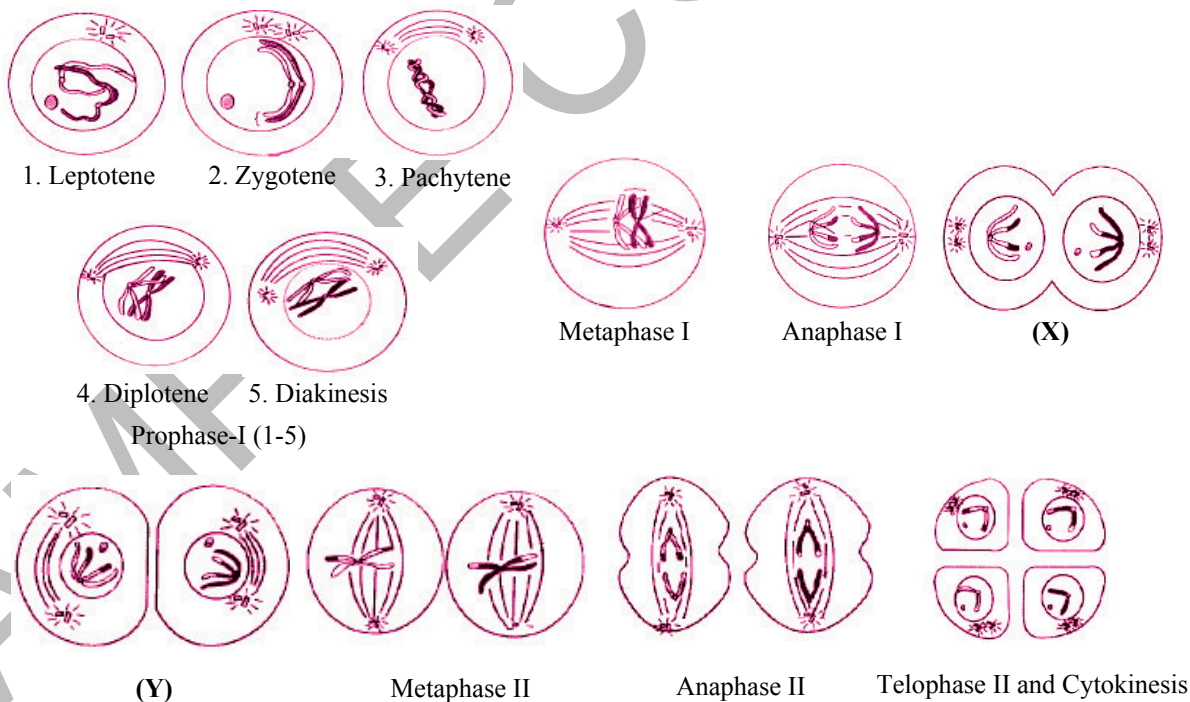
**Questions based on diagram [3 Marks each]**

1. Observe the given diagram and explain the depicted process in your own words.



- Ans:** i. The process depicted in the given diagram is cytokinesis.  
 ii. This step takes place at the end of karyokinesis (nuclear division) of mitosis.  
 iii. It depicts the division of the cytoplasmic material in order to form two daughter cells that resemble each other.

2. Observe the diagram and answer the questions given below it.



i. Identify the type of cell division shown in the diagram.

**Ans:** The type of cell division shown in the diagram is meiosis.

ii. Identify the stages of cell division represented by X and Y.

**Ans:** The stages of cell division represented by X and Y are Telophase-I and Prophase-II respectively.

iii. Which type of cells divide by the given process shown in the diagram?

**Ans:** Cells responsible for production of gametes and spores undergo meiosis.



### Questions based on paragraph [5 Marks]

1. In eukaryotes, the process of division of a somatic parent cell into two daughter cells is known as mitosis. During the M or mitosis phase of a cell cycle, the chromosomes present in the nucleus are separated into two identical sets, which eventually form two daughter nuclei. This is followed by cytokinesis. Onion root tips are most commonly used to observe the different stages of mitosis in the laboratory. Each onion cell contains a total of eight chromosomes. DNA specific stains are used to visualise these chromosomes in different phases of mitosis.

Based on the given paragraph answer the following questions:

- i. Name the stain that can be used to observe the different phases of mitosis.
- ii. Considering the number of chromosomes in an onion cell is 8, what would be the number of chromosomes in each daughter cell after mitosis?
- iii. During which stage of mitosis are spindle fibers formed between centromeres and centrioles?
- iv. Why are onion root tips preferred for study of mitosis?
- v. Mention one difference between mitosis occurring in onion root tip cell and human cheek cells.

- Ans:**
- i. Iodine is the stain that can be used to observe the different phases of mitosis.
  - ii. Since the number of chromosomes in an onion cell is 8 (2n), the number of chromosomes in each daughter cell after mitosis would be 8 (2n).
  - iii. Spindle fibers are formed between centromeres and centrioles during metaphase.
  - iv. Onion root tips are preferred for study of mitosis as they are constantly dividing cells (meristematic tissue) and thus many cells will be in different stages of mitosis.
  - v. A cell plate is formed during cytokinesis of an onion root tip cell (plant cell), whereas a notch (cleavage furrow) is formed during division of human cheek cells.



### Apply your Knowledge

1. **Can you recall?** (Textbook page no. 12)
- i. **How are the foodstuffs and their nutrient contents useful for body?**

**Ans:** Foodstuffs and their nutrients are required for normal functioning of our body. Foodstuffs are broken down during digestion to convert

them into soluble nutrients which are carried by the blood to various cells of the body. The nutrients are oxidized by cellular respiration to release energy.

Importance of some major nutrients is as follows:

- a. Nutrients like carbohydrates and fats provide energy to perform various activities.
- b. Proteins are the major structural components of cells. They are called body building nutrients, as they are responsible for building and repairing the body tissues. In our body, proteins are used to make amino acids, hormones and other body chemicals.
- c. Vitamins and minerals act as the protective and regulating nutrients in our body.

### ii. What is the importance of balanced diet for body?

**Ans:** The importance of balanced diet is as follows:

- a. It helps in proper growth of the body.
- b. It increases immune system to fight/resist diseases.
- c. It increases capacity of work by providing energy.
- d. It is essential for good physical and mental health.

### iii. Which different functions are performed by muscles in the body?

**Ans:** Muscles are mainly responsible for the movements of / in the human body:

There are three main types of muscles:

- a. **Striated (Voluntary) muscles:**  
These muscles are attached to the bones (hence also called as skeletal muscles) and bring about movements of arms, legs.
- b. **Non-Striated (Involuntary) muscles:**  
These muscles bring about movement of eyelids, passage of food through alimentary canal, contraction and relaxation of blood vessels.
- c. **Cardiac muscles:**  
Cardiac muscles bring about contraction and relaxation of the heart.

### iv. What is the importance of digestive juices in digestive system?

**Ans:** Digestive juices contain various enzymes which help in digestion of different types of food. Thus, they convert complex food molecules into simpler form, for example proteins are converted to amino acids, complex carbohydrates to glucose and lipids to fatty acids and alcohols. The digested food is then absorbed by the walls of the small intestine and taken to every cell of the body through blood vessels.



v. **Which system is in action for removal of waste materials produced in human body?**

**Ans:** Waste materials produced in the human body are removed by the excretory system.

vi. **What is the role of circulatory system in energy production?**

**Ans:** In the circulatory system, arteries carry oxygen rich blood from heart to the different parts of the body. Along with oxygen, this blood also contains energy – rich nutrients such as glucose, fatty acids which are used by cells to produce energy.

vii. **How are the various processes occurring in human body controlled? In how many ways?**

**Ans:** a. In human beings different body activities are controlled by two mechanisms, nervous control and chemical control.  
b. Nervous control is brought about with the help of brain, spinal cord and nerves.  
c. Chemical control is brought about with the help of chemical substances called hormones (endocrine system).

2. **Use your brain power.** (Textbook page no. 12)

**Many players are seen consuming some foodstuffs during breaks of the game. Why may be players consuming these foodstuffs?**

**Ans:** i. Many players eat some food during break time. Such food is generally rich in proteins (for e.g. Protein bars) or carbohydrates (for e.g. Banana) which is a quick source of energy and helps players to stay energetic.  
ii. Also drinking water, glucose or electrolytes keeps them hydrated, thus preventing them from feeling thirsty while playing.

Therefore, many players eat some food during break time.

3. **Can you recall?** (Textbook page no. 12)

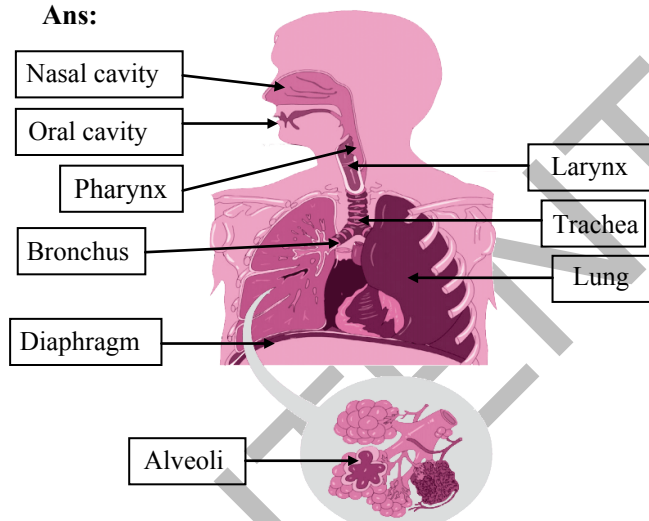
**What is respiration? How does it occur?**

**Ans:** i. Respiration involves release of energy by oxidation of food.  
ii. Respiration involves taking in oxygen-rich air and giving out air containing carbon dioxide with the help of respiratory organs.  
iii. The oxygen inhaled during respiration is used for cellular respiration to oxidize food and release energy in the form of ATP.

4. **Observe.** (Textbook page no. 13)

**Observe and label the diagram given on page no. 13 of your textbook.**

**Ans:**



**Human respiratory system**

*[Note: Trachea, also known as wind pipe is made up of fibrous muscular tissue supported by 'C' – shaped cartilage rings and connects the pharynx and larynx to the lungs.]*

*[Note: Students are expected to refer the accompanying QR code for better understanding.]*



5. **Can you tell?** (Textbook page no. 13)

i. **How many atoms of C, H and O are respectively present in a molecule of glucose?**

**Ans:** One molecule glucose ( $C_6H_{12}O_6$ ) contains 6 atoms of carbon (C), 12 atoms of hydrogen (H) and 6 atoms of oxygen (O).

ii. **Which types of chemical bonds are present between all these atoms?**

**Ans:** In glucose molecule, atoms of carbon, hydrogen and oxygen are held together by covalent bonds.

iii. **In terms of chemistry what happens actually when a molecule is oxidized?**

**Ans:** When an element is oxidized, in chemical terms, it loses electrons and gains a positive charge.

6. **Can you tell?** (Textbook page no. 16)

i. **Which type of cellular respiration performs complete oxidation of glucose?**

**Ans:** Complete oxidation of glucose occurs during aerobic respiration.

ii. **Which cell organelle is necessary for complete oxidation of glucose?**

**Ans:** Mitochondria are required for complete oxidation of glucose.



7. **Can you recall?** (Textbook page no. 16)

**From where do we obtain lipids?**

**Ans:** Lipids are obtained from foodstuffs like oil, ghee, butter, nuts, fish, meat, etc.

8. **Think** (Textbook page no. 17)

i. **Many times, you cannot eat hot food due to inflammation/ulceration in mouth.**

**Ans:** a. Ulcer is caused due to various reasons such as tissue injury by accidental biting of cheek, stress, deficiency of vitamin B<sub>12</sub>, zinc, folic acid or iron.

b. Eating hot or spicy food during inflammation/ulceration in mouth can irritate the injured cells/tissue and cause discomfort.

Therefore, many times, we cannot eat hot food due to inflammation or ulceration in mouth.

ii. **Some persons experience difficulty in night vision since childhood or adolescence.**

**Ans:** Inability to see in dim light is known as night-blindness. It is caused due to deficiency of vitamin A in the diet.

Therefore, some persons experience difficulty in night vision since childhood or adolescence.

9. **Use your brain power.** (Textbook page no. 17)

i. **Many times, we experience dryness in mouth.**

**Ans:** Many times we experience dryness in mouth due to dehydration. While running, walking, playing or other activities, our body loses water in the form of sweat. Thus, to maintain the water level in the body we feel thirsty or experience dryness in the mouth, as a signal to consume more water.

ii. **Oral rehydration solution (Salt-sugar-water) is frequently given to persons experiencing loose motions.**

**Ans:** a. In loose motions/ diarrhoea, body loses excess amount of fluids and salts. This causes dehydration which can be dangerous, especially in case of children. In such cases the body can be rehydrated by giving a solution containing salt and sugar (For e.g. ORS – Oral Rehydration Salts).

b. Drinking this solution helps to replace the fluids and essential salts lost due to diarrhoea. Also, sugar (glucose) enables the intestine to absorb the fluid and salts more efficiently.

Therefore, oral rehydration solution (Salt-sugar-water) is frequently given to persons experiencing loose motions.

iii. **We sweat during summer and heavy exercise.**

**Ans:** During summer and heavy exercise, our body temperature rises. Our body maintains its temperature by sweating. The sweat in turn evaporates and keeps our body cool.

10. **Internet is my friend.** (Textbook page no. 17)  
**Collect information.**

i. **What are symptoms of diseases like night blindness, rickets, beriberi, neuritis, pellagra, anemia, scurvy?**

**Ans:**

	Diseases	Symptoms
a.	Night blindness	Inability to see in dim/low light
b.	Rickets	Softening of bones, causing pain and fractures
c.	Beriberi	Pain in limbs, shortness of breath and swollen feet or legs
d.	Neuritis	Stabbing pain or loss of sensation
e.	Pellagra	High sensitivity to sunlight resulting in inflamed and scaly skin sores
f.	Anemia	Dizziness, fatigue, weakness
g.	Scurvy	Bleeding of gums

[Students can use the internet to collect more information about the disease and its symptoms.]

ii. **What do you mean by coenzymes?**

**Ans:** Co-enzymes are non-protein compounds that bind with enzymes to catalyze reactions.

iii. **Find the full forms of FAD, FMN, NAD, NADP.**

**Ans:** a. FAD : Flavin Adenine Dinucleotide  
 b. FMN : Flavin Mononucleotide  
 c. NAD : Nicotinamide Adenine dinucleotide  
 d. NADP : Nicotinamide Adenine Dinucleotide Phosphate

iv. **How much quantity of each vitamin is required every day?**

**Ans:**

Vitamin	Daily Intake
B <sub>7</sub> (Biotin)	300 mcg
B <sub>9</sub> (Folic acid)	400 mcg
B <sub>3</sub> (Niacin)	20 mg
B <sub>5</sub> (Pantothenic acid)	10 mg
B <sub>2</sub> (Riboflavin)	1.7 mg
B <sub>1</sub> (Thiamine)	1.5 mg
A	5,000 IU
B <sub>6</sub>	2 mg
B <sub>12</sub>	6 mcg
C	60 mg
D	400 IU
E	30 IU
K	80 mcg

[Note: The daily values of vitamins recommended are as per US Food and Drug Administration (FDA), mcg: Microgram, IU: International unit, mg: Milligram]



11. Can you tell? (Textbook page no. 17)

i. What happens to the cells of injured tissue?

Ans: When someone gets injured, the cells in that particular tissue get damaged. If the injury is too severe, then it may cause cell death, and the cells may lose their ability to repair themselves.

ii. Whether new cells are formed during healing of wound?

Ans: Yes, new cells are formed during healing of wounds.

iii. Do the plants get injured when we pluck the flowers? How are those wounds healed?

Ans: Yes, plants get injured when we pluck flowers. Meristematic tissue present in plants gives rise to new cells at the site of injury and help plants to heal their wounds.

iv. How does the growth of any living organism occur? Does the number of cells in their body increase? If yes, how?

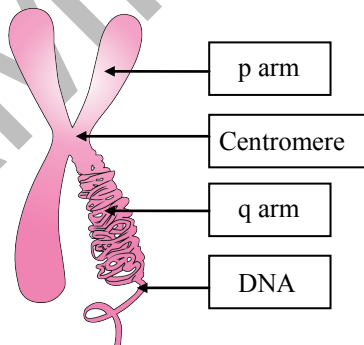
Ans: a. Growth of living organisms occurs by cell division.  
b. Yes, the number of cells in the organism's body increases.  
c. While growing, the number of cells in organism's body increases by mitotic cell division.

v. How the new individual of a species is formed from existing one of same species?

Ans: Organism of one species gives rise to another organism of the same species by the process of reproduction.

12. Can you recall? (Textbook page no. 18)  
What is the shape of chromosome? Give its names in the figure given on page no. 18 of your textbook.

Ans: The size and shape of chromosomes is variable with respect to the different phases of the cell cycle. The chromosome is generally seen X-shaped during metaphase.



Chromosome

[Note: Students are expected to refer the accompanying QR code for better understanding.]



### Reading between the lines

Chromosomes can also be classified according to the position of the centromere into the following types:

1)	Metacentric	Centromere is situated in the middle of the chromosome	It appears 'V' shaped during anaphase
2)	Sub-Metacentric	Centromere is situated some distance away from the middle	It appears 'L' shaped during anaphase
3)	Acrocentric	Centromere is situated near the end of the chromosome	It appears 'J' shaped during anaphase
4)	Telocentric	Centromere is situated near the tip of the chromosome	It shows only one arm hence appears rod shaped

13. Try this. (Textbook page no. 20)

**Apparatus:** Conical flask, glass slides, cover slips, forceps, compound microscope, watch glass, etc.

**Materials:** A medium sized onion, iodine solution, etc.

**Procedure:** Take a medium sized onion. Keep it in a conical flask filled with water in such a way that the roots of onion will be in contact with water. Observe the roots of onion after 4-5 days. Cut the tips of some of the roots and put them in a watch glass. Pour some drops of iodine in watch glass. Take one of the root tip on glass slide press it with the help of forceps. Add 1-2 drops of water and carefully place cover slip over it in such a way that air will not be trapped between. Observe the prepared glass slide under the compound microscope. Which phase of cell division did you observe? Sketch its figure.

Various phases of cell division occurring in root tips of onion are shown in the figure given on page no. 20 of your textbook. Which one of those could you see in the slide?

[Students are expected to observe the different phases of cell division on their own and compare it to the figures given on textbook page no. 20.]

[Note: Students are expected to refer the accompanying QR code for better understanding.]



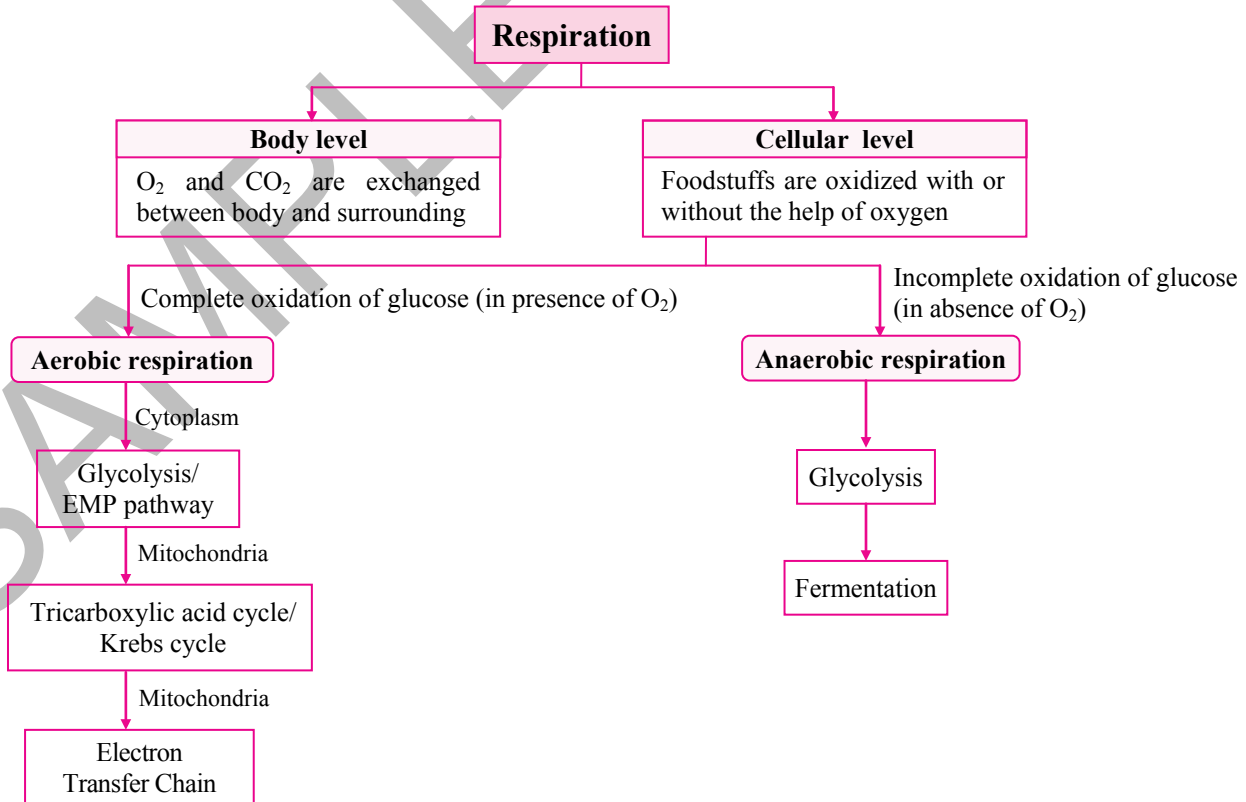


14. **Use your brain power.** (Textbook page no. 20)
- i. **What do you mean by diploid (2n) cell?**  
**Ans:** The cell which has two sets of chromosomes is called a diploid (2n) cell.
- ii. **What do you mean by haploid (n) cell?**  
**Ans:** The cell which has one set of chromosomes is called as a haploid (n) cell.
- iii. **What do you mean by homologous chromosomes?**  
**Ans:** The morphologically and structurally similar chromosomes present in a diploid cell are called homologous chromosomes.
- iv. **Whether the gametes are diploid or haploid? Why?**  
**Ans:** Gametes are haploid (n). It is because they are formed by meiotic division of germ cells.
- v. **How are the haploid cells formed?**  
**Ans:** Haploid cells are formed due to meiotic division of a diploid cell.
- vi. **What is the importance of haploid cells?**  
**Ans:** a. Haploid cells (gametes) are required for sexual reproduction.  
 b. The gametes unite at the time of fertilization and thus chromosome number is restored in the progeny.

- c. The fusion of gametes introduces genetic recombination leading to variations which are important for the process of evolution.
15. **Use of ICT.** (Textbook page no. 20)  
**Collect videos and photographs from different life processes in living organisms. Prepare a presentation and present it on the occasion of science exhibition.**  
**Ans:** Refer Answer the following: Q.29.  
 [Students are expected to prepare a presentation on their own.]
16. **Books are my friend.** (Textbook page no. 20)  
**Read different encyclopedias of technical terms in biology and anatomy and other reference books.**  
 [Students are expected to perform this activity on their own.]
- \*17. **Project:**  
**With the help of information collected from internet, prepare the slides of various stages of mitosis and observe under the compound microscope.**  
 [Students are expected to perform this project on their own.]

### Memory Maps

➤ **Energy production in living organisms:**

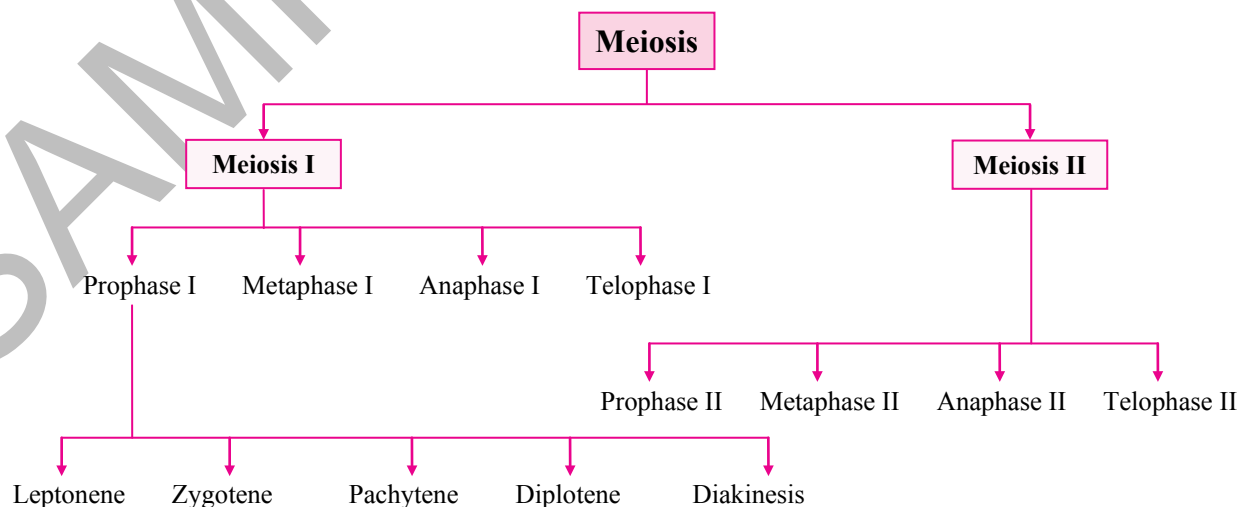
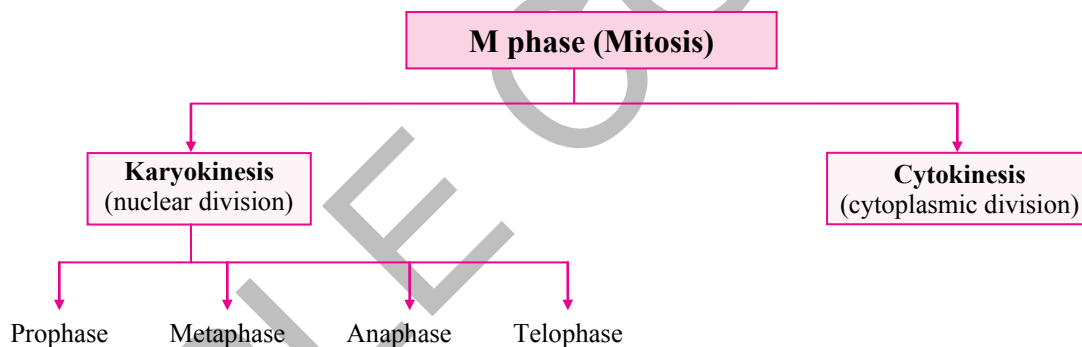




➤ **Reactions of cellular respiration:**

Aerobic respiration		
i.	Glycolysis/EMP pathway	$\text{Glucose} + 2 \text{NAD} + 2\text{ADP} + 2\text{P}_i \rightarrow 2 \text{Pyruvic acid} + 2\text{NADH}_2 + 2\text{ATP}$
ii.	Tricarboxylic acid cycle (TCA)/Krebs cycle	$\text{Acetyl-CoA} + 3\text{NAD}^+ + \text{FAD} + \text{GDP} + \text{P}_i + 3\text{H}_2\text{O} \longrightarrow 2\text{CO}_2 + \text{CoA}^* + 3(\text{NADH} + \text{H}^+) + \text{FADH}_2 + \text{GTP}$ <i>[Note: * CoA formed is recycled for acetylation of another molecule of pyruvate]</i>
iii.	Electron Transfer Chain	34 ATP molecules out of 38 are produced through ETC (10NADH <sub>2</sub> + 2FADH <sub>2</sub> , in which one NADH <sub>2</sub> produces 3 ATP and one FADH <sub>2</sub> produces 2 ATP)
Anaerobic respiration		
i.	Glycolysis/EMP pathway	$\text{Glucose} + 2 \text{NAD} + 2\text{ADP} + 2\text{P}_i \rightarrow 2 \text{Pyruvic acid} + 2\text{NADH}_2^* + 2\text{ATP}$ <i>[Note: * NADH<sub>2</sub> formed is oxidized to NAD and recycled]</i>
ii.	Fermentation	Organic acids or alcohol produced

➤ **Cell division:**





**Chapter Assessment**

[Total Marks: 25]  
[5]

**Q.1. (A) Answer the following.**

- i. Complete the analogy.  
NADH<sub>2</sub> : Nicotinamide adenine dinucleotide :: FADH<sub>2</sub> : \_\_\_\_\_
- ii. What is the difference between aerobic and anaerobic respiration?
- iii. Find the odd one out.  
Diplotene, Zygotene, Diakinesis, Anaphase
- iv. Right or wrong. If wrong, write the correct sentence.  
During meiosis, two diploid cells are formed from one haploid cell.
- v. Name any two hormones produced using fatty acids.

**(B) Choose the correct alternative.**

[3]

- i. The process of cytoplasmic division during mitosis is known as  
(A) diakinesis (B) karyokinesis (C) cytokinesis (D) recombination
- ii. In mitosis, a cell having 2n chromosomes, would form daughter cells having how many chromosomes?  
(A) n (B) 2n (C) 3n (D) 4n
- iii. In case of plants, which of the following is NOT present during cytokinesis?  
(A) Spindle fibers (B) Chromosomes  
(C) Cell plate (D) Nucleolus

**Q.2. Answer the following (any three).**

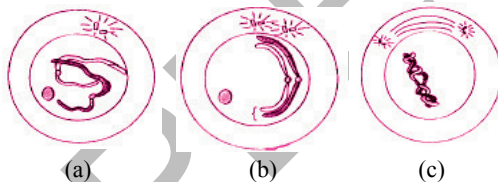
[6]

- i. Define nutrients and give two examples.
- ii. Mention any four advantages of digestion of lipids in the body.
- iii. Write a note on the importance of cell division.
- iv. Differentiate between metaphase and telophase.

**Q.3. Answer the following (any two).**

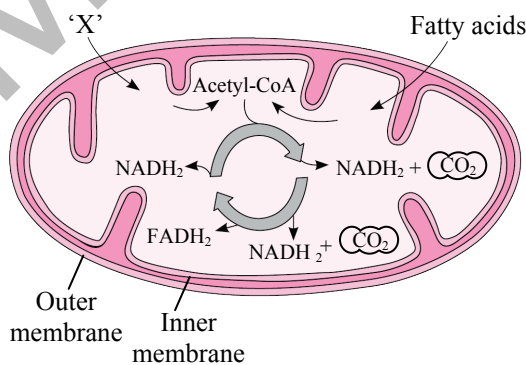
[6]

- i. Explain the three stages of prophase-I of meiosis shown in the diagrams given below.



**Prophase-I of meiosis**

- ii. Explain ATP production in microbes through aerobic respiration.
- iii. Observe the given diagram and answer the questions given below it.



**Krebs cycle**

- a. Mention the cell organelle shown in the diagram.
- b. Which energy rich molecules are synthesised during Krebs cycle?
- c. Identify the compound 'X' which is a product of glycolysis that is utilized in Krebs cycle.



**Q.4. Answer the following (any one).**

[5]

- i. Explain in detail, the process of karyokinesis occurring during mitosis.
- ii. Cellular respiration is the oxidation of foodstuffs for the production of energy. During aerobic respiration, complete oxidation of glucose takes place. Contradictory to this, glucose is incompletely oxidized during anaerobic respiration. Many microbes are capable of surviving anaerobically in environments that lack oxygen. Anaerobic respiration occurs via two steps, namely glycolysis and fermentation. The pyruvic acid formed during glycolysis is converted to organic acids or alcohols during anaerobic process. Higher animals and plants, or seeds submerged in soil under water are capable of performing anaerobic respiration, when the oxygen levels are depleted. Even body cells like erythrocytes and muscle cells perform anaerobic respiration.

Based on the given paragraph answer the questions given below:

- a. Considering that only glycolysis is generating energy currency, how many ATP would be formed during anaerobic respiration?
- b. How does anaerobic respiration occur in yeast?
- c. Give any two examples of products formed by fermentation.
- d. Why do we feel tired after exercise?
- e. Seeds sown in soil in marshy lands having high water content would perform which type of cellular respiration during germination?

**Answers:**

**Q.1. (A)**

- i.  $\text{NADH}_2$  : Nicotinamide adenine dinucleotide ::  $\text{FADH}_2$  : **Flavin adenine dinucleotide**
- ii. Aerobic respiration is the oxidation of foodstuffs in the presence of oxygen whereas anaerobic respiration occurs in the absence of oxygen.
- iii. Anaphase  
Diplotene, zygotene and diakinesis are steps of prophase –I of meiosis, whereas, anaphase is a phase of mitosis.
- iv. Wrong.  
During meiosis, four haploid cells are formed from one diploid cell.
- v. Progesterone, estrogen, testosterone, aldosterone. *[Any two names]*

**(B)**

- i. (C): cytokinesis
- ii. (B):  $2n$
- iii. (A): Spindle fibers

**Q.2.**

- i. Refer Answer the following: Q.28(ii) and Q.5
- ii. The advantages of digestion of lipids in the body are as follows:
  - a. They are used for synthesis of useful molecules like phospholipids that are essential for the formation of the plasma membrane.
  - b. Fatty acids are used to produce hormones like progesterone, estrogen, testosterone, aldosterone, etc.
  - c. They form the covering around the axons of the nerve cells.
  - d. Lipids are high energy substances, containing 9 Kcal of energy per gram of lipids.
- iii. Refer Give reasons: Q.6.



iv.

	Metaphase	Telophase
a.	The nucleolus disappears.	The nucleolus reappears in each daughter cell.
b.	The nuclear membrane completely disappears.	The nuclear membrane is formed around each set of chromosomes.
c.	Chromosomes complete condensation during metaphase.	Chromosomes decondense during telophase.
d.	Spindle fibers are formed between centromere and centriole.	Spindle fibers disappear.
e.	All chromosomes are arranged parallel to the equatorial plane of the cell.	Chromosomes are present near the poles of the cell.

[Any four points]

Q.3. i. Refer Answer the following: Q.26(i-iii)

ii. Refer Answer the following: Q.27(i)

- iii. a. The cell organelle shown in the diagram is mitochondrion.  
 b. Energy rich molecules such as ATP, NADH<sub>2</sub> and FADH<sub>2</sub> are synthesised during Krebs cycle.  
 c. The compound 'X' produced during glycolysis is pyruvic acid.

Q.4. i. Refer Answer the following: Q.25(iii, iv)

- ii. a. Two ATP molecules (net gain of the process of glycolysis) would be generated through anaerobic respiration.  
 b. Pyruvic acid formed by oxidation of glucose through glycolysis, is fermented to produce alcohol in yeast during anaerobic respiration.  
 c. Alcohol, lactic acid, vinegar, vitamins are examples of products formed by fermentation. [Any two examples]  
 d. Our muscle cells perform anaerobic respiration during exercise, consequently generating less amount of energy and resulting in accumulation of lactic acid, due to which we feel tired.  
 e. Seeds sown in soil in a marshy land having high water content would perform anaerobic respiration during germination.



# Std.X



## AVAILABLE SUBJECTS:

- English Kumarbharati
- हिंदी लोकभारती
- हिंदी लोकवाणी
- मराठी अक्षरभारती
- आमोदः (सम्पूर्ण संस्कृतम्)
- आनन्दः (संयुक्त संस्कृतम्)
- Mathematics - I
- Mathematics - II
- Science and Technology - 1
- Science and Technology - 2
- History and Political Science
- Geography

**BUY NOW**

## SALIENT FEATURES:

- Detailed description of the SSC Paper Pattern & Marking Scheme
- Exhaustive coverage of textual questions in all subjects
- Thorough explanation of all concepts in all subjects
- Two Model Question Papers for self-evaluation
- QR Codes in every book provide access to videos and a plethora of subject knowledge for students

**Target** Publications Pvt. Ltd.

88799 39712 / 13 / 14 / 15

mail@targetpublications.org

www.targetpublications.org