

INDIAN SCHOOL AL WADI AL KABIR



DEPARTMENT OF SCIENCE (2023 –2024)

CLASS: XI	SUBJECT: BIOLOGY	DATE OF COMPLETION: 11/02/2024
WORKSHEET WITH ANSWERS	TOPIC: RESPIRATION IN HIGHER PLANTS	NOTE: A4 FILE FORMAT
CLASS & SEC:	NAME OF THE STUDENT:	ROLL NO.

1Mark Questions

1. Alpha-ketoglutarate dehydrogenase results in
 - a. Oxidation and Decarboxylation
 - b. Reduction
 - c. Oxidation
 - d. None of the above
2. _____ is a product of aerobic respiration
 - a. Malic acid
 - b. Pyruvate
 - c. Ethylene
 - d. Lactose
3. Energy gained during aerobic respiration is _____ times more than anaerobic respiration.
 - a. 8
 - b. 12
 - c. 19
 - d. 32
4. Glycolysis is also known as _____

- a. EMP pathway
 - b. TCA pathway
 - c. carbon sequestration
 - d. None of the above
5. **On oxidation of 1 molecule of glucose, _____ ATP is produced through aerobic respiration**
- a. 10
 - b. 25
 - c. 30
 - d. 38

II : Assertion and reasoning:

- a) Assertion and Reason are true and Reason is the correct explanation of the Assertion.
- b) Assertion and Reason are true but Reason is not a correct explanation of the Assertion.
- c) Assertion is true but the Reason is false.
- d) Assertion and Reason are false.

Q6. Assertion: Stomata are absent in submerged hydrophytes.

Reason: Respiration occurs by means of air chambers in submerged plants.

Q7. Assertion: Glycolysis is the first step of respiration in which glucose completely breaks into CO₂ and H₂O.

Reason: In this process, there is net gain of twenty-four molecules of ATP.

Q8. Assertion: Glycolysis occurs in cytoplasm.

Reason: Enzymes for glycolysis are found in cytoplasm. It is common in aerobic/anaerobic respiration.

Q9. Assertion: Plants do not have specialized respiratory organs.

Reason: There is very little transport of gases from one plant part to another.

Q10. Assertion: The incomplete oxidation of glucose into lactic acid or ethanol is fermentation.

Reason: In only prokaryotes, it takes place under anaerobic condition.

2Mark Questions

Q11. How is the energy released and stored during oxidation of compounds in respiration?

Q12. What is 'Energy Currency'. Name the substance in animals and plants that act as an energy currency.

Q13. In man and yeast, when does anaerobic respiration take place?

Q14. On oxidation, which of these releases more energy? Organize them in an arranging order.

- a) 1gm of fat
- b) 1gm of protein
- c) 1gm of glucose
- d) 0.5gm of protein + 0.5gm of glucose

3Mark Questions

Q15. Why is a person fed with glucose or a fruit juice instead of a cheese sandwich that might give more energy, when a person is feeling dizzy?

Q16. Aerobic respiration has more efficiency. Justify.

Q17. Anaerobic respiration is observed in entities living such as human and angiosperms in aerobic conditions. Why?

4Mark Questions

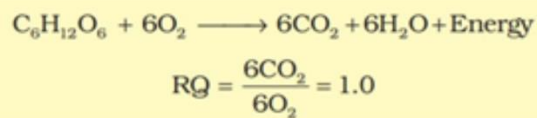
Q18. CASE STUDY BASED QUESTIONS

As we know, during aerobic respiration, O₂ is consumed and CO₂ is released. The ratio of the volume of CO₂ evolved to the volume of O₂ consumed in respiration is called the respiratory quotient (RQ) or respiratory ratio.

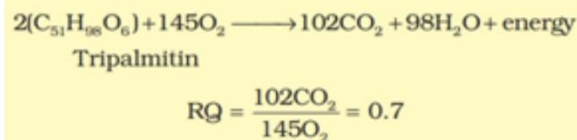
$$RQ = \frac{\text{volume of CO}_2 \text{ evolved}}{\text{volume of O}_2 \text{ consumed}}$$

The respiratory quotient depends upon the type of respiratory substrate used during respiration.

When carbohydrates are used as substrate and are completely oxidised, the RQ will be 1, because equal amounts of CO₂ and O₂ are evolved and consumed, respectively, as shown in the equation below:



When fats are used in respiration, the RQ is less than 1. Calculations for a fatty acid, tripalmitin, if used as a substrate is shown:



When proteins are respiratory substrates the ratio would be about 0.9. In living organisms respiratory substrates are often more than one; pure proteins or fats are never used as respiratory substrates.

1.) Identify the correct statement

Statement 1 – During aerobic respiration, O₂ is consumed and O₂ is released

Statement 2 – During aerobic respiration, O₂ is consumed and CO₂ is released

Statement 3 – During aerobic respiration, CO₂ is consumed and O₂ is released

Statement 4 – During aerobic respiration, CO₂ is consumed and CO₂ is released

a.) Only 1

b.) Only 3

c.) Both 1 & 2

d.) None of the above

2.) In case of aerobic respiration oxygen is _____

a) Consumed

- b) Evolved
- c) Released
- d) All of the above

3.) How respiratory ratio or respiratory quotient are calculated in case of aerobic respiration.

4.) Give reason – why respiration is referred as oxidative reaction?

5Mark Questions

Q19.Explain Glycolysis. State where it occurs and its end products. In both aerobic and anaerobic respiration, determine the fate of these products.

Q20.Explain the significance of Oxygen in aerobic respiration in the context of ETS.

ANSWER KEY

- 1. a
- 2. a
- 3. c
- 4. a
- 5. d
- 6. b
- 7. d
- 8. a
- 9. a
- 10. c

11. The energy released is directly collected in ATP in the form of chemical bonds. $ADP + IP + \text{energy} \rightarrow ATP$ This bond is broken and utilized whenever required $ATP \rightarrow ADP + IP + \text{energy}$

12. Energy is required by every cell to function. Energy currency releases and stores energy as and when required in the cell. In both plants and animals, ATP is known as the energy currency.

13. In man, it occurs when there is a lack of oxygen during cellular respiration hence pyruvic acid is reduced to lactic acid by the lactate dehydrogenase. In yeasts also it occurs in the absence of oxygen.

14. 1gm of fat releases most energy. The following is the ascending order: 1gm of glucose < 0.5 gm of protein + 0.5gm of glucose < 1gm of protein < 1gm of fat.

15. Glucose gives instant energy as it is absorbed and reaches the blood. Cheese sandwich, however, requires time to digest and absorb. As sick people need an immediate energy supply, they are fed with glucose or given fruit juice.

16. In this process, a single molecule of glucose can yield up to 36 ATP molecules. In anaerobic respiration or fermentation, there are only 2 molecules of ATP from every molecule of glucose, which in comparison is lesser than aerobic respiration. Hence aerobic respiration is more efficient.

17. In normal conditions in human beings, aerobic respiration takes place. In intense conditions such as heavy exercises, muscles require too much energy(ATP) hence consume more energy to be able to produce that energy which results in lack of oxygen thereby causing the muscle cells to make lactic acid through anaerobic respiration to meet their energetic needs. Under deficient conditions of oxygen, yeast cells carry out anaerobic respiration to form ethyl alcohol and carbon dioxide.

18. 1) b

2) a

3) Respiratory quotient (RQ) or Respiratory ratio is nothing but the ratio of the volume of CO₂ evolved to the volume of O₂ consumed in respiration. It can be calculated by the formula given below,

$$RQ = \text{Volume CO}_2 \text{ evolved} / \text{Volume of O}_2 \text{ consumed}$$

4.) Respiration is referred as the oxidation reaction because it involves the breakdown of respiratory substrate in the presence of oxygen to release carbon dioxide water and a large amount of energy. This use of oxygen to produce energy from substrate is called as the oxidation reaction.

19. It takes place in the cytoplasm of the cell and is seen in all living entities. In this, glucose goes through partial oxidation for the formation of pyruvic acid(2 molecules). It is obtained from the sucrose in plants which is the resulting product of photosynthesis. Invertase converts sucrose into fructose and glucose

which enter into the glycolytic pathway. These are phosphorylated to produce glucose-6-phosphate which isomerizes to generate fructose-6-phosphate. A sequence of 10 reactions regulated by different enzymes occurs in glycolysis to yield pyruvate from glucose. The chief product of glycolysis is pyruvic acid. The cellular need decides pyruvate's metabolic fate. The three modes in which various cells manage pyruvic acid produced by glycolysis are – lactic acid fermentation, aerobic respiration, and alcoholic fermentation. Under anaerobic conditions in unicellular eukaryotes and prokaryotes, fermentation takes place. Krebs's cycle or aerobic respiration is observed in entities for the complete oxidation of glucose into carbon dioxide and water which requires the supply of oxygen.

20. The aerobic process of respiration occurs in the existence of oxygen and the function of oxygen is limited to the final phase of the process. Presence of oxygen is important as it drives the process by eliminating hydrogen from the system. Oxygen serves as the last hydrogen acceptor. In respiration, the energy of oxidation-reduction is used as opposed to the process of photophosphorylation where light energy is used for the generation of proton gradient that is required for phosphorylation. Hence it is called oxidative phosphorylation. Without oxygen, electrons cannot pass through the co-enzymes and in turn proton pump will not take place hence ATP will not be produced.

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