Shiksha Classes, Bhandara

Biology

Respiration In Plants

(1.) In the electron transport system present in the inner mitochondrial membrane, complexes I and IV are respectively

(a.) NADH Dehydrogenase and FAD H_2

(b.) NAD H_2 and NADH Dehydrogenase

(c.) NADH Dehydrogenase and cytochrome-c oxidase complex

(d.) NADH dehydrogenase and ATP synthase

(2.) In respiration incomplete oxidation of glucose is done under

(a.) Aerobic respiration

(b.) Anaerobic respiration

(c.) Both (a) and (b)

(d.) None of these

(3.) The cellular respiration first takes place in the

(a.) Cytoplasm

(b.) Golgi bodies

(c.) ER

(d.) Lysosomes

(4.) Which of the following scientist has given the scheme of glycolysis?

(a.) Gustav Embden *et. al*

(b.) Kreb *et. al*

(c.) Fritz Lipmann *et. al*

(d.) None of these

(5.) Which metabolic pathway is a common pathway to both anaerobic and aerobic metabolism?

(a.) Glycolysis

(b.) EMP pathway

(c.) Both (a) and (b)

(d.) None of the above

(6.) In mitochondria, enzyme cytochrome oxidase is present in

(a.) Outer membrane

(b.) Perimitochondrial space

(c.) Inner membrane

(d.) Matrix

(7.) TCA cycle enzymes are present in

(a.) Cytoplasm

(b.) Inter membrane space of mitochondria

(c.) Mitochondrial matrix

(d.) Inner membrane of mitochondria

(8.) Among the following, identify the substrate required for the only oxidative reaction that occurs in the process of glycolysis.

(a.) 3-phosphoglyceric acid

(b.) Glyceraldehyde 3-phosphate

(c.) Fructose-6-phosphate

(d.) Glucose-6-phosphate

(9.) Aerobic respiration is

(a.) The process in which complete oxidation of organic substances in the absence of oxygen

(b.) The process in which complete oxidation of organic substances in the presence of oxygen

(c.) The process in which incomplete oxidation of organic substances in the absence of oxygen

(d.) The process in which incomplete oxidation of organic substances in the presence of oxygen

(10.) What will happen, when glucose is administered orally?

(a.) Excretion

(b.) Digestion

(c.) Circulation

(d.) Respiration

(11.) How many ATP molecules could maximally be generated from one molecule of glucose, if the complete oxidation of one mole of glucose to carbon dioxide and water yields 686 kcal and the useful chemical energy available in the high energy phosphate bond of one mole of ATP is 12 kcal?

(a.) Two

(b.) Thirty

(c.) Fifty seven

(d.) One

(12.) In photosynthesis, $NADP\,H_2$ is formed but in respiration it forms during

(a.) HMP

(b.) ETS

(c.) Krebs' cycle

(d.) None of these

(13.) Plants does not need specialised respiratory organ because

(a.) Each plant part takes care of its own gas exchange needs

(b.) Plants do not need great demands for gas exchange

(c.) Both (a) and (b)

(d.) None of the above

(14.) Lactic acid is formed in

(a.) Fermentation

(b.) Glycolysis

(c.) HMP pathways

(d.) None of these

(15.) In which part of mitochondria does ATP synthesis occur?

(a.) F_1

(b.) F_0

(c.) Cristae

(d.) Inner membrane of mitochondria

(16.) In oxidative decarboxylation, enzyme used to

(a.) Pyruvate decarboxylase

(b.) Pyruvate dehydrogenase

(c.) Pyruvate hydrogeneticase

(d.) Pyruvate dehydrogeneticase

(17.) Select the wrong statement.

(a.) When tripalmitin is used as a substrate in respiration, the RQ is 0.7

(b.) The intermediate compound which links glycolysis with Krebs' cycle is malic acid

(c.) One glucose molecule yields a net gain of 36 ATP molecules during aerobic fermentation

(d.) One glucose molecule yields a net gain of 2 ATP molecules during fermentation

(18.) Enzymes found attached to inner membrane of mitochondria instead of matrix is/are

(a.) Succinic Dehydrogenase

(b.) Cytochrome oxidase

(c.) Both (a) and (b)

(d.) Malic Dehydrogenase

(19.) Four respiratory enzymes are given below. Arrange them in increasing order of the carbon number of the substrates on which they act.

I Enolase
II Aconitase
III Fumarase
IV Alcohol Dehydrogenase

(a.) II, IV, III, I

(b.) IV, I, II, III

(c.) I, IV, III, II

(d.) IV, I, III, II

(20.) Link enzyme in cellular respiration is

(a.) Citrate synthetase

(b.) Pyruvate Dehydrogenase

(c.) Isocitrate Dehydrogenase

(d.) Succinyl thiokinase

(21.) Beer and butter milk are products of fermentation by

(a.) Rhizopus stolonifer

(b.) *Caedobacter taeniospiralis*

(c.) Bacillus subtilis

(d.) Saccharomyces cerevisiae

(22.) Apparatus to measure rate of respiration and respiratory quotient is

(a.) Auxanometer

(b.) Potometer

(c.) Respirometer

(d.) Manometer

(23.) Acetyl Co-A binds to oxaloacetic acid to form

(a.) Formaldehyde

(b.) Citrate

(c.) Acetate

(d.) Isocitrate

(24.) In fermentation NADH is oxidised to NAD^+ in ….. rate

(a.) Fast

(b.) Slow

(c.) Usual

(d.) None of these

(25.) Last electron acceptor in respiration is

(a.) Oxygen (b.) Hydrogen

(c.) Carbon dioxide (d.) NADH

(26.) In animal cells, like muscle, during exercise when O_2 is inadequate for cellular respiration, pyruvic acid is reduced into lactic acid by

(a.) O_2 (b.) Carboxylation

(c.) Lactate dehydrogenase (d.) None of the above

(27.) Glucose break down takes place ….. in fermentation

(a.) Partially (b.) Completely

(c.) According to substrate (d.) None of these

(28.) Plants need one of the following for ATP formation

(a.) N and P (b.) N and Cu

(c.) N and Ca (d.) K

(29.) First vitamin to be produced through fermentation process using a wild bacterium was

(a.) Vitamin-D (b.) Vitamin-C

(c.) Vitamin- B_{12} (d.) Vitamin- B_2

(30.) Fate of pyruvic acid during aerobic respiration is

(a.) Lactic acid fermentation (b.) Alcoholic acid fermentation

(c.) Oxidative decarboxylation (d.) Oxidative phosphorylation

(31.) In respiration, respiratory substances can be used

(a.) Carbohydrate (b.) Protein

(c.) Organic acid (d.) All of these

(32.) In oxidative decarboxylation, only a carbon molecule of pyruvic acid is get oxidised, other two carbon molecule goes to form

(a.) Acetyl Co-A (b.) CO_2

(c.) Citric acid (d.) Both (a) and (b)

(33.) Enzymes of electron transport system are present in

(a.) Inner mitochondrial membrane (b.) Matrix

(c.) Intermembranous space (d.) Endoplasmic reticulum

(34.) Fungi are dependent on dead and decaying matter for feeding, it is called

(a.) Saprophytes (b.) Halophytes

(c.) Xerophytes (d.) Nanophytes

(35.) Which of the following reaction does not take place in the cell organelle, that is referred to as 'Power house of the cell'?

(a.) Glycine Decarboxylation
(b.) Glyceraldehyde 3-phosphate dehydrogenation
(c.) Fumaric acid hydration
(d.) Cytochrome oxidation

(36.) Which of the following is true regarding glycolysis?
I. Takes place in cytosol
II. Produces no ATP
III. Has no connection with electron transport chain
IV. Reduces two molecules of NAD^+ for every glucose molecule processed
Choose the correct option

(a.) Only I
(b.) I, II and III
(c.) I and II
(d.) None of these

(37.) The reaction which is catalysed by a protein that is not found in the matrix of mitochondria is

(a.) Conversion of pyruvic acid to acetyl coenzyme-A
(b.) Oxidative Decarboxylation of α-ketoglutaric acid
(c.) Oxidation of Succinic acid
(d.) Cleavage of Succinyl coenzyme-A

(38.) All enzymes of TCA cycle are located in the mitochondrial matrix except one, which is located in inner mitochondrial membranes in eukaryotes and in cytosol in prokaryotes. This enzyme is

(a.) Lactate Dehydrogenase
(b.) Isocitrate Dehydrogenase
(c.) Malate Dehydrogenase
(d.) Succinate Dehydrogenase

(39.) Identify enzyme A in the given reaction of Kreb's cycle

$$OAA + \text{Acetyl Co} - A + H_2O \xrightarrow{A} \text{Citric acid} + \text{Co} - A$$

(a.) Oxaloacetate synthetase
(b.) Citrate synthetase
(c.) Aconitase
(d.) Dehydrogenase

(40.) The enzymes for TCA cycle are present in

(a.) Plastids
(b.) Golgi complex
(c.) Mitochondria
(d.) Endoplasmic reticulum

(41.) Which one of the following is the terminal electron acceptor?

(a.) Molecular CO_2
(b.) Molecular O_2
(c.) Molecular H_2
(d.) $NADPH_2$

(42.) In electron transport system, which of the following acts as a final hydrogen acceptor

(a.) Oxygen
(b.) Hydrogen
(c.) Calcium
(d.) Ubiquinone

(43.) If a starving plant is provided with glucose, the rate of respiration would

(a.) First rise then fall (b.) Become constant

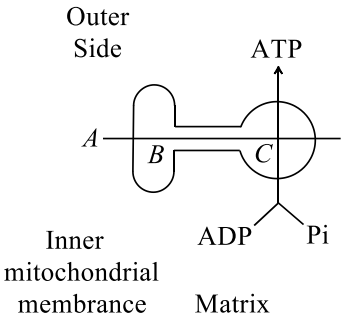
(c.) Decrease (d.) Increase

(44.) Which one is product of aerobic respiration?

(a.) Malic acid (b.) Ethyl alcohol

(c.) Lactic acid (d.) Pyruvic acid

(45.) Given below the diagrammatic presentation of ATP synthesis in mitochondria. Identify A-C and Choose the correct option accordingly



(a.) $A-H^+,\ B-F_1,\ C-F_0$ (b.) $A-3H^+,\ B-F_0,\ C-F_1$

(c.) $A-2H^+,\ B-F_0,\ C-F_1$ (d.) $A-5H^+,\ B-F_1,\ C-F_0$

(46.) In Krebs' cycle,

(a.) ADP is converted into ATP (b.) Pyruvic acid is converted into CO_2 and H_2O

(c.) Glucose is converted into CO_2 (d.) Pyruvic acid is converted into ATP

(47.) Decline in the activity of the enzyme Hexokinase by glucose-6-phosphate is caused by

(a.) Non-competitive (b.) Competitive inhibitors

(c.) Allosteric modulators (d.) Denaturation of enzyme

(48.) In which of the following reactions of glycolysis, oxidation takes place?

(a.) Glucose 6-PO_4 to fructose 6-PO_4 (b.) Glyceraldehydes 3-phosphate to 1, 3-diphosphoglycerate

(c.) 1,3-diphosphoglycerate to 3-phosphoglycerate (d.) 2-phosphoglycerate to phosphoglycerate

(49.) During conversion of pyruvic acid into acetyl Co-A, pyruvic acid is

(a.) Oxidized (b.) Reduced

(c.) Isomerized (d.) Condensed

(50.) During anaerobic respiration in yeast

(a.) H_2O and CO_2 are end-products

(b.) CO_2 , ethanol and energy are end-products

(c.) CO_2 , and H_2O are end-products

(d.) CO_2 , acetic acid and energy are end-products

ANSWER

(1.)	c	**(2.)**	b	**(3.)**	a	**(4.)**	a	**(5.)**	c
(6.)	c	**(7.)**	c	**(8.)**	c	**(9.)**	b	**(10.)**	d
(11.)	b	**(12.)**	a	**(13.)**	c	**(14.)**	a	**(15.)**	a
(16.)	b	**(17.)**	b	**(18.)**	c	**(19.)**	d	**(20.)**	b
(21.)	d	**(22.)**	c	**(23.)**	b	**(24.)**	b	**(25.)**	b
(26.)	c	**(27.)**	a	**(28.)**	a	**(29.)**	b	**(30.)**	c
(31.)	d	**(32.)**	a	**(33.)**	a	**(34.)**	a	**(35.)**	b
(36.)	a	**(37.)**	c	**(38.)**	d	**(39.)**	b	**(40.)**	c
(41.)	b	**(42.)**	a	**(43.)**	d	**(44.)**	a	**(45.)**	c
(46.)	b	**(47.)**	c	**(48.)**	b	**(49.)**	a	**(50.)**	b

EXPLANATION

(1.) (**c**)
Complex I of electron transport system (ETS) is NADH dehydrogenase, which oxidase NADH produced in the mitochondrial matrix during citric acid cycle. Complex IV of cytochrome-and a_3 and two copper centres.

(2.) (**b**)
In fermentation, incomplete oxidation of glucose is achieved under anaerobic condition by sets of reactions where pyruvic acid is converted to CO_2 ethanol and sometimes lactic acid

(3.) (**a**)
The cellular respiration first takes place in the cytoplasm.

(4.) (**a**)
The scheme of glycolysis was given by Gustav Embden, Otto Mayerhof and J Parnas. It is the only process in respiration for anaerobic organism. It is often referred as the EMP pathway

(5.) (**c**)
Glycolysis was discovered by Gustav Embden, Otto Mayerhof and J Parnas. To give honour to them the glycolysis pathway is also called EMP pathway by taking initial name of theirs

(6.) (**c**)
Mitochondria contains various enzymes as follows:
1.Outer Membrane: Acetyl transferase, glycerophosphatase, phospholipase-A, monoamine oxidase, etc.
2.Inner Membrane: Cytochrome oxidase, dehydrogenase, succinate, NADH dehydrogenase, ATPase, etc.
3.Perimitochondrial Space: Adenylate kinase, nucleoside diphosphokinase, etc.
4.Matrix : Pyruvate dehydrogenase, citrate synthase, Aconitase, isocitrate dehydrogenase, fumerase, α-ketogulatrate dehydrogenase, malate dehydrogenase, etc.

(7.) (**c**)
In eukaryotes, all the reactions of tricarboxylic acid (TCA) cycle or Krebs' cycle takes place in the matrix of mitochondria because all enzymes of this cycle are found in the matrix of mitochondria except Succinic dehydrogenase, which is located in the inner membrane of mitochondria.
In prokaryotes, Krebs' cycle occurs in cytoplasm.

(8.) (**c**)
Glyceraldehyde-3-phosphate is required for the oxidative reaction during glycolysis.

(9.) (**b**)
Aerobic respiration occurs in the presence of oxygen that leads to a complete oxidation of organic substances and releases CO_2, water and a large amount of energy. This type of respiration is most common in higher organism

(10.) (**d**)
On administration of glucose orally respiration will take place.

(11.) (**b**)
30 ATP molecules could be generated from 686 kcal energy.

(12.) (**a**)
NADPH is formed during light reaction of photosynthesis and also formed during hexose monophosphate shunt (HMP shunt) of glucose oxidation.

(13.) (**c**)
Plants can get along without respiratory organ because plant part takes care of its own gas exchange needs and less demand for gas exchange. Because only during photosynthesis are large

volumes of gases exchanges and each leaf is well adapted to take care of its own needs, during these period

(15.) (**a**)

During the oxidation process (occurs in inner mitochondrial membrane during electron transport system) enormous amount of free energy is released, some of which is utilized by inner membrane sub units of

F_1 particles containing three coupling factors and ATPase enzyme, in the synthesis of ATP molecules.

(16.) (**b**)

Pyruvate which is formed by the glycolytic catabolism of carbohydrate undergoes oxidative decarboxylation by a complex set of reactions catalysed by pyruvate dehydrogenase

(17.) (**b**)

The intermediate compound which link glycolsis with Krebs' cycle is acetyl Co-A.

(18.) (**c**)

All the enzymes of Krebs' cycle, fatty acid synthesis and amino acid synthesis are found in matrix but **Succinic dehydrogenase** and **cytochrome oxidase** are present on inner membrane of mitochondria.

(19.) (**d**)

Enolase works on 2-phosphoglyceric acid (3C-compound), Aconitase on citric acid (6C-compound). Fumerase on Fumaric acid (4C-compound) and alcohol dehydrogenase on acetaldehyde (2C-compound). Thus, increasing order of these enzymes based on the carbon number of the substrates on which they act is – IV, I, III, II.

(20.) (**b**)

Pyruvic acid synthesized in glycolysis must enter inside the mitochondnia, where oxidative Decarboxylation occurs in presence of NAD^+, pyruvic acid Dehydrogenase complex and coenzyme-A.

$$\text{Pyruvic acid} + NAD^+ + \text{Co-A} \xrightarrow[+\text{Co-A}]{} \text{Acetyl Co-A} + CO_2 + NADH$$

(21.) (**d**)

Saccharomyces cerevisiae is a species of budding yeast. It is commonly known as 'baker's yeast' or 'brewer's yeast'. The yeast ferments sugars present in the flour or added to the dough, giving off carbon dioxide (CO_2) and alcohol (ethanol). The carbon dioxide is trapped as tiny bubbles in the dough, which rises.

(22.) (**c**)

Respiration and respiratory quotient is measured by respirometer

(23.) (**b**)

In Krebs' cycle, acetyl Co-A adds its two-carbon fragment to oxaloacetate, a four-carbon compound. The unstable bond of acetyl Co-A is broken as oxaloacetate the coenzyme and attaches to the acetyl group. The product is the 6C-citrate.

(24.) (**b**)

NADH is oxidised to NAD^+ slowly in fermentation, through the reaction is very vigorous in case of aerobic respiration

(25.) (**b**)

Electron transport chain takes place in the inner mitochondrial membrane and consists of flavins, ubiquinone, cytochromes and oxygen as electron carriers.

Sequence of electron transport :

$$NADH_2 \rightarrow FAD \rightarrow \text{Co-Q} \rightarrow$$

$$\text{Cytochrome -b} \rightarrow \text{Cyt-}c_1 \rightarrow \text{Cyt-a} \rightarrow \text{Cyt} - a_3 \rightarrow O_2$$

(26.) (**c**)
During exercise where O_2 is inadequate for cellular respiration, pyruvic acid is reduced into lactic acid by lactate dehydrogenase
(27.) (**a**)
Fermentation accounts for only a partial breakdown of glucose whereas in aerobic respiration it is completely degraded to CO_2 and H_2O
(28.) (**a**)
N and P are required by plants for ATP formation.
(30.) (**c**)
Pyruvic acid, generated in the cytosol is transported to mitochondria and thus initiate the second phase of respiration. Before pyruvic acid enters Kreb's cycle, operative in the mitochondria, one of the three carbon atoms of pyruvic acid is oxidised to carbon dioxide in a reaction called oxidative decarboxylation
(31.) (**d**)
Usually carbohydrate are oxidised to release energy, but proteins, fats and even organic acids can be used as respiratory substances in some plants, under certain condition
(32.) (**a**)
One of the three carbon atoms of pyruvic acid is oxidised to carbon dioxide. The combination of the remaining two carbon acetate unit is readily accepted by a sulphur containing compound coenzyme A (Co-A) to form acetyl Co-A. This is the connecting link between glycolysis and Kreb's cycle
(33.) (**a**)
In eukaryotes, electron transport and oxidative phosphorylation occur in the inner membrane of mitochondria. The significant enzymes of inner mitochondrial membrane are enzymes of electron transport pathways viz. NAD, FAD, DPN (diphosphopyridine nucleotide) dehydrogenase, five cytochromes (cytochrome-b, cytochrome-c, cytochrome-c_1, cytochromes-a and cytochrome-a_3), ubiquinone or coenzyme-Q_{10}, non-haem copper and iron, ATP synthetase, succinate fatty acid acyl transferase.
(34.) (**a**)
Saprophytes like fungi are dependent on dead and decaying matter
(35.) (**b**)
Mitochondria are known as power house of cell. Glyceraldehyde-3-phosphate dehydrogenation reaction is found in cytoplasm during glycolysis, other three reactions take place in mitochondria.
(36.) (**a**)
In the process of glycolysis, 6 carbon molecules of glucose is split into 2, 3-carbon molecules of pyruvic acid. In this, one molecules of NAD^+ are reduced for each glucose molecule. The energy stored with the NADH is released in the electron transport chain. This process (glycolysis) occurs in cytosol
(37.) (**c**)
The oxidation of Succinic acid to Fumaric acid in Krebs' cycle is catalyzed by Succinic dehydrogenase. Succinic dehydrogenase is attach to mitochondrial inner membrane.
(38.) (**d**)
Succinate dehydrogenase enzyme is present on inner membrane of mitochondria and catalysed the oxidation of succinate to fumarate.
(39.) (**b**)

The TCA cycle starts with the condensation of acetyl group with oxaloacetic acid (OAA) and water to yield citric acid. The reaction is catalyzed by the enzyme citrate synthase and molecule of Co-A is released

(40.) (**c**)

Krebs' cycle is also called as citric acid cycle because citric acid is the first product of this cycle and also called Tricarboxylic acid cycle (TCA) because citric acid is a called Tricarboxylic acid.

In eukaryotic organisms, all reactions of Krebs' cycle take place in matrix of mitochondria because all enzymes of this cycle are found in matrix of mitochondria except Succinic dehydrogenase (located in inner membrane of mitochondria).

(41.) (**b**)

In electron transport chain, cytochrome-a is an electron carrier, which contains copper with iron. It picks up electrons to oxygen. Therefore, oxygen accepts the terminal electrons.

(42.) (**a**)

In electron transport system oxygen acts as the final hydrogen acceptor where it derives the whole process by removing hydrogen from the system

(43.) (**d**)

If a starving plant is provided with glucose, its rate of respiration will increase because of the availability of food for respiration.

(44.) (**a**)

Malic acid is a product of aerobic respiration. Ethyl alcohol and lactic acid are formed as a result of anaerobic respiration (fermentation), while pyruvic acid is produced during both-aerobic and anaerobic respiration.

(45.) (**c**) $A - 2H^+$, $B - F_0$, $C - F_1$

(46.) (**b**) In Krebs' cycle, pyruvic acid is converted into carbon dioxide and water.

(47.) (**c**)

An enzyme may have areas that control the confirmation of active sites. They are called Allosteric sites. Such an enzyme is called Allosteric enzyme, e.g., glucokinase, phosphofructokinase. Substance, which bring about changes in Allosteric sites are called modulators.

(48.) (**b**)

In glycolytic pathway, 3PGAL is converted into 1, 3-diphosphoglyceric acid by an oxidation and phosphorylation reaction, which occurs in presence of H_3PO_4 and coenzyme NAD.

3-phosphoglyceraldehyde + NAD^+ + Pi^{-2} $\rightarrow$ 3-phosphoglyceraldehyde dehydrogenase 1, 3-diphosphplyceric acid + NADH + H^+

(49.) (**a**)

Pyruvic acid forms as a result of glycolysis in cytoplasm of cell. Oxidation of pyruvic acid into acetyl Co-A begins the citric acid cycle (Krebs' cycle) in mitochondria.

(50.) (**b**)

When oxygen is not available, yeast or some other microbes respire anaerobically. In case of anaerobic respiration, the value of respiratory quotient is not utilized, eg,

$$C_6H_{12}O_6 \xrightarrow{\text{Zymase}} 3C_2H_5OH + 2CO_2 + \text{Energy}$$

Glucose Ethyl alcohol