



# BIOLOGY

## BOOKS - MODERN PUBLICATION

### RESPIRATION IN PLANTS

#### Exercise

1. What is the net gain of ATP molecules during glycolysis?



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2. What is Robinson's ester and Newber's ester?



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3. Name the reactant used and products formed during oxidation of pyruvic acid.



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4. What is hexose monophosphate (HMP) pathway?



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5. Name a inhibitor of oxidative phosphorylation.



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6. What is pasteur effect?



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7. Name a inhibitor of oxidative phosphorylation.



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8. What is amphibolic pathway?



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**9.** How the Krebs cycle acts as central pathway of respiration?



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**10.** Why fruits and seeds are stored at low temperature?



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**11.** Why mercury is used in anaerobic respiration experiments?



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**12.** How cell respiration differs from combustion?



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**13.** Name the common intermediated of carbohydrate and fat metabolism.



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**14.** How many ATP molecules could maximally be generated from one molecule of glucose,if the complete oxidation of one mole of glucose to  $CO_2$  and  $H_2O$  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.

**Answer:**



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**15.** All enzymes of TCA cycle are located in the mitochondrial matrix except one which is located in inner mitochondrial membranes in



eukaryotes and cytosol in prokaryotes. This enzyme is:

- A. Isocitrate dehydrogenase
- B. malate dehydrogenase
- C. Succinate dehydrogenase
- D. Lactate dehydrogenase

**Answer:**



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**16.** The overall goal of glycolysis, Krebs cycle and electron transport system is the formation of:

A. ATP in large oxidation reaction

B. Sugars

C. nucleic acids

D. ATP in small stepwise units.

**Answer:**



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17. The net gain of ATP molecules in glycolysis is:

A. 8

B. 2

C. 4

D. 0

**Answer:**



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18. Maximum number of ATP is obtained from:

A. Glucose

B. Palmitic acid

C. Malic acid

D.  $\beta$  - amino acid

**Answer:**



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19. Which of the following cell do not respire?

A. Epidermal cell

B. Cork cell

C. RBC

D. Sieve tube cell

**Answer:**



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**20.** During which stage is the complete oxidation of glucose are the greatest number of ATP molecules formed from ADP?

A. Conversion of pyruvic acid to acetyl Co-A

B. Electron transport chain

C. Glycolysis

D. Krebs cycle.

**Answer:**



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**21.** Chemiosmotic theory of ATP synthesis in the chloroplasts and mitochondrial is based on

A. Proton gradient

B. Accumulation of K ions

C. Accumulation of Na ions

D. Membrane potential

**Answer:**



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**22.** Link between glycolysis, Krebs cycle and  $\beta$ -oxidation of fatty acid or carbohydrate and fat metabolism is:

A. Acetyl CoA

B. A compound formed by oxidative decarboxylation

C. A 2 - carbon compound

D. oxaloacetic acid

**Answer:**



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**23.** Last electron acceptor in respiration is:



A.  $O_2$

B.  $H_2$

C.  $CO_2$

D. and H

**Answer:**



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**24.** In glycolysis, during oxidation electrons are removed by:

A. ATP in large oxidation reaction

B. Glyceraldehyde 3 phosphate

C. NAD

D. Molecular oxygen

**Answer:**



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**25.** Dough kept overnight in warm weather becomes soft and spongy because of:

A. Absorption of carbon dioxide from atmosphere

B. Fermentation

C. Cohesion

D. Osmosis.

**Answer:**



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**26.** Plants adapted to low light intensity have:

- A. Larger photosynthetic unit size than the sun plants
- B. Higher rate of  $CO_2$  fixation than the sun plants
- C. More extended root system
- D. Leaves modified to spines.

**Answer:**



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27. The pyruvic acid formed during glycolysis is oxidised to  $CO_2$  and  $H_2O$  in a cycle called:

- A. Calvin cycle
- B. Nitrogen cycle
- C. Hill reaction
- D. Krebs's cycle

**Answer:**



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28. Respiratory quotient (RQ) is one in case of:

- A. Fatty acids
- B. Nucleic acid
- C. Carbohydrates
- D. Organic acid

**Answer:**



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29. Which of the following three organelles are involved in photorespiration?

A. Chloroplast, mitochondrion, glyoxysome

B. Chloroplast, peroxisome, mitochondrion

C. Chloroplast, lysosome, peroxisome

D. chloroplast, lysosome, glyoxysome.

**Answer:**



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30. R.Q is less than one when aerobic respiration takes place in fats or proteins.

A. Carbohydrates are used as respiratory substrate

B. Organic acids are used as respiratory substrate

C. The oxidation of the respiratory substrate consumed more oxygen than the amount  $CO_2$  released



D. the oxidation of the respiratory substrate consumed less oxygen, than the amount of  $CO_2$  release.

**Answer:**



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**31.** Match the number of carbon atoms given in List 1 with that of the compounds given in

List II and select correct option:

List I	List II
A. 4C compound	1. Acetyl CoA
B. 2C compound	2. Pyruvate
C. 5C compound	3. Citric acid
D. 3C compound	4. $\alpha$ -ketoglutaric acid
	5. Malic acid

A. A-2,B-5,C-3,D-1

B. A-3,B-1,C-4,D-2

C. A-5,B-1,C-4,D-2

D. A-5,B-3,C-,D-2.

**Answer:**



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32. In which of the following reaction of glycolysis, a molecule of water is removed from the substrate?

A. Fructose-6-phosphate  $\rightarrow$  fructose-1,6-bisphosphate

B. 3-phosphoglycerate  $\rightarrow$  1,3-bisphosphoglyceric acid

C. *PEP*  $\rightarrow$  pyruvic acid

D. 2-phosphoglycerate  $\rightarrow$  *pPEP*.

**Answer:**



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**33.** What is the name of triphosphate bonds of ATP?

A. A proton gradient forms across the inner membrane

B. There is a change in the permeability of the inner mitochondrial membrane toward adenosine diphosphate (ADP)

C. High energy bonds are formed in  
mitochondrial proteins

D. ADP is pumped out of the matrix into  
intermembrane space.

**Answer:**



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**34.** In germinating seeds fatty acids are  
degraded exclusively in the:

A. Peroxisomes

B. mitochondria

C. Proplastids

D. Glyoxysomes

**Answer:**



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**35.** The energy -releasing process in which the substrate is oxidized without an external electron acceptor is called

A. Aerobic respiration

B. Glycolysis

C. Fermentation

D. Photorespiration

**Answer: In cellular respiration, the final acceptor molecule of proton is :**



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**36. Most of the enzymes of TCA cycle are present in:**

A. Cytoplasm

B. Inter membrane space of mitochondria

C. Mitochondrial matrix

D. Inner membrane of mitochondria

**Answer:**



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**37.** in hurdle race, what is the major energy source of the leg muscle?



A. Preformed ATP

B. Glycolysis

C. Pyruvate and lactate

D. Oxidative metabolism

**Answer:**



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**38. Oxidative phosphorylation refers to:**

A. Anaerobic production

B. Anaerobic productin of ATP

C. Citric acid cycle production of ATP

D. Production of ATP by chemiosmosis

**Answer: Alcoholic fementation.**



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**39.** Acetyl CoA produced from pyruvate by:

A. Oxidative decarboxylationb

B. Oxidative hotophosphorylation

C. Oxidative hydrogenation

D. Oxidative photorespiration

**Answer:**



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**40.** Aerobic respiratory pathways is appropriately termed:

A. Catabolic

B. Parabolic

C. Amphibolic

D. Anabolic

**Answer:**



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**41.** The process by which ATP is produced in the inner membrane of a mitochondrion. The electron transport system transfers protons from the inner compartment of the outer, as the protons flow back to the inner

compartment, the energy of their movement is used to add phosphate to ADP, forming ATP:

- A. Chemiosmosis
- B. Phosphorylation
- C. Glycolysis
- D. Fermentation.

**Answer:**



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42. In citric acid cycle, the step which is not mediated by dehydrogenase enzyme is:

- A. Oxaloacetic acid to citric acid
- B. Citric acid to  $\alpha$ ketoglutaric acid
- C. Succirnic acid to fumaric acid
- D. Malilc acid to oxaloacetic acid

**Answer:**



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43. in mitochondrial electron transport system, for every two pairs of electrons that pass from and molecules through a sequential series of cytochrome enzymes to molecular oxygen generate:

A. 3 ATP

B. 4 ATP

C. 6 ATP

D. 2 ATP

**Answer:**





44. During alcoholic fermentation by yeast two molecules of glucose produce:

A. 2 molecules of ethanol + 2 molecules of



B. 4 molecules of ethanol + 4 molecules of



C. 6 molecules of ethanol + 6 molecules of





D. 3 molecules of ethanol + 3 molecule of  $CO_2$ .

**Answer:**



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**45.** In a triangle, the angle opposite to the longer side is :

A. Cytochrome f

B. Plastocyanin

C. Cytochrome  $B_6$

D. Quinone

**Answer:**



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**46.** Which of these steps in Krebs cycle indicates substrate level phosphorylation ?

A. Conversion of succinic acid to  $\alpha$  ketoglutaric acid

B. Conversion of succinic acid to malic acid

C. Conversion of succinly CoA to succinic acid

D. Convesion off malic acid to oxaloacetic acid

**Answer:**



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47. In the electron transport system present in the inner mitochondrial membrane, complex I and IV are respectively:

A.  $NADH$  dehydrogenase and  $FADH_2$

B.  $FADH_2$  and  $NADH$  dehydrogenase

C.  $NADH$  dehydrogenase and cytochrome oxidase complex

D.  $NADH$  dehydrogenase and ATP synthase

**Answer:**





**48.** Select the wrong statement

A. When tripalmitin is used as a substrate in respiration the R.Q 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

respiration

D. One glucose molecule yields a net gain of 2 ATP molecules during fermentation

**Answer:**



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**49.** Which of the following minerals activate the enzymes involved in respiration?

A. Nitrogen and phosphorus

B. Magnesium and manganese

C. Potassium and calcium

D. Sulphur and iron

**Answer:**



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**50.** Fill the following sentences with suitable word:

..... is the process of respiration which occurs in the absence of oxygen.



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51. Fill the following sentences with suitable word:

During glycolysis .... molecules of NADH and  $H_2$  are formed.



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52. Fill the following sentences with suitable word:



Enzymes takin part in glycolysis are located in

.....



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**53.** Fill the following sentences with suitable word:

Oher namne of glycolysis is .....



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**54.** Fill the following sentences with suitable word:

During respiration pyruvic acid is formed by the process of .....



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**55.** Fill the following sentences with suitable word:

The universal hydrogen acceptor is .....



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**56.** Fill the following sentences with suitable word:

The final electron acceptor in respiration is .....



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**57.** Fill the following sentences with suitable word:

The enzyme ATP -synthetase is located in .....



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**58.** Fill the following sentences with suitable word:

Mitochondrial matrix has the enzymes of .....



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**59.** Fill the following sentences with suitable word:

Main source of ATP in a cell is .....





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**60.** Fill the following sentences with suitable word:

Respiratory quotient for glucose is .....



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**61.** Fill in the blank

Tricarboxylic acid cycle is another name of .....



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**62.** Fill the following sentences with suitable word:

Coenzyme FAD removes H-atoms from .....



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**63.** Fill the following sentences with suitable word:

Fermentation of glucose by the yeast cells produces ..... and .....



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**64.** Fill the following sentences with suitable word:

Anaerobic respiration was first reported by.....



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**65.** Fill the following sentences with suitable word:

Acetyl Co-A is formed from ..... and coenzyme A.



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**66.** Fill the following sentences with suitable word:

In prokaryotes,..... molecules of ATP are formed per molecule of glucose oxidised.



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**67.** Fill the following sentences with suitable word:

Breakdown of glucose is called.....while formation of glucose from non -carbohydrate sources is called .....



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**68.** Fill the following sentences with suitable word:

..... involves the removal of amino from

amino acid while ..... involves transfer of amino group from one amino acid to a  $\alpha$ -keto acid to form a new amino acid.



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**69.** Fill the following sentences with suitable word:

Acceptor molecule of Krebs cycle is ..... while the substrate molecule of Krebs cycle is .....



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70. Match the term column A with suitable terms in column B :

Column A	Column B
(i) TCA-Cycle	(a) EMP-Pathway
(ii) Inner mitochondrial membrane	(b) Respiratory fuel
(iii) Oxidative phosphorylation	(c) Fermentation
(iv) Glycolysis	(d) Mitochondria
(v) Glucose	(e) Alcohol fermentation
(vi) Ratio of $\text{CO}_2$ produced to oxygen consumed	(f) Hans Krebs
(vii) Aerobic respiration	(g) ATP-synthetase
(viii) Anaerobic respiration	(h) Muscle-fatigue
(ix) Yeast	(i) $\text{F}_0\text{-F}_1$ particles
(x) Lactic acid	(j) Respiratory quotient.



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71. Match the term column A with suitable terms in column B :

Column A	Column B
(i) TCA-Cycle	(a) EMP-Pathway
(ii) Inner mitochondrial membrane	(b) Respiratory fuel
(iii) Oxidative phosphorylation	(c) Fermentation
(iv) Glycolysis	(d) Mitochondria
(v) Glucose	(e) Alcohol fermentation
(vi) Ratio of CO <sub>2</sub> produced to oxygen consumed	(f) Hans Krebs
(vii) Aerobic respiration	(g) ATP-synthetase
(viii) Anaerobic respiration	(h) Muscle-fatigue
(ix) Yeast	(i) F <sub>1</sub> -F <sub>0</sub> particles
(x) Lactic acid	(j) Respiratory quotient.



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**72. Write True or False:**

Three molecules of ATP are synthesized during glycolysis.



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**73.** Write True or False:

Anaerobic respiration in muscle cell lead to formatin of lactic acid.



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**74.** Write True or False:

In most eukjaryotic cell,the net gain of ATP per glucose molecule oxidised is 38 ATP.



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**75.** Write True or False:

Glycolysis takes place in the matrix of mitochondria.



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**76.** True or False

Fermentation is conducted by all micro-organisms.



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**77. True or False**

End product of Krebs cycle is pyruvic acid.



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**78. True or False**

Terminal cytochrome of the respiratory chain is

$a_3$ .



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**79.** True or False

Aerobic respiration produces energy about 18 times than in anaerobic respiration.



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**80.** True or False

R.Q. for malic acid is less than one.



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**81.** Write True or False:

Oxidation of one molecule of pyruvic acid produces 15 ATP molecules.



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**82.** R.Q is less than one when aerobic respiration takes place in fats or proteins.



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**83.** Glycolysis is also called EMP pathway.



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**84.** During strenuous exercise or physical work, the demand for oxygen increases several fold so that it does not diffuse into skeletal muscle fibers at the rates required by them.



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**85.** In Kerb's cycle malate is dehydrogenated to produce oxaloacetate.



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**86.** NAD functions in cell respiration as an co-enzyme.



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**87.** Transfer of energy in animal cell is in the form of ATP.



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**88.** Largest amount of phosphate bond energy is produced in the process of respiration during glycolysis.



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**89.** Potential energy stored in organic molecules is converted into chemical energy in high energy phosphate bonds of ATP.



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**90.** What are the differences between mitochondria and chloroplast?



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**91.** These questions consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses.

If both Assertion and Reason are true and Reason is correct explanation of Assertion.

If both assertion and Reason are true but reason is not correct explanation of Assertion.

If Assertion is true but Reason is false.

If both Assertion and Reason are false.

Assertion: In animal cells, first phase in breakdown of glucose is Krebs' cycle.

Reason:EMP pathway is another name for  
Krebs' cycle.

A. A

B. B

C. C

D. D

**Answer:**



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**92.** These questions consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses.

If both Assertion and Reason are true and Reason is correct explanation of Assertion.

If both assertion and Reason are true but reason is not correct explanation of Assertion.

If Assertion is true but Reason is false.

If both Assertion and Reason are false.

Assertion: There are 4 carbon atoms in an oxaloacetic acid molecule, which joins with an



acetyl group during step I Krebs' citric acid cycle.

Reason: There are 6 carbon atoms in citric acid molecule.

A. A

B. B

C. C

D. D

**Answer:**



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**93.** These questions consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses.

If both Assertion and Reason are true and Reason is correct explanation of Assertion.

If both assertion and Reason are true but reason is not correct explanation of Assertion.

If Assertion is true but Reason is false.

If both Assertion and Reason are false.

Assertion: Mitochondria is known as power

house of cell.

Reason:ATP production takes place here.

A. A

B. B

C. C

D. D

**Answer:**



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**94.** Name the unit of oxidative phosphorylation.



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**95.** Give the location of enzymes of TCA-cycle.



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**96.** Give the full form of EMP-pathway.



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**97.** How many calories are produced by aerobic oxidation of 1 gm mole of glucose?



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**98.** Which organic compound acts as link between glycolysis and Krebs cycle?



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99. What are end-products of glycolysis?



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100. How many  $NADH_2$  molecules are produced from one molecule of Acetyl CoA in TCAcycle?



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**101.** Name the final acceptor of electrons in ETC.



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**102.** Give the number of ATP molecule produced from one glucose molecule in aerobic respiration.



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**103.** Name four parts of cell respiration.



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**104.** Name the first product formed in TCA cycle.



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**105.** Give the location of glycolysis.



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**106.** Name the energy currency of cell.



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**107.** Who proposed the chemiosmotic mechanism of ATP synthesis?



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**108.** What is first electron carrier on the Route-  
II ETC?



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**109.** By which process, the fatty acids change  
into Acetyl CoA?



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**110.** Why does anaerobic respiration produce less energy than aerobic respiration?



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**111.** Name the four steps of oxidation in Krebs' cycle.(TCA)



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**112.** What is fermentation? name any two organic compounds produced in this process.



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**113.** What is glycolysis? Name the two monosaccharide which readily enter the glycolytic pathway.



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**114.** What is meant by Respiration Quotient (R.Q.)? When will be the value of R.Q be 1 and when will be it less than 1?



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**115.** What are the chemical changes in a pyruvic acid molecule before it enters mitochondria?



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**116.** Name the end products of aerobic and anaerobic glycolysis. List the two ways by which molecules of ATP are produced in glycolysis during aerobic respiration in a cell.



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**117.** Where is electron transport system located in the cell?



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**118.** Differentiate between: Glycolysis and Krebs' cycle



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**119.** Define R.Q. What is its significance?



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**120.** What is oxidative decarboxylation? What happens to pyruvate immediately after this

reaction? Name the enzyme involved in this reaction.



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**121.** What is the end product of glycolysis in aerobes and where does this process occur ?  
List the conditions under which the fermentation occurs in plant cell?



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**122.** What is the importance of  $F_0 - F_1$  particles in ATP production during aerobic respiration.



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**123.** What is compensation point ? Explain it briefly.



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**124.** Define R.Q. (Respiratory Quotient). Give R.Q., if respiratory substrate is oxalic acid, tripalmitin and glucose.



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**125.** What is fermentation? name any two organic compounds produced in this process.



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**126.** What is glycolysis? Name the two monosaccharide which readily enter the glycolytic pathway.



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**127.** What is meant by R.Q. ? Why does its value differ for different substrate?



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**128.** Describe the process of oxidation of pyruvic acid during anaerobic respiration.



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**129.** Give list of components of ETS.



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**130.** Write the significance of Citric acid cycle.



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**131.** What are redox reactions?



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**132.** Where is electron transport system operative in mitochondria? Explain the system highlighting the role of oxygen.



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**133.** What is RUBISCO ?How does it act as oxygenase?



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**134.** Write a note on photorespiration.



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**135.** What is anaerobic respiration?Explain the types of fermentation.



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**136.** Write schematic representation of Krebs cycle.



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**137.** Describe briefly process of glycolysis.



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**138.** How do plants synthesize ATP during respiration?



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**139.** How does oxidative phosphorylation differ from photophosphorylation? Explain.



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**140.** Differentiate between  $C_3$  and  $C_4$  photosynthetic pathways.



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**141.** Explain the major steps in Krebs cycle. Why this cycle also called citric acid cycle?



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**142.** Give a simple graphic representation of Calvin cycle.



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**143.** How are glycolysis ,Krebs cycle and ETS linked?



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**144.** Write six difference between alcoholic fermentation and lactic acid fermentation.



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**145.** Differentiate between: Glycolysis and Krebs' cycle



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**146.** Illustrate the mechanism of electron transport system(ETS).



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**147.** What is shuttle system? Give its role also.



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**148.** Depict an outline of pathways of anaerobic respiration.



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**149.** Explain the process of crassulacean acid metabolism? How is it advantageous to plants?



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**150.** Explain the major steps in Krebs cycle. Why this cycle also called citric acid cycle?



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## Example

1. Differentiate between respiration and combustion



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2. Differentiate between: Glycolysis and Krebs' cycle



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### 3. Differentiate :

Aerobic respiration and anaerobic respiration



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4. What are respiratory substrates? Name the most common respiratory substrate.



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5. Give the schematic representation of glycolysis?



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6. What are the main steps in aerobic respiration? Where does it take place?



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7. Give the schematic representation of an overall view of Krebs' cycle.



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**8.** Explain ETS.



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**9.** Distinguish between the following: Aerobic respiration and Anaerobic respiration



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**10.** Distinguish between the following:  
Glycolysis and Fermentation





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**11.** Distinguish between the following:  
Glycolysis and Citric acid Cycle



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**12.** What are the assumptions made during the calculation of net gain of ATP?



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13. Discuss 'The respiratory pathway is an amphibolic pathway.'



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14. Define RQ. What is its value for fats?



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15. What is oxidative phosphorylation?



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**16.** What is the significance of step-wise release of energy in respiration?



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