



## BIOLOGY

### BOOKS - TRUEMAN BIOLOGY

### RESPIRATION IN PLANTS

#### Multiple Choice Questions

1. Respiration is

- A. anabolic and exothermic
- B. anabolic and endothermic
- C. catabolic and endothermic
- D. catabolic exothermic

**Answer: D**



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2. in the process of respiration in plants 180 gms of sugar plus 192 gms of oxygen produce

A.  $132gCO_2 + 54gH_2O + 337k$  cal

B.  $264gCO_2 + 108gH_2O + 686k$  cal

C. 528 g  $CO_2$  + 216 g water+ 686 kcal

D. Large amount of  $CO_2$  and energy

**Answer: B**



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3. When respiratory substrate is fat, respiration is called

A. protoplasmic respiration

B. floating respiration

C. cellular respiration

D. dark respiration

**Answer: B**



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4. The efficiency of respiration is approximately

A. 40%

B. 50%

C. 60%

D. 100%

**Answer: C**



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5. Glyceraldehyde phosphate is oxidised in glycolysis. What is the fate of hydrogen atom and electron liberated. They cause

- A. They reduce  $NAD^+$
- B. They oxidise  $NAD^+$
- C. They are transferred to Pyruvic acid
- D. They are removed by FAD

**Answer: A**



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6. In the formation of Acetyl Co-A from pyruvic acid in mitochondria, pyruvic acid gets

- A. oxidised
- B. decarboxylated
- C. both (1) and (2)

D. reduced and isomerised

**Answer: C**



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7. When a yeast produces wine, which is not formed ?

A. Acetaldehyde

B. Ethyl Alcohol

C.  $CO_2$

D. Acetyl coenzymeA

**Answer: D**



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8. The net gain of glycolysis of one molecule of glucose is the formation of

- A.  $2\text{NADH} + \text{H}^+ + 4\text{ATP} + 1$  Pyruvic acid
- B.  $2\text{NADH} + \text{H}^+ + 2\text{ATP} + 2$  Pyruvic acid
- C.  $2\text{ATP} + 2\text{NADH} + \text{H}^+ + 2$  Pyruvic acid
- D.  $2\text{ATP} + 2\text{NADH} + \text{H}^+ + 2$  Pyruvic acid +  $\text{CO}_2$

**Answer: B**



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9. During photosynthesis oxygen in glucose comes from

- A.  $\text{C}_6\text{H}_{12}\text{O}_6$
- B.  $\text{O}_2$
- C.  $\text{CO}_2$
- D. both (1) and (2)

**Answer: B**

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**10.** How many oxygen molecules are used in glycolysis of one molecule of glucose ?

A. 1/2

B. 1

C. 0

D. 2

**Answer: C**

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

A. OAA

B. Cytochrome

C. Acetyl Co-A

D. Pyruvic acid

**Answer: C**

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**12. When yeast ferments glucose, the products are:**

A.  $C_2H_5OH + CO_2$

B.  $C_2H_5OH + \text{Energy}$

C.  $CO_2 + H_2O + \text{Energy}$

D.  $CH_3OH + H_2O + \text{Energy}$

**Answer: A**

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13. Energy required to form glucose from pyruvate is equivalent to

A. 32 ATP

B. 16 ATP

C. 8 ATP

D. 4 ATP

**Answer: C**



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14. Which is formed through phosphorylation in glycolysis?

A. Fructose 1-6 Biphosphate

B. DHA-3- phosphate

C. Both are correct

D. Glyceraldehyde-3-phosphate

**Answer: A**



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15. Which step of glycolysis requires pyruvic kinase,  $Mg^{++}$ ,  $K^+$  and *ADP*?

- A. Conversion of PEP into pyruvic acid
- B. Conversion of 3PGA into 2PGA
- C. Cleavage of Fructose 1-6 Biphosphate
- D. All of the above

**Answer: A**



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16. One molecule of glucose requires 2 ATP to get phosphorylated to form Fructose 1-6 Biphosphate in glycolysis. How many ATP are used in the same process if the substrate is fructose ?

A. 1

B. 2

C. 0

D. 4

**Answer: B**



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17. Amphibolic cycle that occurs only in aerobic condition is

A. EMP pathway

B. Glycolysis

C. Krebs' cycle

D. ETC

**Answer: C**



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**18.** During respiration, pyruvic acid is

- A. broken to form a 2-carbon compound and  $CO_2$
- B. produced in Krebs' cycle
- C. formed only if fat is used
- D. produced only in aerobic condition

**Answer: A**



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19. Krebs' cycle starts with the formation of a six carbon compound by reaction between

- A. OAA and puruvic acid
- B. OAA and Acetyl Co- A
- C. Pyruvic acid and Acetyl Co-A
- D. OAA and citrate synthetase

**Answer: B**



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20. Aerobic glycolysis is \_\_\_\_\_ times efficient than anaerobic glycolysis

- A. 2 times
- B. 4 time
- C. 10 times
- D. 18 times

**Answer: D**



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**21.** Ratio of  $CO_2$  produced in aerobic and anaerobic respiration is

A. 3 : 1

B. 2 : 1

C. 4 : 1

D. 1 : 1

**Answer: A**



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**22.** Each molecule of pyruvic acid entering the Krebs's cycle produces \_\_\_\_\_ molecules of Carbon dioxide.

A. 3

B. 2

C. 4

D. 6

**Answer: A**



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**23.** Number of ATP molecules which can be built on complete oxidation of pyruvic acid is

A. 38

B. 30

C. 8

D. 15

**Answer: D**

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24. Most of the energy in the cell is liberated by oxidation of carbohydrate when

- A. pyruvic acid is changed into  $CO_2$  &  $H_2O$
- B. pyruvic acid is converted into Acetyl CoA
- C. sugar is converted into Pyruvic acid
- D. glucose is converted into Alcohol &  $CO_2$

**Answer: A**

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25. How much energy is conserved as ATP per mole of  $O_2$  reduced into  $H_2O$ ?

- A. 36



B. 38

C. 6

D. 36 in eukaryotes and 38 in prokaryotes.

**Answer: C**



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**26.** Amount of energy available per mole of oxygen used in biological oxidation is

A. 150

B. 3600

C. 686

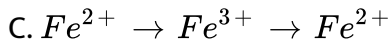
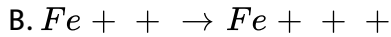
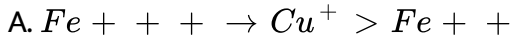
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**Answer: D**



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27. Flow of electrons in ETS is



D. 110

**Answer: C**



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28. Krebs's cycle was discovered by Krebs in pigeon muscles in 1940. Which step is called gateway step. Link reaction/transition reaction in respiration.

A. Glycolysis

B. Formation of acetyl Co-A

C. Citric acid formation

D. ETS Terminal oxidation

**Answer: B**



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**29.** In Kreb's cycle

A. Acetyl coenzyme A undergoes 4 oxidations and 2 decarboxylations

B. Pyruvic acid undergoes 4 oxidations and 2 decarboxylations

C. TCA undergoes 4 oxidations and 4 decarboxylations

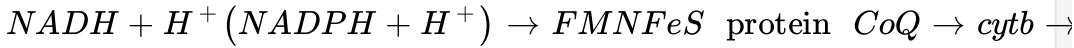
D. OAA undergoes 4 oxidations and 2 decarboxylations

**Answer: A**



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30. Flow of electrons in ETS is



.At three steps ATP is formed (oxidative phosphorylation). Where does II

ATP is formed?

A. Between  $NADH_2$  and FMN

B.  $Cyt b$  and  $Cytc_1$

C.  $Cyta$  and  $Cyta_3$

D.  $FMN \rightarrow FeS$  protein

**Answer: B**



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31. For formation of ethanol, pyruvic acid is first changed to acetaldehyde

by enzyme

A. carboxylase

B. dehydrogenase

C. decarboxylase and dehydrogenase

D. oxidase and decarboxylase

**Answer: C**



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**32.** Oxidation of one molecule of glucose yields 38 mols of ATP in the proportion of

A. all the 38 mols in mitochondrio

B. 8 outside mitochondria and 30 inside mitochondrion

C. two glycolysis and 36 inside the- Kreb , cycle

D. two outside and 36 inside the mitochondria.

**Answer: B**



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33. Inner mitochondrial membrane possesses enzymes

- A. AT Pase, succinic dehydrogenase cytochrome oxidase .
- B. Malate dehydrogenase, citrate synthetase
- C. Diphosphokinase and cyclase
- D. citrate synthetase

**Answer: A**



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34. In electron transport system (ETS) which of the following cytochromes reacts with oxygen

- A. cyt b
- B. *cytc<sub>1</sub>*
- C. cyt a

D. *cyta*<sub>3</sub>

**Answer: D**



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**35.** The molecule that regularly enters through the inner membrane of mitochondrion is

A. ATP

B. pyruvic acid

C. glucose

D. citric acid

**Answer: B**



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36. Cyt  $a_3$  possesses

- A. Fe and Cu
- B. Fe
- C. Mn
- D. Fe, Mn + Cu

Answer: A



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37. Which of the following connects glycolysis to Krebs cycle ?

- A. Substrate level phosphorylation
- B. Photophosphorylation
- C.  $FADH_2$  formation
- D. Both occur in matrix of mitochondria



**Answer: A**



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**38.** ETS in bacteria is found

- A. cell membrane
- B. cell wall
- C. cytoplasm
- D. mitochondrion

**Answer: A**



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**39.** In cell respiration, which does not involve EMP pathway?

- A. Pyruvic acid into  $CO_2$  and  $H_2O$

B. Glucose into lactic acid

C. Glucose into  $CO_2$  and  $H_2O$

D. Glucose into alcohol

**Answer: A**



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**40.** Zymosis is also called

A. fermentation

B. action of zymogens

C. pasteurization

D. synapsis of chromosomes

**Answer: A**



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41. Correct sequence of events in Krebs' cycle is

A. Acetyl CoA  $\rightarrow$  citrate  $\rightarrow$  pyruvate a-ketoglutarate  $\rightarrow$  succinate  
 $\rightarrow$  malate  $\rightarrow$  fumarate  $\rightarrow$  OAA

B. Acetyl CoA  $\rightarrow$  citric acid  $\rightarrow$  a-keto-glutaric acid  $\rightarrow$  succinic acid  
 $\rightarrow$  fumaric acid  $\rightarrow$  malic acid  $\rightarrow$  OAA

C. Acetyl CoA  $\rightarrow$  citric acid  $\rightarrow$  malic acid  $\rightarrow$   $\alpha$ -ketoglutaric acid  
 $\rightarrow$  succinic acid  $\rightarrow$  OAA

D. Pyruvic acid  $\rightarrow$  Acetyl CoA  $\rightarrow$  citrate  $\rightarrow$  malate  $\rightarrow$  fumarate

Answer: B



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42. RQ is

A.  $\frac{\text{vol of } CO_2 \text{ released in respiration}}{\text{vol of } O_2 \text{ consumed in respiration}}$

- B.  $\frac{\text{vol of } CO_2 \text{ consumed in photosynthesis}}{\text{vol of } O_2 \text{ consumed in respiration}}$
- C.  $\frac{\text{vol of } CO_2 \text{ taken in photosynthesis}}{\text{vol of } CO_2 \text{ released in respiration}}$
- D.  $\frac{\text{vol of } CO_2 \text{ taken in photosynthesis}}{\text{vol of } CO_2 \text{ released in photosynthesis}}$

**Answer: A**



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**43.** During starvation, RO value will be

- A. 0
- B. less than unity
- C. more than unity
- D. unity

**Answer: B**



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44. When respiratory substrate is cereal/ starchsprouting potato tuber, then RO value is

- A. 0
- B. unity
- C. greater than 1
- D. lesser than 1

**Answer: B**



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45. In anaerobic condition, value of RQ will be

- A. 1
- B. 2
- C. infinity
- D. 0

**Answer: C**



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**46.** If a substance is rich in oxygen, then value of RO (Respiratory Quotient) will be

- A. unity
- B. less than 1
- C. greater than 1
- D. 0

**Answer: C**



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**47.** RO value in succulents/CAM plants in night is

A. It1

B. unity

C. gt1

D. Zero

**Answer: D**



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**48.** When production of  $CO_2$  is more than intake of  $O_2$ , the respiratory substrate is

A. sucrose

B. organic acid

C. glucose

D. fat/protein

**Answer: B**

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49. Enzyme ATPase is found in ..... of oxysome.

A. Head ( $F_1$ )

B. Base ( $F_0$ )

C. Stalk

D.  $F_0 - F_1$

**Answer: A**

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50. Which of the following observations most strongly support the view that mitochondria contain transport enzymes aggregated into compact association ?

A. Mitochondria have a highly folded inner membrane



- B. Disruption of mitochondria yield membrane fragments which are able to synthesize ATP
- C. A contractile protein able to utilize ATP is found in mitochondria
- D. None of the above.

**Answer: B**

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51. The Nobel Prize for the discovery of TCA cycle and ATP biosynthesis was awarded to

- A. Hans Krebs
- B. Lipman
- C. Krebs and Lipman jointly
- D. Vishniac and Ochoa

**Answer: C**

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52. In anaerobic respiration, pyruvic acid in muscles forms

- A. ATP
- B. Lactic acid
- C. Acetyl Co- A
- D. NAD

**Answer: B**

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53. Terminal oxidation in ETS is

- A. stoppage of oxidation
- B. final release of protons
- C. only step where actual oxidation using  $O_2$  occurs

D. ETS initiation

**Answer: C**



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54. Krebs' cycle also called TCA (Tricarboxylic acid cycle) or citric acid cycle (organic acid cycle). It is also called metabolic sink as it is

- A. common pathway for carbohydrates . fats and proteins (amino acids)
- B. common pathway for carbohydrates and fats only
- C. common pathway for carbohydrates and organic acids only
- D. none of the above

**Answer: A**



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55. One turn of Krebs' cycle for the oxidation of 1 mol of sucrose produce how many ATP molecules ?

A. 12

B. 24

C. 22

D. 11

**Answer: A**



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56. Acetaldehyde is intermediate product in

A. lactic acid fermentation

B. ethyl alcohol fermentation

C. Kreb's cycle

D. glycolysis

**Answer: B**



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**57.** One molecule of sucrose yields ..... ATP in anaerobic respiration

A. 2

B. 4

C. 38

D. 36

**Answer: B**



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**58.** One molecule of  $NADH + H^+ / NADPH + H^+$  has sufficient energy to generate 3 ATP through ETS. This energy is approximately

A. 52.6 k cal

B. 21.9 k cal

C. 18 k cal

D. 36 k cal

**Answer: B**

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**59.** Proteins enter into Krebs' cycle through

A.  $\alpha$ -Ketoglutarate

B. OAA

C. both (1) and (2)

D. None of these

**Answer: C**

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60. If fructose 1-6 Bisphosphate is oxidised in aerobic respiration, the ATP production will be

- A. 36
- B. 38
- C. 32
- D. 40

**Answer: D**



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61. Respiration of starved leaves (consuming proteins) is called

- A. protoplasmic respiration
- B. floating respiration
- C. photorespiration

D. oxidative phosphorylation

**Answer: A**



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**62.** To start respiration, a living cell requires

A. only glucose

B. glucose +  $O_2$

C. glucose, ATP and enzymes

D. glucose + enzymes

**Answer: C**



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63. The rate of oxidative phosphorylation and ATP synthesis is related with

- A. quantasomes
- B. ribosomes
- C. elementary particles
- D. lysosomes

**Answer: C**



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64. Enzymes involved in oxidative decarboxylation of pyruvic acid are found in

- A. cytoplasm
- B. matrix of Mitochondrion
- C.  $F_0 - F_1$  particles

D. oxysomes

**Answer: B**



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65. As compared to anaerobic respiration, the energy gained during aerobic respiration is

A. 8 times

B. 19 times

C. 12 times

D. 36 times

**Answer: B**



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66. Cytochromes are found in

- A. entire inner mitochondrial membrane
- B. cristae only
- C. matrix of mitochondria
- D. oxysomes

**Answer: A**



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67. Cytochrome oxidase is related with

- A. Cyt b
- B. Cyt  $a_3$
- C. Cyt  $c_1$
- D. Cyt. c

**Answer: B**



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**68.** Cytochromes are

- A.  $O_2$  acceptor
- B.  $H_2$  acceptor
- C. Electron acceptor
- D. All of these

**Answer: C**



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**69.** Rate of respiration shall increase

- A. where no light is present

B. in winter

C. in high temperature

D. in rainy season

**Answer: C**



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**70.** All enzymes of TCA cycle except succinic dehydrogenase and cytochrome oxidase are found in

A. cytosole and oxysomes

B. matrix of mitochondrion

C. inner membrane of mitochondrion

D. outer membrane of mitochondrion

**Answer: B**



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71. In the electron transport system, the reduced coenzymes are regenerated by

- A. gain of protons
- B. loss of electrons
- C. addition of hydrogen
- D. gain of electrons .

**Answer: B**



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72. Poisons like cyanide inhibit  $Na^+$  influx during cellular transport. This inhibitory effect is reversed by an injection of ATP. This demonstrates that

- A.  $Na^+ - K^+$  pump operates in all cells
- B. ATP is carrier protein

C. Energy for  $Na^+ - K^+$  pump come from ATP

D. ATP is hydrolysed by ATPase to release energy

**Answer: C**



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**73.** Proton channel occurs in

A.  $F_0$

B.  $F_1$

C.  $F_4$

D.  $F_5$

**Answer: A**



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74. The first 5C dicarboxylic acid in Krebs' cycle which is used in nitrogen metabolism is

- A. OAA
- B. Citric acid
- C.  $\alpha$ -ketoglutaric acid
- D. Acetyl Co-A

**Answer: C**



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75. Hydrogen atoms released at succinate level in Krebs cycle are accepted by

- A. FAD
- B. NAD
- C. ADP



D. FMN

**Answer: A**



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**76.** Fructose-6-phosphate is changed to Fructose 1-6 biphosphate with the help of enzyme

A. phosphoglycerate

B. enolase

C. phosphofructokinase

D. phosphatase

**Answer: C**



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77. In ETC, ATP is not formed in which of the following steps

- A. FMN- UQ
- B. Cyt c-cyt a
- C. Cyt b - cyt c
- D. Cyt a- cyt  $a_3$

**Answer: B**



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78. Krebs' cycle is completed with the formation of

- A. citric acid
- B. OAA
- C. succinic acid
- D. malic acid

**Answer: B**



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**79.** The end product of oxidative phosphorylation is

A. ATP

B.  $O_2$

C.  $NADH_2$

D.  $ATP \& H_2O$

**Answer: D**



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**80.** How many ATP are formed in ETS from reduced NAD generated in one turn cycle of Krebs' cycle ?

A. 3

B. 6

C. 12

D. 9

**Answer: D**



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**81.** Krebs' cycle starts with reaction between

A. OAA+Acetyl CoA

B. OAA+Pyruvic acid

C. Acetyl CoA+Citric acid

D. OAA+Citric acid

**Answer: A**



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82. *ATP* formation in chloroplast and mitochondrion is explained by

- A. Lock and Key Theory of Fisher
- B. Chemiosmotic Theory of Mitchell
- C. Lipmann and Lohmann Theory
- D. Chemical coupling theory

**Answer: B**



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83. What is the main feature of -P bond in ATP

- A. 2 bonds having high energy
- B. 2 Molecules of phosphrous in ATP
- C. 3 atoms of high energy phosphate

D. None of these

**Answer: A**



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**84.** Which would be the last substrate to be used in respiration ?

A. Fat

B. Protein

C. Organic acid

D. starch

**Answer: B**



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85. A mass of living cells are kept in a culture medium under anaerobic conditions. The cells were supplied with labelled  $C^{14}$  glucose. Pick up the true statement

- A.  $CO_2$  will contain  $C^{14}$
- B. cell would burst
- C. water will have radioactivity
- D. ATP will have radioactivity

**Answer: A**



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86. Differences between photophosphorylation (PP) and oxidative phosphorylation (OP) is

- A. In PP it is synthesis of ATP while in OP it is of ADP
- B. In PP,  $O_2$  is evolved while in OP  $O_2$  is used up

C. Both can not take place in light .

D. pp occurs in green leaves while OP cannot occur in green leaves

**Answer: B**



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**87. Which one is absent in erythrocytes ?**

A. Krebs' cycle

B. Enzymes

C. EMP pathway

D. Hyaloplasm

**Answer: A**



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**88.** Calorific value of carbohydrates, proteins & fats are

A. 4: 6: 9

B. 6: 4: 9

C. 4: 4: 9

D. 4: 9: 9

**Answer: C**



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**89.** Which one of the following is the source of energy that produces the chemiosmotic gradient in mitochondria ?

A. Electrons moving down the electron transport chain

B. The production of NAOH

C. An ATP-dependent proton pump

D. The components of the electron transport chain

**Answer: A**



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**90.** When  $O_2$  is not available to a muscle, NADH formed in glycolysis does not pass electrons to the ETC. Instead it passes them to

- A. Acetyl Co A
- B. pyruvic acid
- C. fructose
- D. ADP

**Answer: B**



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**91.** Number of Oxygen atoms required for complete oxidation of pyruvic acid is

A. 6

B. 12

C. 3

D. 8

**Answer: A**



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**92.** Cyanide kills the organisms/stop cell activity by

A. reducing water potential

B. decreasing diffusion of oxygen

C. interfering in respiratory mechanism by preventing transfer of electron from copper of cyt  $a_3$  to oxygen

D. coagulating proteins of carriers in ETC

**Answer: C**



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93. During oxidative phosphorylation, protons return to

- A. matrix from outside
- B. outside from matrix
- C. in both directions
- D. mitochondria to cytoplasm

**Answer: A**



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94. The energy from electron transport is utilized in transporting proton

( $H^+$ ) from

- A. matrix to outside
- B. outside to matrix

C. in both directions

D. none of these

**Answer: A**



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**95.** Enzyme helping in oxidatvie decarboxylation of pyruvic acid is

A. pyruvic kinase

B. pyruvic dehydrogenase

C. succinic dehydrogenase

D. pyruvic oxidase

**Answer: B**



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96. Glyceraldehyde 3-phosphate (PGAl<sub>d</sub> or GAP) is oxidised during glycolysis. What happens to the hydrogen atom and the electron that are removed during its oxidation ?

- A. They reduce  $NAD^+$
- B. They oxidise  $NAD^+$
- C. They are transferred to pyruvic acid
- D. They are eliminated

**Answer: A**



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97. In Which step,  $CO_2$  is not released ?

- A. Glycolysis
- B. Lactic acid fermentation
- C. Oxidation of malic acid into OAA

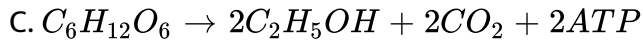
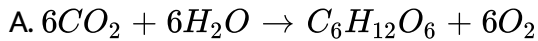
D. All of the above

Answer: D



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98. General equation for aerobic respiration is



Answer: B



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99. the number of glucose molecules required to produces 38 ATP molecules under anaerobic conditions by a yeast cells is

- A. 2
- B. 1
- C. 19
- D. 38

**Answer: C**



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100. One turn of Krebs' cycle produces

- A. 1  $FADH_2$ , 1 NADH and 1 ATP
- B. 1  $FADH_2$ , 2 NADH and 1 ATP
- C. 1  $FADH_2$ , 3 NADH and 1 ATP
- D. 2  $FADH_2$ , 2 NADH and 2 ATP



**Answer: C**



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**101.** Excess of ATP inhibits respiration by inhibiting one of the following enzymes

- A. phosphofruktokinase
- B. pyruvic dehydrogenase
- C. isomerase
- D. acoitase

**Answer: A**



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**102.** Anaerobic respiration of animals/humans produces

A.  $CO_2$  and  $H_2O$

B.  $C_2H_5OH$  and  $CO_2$

C. Lactic acid and  $H_2O$

D. Glucose and  $O_2$

**Answer: C**

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**103.** Choose the correct statement

A. respiration is carried out by only leaf cells

B. end product of anaerobic respiration is  $CO_2$  + Pyruvic acid

C. substrate level phosphorylation occurs when  $\alpha$ -ketoglutaric acid changes to succinic acid

D. dark respiration in plants occurs only in night

**Answer: C**



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104. In alcoholic fermentation by yeasts, the  $NADH_2$  produced during glycolysis is used to reduce

- A. Acetaldehyde to ethanol
- B. NADP to  $NADPH_2$
- C. Pyruvic acid to lactic acid
- D. Lactic acid to pyruvic acid

Answer: A



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105. Maximum energy is obtained by the oxidation of

- A. glucose
- B. palmitic acid

C. malic acid

D. amino acid

**Answer: B**



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**106.** Fat has two components, glycerol and fatty acids. They enter common pathway of respiration as

A. DHAP and ketoglutarate

B. Glyceraldehyde-3-phosphate and acetyl CoA

C. Glycolic acid and acetyl CoA

D. OAA and Glyceric acid

**Answer: B**



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107. If it is calculated that less than 5% of the energy of glucose is recovered as ATP in glycolysis, the remaining energy is left in

- A.  $CO_2$  and NADPH
- B. Pyruvate and  $FADH_2$
- C. Pyruvate and NADH
- D.  $CO_2$  and  $NADH_2$

Answer: C



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108. The usual RQ for humans lies between 0.7 and 1.0 because

- A. they respire fat and protein
- B. they utilize and respire fat and carbohydrate
- C. they respire carbohydrate and proteins
- D. they respire proteins and carbohydrate

**Answer: B**



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**109.** How many molecules of  $\text{NADH} + \text{H}^+$  are produced at the end of anaerobic respiration

A. 2

B. 4

C. 6

D. 0

**Answer: D**



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**110.** In Beta oxidation, ATPs are produced by

A. Flavin & Acetyl CoA

B. Fatty acid

C. NADH and FADH<sub>2</sub>

D.  $NAD^+$

**Answer: B**



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**111.** A business man of 70 kg weight requires 2800 kcal energy daily. How many glucose molecules and ATP molecules does he require to produce this much energy ?

A. 11 molecules of glucose and 384 molecules of ATP

B. 20 molecules of glucose and 380 molecules of ATP

C. 1 Molecule of glucose and 38 molecules of ATP

D. 6 molecules of glucose and 584 molecules of ATP

**Answer: B**



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**112.** Which intermediate product is found in all three of the following process

- (a) anaerobic respiration
- (b) aerobic respiration
- (c) photosynthesis

- A. succinic acid
- B. lactic acid
- C. Ribulose diphosphate
- D. Phosphoglyceric acid

**Answer: D**



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113. In glycolysis, enzyme enolase produces

- A. PGA
- B. PEP
- C. PGAL
- D. Pyruvate

**Answer: B**



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114. Number of carbon atoms available in acetyl CoA is

- A. 6
- B. 4
- C. 3
- D. 2

**Answer: D**



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**115.** Which can readily respire without oxygen ?

- A. Anabaena
- B. Saccharomyces
- C. Mushroom
- D. Fish

**Answer: B**



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**116.** Cytochrome is a component of ETC in mitochondria/chloroplast, acting as electron acceptor. It is a

A. glycoprotein

B. lipid

C.  $Ca^{2+}$  containing metallo flavoprotein

D.  $Fe^{+++}$  containing prophyrin pigment protein

**Answer: D**

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**117.** Match the biochemical processes given under column I with their respective cellular locations given under column II. From the answers, choose the one which gives the correct combination of alphabets

Column - I	Column - II
A Krebs cycle	--
B Glycolysis	J Grana
C Link Reaction	K Mitochondrial matrix
	L Cytoplasm

A. A = L, B = K, C = L

B. A = K, B = L, C = J

C. A = K, B = L, C = K

D. A = L, B = K, C = J

**Answer: C**



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**118.** First oxidative decarboxylation during aerobic respiration occur in

A. cytoplasm

B. mitochondrial inner spac

C. mitochondrial outer space

D. mitochondrial matrix.

**Answer: D**



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119. One mole of glucose on complete oxidation in aerobic respiration yields ?

- A. 2870 KJ
- B. 5000 KJ
- C. 686 KJ
- D. 1870 KJ

**Answer: A**



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120. Protons (*as*  $NADH$ ,  $FADH_2$ ) taking part in oxidative phosphorylation enter mitochondria as

- A. OAA
- B. Acetyl-CoA
- C. Pyruvic acid

D. Acetaldehyd

**Answer: C**



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**121.** Number of multiprotein complexes in ETS in mitochondria is

A. 2

B. 3

C. 4

D. 5

**Answer: D**



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**122.** Complex V in ETS consists of

A.  $F_0 - F_1$

B. ATP synthase

C. Both correct

D. Cytochrome C oxidase

**Answer: C**



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**123.** In which one of the following do the two names refer to one and the same thing

A. Citric acid cycle and Calvin cycle

B. Krebs' cycle and Calvin cycle

C. TCA cycle and urea cycle

D. Tricarboxylic acid cycle and citric acid cycle

**Answer: D**

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**124.** ETC is also called

- A. photooxidation
- B. oxidative phosphorylation
- C. cyclic phosphorylation
- D. noncyclic phosphorylation

**Answer: B**

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**125.** Which one of the following enzymes is absent in electron transport system ?

- A. NADH dehydrogenase
- B. Cytochrome C-oxidas



C. Succinate Q-reductase

D.  $G_e$  phosphate dehydrogenase

**Answer: D**



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**126.** Which one of the following enzymes of respiratory pathway has the coenzyme FAD linked with it?

A. Citric acid synthetase

B. Fumerase

C. Succinic acid dehydrogenase

D.

**Answer: C**



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127. During the reaction  $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$  which compound is reduced ?

- A. Oxygen
- B. Carbon dioxide
- C. Glucose
- D. Water

**Answer: A**



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128. Glyceraldehyde-3-phosphate is

- A. produced from glucose during glycolysis
- B. part of PS-I
- C. produced from pyruvate before entering the mitochondria
- D. an amino acid used for making protein

**Answer: A**



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**129.** Dough kept overnight in warm weather becomes soft and spongy due to

- A. absorption of carbon dioxide from atmosphere
- B. fermentation
- C. cohesion
- D. osmosis

**Answer: B**



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**130.** Fatty acids enter cellular respiration as

- A. one carbon fragment
- B. two carbon fragments
- C. three carbon fragments
- D. long chain of 16 to 20 carbon atoms

**Answer: B**

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**131.** In glycolysis, during oxidation electrons are removed by

- A. ATP
- B. GAP
- C.  $NAD^+$
- D. molecular oxygen

**Answer: C**

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**132.** The production of ATP by oxidative phosphorylation is driven by energy from

A. coenzyme A

B. cytochromes

C. formation of NADH

D. diffusion of protons from inter membrane space to the matrix of mitochondrion

**Answer: D**



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**133.** Both mitochondria and chloroplasts

A. use a hydrogen ion (proton) gradient to produce ATP

B. obtain electron from water

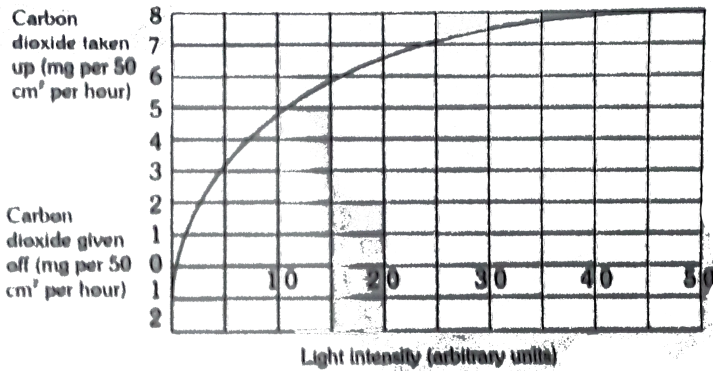
C. reduce  $NAD^+$ , forming NADP

D. release oxygen as a by product

Answer: A

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134. The graph shows the relation between light intensity and the giving off and taking up of carbon dioxide by the leaves of a plant. Why is most carbon dioxide given off when the light intensity is zero units.



A. because it is just the start of the experiment

B. only respiration is taking place at this intensity of light

C. the rate of photosynthesis is equivalent to the rate of respiration

D. the rate of photosynthesis is more than the rate of respiration

**Answer: B**



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**135.** Chemiosmosis is

A. synthesis of ATP using the driving force of proton gradient across mitochondrial inner membrane

B. synthesis of ATP by the discharge of chemical potential created by protons and hydroxyl ions on different sides of a membrane

C. chemical synthesis of ATP by taking energy rich bond from a respiratory substrate

D. both (1 ) and (2)

**Answer: D**



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**136.** Which of the following process makes direct use of oxygen ?

- A. Glycolysis
- B. Fermentation
- C. Electron transport
- D. Krebs citric acid cycle

**Answer: C**

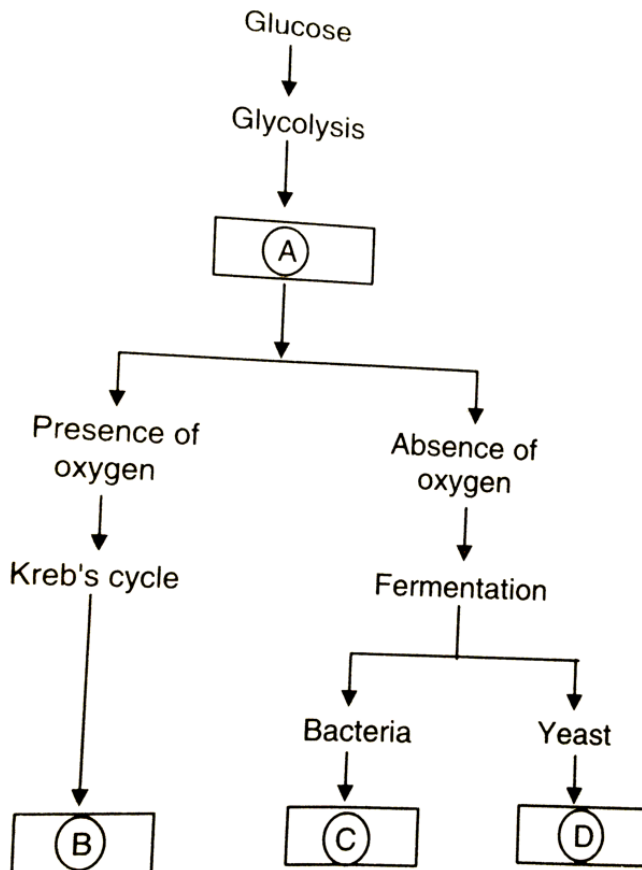


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**137.** The following is a simplified scheme showing the fate of glucose during aerobic and anaerobic respiration. Identify the end products that are formed at stages indicates as A, B, C, and D. Identify the correct option



from those given below.



A. A = carbon dioxide and water, B = pyruvic acid, C = ethyl alcohol and carbon dioxide, D = lactic acid

B. A= pyruvic acid, B = carbon dioxide and water, C = lactic acid, D = ethyl alcohol and carbon dioxide

C. A = pyruvic acid, B = carbon dioxide and water, C = ethyl alcohol and carbon dioxide, D = lactic acid

D. A = pyruvic acid, B = ethyl alcohol and carbon dioxide, C = lactic acid, D = carbon dioxide and water

**Answer: B**

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**138.** Ganong's respiroscope is used to demonstrate.....

- A. evolution of  $O_2$  in photosynthesis
- B. evolution of  $CO_2$  in photosynthesis
- C. evolution of  $CO_2$  in aerobic respiration
- D. evolution of heat in aerobic respiration

**Answer: C**

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**139.** During which stage in the complete oxidation of glucose are the greatest number of ATP molecules formed from ADP

Or

Largest amount of phosphate bond energy is produced in the process of respiration during

A. Electron transport chain

B. Glycolysis

C. Kerbs' cycle

D. Oxidation of pyruvic acid

**Answer: A**



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**140.** In glycolysis ultimately (or end product of glycolysis is)

A. Acetyl CoA

B. pyruvate

C. ethanol

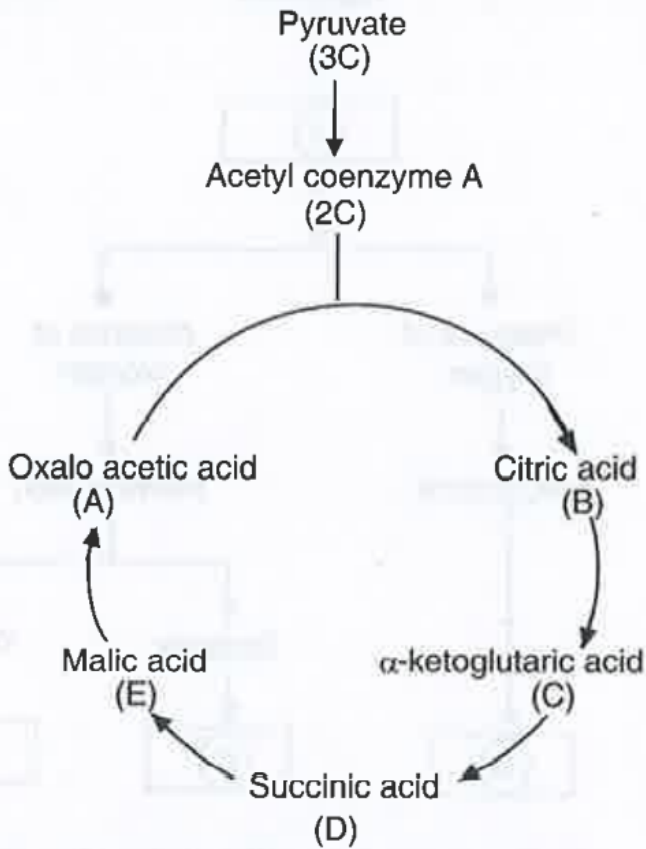
D.  $CO_2 + H_2O$

**Answer: B**



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**141.** Choose the correct combination of labelling the number of carbon compounds in the substrate molecules, involved in the citric acid cycle



- A. (A) 4C, (B) 6C, (C) 5C, (D) 4C, (E) 4C
- B. (A) 6C, (B) 5C, (C) 4C, (D) 3C, (E) 2C
- C. (A) 2C, (B) 3C, (C) 4C, (D) 5C, (E) 6C
- D. (A) 4C, (B) 5C, (C) 6C, (D) 4C, (E) 4C

**Answer: A**

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142. Which is not true for glycolysis

- A. End product is  $CO_2$  and  $H_2O$
- B. Substrate level phosphorylation
- C. Production of ATP
- D. Expenditure of ATP

Answer: A



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143. 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. Fifty-seven

B. One

C. Two

D. Thirty

**Answer: A**



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**144.** 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. malate dehydrogenase

B. succinate dehydrogenase

C. lactate dehydrogenase

D. isocitrate dehydrogenase

**Answer: B**



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**145.** Which one of the following mammalian cells is not capable of metabolising glucose to carbon-dioxide aerobically ?

- A. Liver cells
- B. Red blood cells
- C. White blood cells
- D. Unstriated muscle cells

**Answer: B**



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

- A. sugars



B. nucleic acids

C. ATP in small stepwise units

D. ATP in one large oxidation reaction

**Answer: C**



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**147.** A competitive inhibitor of succinic dehydrogenase is

A. Malonate

B. Succinate

C. Citrate

D. Fumarate

**Answer: A**



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**148.** In Krebs cycle, the following reactions are involved in the production of 15 ATP molecules by oxidation of food stuffs

1. Oxidation of pyruvic acid to acetyl Co-A
2. Oxidation of alpha-ketoglutaric acid
3. Oxidation of isocitrate
4. Oxidation of malate
5. Oxidation of succinate
6. Conversion of succinyl Coenzyme-A to succinic acid.

The correct sequence of these reactions is:

- A. 1, 2, 4, 3, 5, 6
- B. 1, 3, 2, 6, 5, 4
- C. 1, 4, 3, 2, 5, 6
- D. 1, 2, 4, 5, 3, 6

**Answer: B**



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**149.** Carbon monoxide inhibits mitochondrial electron transport by

- A. Inhibiting the electron transfer of complex
- B. Blocking electron transport at the level of the cytochrome-b cytochrome Co-complex
- C. Binding to the oxygen binding site of cytochrome oxidase
- D. Binding to haemoglobin in the erythrocytes and therefore blocking the transport of oxygen to tissues

**Answer: C**



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**150.** Out of the following, which is the rate limiting enzyme in glycolysis?

- A. Pyruvate kinase
- B. Phosphofructo kinase
- C. Phosphoglucoisomerase

## D. Gluco kinase

Answer: B

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151. Match list-I with list-II and select the correct answer using the code given below the lists.

List-I(Substrate)	List-II(Enzyme)
A. 2 Phosphoglycerat	1. Phosphofruc-tokinase
B. Fructose-6-phosphate	2. Pyruvate kinase
C. Glucose-6-phosphate	3. Phosphohexo-seisomerase
D. Phosphoenolpyruvate	4. Glucokinase 5. Enolase

A. Codes *A B C D*  
(1) 2 4 1 5

B. Codes *A B C D*  
(2) 2 1 3 5

C. Codes *A B C D*  
(3) 5 4 1 2

D. Codes A B C D  
(4) 5 1 3 2

Answer: D

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152. Match List-I (Compound oxidized during Krebs's cycle) with List-II (Compound formed on oxidation) and select the correct answer using the codes given below the lists:

List-I (Compound oxidized during Kreb's cycle)	List-II (Compound formed on oxidation)
A. Pyruvic acid	1. Acetyl Co-A
B. Isocitric acid	2. Succinyl Co-A
C. $\alpha$ -Ketoglutaric acid	3. Oxaloacetic acid
D. Succinic acid	4. $\alpha$ -ketoglutaric acid
	5. Fumaric acid

A. Codes A B C D  
(1) 1 3 2 5

- B. Codes *A B C D*  
(2) 2 1 3 4
- C. Codes *A B C D*  
(3) 3 1 2 5
- D. Codes *A B C D*  
(4) 1 4 2 5

**Answer: D**



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**153.** If glucose-fed yeast cells are transferred from aerobic environment to anaerobic one, the rate of glucose consumption will

- A. Decrease
- B. Increase
- C. Alter, depending on concentration of other nutrients
- D. Will not change

**Answer: B**



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154. Which of the following is not a substrate for decarboxylation?

- A. Pyruvate
- B. Citrate
- C. Alpha-keto-glutarate
- D. Will not change

**Answer: B**



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155. All of the following are four carbon compounds except

- A. Malic acid
- B. Succinic acid
- C. Pyruvic acid
- D. Oxaloacetic acid

**Answer: C**



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**156.** The citric acid cycle

- A. Is the major anabolic pathway for glucose synthesis
- B. Is an anaerobic process
- C. Generates fewer molecules of ATP than glycolysis
- D. Contains intermediates for amino acid synthesis

**Answer: D**



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**157.** During aerobic respiration, all the ATPs are synthesized as a result of

- A. Oxidative phosphorylation



B. Oxidative and substrate level phosphorylation

C. Substrate level phosphorylation

D. Oxidative and photophosphorylation

**Answer: B**



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**158.** Krebs's cycle

A. Liberates a minor part of energy during respiration

B. Is operative in photorespiration

C. Reactions are independent of oxygen supply

D. Is a link between carbohydrate and nitrogen metabolism

**Answer: D**



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**159.** Consider the following

1. Succinic dehydrogenase
2. Aconitase
3.  $\alpha$ -ketoglutarate dehydrogenase
4. Isocitric dehydrogenase

What is the correct order in which the above enzymes catalyze the reaction in Kreb's cycle?

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

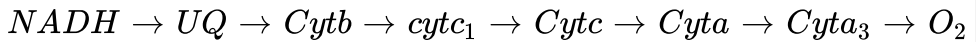
**Answer: D**



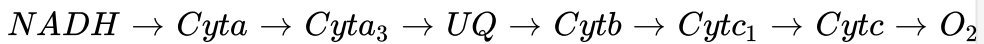
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160. Which one of the following is the correct sequence of electron transport in Mitochondria?

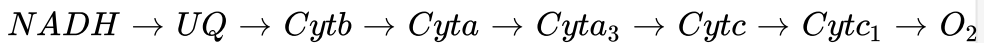
A.



B.



C.



D.



**Answer: A**



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**161.** Consider the following enzymes of glycolytic pathway

1. Glyceraldehyde-3 phosphate dehydrogenase
2. Enolase
3. Pyruvate kinase
4. Phosphoglycerate kinase

The correct order in which they appear in the pathway is

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

**Answer: D**



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**162.** Consider the following intermediates formed during Krebs cycle

1.  $\alpha$ -ketoglutarate
2. Isocitrate

3. Succinate 4. Malate

5. Fumerates

The correct sequences in which the above intermediates are formed is -

A. 1, 2, 4, 3, 5

B. 2, 1, 5, 4, 3

C. 3, 1, 2, 5, 4

D. 2,1,3, 5,4

**Answer: D**



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**163.** Consider the following statements in Citric Acid Cycle

1. The generation of ATP is done at two steps
2. NAD is reduced to NADH at two steps
3. FAD is reduced to  $FADH_2$ , at one step

Which of the statements given above is/are correct?

A. 1 and 2 only

B. 3 only

C. 1 and 3 only

D. 1, 2 and 3

**Answer: B**



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**164.** Consider the following

1. Two lactate molecules

2. Two Pyruvate molecules

3. Two ATP molecules

4. Two  $NADH + 2H^+$

Which of the above are the end products of aerobic glycolysis?

A. 1 and 4

B. 1 and 3

C. 1, 3 and 4

D. 2, 3 and 4

**Answer: D**



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**165.** Consider the following:

1. Succinate 2. Succinyl CoA

3.  $NADH + H^+$  4.  $CO_2$

When  $\alpha$ -ketoglutarate dehydrogenase enzyme acts on  $\alpha$ -ketoglutarate, which of the above are produced?

A. 1 and 2 only

B. 1 and 3 only

C. 1, 3 and 4

D. 2, 3 and 4

**Answer: D**



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**166.** Which of the following serves as the breakdown site for beta-oxidation?

- A. Cytosol
- B. Extramembrane space of mitochondria
- C. Matrix of mitochondria
- D. Smooth endoplasmic reticulum

**Answer: C**



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**167.** The pyruvate dehydrogenase complex catalyzes the conversion of pyruvate to acetyl CoA. Which of the following changes will increase the metabolic consumption of pyruvate?



- A. High levels of ATP
- B. High levels of NADH
- C. Low levels of glucose
- D. Low levels of Acetyl CoA

**Answer: D**

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**168.** What is the total number of  $FADH_2$  molecules produced by glycolysis and the citric acid cycle (two turns of the cycle)?

- A. 1 mole at Succinate to Fumarate conversion
- B. 2 moles at Succinate to Fumarate conversion
- C. 3 moles at Malate to Oxaloacetate conversion
- D. 4 moles at Malate to Oxaloacetate conversion

**Answer: B**

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**169.** During carbohydrate metabolism, NADH is produced in which of the following location(s)?

I. Cytosol

II. Mitochondrial matrix

III. Nucleus

A. I only

B. II only

C. I and II only

D. I, II, and III

**Answer: C**

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170. When examining the TCA cycle, alpha ketoglutarate dehydrogenase complex requires the set of cofactors as which of the following?

- A. Citrate synthase
- B. Cis-aconitate
- C. Pyruvate dehydrogenase
- D. Fumarate

**Answer: C**



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171. For each acetyl Co-A oxidized by the citric acid cycle, what is the energy gain?

- A. Two molecules of NADH, one  $FADH_2$  and one nucleoside triphosphate

B. Three molecules of NADH, one  $FADH_2$  and one nucleoside triphosphate

C. Two molecules of NADH, one  $FADH_2$  and two nucleoside triphosphate

D. Three molecules of NADH, one  $FADH_2$  and two nucleoside triphosphate

**Answer: B**



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**172.** True about citric acid cycle

A. 8 ATP molecules are produced

B. Fat soluble vitamins are required

C. Involved in fatty acid synthesis

D.  $O_2$  is consumed

**Answer: C**



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**173.** A person with a coenzyme Q deficiency will have a defect in oxidative phosphorylation. Which of the following would be expected in this person?

- A. accumulation of glucose
- B. accumulation of lactate
- C. high levels of ATP
- D. fructose deficiency

**Answer: B**



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174. Fluoroacetate, a potent toxin extracted from plants, is converted to fluorocitrate, which is a strong inhibitor of the TCA cycle. Which of the following would be expected in a person exposed to fluoroacetate?

- A. an increase in intracellular levels of ATP
- B. an increase in intracellular levels of glucose
- C. a decrease in levels of ethanol
- D. a decrease in the function of the electron transport chain

**Answer: D**



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175. Aerobic respiratory pathway is appropriately termed

- A. Amphibolic
- B. Anabolic
- C. Catabolic

D. Parabolic

**Answer: A**



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**176.** Which of the following membrane bound complex in mitochondria is not a proton pump?

- A. NADH dehydrogenase
- B. Succinate dehydrogenase
- C. Cytochrome  $bc_1$
- D. Cytochrome c oxidase

**Answer: B**



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177. Citric acid cycle is.....step in carbohydrate metabolism

- A. First
- B. Second
- C. Third
- D. Fourth

**Answer: C**



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178. Respiratory quotient (R.Q.) for a fatty acid, Tripalmitin is

- A. 0.9
- B. 1.4
- C. 1
- D. 0.7



**Answer: D**



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**179.** In mitochondria, protons accumulate in the

- A. Outer membrane
- B. Inner membrane
- C. intermembrane space
- D. Matrix

**Answer: C**



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**180.** Total number of ATP molecules produced per glucose molecule in eucaryotic cell is

A. 4

B. 36

C. 2

D. 38

**Answer: C**



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**181.** Two pairs of electrons passing from NADH molecules to oxygen generate

A. 3ATP

B. 4ATP

C. 6ATP

D. 2ATP

**Answer: C**

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**182.** Which of these steps in Kreb's cycle indicates substrate level phosphorylation

- A. Conversion of succinic acid to a-ketoglutaric acid
- B. Conversion of succinic acid to malic acid
- C. Conversion of succinyl CoA to succinic acid
- D. Conversion of citric acid to a-ketoglutaric acid

**Answer: C**

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**183.** EMP pathway occurs in the

- A. Cytoplasm
- B. Mitochondrion

C. Chloroplast

D. Lysosome

**Answer: A**



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**184.** When proteins are respiratory substrate, RQ will be

A. 0.7

B. 1

C. 0.9

D. More than one

**Answer: C**



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185. Anaerobic respiration in yeast yields

- A. Ethanol and  $CO_2$
- B. Lactic acid and  $O_2$
- C.  $CO_2$  and water
- D. Pyruvic acid and  $O_2$

**Answer: A**



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186. Arrange the following compounds of Krebs cycle in an ascending order with respect to the number of carbon atoms they possess

- {A) Succinic acid (B) Acetyl Co -A
- (C) a - Ketoglutaric acid
- (D) Citric acid

A. A-D-C-B

B. C - A - D - B

C. B-A-C-D

D. D -C- B -A

**Answer: C**



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**187.** Which of the following biomolecules is common to respiration-mediated breakdown of fats, carbohydrates and proteins

A. Pyruvic acid

B. Acetyl CoA

C. Glucose - 6 -phosphate

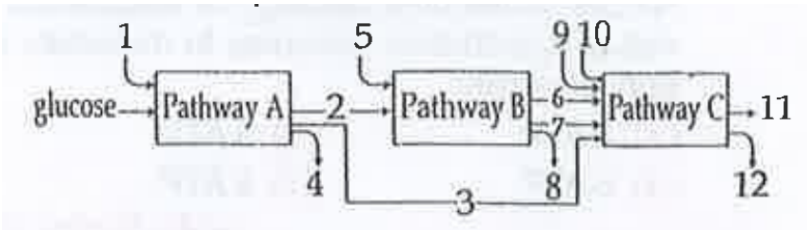
D. Fructose 1, 6 - bisphosphate

**Answer: B**



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188. The three boxes in this diagram represent the three major biosynthetic pathways in aerobic respiration. Arrows represent net reactants or products.



Arrows numbered 4, 8 and 12 can all be

- A.  $H_2O$
- B.  $FAD^+$  or  $FADH_2$
- C. NADH
- D. ATP

**Answer: D**



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189. In which one of the following processes  $CO_2$  is not released

- A. Lactate fermentation
- B. Aerobic respiration in plants
- C. Aerobic respiration in animals
- D. Alcoholic fermentation

**Answer: A**



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190. Last  $e^-$  acceptor during *ETS* is

- A.  $O_2$
- B. Water
- C. Cytochrome C
- D. Cytochrome  $a_3$



**Answer: A**



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**191.** Which of the metabolites is common to respiration-mediated breakdown of fats, carbohydrates and proteins?

- A. Glucose-6-phosphate
- B. Fructose 1, 6-bisphosphate
- C. Pyruvic acid
- D. Acetyl CoA

**Answer: D**



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**192.** Oxidative phosphorylation is

- A. Formation of ATP by transfer of phosphate group from a substrate to ADP
- B. Oxidation of phosphate group in ATP
- C. Addition of phosphate group to ATP
- D. Formation of ATP by energy released from electrons removed during substrate oxidation

**Answer: D**



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**193.** Which of the following cell organelles is responsible for extracting energy from carbohydrates to form ATP?

- A. Lysosome
- B. Ribosome
- C. Chloroplast

## D. Mitochondrion

Answer: D



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194. Which statement is wrong for Krebs' cycle ?

- A. There are three points in the cycle where  $NAD^+$  is reduced to  $NADH + H^+$
- B. There is one point in the cycle where  $FAD^+$  is reduced to  $FADH_2$
- C. During conversion of succinyl CoA to succinic acid, a molecule of GTP is synthesised
- D. The cycle starts with condensation of acetyl group (acetyl CoA) with pyruvic acid to yield citric acid

Answer: D



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**195.** Which of these statements is incorrect.

- A. Oxidative phosphorylation takes place in outer mitochondrial membrane
- B. Glycolysis operates as long as it is supplied with NAD that can pick up hydrogen atoms.
- C. Glycolysis occurs in cytosol.
- D. Enzymes of TCA cycle are present in mitochondrial matrix.

**Answer: A**



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