DPP - Daily Practice Problems

Chapter-wise Sheets

Date : _____ **Start Time :** _____ **End Time :** _____

BIOLOGY CB14

SYLLABUS : Respiration in Plants

Max. Marks : 180 **Marking Scheme :** + 4 for correct & (–1) for incorrect **Time : 60 min.**

INSTRUCTIONS : This Daily Practice Problem Sheet contains 45 MCQs. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.

1. Respiratory Quotient (R.Q.) is defined as:
(a) vol. of O_2/vol. of CO_2
(b) vol. of CO_2 /vol. of O_2
(c) vol. of O_2/vol. of N_2
(d) vol. of N_2/vol. of CO_2

2. What is the end product of glycolysis of a glucose molecule?
(a) Fructose 1, 6- diphosphate
(b) Pyruvate and ATP
(c) Phosphoglyceraldehyde
(d) Lactic acid and ATP

3. Connecting link between glycolysis and Krebs cycle is/ before entering Krebs cycle pyruvate is changed to
(a) oxaloacetate (b) phosphoenol pyruvate
(c) pyruvate (d) acetyl CoA

4. Site of respiration in bacteria is
(a) episome (b) ribosome
(c) mesosome (d) microsome

5. Terminal cytochrome of respiratory chain which donates electrons to oxygen is
(a) Cyt. b (b) Cyt. c
(c) Cyt. a_1 (d) Cyt. a_3

6. Which of the following processes make direct use of oxygen ?
(a) Glycolysis (b) Fermentation
(c) Electron transport (d) citric acid cycle

7. Glycolysis is a
(a) redox process (b) aerobic process
(c) oxidative process (d) reductive process

8. In Kreb's cycle, the FAD participates as electron acceptor during the conversion of
(a) succinyl CoA to succinic acid
(b) α - ketoglutarate to succinyl CoA
(c) fumaric acid to malic acid
(d) succinic acid to fumaric acid

9. The major reason that glycolysis is not as energy productive as respiration is that
(a) NAD^+ is regenerated by alcohol or lactate production, without the high-energy electrons passing through the electron transport chain.
(b) it is the pathway common to fermentation and respiration.
(c) it does not take place in a specialized membrane-bound organelle.
(d) pyruvate is more reduced than CO_2; it still contains much of the energy from glucose.

RESPONSE GRID					
	1. ⓐⓑⓒⓓ	2. ⓐⓑⓒⓓ	3. ⓐⓑⓒⓓ	4. ⓐⓑⓒⓓ	5. ⓐⓑⓒⓓ
	6. ⓐⓑⓒⓓ	7. ⓐⓑⓒⓓ	8. ⓐⓑⓒⓓ	9. ⓐⓑⓒⓓ	

Space for Rough Work

10. Which of the following is a 4-carbon compound?
(a) Oxaloacetic acid (b) Citric acid
(c) Phosphoglyceric acid (d) Phosphoenol pyruvate

11. Which of the following is a biological uncoupler of oxidative phosphorylation ?
(a) Thermogenin
(b) 2, 4 – Dichlorophenoxy acetic acid
(c) 2, 4 – Dinitrophenol
(d) Ethylene diaminotetra acetic acid

12. Which of the following is not true for oxidative phosphorylation?
(a) It uses oxygen as the initial electron donor.
(b) It involves the redox reactions of electron transport chain.
(c) It involves an ATP synthase located in the inner mitochondrial membrane.
(d) It depends on chemiosmosis.

13. In which of the following reaction of glycolysis, a molecule of water is removed from the substrate ?
(a) Frucoste-6-phosphate $\rightarrow$ Fructose 1, 6-biphosphate
(b) 3-phosphate glyceraldehyde $\rightarrow$ 1, 3 biphosphoglyceric acid
(c) Phosphoenol-pyruvate $\rightarrow$ Pyruvic acid
(d) 2-phosphoglycerate $\rightarrow$ PEP

14. The first dicarboxylic acid in Krebs' cycle is
(a) isocitric acid (b) pyruvic acid
(c) oxalo acetic acid (d) α-ketoglutaric acid

15. Final electron acceptor in oxidative phosphorylation is
(a) hydrogen (b) dehydrogenase
(c) cytochrome (d) oxygen

16. Quantasomes are found in
(a) mitochondria (b) chloroplast
(c) lysosome (d) endoplasmic reticulum

17. Which of the following statement(s) is/are incorrect ?
(i) Proton channel of oxysome / complex V / ATP synthase is located in F_1.
(ii) Metabolic water is produced in terminal oxidation / produced in respiration.
(iii) CoQ accepts electron from NADH dehydrogenase (complex I) and also can accept electron from $FADH_2$/ succinate Q-reductase / complex II.
(iv) Cytochrome *c* is a small protein attached to outer surface of the inner mitochondrial membrane and acts as mobile carrier for transfer of electrons between complex I (Cyt *bc*, complex) and III.
(v) Complex IV refers to cytochrome *c* oxidase (cyt *a*, a_3 and 2 Cu per centre).
(vi) If a cell is treated with a drug that inhibits ATP synthase, the pH of mitochondrial matrix will increase.
(a) (i), (ii) and (iii) (b) (iii), (v) and (vi)
(c) (i) and (iv) (d) Only (iii)

18. Which of the following is an important intermediate found in all the types of respiration ?
(a) Acetyl CoA (b) Pyruvic acid
(c) Oxaloacetate (d) Tricarboxylic acid

19. Incomplete oxidation of glucose into pyruvic acid with several intermediate steps is known as
(a) TCA-pathway (b) Glycolysis
(c) HMS-pathway (d) Krebs cycle

20. Common enzyme in glycolysis and pentose phosphate pathways is
(a) hexokinase (b) aconitase
(c) fumarase (d) dehydrogenase

21. Out of 36 ATP molecules produced per glucose molecule during respiration
(a) 2 are produced outside glycolysis and 34 during respiratory chain.
(b) 2 are produced outside mitochondria and 34 inside mitochondria.
(c) 2 during glycolysis and 34 during Krebs cycle.
(d) all are formed inside mitochondria.

22. R.Q. is highest when respiratory substance is
(a) fat (b) malic acid
(c) glucose (d) protein

23. Electron transport chain is inhibited by
(a) rotenone and amytal
(b) antimycin-A
(c) cyanide (CN^-), azide (N^{3-}) and carbon monoxide (CO)
(d) All of the above

24. Though vertebrates are aerobes, but their (i) show anaerobic respiration during (ii). During this, (iii) of skeletal muscle fibres is broken down to release lactic acid and energy. Lactic acid, if accumulates causes muscle fatigue.
Fill up the blanks in the above paragraph and select the correct option.

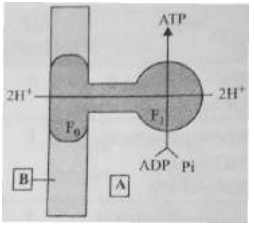
	(i)	(ii)	(iii)
(a)	skeletal muscles	heavy exercise	glucose
(b)	skeletal muscles	mild exercise	glycogen
(c)	skeletal muscles	heavy exercise	glycogen
(d)	cardiac muscles	heavy exercise	glycogen

RESPONSE GRID

10. ⓐⓑⓒⓓ	**11.** ⓐⓑⓒⓓ	**12.** ⓐⓑⓒⓓ	**13.** ⓐⓑⓒⓓ	**14.** ⓐⓑⓒⓓ
15. ⓐⓑⓒⓓ	**16.** ⓐⓑⓒⓓ	**17.** ⓐⓑⓒⓓ	**18.** ⓐⓑⓒⓓ	**19.** ⓐⓑⓒⓓ
20. ⓐⓑⓒⓓ	**21.** ⓐⓑⓒⓓ	**22.** ⓐⓑⓒⓓ	**23.** ⓐⓑⓒⓓ	**24.** ⓐⓑⓒⓓ

Space for Rough Work

25. Identify A and B in the given diagram showing ATP synthesis in oxysomes



(a) A = Mitochondrial matrix
B = Outer mitochondrial membrane
(b) A = Mitochondrial matrix
B = Inner mitochondrial membrane
(c) A = Cell cytoplasm
B = Inner mitochondrial membrane
(d) A = Cell cytoplasm
B = Outer mitochondrial membrane

26. Potassium cyanide is known to interfere with the formation and use of ATP in cell metabolism.
If the use of potassium cyanide resulted in an accelerated entry of a solute into a cell, it may be reasonably assumed that, under normal circumstances, the solute enters by
(a) active transport (b) osmosis
(c) passive diffusion (d) pinocytosis

27. When yeast growing anaerobically in glucose-rich-environment is exposed to oxygen in sufficient quantity, its rate of glucose utilization decreases. This pheno-menon is known as the Pasteur effect. Adding an uncoupler of oxidative phosphorylation would have what effect on Pasteur effect?
(a) Pasteur effect will be enhanced
(b) Pasteur effect will remain unchanged
(c) Pasteur effect will not take place
(d) Variable effect

28. An inhibitor is added to a cell culture so that succinate accumulates. The enzyme catalysing the formation of which substance has been blocked?
(a) Citrate (b) Oxaloacetate
(c) α -ketoglutarate (d) Fumarate

29. One of the following is common to glycolysis as well as Krebs cycle in eukaryotes :
(a) Substrate level phosphorylation
(b) Photophosphorylation
(c) Localization in mitochondria
(d) Production of $FADH_2$

30. A mutant cell lacking mitochondria will show:
(a) Inability to oxidize carbohydrates
(b) Inability to oxidize fats
(c) Inability to oxidize carbohydrates and fats
(d) Inability to synthesize glucose

31. During the early stages of alcoholic fermentation there is a high rate of growth of yeast. After some time the rate decreases. Which of the following conditions in the culture medium is least likely to have caused this?
(a) Depletion of glucose
(b) Depletion of oxygen
(c) Depletion of mineral salts
(d) Accumulation of waste products

32. Hexose monophosphate shunt does not take place when :
(a) Oxygen is not enough
(b) Glucose is the substrate
(c) NAD is available
(d) NAD is not available due to shortage of oxygen

33. Chemiosmotic theory of ATP synthesis in the chloroplasts and mitochondria is based on
(a) membrane potential (b) accumulation of Na ions
(c) accumulation of K ions (d) proton gradient

34. During the stage in the complete oxidation of glucose are the greatest number of ATP molecules formed from ADP
(a) glycolysis
(b) krebs cycle
(c) conversion of pyruvic acid to acetyl Co-A
(d) electron transport chain

35. 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) Thirty (b) Fifty-seven
(c) One (d) Two

36. 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) isocitrate dehydrogenase
(b) malate dehydrogenase
(c) succinate dehydrogenase
(d) lactate dehydrogenase.

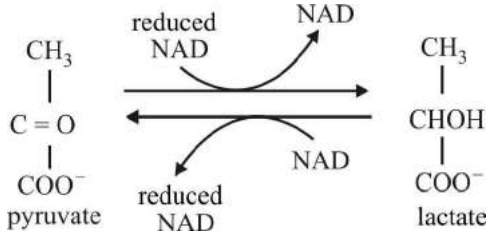
37. The energy-releasing process in which the substrate is oxidised without an external electron acceptor is called
(a) fermentation (b) photorespiration
(c) aerobic respiration (d) glycolysis

RESPONSE GRID					
	25. ⓐⓑⓒⓓ	**26.** ⓐⓑⓒⓓ	**27.** ⓐⓑⓒⓓ	**28.** ⓐⓑⓒⓓ	**29.** ⓐⓑⓒⓓ
	30. ⓐⓑⓒⓓ	**31.** ⓐⓑⓒⓓ	**32.** ⓐⓑⓒⓓ	**33.** ⓐⓑⓒⓓ	**34.** ⓐⓑⓒⓓ
	35. ⓐⓑⓒⓓ	**36.** ⓐⓑⓒⓓ	**37.** ⓐⓑⓒⓓ		

Space for Rough Work

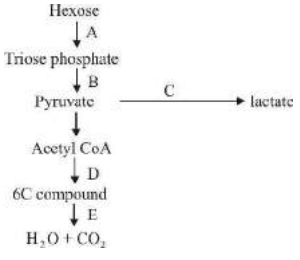
38. In TCA cycle the conversion of succinyl Co-A to succinic acid requires
(a) Acetyl Co-A + GTP + iP
(b) Acetyl Co-A + GDP + iP
(c) Co-A + GTP + iP
(d) GDP + iP

39. The diagram shows the reversible conversion of pyruvate to lactate by the enzyme lactate dehydrogenase.



What would be the effect of inhibition of lactate dehydrogenase in a mammalian cell under anaerobic conditions?
(a) A decrease in cell pH, due to the accumulation of lactic acid.
(b) A decrease in glycolysis, due to the lack of NAD.
(c) An increase in ATP production, due to increased amounts of reduced NAD.
(d) An increase in the activity of the Krebs cycle, due to increased amounts of pyruvate.

40. The diagram summarises the pathway of glucose breakdown.



When two steps result in a net increase of ATP?
(a) A and C (b) A and D
(c) B and D (d) B and E

41. $FADH_2$ is produced during the following reaction
(a) Succinic acid to fumaric acid
(b) Fumaric acid to malic acid
(c) Succinyl Co-A to succinic acid
(d) Isocitric acid to oxaloacetic acid

42. What is the function of molecular oxygen in cellular respiration?
(a) It causes the breakdown of citric acid.
(b) To combine with glucose to produce carbon dioxide.
(c) To combine with carbon from organic molecules to produce carbon dioxide.
(d) To combine with hydrogen from organic molecules to produce water.

43. Sugars are not as good as fats as a source of energy for cellular respiration, because sugars
(a) produce toxic amino groups when broken down.
(b) contain more hydrogen.
(c) usually bypass glycolysis and the Krebs cycle.
(d) contain fewer hydrogen atoms and electrons.

44. For bacteria to continue growing rapidly when they are shifted from an environment containing O_2 to an anaerobic environment, they must
(a) produce more ATP per mole of glucose during glycolysis.
(b) produce ATP during oxidation of glucose.
(c) increase the rate of glycolysis.
(d) increase the rate of TCA cycle.

45. Protein is used as respiratory substrate only when
(a) Carbohydrates are absent
(b) Fats are absent
(c) Both carbohydrates and fats are exhausted
(d) Fats and carbohydrates are abundant

RESPONSE GRID					
	38. ⓐⓑⓒⓓ	**39.** ⓐⓑⓒⓓ	**40.** ⓐⓑⓒⓓ	**41.** ⓐⓑⓒⓓ	**42.** ⓐⓑⓒⓓ
	43. ⓐⓑⓒⓓ	**44.** ⓐⓑⓒⓓ	**45.** ⓐⓑⓒⓓ		

Space for Rough Work

DAILY PRACTICE PROBLEM DPP CHAPTERWISE 14 - BIOLOGY			
Total Questions	45	Total Marks	180
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	45	Qualifying Score	60
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

HINTS & SOLUTIONS

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1. (b) During aerobic respiration, oxygen is consumed and CO_2 is released. R.Q is defined as ratio of volume of CO_2 released and O_2 consumed by the respiratory substrate.

$$\text{R.Q.} = \frac{\text{Volume of } CO_2}{\text{Volume of } O_2}$$

2. (b) As a result of glycolysis, one molecule of glucose is broken down to two molecules of pyruvate. During glycolysis, 4 molecules of ATP are produced but 2 molecules of ATP are consumed in the activation of glucose molecule. Therefore, there is a net gain of 2 molecules of ATP.

3. (d) The end product of glycolysis is pyruvate. It enters mitochondria and is oxidatively decarboxylated to acetyl CoA before entering into Krebs cycle.

4. (c) Mesosomes are the invaginations of the plasma membrane that can form into vesicles. They are found to be present in both gram-positive and gram-negative bacteria. Mesosomes may play a role in cell wall formation during cell division and/or chromosome replication and distribution and/or electron transfer systems of respiration.

5. (d) Terminal cytochorome is cyt a_3. cyt a_3 posseses two copper centers. It helps in transfer of electrons to oxygen.

6. (c)

7. (d) Glycolysis is a reductive process in which glucose is broken down in the absence of oxygen within the cytoplasm of the cell. It forms 2 pyruvate molecules, 2 net ATP molecules, 2 $NADH_2$ molecules.

8. (d) In Kreb's cycle, the FAD participates as electron acceptor during the conversion of succinic acid to fumaric acid.

9. (d) **10. (a)** **11. (a)** **12. (a)** **13. (d)**
14. (d) **15. (d)** **16. (b)** **17. (c)** **18. (b)**
19. (b) **20. (a)** **21. (b)** **22. (b)** **23. (d)**

24. (c) Muscle fatigue is the reduction in force of contraction of a muscle after prolonged stimulation. In the absence of oxygen, skeletal muscle of human beings can contract for a short time, but it gets fatigued soon. This is due to the fact that in the absence of oxygen, products of glycolysis mainly lactic acid is not disposed off and accumulates in the muscles. This leads to muscle fatigue and pain in the muscles. A muscle gets fatigued sooner after a strenuous exercise than after a mild exercise. Faster breathing for sometime after a strenuous exercise supplies extra oxygen, disposes off excess lactic acid and muscle fatigue disappears.

25. (b)

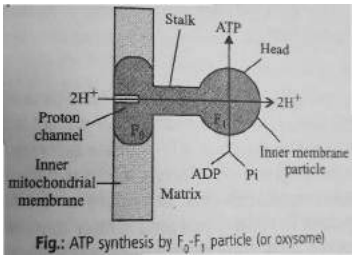

Fig.: ATP synthesis by F_o-F_1 particle (or oxysome)

26. (a) Under normal circumstances, the cell must have sodium pumps (Na^+/K^+ ATPase) which actively transport ATP into the cell. When KCN is added, the carriers are destroyed, thus ATP can enter freely.

27. (c) Since oxygen will not participate, the Pasteur effect will not take place.

28. (d) During Krebs cycle fumarate is formed from succinate and hence, synthesis of fumarate is blocked.

29. (a) Substrate-level-phosphorylation means synthesis of ATP by utilizing energy released directly by the substrates. In glycolysis, there are two steps in which ATP is synthesized. In Krebs cycle, there is only one step where GTP is synthesized when succinyl CoA is converted to succinic acid.

30. (c) Mitochondria oxidize not only carbohy drates but also the products of fats i.e. fatty-acids through acetyl CoA and glycerol through phosphoglyceraldehyde.

31. (b) Yeast causes alcoholic fermentation without using oxygen and hence depletion of oxygen has no effect on the metabolism or growth of yeast cells.

32. (c) When oxygen is available $NADH_2$ produced in EMP-Krebs cycle pathway is released in the form of NAD. When there is shortage of oxygen NAD is not available and NADP takes up its place.

33. (d)

34. (d) ATP molecules from ADP are generated maximum in electron transport chain.

35. (b) 12 kcal of energy present in one molecule of ATP & on oxidation of one mole of glucose into CO_2 and H_2O energy released in 686 kcal. So no. of ATP which can store this energy would be = 57.1 = 57 ATPs.

36. (c) Succinate:ubiquinone oxidoreductase, also known in mitochondria as Complex II, provides a link between the citric acid cycle and the membrane-bound electron-transport system. The membrane extrinsic, water-soluble domain, known as succinate dehydrogenase (SDH), contains the fumarate/succinate active site with a covalently bound FAD group and three iron-sulfur clusters: $[2Fe\text{-}2S]^2$ +/1+, $[4Fe\text{-}4S]^2$+/1+, and $[3Fe\text{-}4S]^1$ +/0. The enzyme catalyzes the interconversion of fumarate and succinate, and is closely related to fumarate reductase.

37. (d) Glycolysis takes place in all body cells and is of two types-
(a) Anaerobic glycolysis-From glycogen or glucose to lactic acid in muscles.
(b) Aerobic glycolysis- From glycogen or glucose to pyruvic acid (all cells of body).

38. (d)

39. (b) One of the functions of the electron transport chain and the conversion of pyruvate to lactate is the regeneration of NAD from reduced NAD. NAD is needed in glycolysis.

40. (d) ATP formation occurs both at 2, where glyceraldehyde-3-phosphate is converted to pyruvate; and at 5, where the six-carbon compound, citrate, releases water and CO_2 in the Krebs cycle.

41. (a) $FADH_2$ is produced during the formation of fumaric acid from succinic acid in the kreb's cycle of aerobic respiration.

42. (d) The oxygen obtained from cellular respiration combines with the hydrogen obtained from the oxidation of organic molecules to form water.

43. (d) Fats make more electrons available to the electron transport system and more hydrogen ions available for chemiosmosis.

44. (c)

45. (c) Primary respiratory substrate is carbohydrate and secondary respiratory substrate is fat.