

Chapter 11 Bioenergetics

TOPIC-WISE MULTIPLE CHOICE QUESTIONS INTRODUCTION, PHOTOSYNTHESIS

KIPPY MCQs

- (1) All life on this planet earth is powered, directly or indirectly by:
 - (a) Wind energy
 - (b) Hydroelectric power
 - (c) Solar energy
 - (d) Tidal energy
- (2) Is a kind of chemical link between catabolism & anabolism:
 - (a) Glucose
 - (b) Energy
 - (c) ATP
 - (d) Enzymes
- (3) Energy-capturing process is:
 - (a) Respiration
 - (b) Photosynthesis
 - (c) Digestion
 - (d) None of these
- (4) Which of the following acts both as reactant & product in process of photosynthesis?
 - (a) Water
 - (b) Carbon dioxide
 - (c) Oxygen
 - (d) Glucose
- (5) Rate of photosynthesis & respiration are exactly equal at:
 - (a) Day
 - (b) Night
 - (c) Dawn & dusk
 - (d) All the times
- (6) Oxygen released during photosynthesis comes from:
 - (a) Water
 - (b) Carbon dioxide
 - (c) Oxygen
 - (d) Glucose
- (7) Niel's hypothesis was based on his investigations on photosynthesis in:
 - (a) Spirogyra
 - (b) Bacteria
 - (c) Plants
 - (d) Yeast
- (8) The branch of biology which deals with energy transformation in living organisms is:
 - (a) Thermodynamics
 - (b) Bioenergetics
 - (c) Biotechnology
 - (d) Biophysics
- (9) At compensation point:
 - (a) Plant can live even with close stomata
 - (b) Photosynthesis and respiration is just equal
 - (c) Is very brief period occurring at dawn and dusk
 - (d) All of these

PAST PAPERS MCQs

- (10) The hypothesis that plants split water as a source of hydrogen was given by: (LHR 2017)
 - (a) Van Neil
 - (b) Krebs
 - (c) Calvin
 - (d) Pasteur
- (11) The source of O₂ released in photosynthesis is: (LHR 2018)
 - (a) CO₂
 - (b) Chlorophyll
 - (c) H₂O
 - (d) Glucose
- (12) Oxygen released during photosynthesis comes from: (DGK 2017)
 - (a) Carbon dioxide
 - (b) Water
 - (c) Nitrogen dioxide
 - (d) Sulphurdioxide

- (13) Quantitative study of energy conservation in biological system is called: (DGK 2017)
 (a) Thermodynamics (b) Respiration
 (c) Bioenergetics (d) Metabolism
- (14) Van Niel hypothesized that source of oxygen during photosynthesis is: (DGK 2017)
 (a) Water (b) Carbon dioxide
 (c) Chlorophyll (d) NADP
- (15) The moment in plants when carbon dioxide released by respiration equals the quantity required by photosynthesis is termed as: (SWL 2017)
 (a) Compensation point (b) Homeostasis
 (c) Chemiosmosis (d) Action spectrum
- (16) Energy poor inorganic oxidized compounds are reduced to energy rich carbohydrates during: (LHR 2017)
 (a) Respiration (b) Photosynthesis
 (c) Development (d) Growth
- (17) The chemical links between catabolism and Anabolism is: (RWP 2017, DGK 2019)
 (a) DNA (b) NAD
 (c) ATP (d) RNA
- (18) The Hypothesis that source of Oxygen released during photosynthesis is water and not Carbon dioxide was given by: (BWP 2021)
 (a) Calvin (b) Kreb
 (c) Niel (d) T.W Engelmann

CHLOROPLAST-THE SITES OF PHOTOSYNTHESIS IN PLANTS

KIPS MCQs

- (19) _____ of plants capture light energy and convert it into chemical energy:
 (a) Mitochondria (b) Chloroplast
 (c) Peroxisomes (d) Glyoxisomes
- (20) Chloroplast are present in very large number, about _____ per square millimeter of leaf surface.
 (a) 1.5 million (b) 2.5 million
 (c) 12000 (d) 0.5 million
- (21) Each mesophyll cell has about _____ chloroplast.
 (a) 20-50 (b) 50-75
 (c) 20-100 (d) 25-65
- (22) Chlorophyll and other pigments are found in:
 (a) Stroma (b) Thylakoid membrane
 (c) Chloroplast covering (d) Inter grana

PAST PAPERS MCQs

- (23) Photosynthetic prokaryotes lack: (LHR 2017)
 (a) Ribosomes (b) Cytoplasm
 (c) Chloroplasts (d) Cell membrane
- (24) Thylakoid membranes are involved in ATP synthesis by: (LHR 2017)
 (a) Glycolysis (b) Dark reaction
 (c) Chemiosmosis (d) Photolysis
- (25) The fluid filled region of the Chloroplast is: (BWP 2017)
 (a) Matrix (b) Cisternae
 (c) Stroma (d) Cytoplasm

- (26) Chloroplasts has a double membranous envelope that encloses dense fluid filled region known as: (LHR 2018)
 (a) Matrix (b) Stroma
 (c) Thylakoid (d) Granum
- (27) Each mesophyll cell has about: (GRW 2019)
 (a) 80 chloroplast (b) 200 chloroplast
 (c) 20-100 chloroplast (d) 500 chloroplast
- (28) Dark reactions of photosynthesis occur in which part of chloroplast: (SGD 2019)
 (a) Inner membrane (b) Grana
 (c) Intergrana (d) Stroma
- (29) The number of chloroplast in each mesophyll cell is about: (GRW 2018, MTN 2019, FSD 2019, RWP 2019, SGD 2021)
 (a) 10-100 (b) 10-200
 (c) 20-100 (d) 20-200

PHOTOSYNTHETIC PIGMENTS

KIPS MCQs

- (30) Thylakoid membranes contain several kinds of pigments, but _____ are main photosynthetic pigments.
 (a) Carotenoids (b) Carotenes
 (c) Xanthophylls (d) Chlorophylls
- (31) Head of chlorophyll molecule is not:
 (a) Porphyrin ring (b) Light absorbing
 (c) Hydrophobic (d) Flat & square
- (32) Molecular formula of chlorophyll b is:
 (a) $C_{55}H_{70}O_5N_4Mg$ (b) $C_{55}H_{72}O_5N_4Mg$
 (c) $C_{55}H_{72}O_6N_4Mg$ (d) $C_{55}H_{70}O_6N_4Mg$
- (33) Chlorophyll 'a' is:
 (a) Violet-blue pigment (b) Orange-red pigment
 (c) Blue-green pigment (d) Yellow-green pigment
- (34) Which of the following pigment found in reaction center?
 (a) Chlorophyll a (b) Chlorophyll b
 (c) Carotenoids (d) All
- (35) Portion of chlorophyll molecule which absorbs light is:
 (a) Porphyrin (b) Phytol
 (c) Reaction centre (d) Phytochrome
- (36) Which structure present in both plants and bacteria?
 (a) Chloroplast (b) Thylakoid membrane
 (c) Granum (d) Chlorophyll
- (37) The wave length least absorbed by chlorophylls:
 (a) Violet-blue (b) Orange red
 (c) Green & yellow (d) None of these
- (38) Which one is not the characteristic of chlorophylls?
 (a) They are green in colour (b) They are insoluble in alcohol
 (c) They are insoluble in water (d) They are also present in algae
- (39) In chlorophyll a & b molecules the variable atoms are:
 (a) C and H (b) H and O
 (c) O and N (d) N and Mg

- (40) **Antenna complex of photosystem contains:**
 (a) Chlorophyll 'a' (b) Chlorophyll 'b'
 (c) Carotenoids (d) All of these
- (41) **Functional group bounded to porphyrin ring of chlorophyll b is:**
 (a) Mg (b) CH_3
 (c) COH (d) CHO
- (42) **The most abundant chlorophyll is:**
 (a) Chlorophyll a (b) Chlorophyll b
 (c) Chlorophyll c (d) Chlorophyll d
- (43) **Which is not the function of carotenoids?**
 (a) They protect human eye (b) Protect chlorophyll from intense light
 (c) Absorb light energy (d) They initiate photosynthetic reactions

PAST PAPERS MCQs

- (44) **Magnesium of chlorophyll is replaced in haemoglobin by:** (FSD 2017)
 (a) Calcium (b) Phosphorous
 (c) Potassium (d) Iron
- (45) **Haeme portion of Haemoglobin contains an atom of:** (FSD 2019)
 (a) Magnesium (b) Iron
 (c) Calcium (d) Phosphorous
- (46) **Which metal atom is present in chlorophyll:** (LHR 2019)
 (a) Cu (b) Fe
 (c) Mg (d) K
- (47) **Haem portion of haemoglobin is also a porphyrin ring but containing on iron instead of:** (LHR 2019)
 (a) Magnesium (b) Potassium
 (c) Sodium (d) Chlorine
- (48) **Chlorophyll 'a' photosystem I absorbs maximum light of:** (MTN 2019)
 (a) 670 nm (b) 680 nm
 (c) 690 nm (d) 700 nm
- (49) **Chlorophyll 'a' is:** (MTN 2017, MTN 2019, LHR 2021)
 (a) Yellow green (b) Orange green
 (c) Blue green (d) Green black
- (50) **Which of the following is related to phytol:** (LHR 2021)
 (a) $\text{C}_{20}\text{H}_{39}$ (b) $\text{C}_{39}\text{H}_{20}$
 (c) $\text{C}_{22}\text{H}_{40}$ (d) $\text{C}_{40}\text{H}_{22}$
- (51) **Xanthophylls absorb the light:** (MTN 2021)
 (a) Yellow to orange (b) Red to orange
 (c) Green to yellow (d) Green to orange
- (52) **Yellow to orange color pigments presents in chloroplast:** (DGK 2021)
 (a) Carotenoids (b) Xanthophylls
 (c) Carotenes (d) Chlorophyll b
- (53) **Haem portion of haemoglobin contains an atom instead of:** (RWP 2021)
 (a) Magnesium (b) Iron
 (c) Calcium (d) Phosphorus
- (54) **Functional group of chlorophyll 'a' is:** (FSD 2022)
 (a) CH_3 (b) CHO
 (c) COOH (d) OH

ENTRY TEST BASED MCQs

- (55) Chlorophyll molecule contains: (UHS 2017)
 (a) Mg^{++} (b) K^+
 (c) Ca^{++} (d) Na^+
- (56) Carotenoids absorb light of: (UHS 2017)
 (a) Yellow-orange orange (b) Orange-red orange
 (c) Yellow-red orange (d) Blue-violet orange
- (57) Chlorophyll 'a' and chlorophyll 'b' differ in one of the functional groups, Chlorophyll 'a' has: (UHS 2017)
 (a) -CHO (b) -CH₃
 (c) -CH₂ (d) -NH₂
- (58) Pick the characteristic of tail of chlorophyll: (2017-Retake)
 (a) Hydrophilic (b) Present in stroma
 (c) Hydrophobic (d) C₂₀H₂₀
- (59) When we extract carotenoids from its source we see that it is: (UHS 2018)
 (a) Violet in colour (b) Yellow green in colour
 (c) Blue green in colour (d) Yellow and orange red in colour
- (60) The photosynthetic pigments of plants are arranged as clusters in thylakoid membranes. The reaction centers of these clusters consist of _____ molecules. (UHS 2019)
 (a) ATP (b) Glucose
 (c) Chlorophyll (d) Carotenoids
- (61) What is the colour of chlorophyll 'b' molecule? (UHS 2022)
 (a) Bluish green (b) Yellowish green
 (c) Dark green (d) Reddish green

LIGHT DRIVING ENERGY**KIPS MCQs**

- (62) Only about _____ of the light falling on the leaf surface is absorbed.
 (a) 1% (b) 2%
 (c) 25% (d) 50%
- (63) The first action spectrum was obtained by German biologist, T.W. Engelmann in 1883, by working on:
 (a) Bacteria (b) Spirogyra
 (c) Plants (d) None of these
- (64) About _____ of total photosynthesis is carried out by terrestrial plants.
 (a) 10% (b) 20%
 (c) 50% (d) 90%
- (65) Range of visible light used in photosynthesis is:
 (a) 350-700 nm (b) 350-750 nm
 (c) 380-700 nm (d) 380-750nm
- (66) Action spectrum of chlorophyll was first obtained by:
 (a) Calvin (b) Kreb
 (c) Engelmann (d) Schleiden
- (67) Absorption spectrum of chlorophyll indicates that absorption is maximum at:
 (a) 430nm & 670nm (b) 380nm & 750nm
 (c) 500nm & 600nm (d) 670nm & 700nm

- (68) When equal intensities of light are given rate of photosynthesis is maximum in?
 (a) Blue light (b) Red light
 (c) Green (d) Yellow
- (69) When equal intensities of light are given, rate of photosynthesis is maximum in?
 (a) Blue light (b) Red light
 (c) Green (d) Yellow

PAST PAPERS MCQs

- (70) The first action spectrum was obtained by T.W. Engelman in 1883 working on (SGD 2017)
 (a) Nostoc (b) Chlorella
 (c) Spirogyra (d) Volvox
- (71) Total photosynthesis is carried out by the terrestrial plants is about: (BWP 2017)
 (a) 15% (b) 20%
 (c) 10% (d) 22%
- (72) Oxygen in carbohydrate during photosynthesis is obtained from: (SWL 2022)
 (a) CO₂ (b) H₂O
 (c) O₂ (d) (CH₂O)₃
- (73) Which part of light spectrum produces more oxygen during photosynthesis: (LHR 2022)
 (a) Blue (b) Green
 (c) Yellow (d) Red
- (74) Which light wavelength is least absorbed by chlorophyll: (BWP 2022)
 (a) Violet (b) Blue
 (c) Yellow (d) Orange

ENTERY TEST BASED MCQs

- (75) Which of the following color is maximum absorbed by chlorophyll?
 (a) Red (b) Yellow
 (c) Green (d) Indigo
- (76) Graph showing effectiveness of absorbed light is called: (UHS 2017-Retake)
 (a) Absorption spectrum (b) Light spectrum
 (c) Action spectrum (d) Dark spectrum

REACTIONS OF PHOTOSYNTHESIS**KIPS MCQs**

- (77) Which of the following has assimilatory power during photosynthesis in plants?
 (a) ADP (b) NADPH
 (c) ATP (d) Water

ENTERY TEST BASED MCQs

- (78) Source of oxygen for glucose synthesis in plants is:
 (a) Environment (b) H₂S
 (c) Carbon dioxide (d) Water

LIGHT DEPENDENT REACTIONS**KIPS MCQs**

- (79) All of the following are electron carriers of ETC in photosynthesis except:
 (a) Pq (b) Cyt
 (c) Pc (d) Co Q
- (80) Z-scheme is another name used for:
 (a) Dark reaction (b) Light reaction
 (c) Non-cyclic phosphorylation (d) Cyclic phosphorylation

- (81) In cyclic phosphorylation, electron are returned back from Fd to:
 (a) Pq (b) Cytochrome. Complex
 (c) Pc (d) None of these
- (82) Following component is produced as a result of cyclic phosphorylation.
 (a) ATP (b) NADPH
 (c) Oxygen (d) All of these
- (83) Which of the following is formed in both cyclic and non-cyclic phosphorylation?
 (a) ATP (b) CO₂
 (c) NADPH (d) Both 'a' and 'c'
- (84) Thylakoid membranes are involved in ATP synthesis by:
 (a) Cyclic phosphorylation (b) Non-cyclic phosphorylation
 (c) Chemiosmosis (d) All of these
- (85) In Z-scheme Fd donate electrons to:
 (a) Photosystem I (b) NADP
 (c) Primary electron acceptor (d) Plastocyanin
- (86) Which is not the product of light reaction?
 (a) O₂ (b) ATP
 (c) NADPH₂ (d) None of these
- (87) Which of the following is copper containing electron carrier?
 (a) Plastoquinone (b) Cytochrome
 (c) Plastocyanin (d) None of these
- (88) Which of the following component is produced as a result of non cyclic phosphorylation but not in cyclic?
 (a) ATP (b) NADPH
 (c) Both of these (d) None of these

PAST PAPERS MCQs

- (89) Thylakoid membranes are involved in ATP synthesis by: (LHR 2017)
 (a) Glycolysis (b) Dark reaction
 (c) Chemiosmosis (d) Photolysis
- (90) Thylakoid membranes are involved in ATP synthesis by a process known as: (LHR 2018)
 (a) Photolysis (b) Glycolysis
 (c) Chemiosmosis (d) Redox process
- (91) pH gradient drives the formation of ATP across membrane in the process called: (GRW 2018)
 (a) Respiration (b) Chemiosmosis
 (c) Calvin cycle (d) Conduction
- (92) Which is stimulus for cyclic phosphorylation? (MTN 2019)
 (a) Low CO₂ (b) Low O₂
 (c) Low ATP (d) Low NADPH
- (93) As a result of energy conversion during light dependent reaction, reducing and assimilatory power is formed in the form of: (LHR 2021)
 (a) NADP (b) ADP
 (c) NAD (d) NADPH₂ and ATP
- (94) Plastocyanin is a protein which contains _____. (BWP 2019, GRW 2021)
 (a) Calcium (b) Iron
 (c) Copper (d) phosphorus
- (95) Photosystem I is also called as: (MTN 2021)
 (a) P₆₈₀ (b) P₇₀₀
 (c) P₇₈₀ (d) P₆₆₀

- (96) Photosystem I has chlorophyll 'a', which absorbs maximum light of: (FSD 2021)
 (a) 400nm (b) 500nm
 (c) 600nm (d) 700nm
- (97) The product of cyclic phosphorylation is / are: (SVL 2022)
 (a) ATP (b) NADP
 (c) NADP and ATP (d) NADP, ATP and O₂
- (98) Which of the following is produced by the reactions taken place in thylakoids? (GRW 2022, RWP 2022)
 (a) CO₂ + H₂O (b) NADP⁺ + ADP
 (c) ATP, NADPH₂ + CO₂ (d) O₂ + ATP
- (99) Which redox process is endergonic: (SGD 2022)
 (a) Photosynthesis (b) Respiration
 (c) Glycolysis (d) Krebs cycle

ENTRY TEST BASED MCQs

- (100) Glycerate-3-phosphate in the presence of ATP and reduced NADP from light dependent stage is reduced to: (UHS 2017)
 (a) 3-carbon compound (b) 5-carbon compound
 (c) Ribulose biphosphate (d) 6-carbon compound
- (101) Splitting of water in sun light is called: (UHS 2017-Retake)
 (a) Lysis (b) Photolysis
 (c) Condensation (d) Hydrolysis
- (102) Which of the following photosystem is involved in cyclic photophosphorylation? (UHS 2019)
 (a) PS I and PS II (b) PS III
 (c) PS II (d) PS I
- (103) In chemiosmosis the proton (H⁺) pumps moves from _____. (UHS 2019)
 (a) Stroma to Lumen (b) Lumen to Stroma
 (c) Stroma to cytoplasm (d) Cytoplasm to Stroma

LIGHT INDEPENDENT REACTIONS**KIPS MCQs**

- (104) Dark reactions of photosynthesis occur in/at:
 (a) Thylakoid membrane (b) Thylakoid interior space
 (c) Stroma (d) Mitochondria
- (105) During Calvin cycle, 1,3 Bisphosphoglycerate is converted into:
 (a) 3-phosphoglycerate (b) Glyceraldehydes 3-phosphate
 (c) RuP (d) RuBP
- (106) How many ATP are consumed per Calvin cycle?
 (a) 3 (b) 6
 (c) 9 (d) 18
- (107) In order to produce one molecule of G3P, how many CO₂ molecules are required?
 (a) 1 (b) 3
 (c) 5 (d) 6
- (108) Which product of light reaction is not required for dark reaction?
 (a) O₂ (b) ATP
 (c) NADPH₂ (d) Both a & c
- (109) How many ATP are required for the formation of one molecule of hexose sugar?
 (a) 9 (b) 6
 (c) 12 (d) 18

(110) Number of NADPH required for one complete Calvin cycle is:

- (a) 6 (b) 1
(c) 3 (d) 9

(111) The most abundant protein in plant is:

- (a) Co-enzyme Q (b) Cytochrome
(c) Carrier proteins (d) Rubisco

PAST PAPERS MCQs

(112) The dark reactions in photosynthesis occurs in: (FSD 2017, GRW 2017)

- (a) Cytoplasm (b) Chloroplast
(c) Stroma (d) Grana

(113) Rubisco is (SGD 2017)

- (a) Compound used during light reaction (b) An electron acceptor
(c) An enzyme (d) A coenzyme

(114) Rubisco is the most abundant protein in: (DGK 2017)

- (a) Golgi bodies (b) Mitochondria
(c) Chloroplast (d) Nucleoli

(115) The most abundant protein in chloroplast and probably most abundant in the world is: (DGK 2017)

- (a) Haemoglobin (b) Rubisco
(c) Insulin (d) Globulin

(116) Most abundant protein on earth is: (FSD 2019)

- (a) Rubisco (b) Haemoglobin
(c) Athuenea (d) Fibrinoges

(117) Probably the most abundant protein on earth is (DGK 2019)

- (a) Haemoglobin (b) Myoglobin
(c) Rubisco (d) Pepsin

(118) Calvin cycle is also known as: (LHR 2018, SWL 2021, LHR 2021)

- (a) C₃ pathway (b) C₂ pathway
(c) C₄ pathway (d) C₅ pathway

(119) The dark reaction occurs in: (MTN 2017, RWP 2017, BWP 2022)

- (a) Cytoplasm (b) Chloroplast
(c) Stroma (d) Grana

(120) Which of the following does not occur during Calvin Cycle? (DGK 2022)

- (a) Carbon fixation (b) Reduction
(c) Regeneration of Rubisco (d) Release of O₂

(121) For chloroplast to produce sugar form CO₂ in dark reaction _____ is needed. (SGD 2022)

- (a) ADP (b) NAD
(c) NADP (d) ATP

ENTERY TEST BASED MCQs

(122) Calvin cycle occurs in: (UHS 2017)

- (a) Grana of chloroplast (b) Chlorophyll (Reaction center)
(c) Stroma of chloroplast (d) Roots of plants

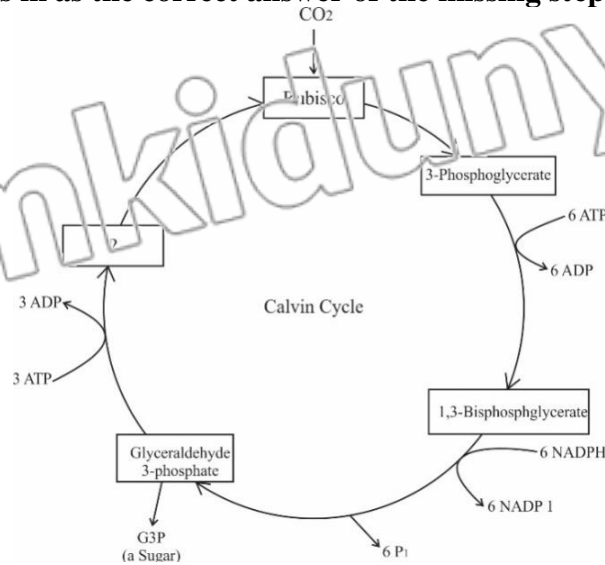
(123) CO₂ acceptor in Calvin cycle is: (UHS 2017 Retake)

- (a) Rubisco (b) RuP
(c) RuBP (d) G₃P

(124) _____ is the site of light independent reaction.

- (a) Thylakoid space (b) Grana
(c) Thylakoid membrane (d) Stroma

- (125) The following flowchart depict the steps of the Calvin Cycle. Which option according to you fits in as the correct answer of the missing step? (UHS 2019)



- (a) Hydrogenase
(b) Ribulose bisphosphate
(c) Oxaloacetate
(d) Pyruvate

RESPIRATION (AEROBIC AND ANAEROBIC RESPIRATION)

KIPS MCQs

- (126) Respiration is a/an:
(a) Oxidation process
(b) Reduction process
(c) Redox process
(d) None of these
- (127) The most common fuel used by the cell to provide energy by cellular respiration is:
(a) Starch
(b) Glycogen
(c) Glucose
(d) Fats
- (128) Cell processes pyruvic acid in:
(a) Alcoholic fermentation
(b) Lactic acid fermentation
(c) Aerobic respiration
(d) All of these
- (129) How much energy of glucose is converted into ATP during anaerobic respiration?
(a) 2%
(b) 4%
(c) 20%
(d) 100%

PAST PAPERS MCQs

- (130) The amount of energy present within the chemical bonds of glucose is converted into ATP during anaerobic respiration is (GRW 2017)
(a) 1%
(b) 2%
(c) 3%
(d) 4%
- (131) The breaking of the terminal phosphate of ATP release energy: (LHR 2013, BWP 2013, DCK 2014, GRW 2014, SWL 2015, RWP 2019, FSD 2019)
(a) 7.3 cal
(b) 7.3 J
(c) 7.3 Kcal
(d) 7.3 watt
- (132) In the absence of oxygen, yeast cells obtain energy by fermentation, producing CO₂, ATP and: (SGD 2019)
(a) Acetyl.Co-A
(b) Ethanol
(c) Lactate
(d) Pyruvate

- (133) Alcoholic and lactic acid fermentations yield small amount of energy present within the chemical bonds of glucose which is converted into ATP. It is only about _____ %.
 (a) 2 (b) 5
 (c) 10 (d) 20 (GRW 2021)
- (134) Formula of lactic acid is: (MTN 2017, DGK 2021)
 (a) $C_3H_4O_3$ (b) $C_3H_5O_3$
 (c) $C_3H_5O_2$ (d) C_2H_5OH
- (135) The breaking of the terminal phosphate of ATP release energy: (SGD 2021, DGK 2022)
 (a) 4.5Kcal (b) 3.7Kcal
 (c) 6.8Kcal (d) 7.3Kcal
- (136) In which of the given parts of body lactic acid formulation takes place? (SWL 2022)
 (a) Brain (b) Muscle
 (c) Heart (d) Liver

ENTRY TEST BASED MCQs

- (137) What is the end product of glucose by yeast in anaerobic respiration? (UHS 2022)
 (a) Ethanol and oxygen (b) Ethanol and water
 (c) Ethanol and CO_2 (d) Lactic acid and CO_2
- (138) Which of the following is not a consequence of anaerobic respiration in human muscles cells? (UHS 2022)
 (a) Cramps (b) High consumption of energy
 (c) Pain (d) Tiredness

GLYCOLYSIS

KIPS MCQs

- (139) ATP are consumed in which phase of glycolysis:
 (a) Preparatory phase (b) Oxidative phase
 (c) Payoff phase (d) None of these
- (140) Net production of ATP during glycolysis is:
 (a) 2 ATP (b) 4 ATP
 (c) 6 ATP (d) 36 ATP
- (141) Total production of ATP during glycolysis is:
 (a) 2 (b) 4
 (c) 6 (d) 8

PAST PAPERS MCQs

- (142) Glycolysis mean breakdown of: (MTN 2017)
 (a) Lipid (b) Glucose
 (c) Carbohydrate (d) Protein
- (143) In first step of citric acid cycle, acetyl Co A reacts with oxaloacetate to form: (DGK 2019)
 (a) NADH (b) Pyruvate
 (c) Citrate (d) FADH
- (144) Pyruvic Acid is produced as a result of: (GRW 2019, RWP 2021)
 (a) Krebs cycle (b) Glycolysis
 (c) Phosphorylation (d) Respiratory chain

- (145) During glycolysis 1 – 3 Bisphosphoglycerate gives one phosphate to ADP to convert into ATP and becomes _____. (GRW 2021)
 (a) 3-phosphoglycerate (b) 2-phosphoglycerate
 (c) Phosphoenol pyruvate (d) phosphoglycerate
- (146) Glycolysis take place in: (DGK 2021)
 (a) Cytosol (b) Mitochondria
 (c) Nucleus (d) Vacuole
- (147) Glycolysis occurs in: (BWP 2021)
 (a) Mitochondria (b) Vacuole
 (c) Chloroplast (d) Cytosol
- (148) Glycolysis is the breakdown of glucose upto the formation of: (FSD 2021)
 (a) Lactic acid (b) Alcohol
 (c) Pyruvic acid (d) Acetic acid
- (149) Oxidative phase of glycolysis starts with dehydrogenation of: (MTN 2022)
 (a) Glucose (b) Fructose
 (c) Glyceraldehyde-3-phosphate (d) NADH
- (150) In which of the following the first molecule is reduced to second molecule? (GRW 2022, RWP 2022)
 (a) Pyruvic acid to acetyl-CO-A (b) Glucose to pyruvic acid
 (c) Glucose to lactic acid (d) Glucose to CO₂

ENTRY TEST BASED MCQs

- (151) Glycolysis is conversion of: (UHS 2017-Retake)
 (a) Glucose to Acetyl Co-A (b) Glucose to pyruvate
 (c) Glucose to G3P (d) Glucose to Serine
- (152) At the last step of glycolysis which of the following compound is formed? (UHS 2018)
 (a) Fructose phosphate (b) Pyruvic acid/ Pyruvate
 (c) Ethyl alcohol (d) Lactic acid
- (153) The enzymes required in glycolysis are present in: (UHS 2018)
 (a) Golgi apparatus (b) Inner mitochondrial membrane
 (c) Cell cytoplasm (d) Matrix of mitochondria
- (154) Glycolysis takes place in the _____ of cell. (UHS 2019)
 (a) Golgi complex (b) Cytoplasm
 (c) Nucleus (d) Mitochondria
- (155) How many molecules of ATP would be utilized for phosphorylation of one glucose molecule during glycolysis? (UHS 2019)
 (a) One (b) Two
 (c) Four (d) Three
- (156) What is the end product of glucose by yeast in anaerobic respiration? (UHS 2022)
 (a) Ethanol and oxygen (b) Ethanol and water
 (c) Ethanol and CO₂ (d) Lactic acid and CO₂

PYRUVIC ACID OXIDATION & KREBS CYCLE**ENTRY TEST MCQs**

- (157) Active acetate is another name used for:
 (a) Acetate (b) Acetyl
 (c) Pyruvic acid (d) Acetyl-CoA
- (158) Which of the following is 5-carbon compound?
 (a) Oxaloacetate (b) Citrate
 (c) α -ketoglutarate (d) Succinate

- (159) **FADH₂ is formed during following step of Kreb's cycle:**
 (a) Isocitrate to α -ketoglutarate (b) α -ketoglutarate to succinate
 (c) Succinate to fumarate (d) Fumarate to malate
- (160) **Kreb's cycle is also known as:**
 (a) Calvin cycle (b) Citric acid cycle
 (c) Glycolysis (d) Oxidative phosphorylation
- (161) **Active acetate is formed from:**
 (a) Pyruvate (b) Glucose
 (c) Fermentation (d) Oxaloacetate
- (162) **Which one is not a 4 'C' compound?**
 (a) Malate (b) Oxaloacetate
 (c) α -ketoglutarate (d) Fumarate

PAST PAPERS MCQs

- (163) **In the first step, of the citric acid cycle, acetyl-CoA reacts with oxaloacetate to form:** (LHR 2019)
 (a) Succinate (b) Rubisco
 (c) Malate (d) Citrate
- (164) **Number of NADH produced by passing one pyruvate molecule through Krebs Cycle pyruvic oxidation is / are:** (LHR 2022)
 (a) 1 (b) 2
 (c) 3 (d) 4

ENTRY TEST BASED MCQs

- (165) **Acceptor of acetyl Co-A in Krebs cycle is:** (UHS 2017-Retake)
 (a) Oxaloacetate (b) Succinate
 (c) Citrate (d) Fumarate
- (166) **In aerobic respiration:** (UHS 2018)
 (a) Pyruvate is completely oxidized to form oxygen and water
 (b) Pyruvate is converted to ethanol and carbon dioxide
 (c) Pyruvate is carboxylated to produce citrate
 (d) Pyruvate is completely oxidized to form carbon dioxide and water
- (167) **The enzymes required for Krebs cycle are found in _____.** (UHS 2018)
 (a) Lysosomes (b) Cytoplasm
 (c) Matrix (d) F₁ particles

RESPIRATORY CHAIN**KIPS MCQs**

- (168) **Pick the exact sequence of cytochromes in respiratory chain:**
 (a) b, c, a₃, a (b) c, b, a₃, a
 (c) b, c, a, a₃ (d) a, b, c, a₃
- (169) _____ are electron carriers containing haeme of related prosthetic group.
 (a) Phytochromes (b) Cytochromes
 (c) Haemoglobin (d) Chlorophyll
- (170) **In electron transport system NADH is oxidized by:**
 (a) O₂ (b) Cytochrome b
 (c) Cytochrome a (d) Coenzyme Q
- (171) **NAD is:**
 (a) A coenzyme (b) Dinucleotide
 (c) Electron-carrier (d) All of these

(172) Number of ATP produced by FADH₂ in Respiratory chain is:

- (a) 2 (b) 3
(c) 4 (d) 5

PAST PAPERS MCQs

(173) In respiratory chain NADH is oxidized by: (LHR 2019)

- (a) Cytochrome (b) Co-enzyme
(c) Oxygen (d) H₂O

(174) During respiratory chain NADH is oxidized by: (GRW 2021)

- (a) cytochrome b (b) cytochrome c
(c) cytochrome a (d) coenzyme Q

(175) Every molecule of NADH fed in to electron transport chain produces: (MTN 2022)

- (a) 3 ATP (b) 6 ATP
(c) 4 ATP (d) 2ATP

ENTERY TEST BASED MCQs

(176) NADP, nicotinamide adenine dinucleotide phosphate, is carrier of: (UHS 2018)

- (a) Hydrogen (b) -OH group
(c) Phosphate (d) O₂ group

(177) Each carrier in electron transport chain is first _____ and then _____. (UHS 2022)

- (a) Broken-down, regenerate (b) Generated, broken down
(c) Oxidized, reduced (d) Reduced, oxidized

(178) Electron transport chain explains: (UHS 2022)

- (a) Photophosphorylation (b) Z-scheme
(c) Photolysis (d) Mechanism of ATP synthesis

ANSWER KEY

(Topic-Wise Multiple Choice Questions)

1	c	31	c	61	b	91	b	121	a	151	b
2	c	32	d	62	a	92	c	122	b	152	c
3	b	33	c	63	b	93	d	123	c	153	c
4	a	34	a	64	a	94	e	124	d	154	b
5	c	35	a	65	d	95	b	125	c	155	b
6	a	36	d	66	c	96	d	126	a	156	c
7	b	37	c	67	a	97	a	127	c	157	d
8	b	38	b	68	b	98	d	128	d	158	c
9	d	39	b	69	b	99	a	129	a	159	d
10	a	40	d	70	c	100	a	130	b	160	b
11	c	41	d	71	c	101	b	131	c	161	a
12	b	42	a	72	a	102	d	132	b	162	c
13	C	43	d	73	d	103	a	133		163	d
14	a	44	d	74	c	104	c	134	c	164	c
15	a	45	b	75	a	105	b	135	d	165	a
16	b	46	c	76	c	106	c	136	b	166	d
17	c	47	a	77	c	107	b	137	c	167	c
18	c	48		78	c	108	a	138	b	168	c
19	b	49		79	d	109	d	139	a	169	b
20	d	50	a	80	c	110	a	140	a	170	d
21	c	51		81	b	111	d	141	b	171	d
22	b	52	b	82	a	112	c	142		172	a
23	c	53	a	83	a	113	c	143	c	173	b
24	c	54	a	84	d	114	c	144	b	174	d
25	c	55	a	85	b	115	b	145	a	175	a
26	b	56	d	86	a	116	a	146	a	176	a
27	c	57	b	87	c	117	c	147	d	177	d
28	d	58	c	88	b	118	a	148	c	178	D
29	c	59	d	89	c	119	c	149	c		
30	d	60	c	90	c	120	d	150	c		

INTRODUCTION, PHOTOSYNTHESIS AND NECESSARY COMPONENTS

KIPS QUESTIONS

Q:1 What is bioenergetics?

Ans: Bioenergetics is the quantitative study of energy relationships in biological systems. The biological energy transformations obey the laws of thermodynamics.

Q:2 How did the evolution of photosynthesis affect the metabolic pathway?

Ans: The photosynthesis was the source of free oxygen, which initiated the more effective pathways of aerobic respiration.

Q:3 Define compensation point. At what time it occurs?

Ans: The point at which there is no net gaseous exchange between the leaves and the atmosphere is called compensation point. It has been observed that at dawn and dusk, when light intensity is low, the rate of photosynthesis and respiration may, for a short time, equals each other. Thus the oxygen released from photosynthesis is just the amount required by cellular respiration.

Q:4 Define photosynthesis.

Ans: Photosynthesis can be defined as the process in which energy poor inorganic oxidized compounds of carbon (i.e., CO₂) and hydrogen (i.e., mainly water) are reduced to energy-rich carbohydrate (i.e., sugars-glucose) using the light energy that is absorbed and converted into chemical energy by chlorophyll and some other photosynthetic pigments.

PAST PAPER QUESTIONS

Q:5 Define photosynthesis. Write its equation. (LHR 2017)

Q:6 What is compensation point? What does it indicate? (SWL 2017)

Q:7 Define photosynthesis. Give its summary equation. (GRW 2019)

Q:8 What is source of Oxygen during photosynthesis? (MTN 2019)

Q:9 Define photosynthesis with the help of an equation. (BWP 2021)

Q:10 What do you know about compensation point? (GRW 2021)

Q:11 What is compensation point? When it occurs? (MTN 2019, LHR 2022)

Q:12 What is compensation point? (FSD 2017, FSD 2019, SWL 2022)

Q:13 Define bioenergetics. Does it obey the law of thermodynamics? (SWL 2017, GRW 2022, RWP 2022)

CHLOROPLAST-THE SITES OF PHOTOSYNTHESIS IN PLANTS

KIPS QUESTIONS

Q:14 List four features of leaf which show that it is able to carry out photosynthesis effectively.

Ans:

- (1) Flatness
- (2) Arrangement of conducting vessels
- (3) Stomata
- (4) Arrangement of Mesophyll cells

PAST PAPER QUESTIONS

Q:15 What is stroma? Give its function. (RWP 2017)

PHOTOSYNTHETIC PIGMENTS

KIPS QUESTIONS

Q:16 What is spectrophotometer?

Ans: Spectrophotometer is an instrument which is used to measure relative abilities of different pigments to absorb different wavelengths of light.

Q:17 What is role of accessory pigments in light absorption?

Ans:

- The accessory pigments absorb other wavelength of light which are not absorbed by chlorophyll.
- They provide protection to chlorophylls from intense light.

Q:2 Why are the carotenoids usually not obvious in the leaves? They can be seen in the leaves before leaf fall. Why?

Ans: The carotenoids are masked by green coloured chlorophyll. Just before leaf fall, the chlorophyll is broken down and disappears and the carotenes become dominant and obvious.

Q:18 What is meant by bacteriochlorophyll?

Ans: The chlorophyll found in photosynthetic bacteria is called bacteriochlorophyll.

Q:19 What is porphyrin ring?

Ans: It is flat, square and light absorbing part. Head has a complex porphyrin ring. This ring is made up of four jointed smaller units called pyrrole ring.

PAST PAPER QUESTIONS

Q:20 Give the function of spectrophotometer. **(LHR 2017)**

Q:21 What are carotenoids? **(DGK 2017)**

Q:22 What is importance of Mg in chlorophyll molecules? **(DGK 2017)**

Q:23 What is the use of spectrophotometer? **(DGK 2017)**

Q:24 What are accessory pigments? Give their role **(DGK 2017)**

Q:25 What is a porphyrin ring of a chlorophyll molecule? **(GRW 2018)**

Q:26 What is porphyrin ring? **(SWL 2019)**

Q:27 What are accessory pigments? **(FSD 2019)**

Q:28 Define absorption spectrum along with its diagram. **(DGK 2019)**

Q:29 Write down the molecular formulae for chlorophyll “a” and “b”. **(LHR 2019, LHR 2021)**

Q:30 Give accessory photosynthetic pigments. **(GRW 2021)**

Q:31 Differentiate between chlorophyll a and chlorophyll b their molecule formula. **(DGK 2021)**

Q:32 How chlorophyll ‘a’ is different from chlorophyll ‘b’? **(FSD 2021)**

Q:33 Differentiate between chlorophyll- a and chlorophyll – b. **(LHR 2019, GRW 2021, FSD 2022)**

Q:34 What are accessory pigments? Give their role. **((MTN 2019, GRW 2022, RWP 2022)**

LIGHT DRIVING ENERGY

KIPS QUESTIONS

Q:35 What is the difference between an action spectrum and an absorption spectrum?

Ans:

Absorption Spectrum	Action Spectrum
The absorption spectrum for chlorophyll indicates the level of absorption of different wave length of light.	Action spectrum shows the effectiveness of different wavelengths of lights in photosynthesis

PAST PAPER QUESTIONS

Q:36 Draw action spectrum showing photosynthesis rate at various light colours. **(LHR 2019)**

Q:37 Differentiate between absorption spectrum and action spectrum. **(FSD 2017, SWL 2019)**

Q:38 What is action spectrum? **(RWP 2017, DGK 2022)**

Q:39 How absorption spectrum differs from action spectrum? **(SWL 2022)**

Q:40 How action spectra can be obtained? **(LHR 2022)**

REACTIONS OF PHOTOSYNTHESIS**KIPS QUESTIONS**

Q:41 Differentiate between light dependent and light independent phase of photosynthesis

Ans:

LIGHT DEPENDENT REACTIONS**KIPS QUESTIONS**

Q:42 What is photosystem? Give its composition.

Ans: Photosystem:

Photosynthetic pigments are organized into clusters called Photosystem.

Composition:

Each Photosystem consists of a light-gathering antenna complex and a reaction centre.

Q:43 Define photolysis. What is role of water in photosynthesis?

Ans: Photolysis:

The water splitting step of photosynthesis that releases oxygen is called photolysis.

Role of Water:

Water provides hydrogen to carbohydrate and its oxygen is source of atmospheric oxygen that is used in aerobic respiration.

Q:44 Write various differences between non-cyclic & cyclic phosphorylation.

Ans:

Non-cyclic Phosphorylation	Cyclic Phosphorylation
Electrons are not reused.	Electrons are reused.
It uses PS I & II.	It uses only PS I.
It generates both ATP & NADPH ₂ .	It generates only ATP.

Q:45 What are photosystems and their types?

Ans. Photosystem:

Photosystems are clusters of photosynthetic pigments present in thylakoid membranes which help in efficient absorption of solar energy and its utilization.

Types: There are two photosystems: photosystem I (PS I) and photosystem II (PS II).

Photosystem I (PS I)	Photosystem II (PS II)
Photosystem I has chlorophyll a molecule which absorbs maximum light of 700 nm and is called P700, A specialized molecule called primary electron acceptor is also associated with reaction centre. It traps the high energy electrons from the reaction centre and then passes it on to the series of electron carriers.	The reaction centre for photosystem II is P680 which absorbs maximum in the region of 680 nm. Like PS I a primary electron acceptor is also associated with PS II.

Q:46 Define chemiosmosis

Ans: The coupling reaction in which synthesis of ATP molecule takes place during movement of H⁺ across an H⁺ gradient is called chemiosmosis.

Q:47 What is an antenna complex?

Ans: Antenna complex is a light gathering part. It is composed of many molecules of chlorophyll a and chlorophyll b and carotenoids. Light energy absorbed by the antenna complex is transferred to reaction centre.

PAST PAPER QUESTIONS

- Q:48 Differentiate between antenna complex and reaction center. (LHR 2017)
- Q:49 Explain chemiosmosis. (GRW 2017)
- Q:50 What is photophosphorylation? (MTN 2017)
- Q:51 Define Photolysis and Photophorylation. (BWP 2017)
- Q:52 What is "Z" scheme? Why is it called so? (RWP 2017)
- Q:53 Write photolysis of water in photosynthesis. (LHR 2018)
- Q:54 What is Z-scheme of phosphorylation? (LHR 2018)
- Q:55 Give the steps of glycolysis where NADH is formed. (DGK 2019)
- Q:56 Define Calvin Cycle. (BWP 2019)
- Q:57 What is cytochrome? Give role. (LHR 2021)
- Q:58 Define chemiosmosis. (MTN 2017, LHR 2019, LHR 2021)
- Q:59 Define photophosphorylation. Give types. (MTN 2021)
- Q:60 What are cytochromes? (SGD 2017, GRW 2018, MTN 2021)
- Q:61 What are photosystems? (DGK 2021)
- Q:62 Give the importance of cytochromes in electron transport chain. (MTN 2022)
- Q:63 What is chemiosmosis? (SGD 2022)

LIGHT INDEPENDENT REACTIONS**PAST PAPER QUESTIONS**

- Q:64 Give function of NADP Reductase. (BWP 2017)
- Q:65 What is Rubisco? (FSD 2014, RWP 2017)
- Q:66 How pyruvic acid is activated? (GRW 2021)
- Q:67 Why calvin cycles is called as C₃-Pathway? (GRW 2021)
- Q:68 How dark reaction can be summarized in an equation? (GRW 2021)
- Q:69 Define Calvin Benson cycle. (FSD 2022)
- Q:70 What is rubisco? Give its function. (DGK 2019, RWP 2021, LHR 2021, LHR 2022)

RESPIRATION (AEROBIC AND ANAEROBIC RESPIRATION)**KIPS QUESTIONS**

Q:71 What are aerobic respiration and anaerobic respiration?

Ans.

- The type of respiration that occurs in the presence of oxygen is-called **aerobic respiration**. In the presence of oxygen the glucose is completely oxidized to CO₂ and water and energy is released.
- In **anaerobic respiration** the atmospheric oxygen is not involved and glucose is split into two molecules of pyruvate with release of about 2% of energy present in the chemical bonds of glucose. Anaerobic respiration is also called fermentation.

PAST PAPER QUESTIONS

- Q:72 What is lactic acid fermentation? Give its reaction. (BWP 2015)
- Q:73 What is external respiration? (DGK 2016)
- Q:74 What is fermentation? Name its two types. (LHR 2015, BWP 2016)
- Q:75 What are aerobic and anaerobic respiration? (RWP 2016)
- Q:76 What is cellular respiration? (LHR 2016)
- Q:77 What is mean by internal Respiration? (MTN 2017)
- Q:78 What is Anaerobic Respiration? (MTN 2017)
- Q:79 How NADH and ATP can inhibit cellular respiration. (SGD 2017)
- Q:80 Write balanced equation of alcoholic fermentation. (MTN 2021)
- Q:81 What is alcoholic fermentation? (SWL 2021, MTN 2021, DGK 2021)

- Q:82** Enlist stage of cellular respiration. (DGK 2021)
Q:83 Define Alcoholic fermentation. Write its equation. (GRW 2017, BWP 2021)
Q:84 What is biological oxidation? (RWP 2019, RWP 2021)
Q:85 Differentiate between aerobic and anaerobic respiration. (RWF 2019, RWP 2021)
Q:86 Describe Lactic acid fermentation and give its equation. (MTN 2022)
Q:87 What are the difference between alcoholic and lactic acid fermentation? (GRW 2019, FSD 2022)
Q:88 Give any two differences between photosynthesis and respiration. (SGD 2019, FSD 2021, BWP 2022)
Q:89 What is lactic acid fermentation? (SGD 2022)

GLYCOLYSIS

KIPS QUESTIONS

Q:90 What is the net production of ATP during glycolysis?

Ans: 2 ATP

PAST PAPER QUESTINS

Q:91 Define glycolysis. Where does it take place? (LHR 2017)

PYRUVIC ACID OXIDATION & KREBS CYCLE

KIPS QUESTIONS

Q:92 Enlist others name of Krebs cycle.

Ans:

PAST PAPER QUESTINS

Q:93 What happens to pyruvic Acid before entering into Kreb's cycle? (BWP 2019)

Q:94 What happens to pyruvic acid before entering into citric acid cycle? (SWL 2021)

Q:95 Point out the role of mitochondria in respiration. (BWP 2022)

RESPIRATORY CHAIN

KIPS QUESTIONS

Q:96 Define oxidative phosphorylation. Where does it occur?

Ans. Oxidative Phosphorylation:

Synthesis of ATP in the presence of oxygen is called oxidative phosphorylation.

Location:

It occurs in mitochondria in association with respiratory chain.

Q:97 What is the main difference between photophosphorylation and oxidative phosphorylation?

Ans:

Photophosphorylation	Oxidative Phosphorylation
Phosphorylation is the generation of ATP with the help of light energy during light reactions of photosynthesis.	Oxidative phosphorylation is the production of ATP by the breakdown of glucose and other related products.
It is usually associated with chloroplast.	It is commonly associated with mitochondria.

Q:98 What is the location of ETC and chemiosmosis in photosynthesis and cellular respiration?

Ans: Membranes of Thylakoid and inner membrane of mitochondria respectively are involved in them.

PAST PAPER QUESTINS

Q:99 Differentiate between photophosphorylation and oxidative phosphorylation. (LHR 2018)

Q:100 What is oxidative phosphorylation? (DGK 2022)