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Name.: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Date : 04/10/2015

Test No.: 0 8

Subject Code.: 2 2 2

Time : 3 Hrs. **M.M. : 720**

HORIZON TEST SERIES for Medical Entrance Exam. 2016

[Test No. (8)_Batch 1]

INSTRUCTIONS FOR STUDENTS

1. Read each question carefully.
2. It is mandatory to use Blue/Black Ball Point Pen to darken the appropriate circle in the answer sheet.
3. Mark should be dark and should complete fill the circle.
4. Rough work must be done on the Question Paper, no additional sheet will be provided for this purpose.
5. Do not use white-fluid or any other rubbing material on answer sheet. No change in the answer once marked.
6. Student cannot use log tables and calculators or any other material in the examination hall.
7. Before attempting the question paper, student should ensure that the test paper contains all pages and no page is missing.
8. Each correct answer carries four marks. One mark will be deducted for each incorrect answer from the total score.
9. Before handing over the answer sheet to the invigilator, candidate should check the particulars have been filled and marked correctly.
10. Immediately after the prescribed examination time is over, the answer sheet to be returned to the invigilator.
11. Use of Calculator and other Electronic device is not permitted.

Test No. 8

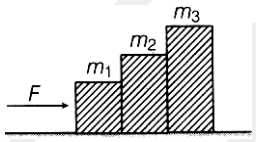
Topics of The Test

Physics	Laws of Motion, Friction and Circular Motion
Chemistry	Solid state
Biology	Zoology : Circulation Botany : Photosynthesis

Test No. 8

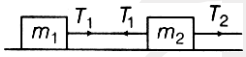
[PHYSICS]

1. Three blocks of masses m_1 =1kg, m_2 =2kg and m_3 =3kg are placed in contact on a horizontal frictionless plane as shown in figure. A force of 12 N is applied on m_1. Acceleration of the system is



(A) 12 m/s^2 (B) 2 m/s^2
(C) 6 m/s^2 (D) 4 m/s^2

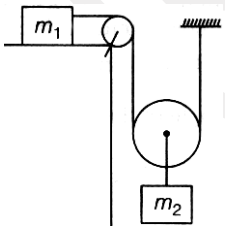
2. In figure, a system of two masses m_1 and m_2 are connected to each other. The ratio of tensions, T_1 and T_2 is



(A) $\frac{m_1}{m_1+m_2}$ (B) $\frac{m_2}{m_1+m_2}$

(C) $\frac{m_1}{m_2}$ (D) $\frac{m_2}{m_1}$

3. If the surface is smooth, then the acceleration of the block m_2 will be



(A) $\frac{m_2 g}{4m_1+m_2}$ (B) $\frac{2m_2 g}{4m_1+m_2}$

(C) $\frac{2m_1 g}{m_1+4m_2}$ (D) $\frac{2m_2 g}{m_1+m_2}$

4. A piece of ice slides down a rough inclined plane at θ inclination in twice the time that it takes to slide down an identical but frictionless inclined plane. What is the coefficient of friction between ice and incline ?

(A) $\frac{3}{7\cot\theta}$ (B) $\frac{4}{7\cot\theta}$

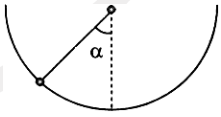
(C) $\frac{3}{4\cot\theta}$ (D) $\frac{7}{9\cot\theta}$

5. A man wants to slide down a rope. The breaking load for the rope is $\frac{2}{3}$ rd of the weight of the man. With what minimum acceleration should the man slide down?

(A) $\frac{g}{4}$ (B) $\frac{g}{3}$

(C) $\frac{2g}{3}$ (D) $\frac{g}{6}$

6. An ant crawls up a hemispherical surface slowly as shown in figure. So, coefficient of friction between ant and surface is 1/3. It makes an angle α with vertical, so maximum value of α is



(A) $\sec\alpha = 3$ (B) $\text{cosec}\,\alpha = 3$

(C) $\cot\alpha = 3$ (D) $\sin\alpha = 4/9$

Space for Rough Work

7. A body of mass M is kept on rough horizontal surface. A person is trying to pull body by applying a horizontal force but body is not moving. The force exerted by surface on the body F is

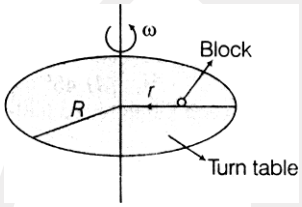
(A) $F = Mg$

(B) $Mg \le F \le Mg\sqrt{1+\mu^2}$

(C) $F = \mu Mg$

(D) $Mg \ge F \ge Mg\sqrt{1+\mu^2}$

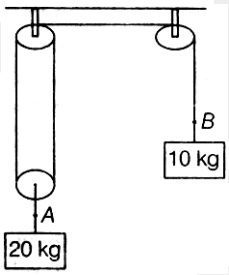
8. The maximum value of *r*, so that block do not slip with respect to turn table is



(A) $\frac{\mu g}{\omega^2}$ (B) R

(C) $\frac{\omega^2}{\mu g}$ (D) zero

9. Pulleys are massless and frictionless and rope is massless.



For the above system to be in equilibrium choose the correct option.

(A) Tension at B is less than 100 N
(B) Tension at A is more than 200 N
(C) Tension at B is more than 200 N
(D) None of the above

ASSERTION AND REASON

This is a assertion and reason type question and it has 4 choices (A), (B), (C) and (D), out of which only one is correct.

(A) Both assertion and reason are true and reason is the correct explanation of the assertion
(B) Both assertion and reason are true but reason is not the correct explanation of assertion
(C) Assertion is true but reason is false
(D) Both assertion and reason are false

10. **Assertion** A string can never remain horizontal when loaded at the middle, howsoever large the tension may be.

Reason For horizontal string angle with vertical.

$$\theta = 90°$$

$$\Rightarrow \quad T = \frac{w}{2\cos\theta} = \frac{w}{2\cos 90°} = \infty$$

11. To determine the coefficient of friction between a rought surface and a block, the surface is kept inclined at 45° and the block is released from rest. The block takes a time *t* in moving a distance *d*. The rough surface is then replaced by a smooth surface and the same experiment is repeated. The block now takes a time *t*/2 in moving down the same distance *d*. The coefficient of friction is

(A) 3/4 (B) 5/4
(C) 1/2 (D) $1/\sqrt{2}$

12. The upper half of an inclined plane of inclination θ is perfectly smooth while lower half is rough. A block starting from rest at the top of the plane will gain come to rest at the bottom, if the coefficient of friction between the block and lower half of the plane is given by

(A) $\mu = \frac{1}{\tan\theta}$ (B) $\mu = \frac{2}{\tan\theta}$

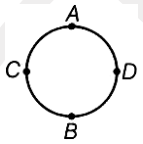
(C) $\mu = 2\tan\theta$ (D) $\mu = \tan\theta$

Space for Rough Work

13. Two forces in the ratio 1 : 2 act simultaneously on a particle. The resultant of these forces is three times the first force. The angle between them in
(A) 0° (B) 60°
(C) 90° (D) 45°

14. A can filled with water is revolved in a vertical circle of radius 4 m and the water does not fall down. The time period for a revolution is about
(A) 2 s (B) 4 s
(C) 8 s (D) 10 s

15. A stone is attached to one end of a string and rotated in a vertical circle. If string breaks at the position of maximum tension, it will break at



(A) *A* (B) *B*
(C) *C* (D) *D*

16. A body of mass 1 kg is rotating in a vertical circle of radius 1 m. What will be the difference in its kinetic energy at the top and bottom of the circle ?
(take, g = 10 ms^{-2})
(A) 10 J (B) 20 J
(C) 30 J (D) 50 J

17. A motorcycle is going on an overbridge of radius *R*. The driver maintains a constant speed. As the motorcycle is ascending on the overbridge, the normal force on it
(A) increases
(B) decreases
(C) remains the same
(D) fluctuates erratically

18. Angular velocity of hour hand of a watch is
(A) $\frac{\pi}{43200}$ rad s^{-1} (B) $\frac{\pi}{30}$ rad s^{-1}
(C) $\frac{\pi}{21600}$ rad s^{-1} (D) $\frac{\pi}{1800}$ rad s^{-1}

19. A particle describes a horizontal circle in a conical funnel whose inner surface is smooth with speed of 0.5 ms^{-1}. What is the height of the plane of circle from vertex of the funnel ?
(A) 0.25 m (B) 2 cm
(C) 4 cm (D) 2.5 cm

20. A coin placed on a rotating turn table just slips, if its is placed at a distance of 8 cm from the centre. If angular speed of the turn table is doubled, then it will just slip at a distance of
(A) 1 cm (B) 2 cm
(C) 4 cm (D) 8 cm

21. A balloon with mass *m* is descending down with an acceleration *a* (where, $a < g$). How much mass should be removed from it so that it starts moving up with an acceleration *a* ?
(A) $\frac{2ma}{g+a}$ (B) $\frac{2ma}{g-a}$
(C) $\frac{ma}{g+a}$ (D) $\frac{ma}{g-a}$

22. An object of mass 10 kg moves at a constant speed of 10 m/s. A constant force that acts for 4 s on the object, gives it a speed 2 m/s in opposite direction. The force acting on the object is
(A) –3N (B) –30N
(C) 3 N (D) 30 N

23. A light spring balance changes from the block of the other light spring balance and a block of mass *M* kg hangs from the former one. Then, the correct statement about the scale reading is
(A) both the scales read *M* kg each
(B) the scale of the lower one reads *M* kg and of the upper one zero
(C) the reading of the two scales can be anything but the sum of the readings will be *M* kg
(D) both the scales read *M*/2 kg

Space for Rough Work

24. The apparent weight of a person inside a lift is w_1 when lift moves up with a certain acceleration and is w_2 when lift moves down with same acceleration.
The weight of the person when lift moves up with constant speed is

(A) $\frac{w_1 + w_2}{2}$ (B) $\frac{w_1 - w_2}{2}$

(C) $2w_1$ (D) $2w_2$

25. A man slides down on a telegraphic pole with an acceleration equal to one-fourth of acceleration due to gravity. The frictional force between man and pole is equal to in terms of man's weight w

(A) $\frac{w}{4}$ (B) $\frac{w}{2}$

(C) $\frac{3w}{4}$ (D) w

26. A stone is dropped from a height h. It hits the ground with a certain momentum p. If the same stone is dropped from a height 100% more than previous height, the momentum when it hits the ground will change by

(A) 68% (B) 41%

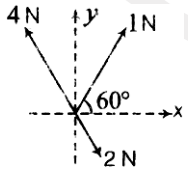
(C) 200% (D) 100%

27. The object at rest suddenly explodes into three parts with the mass ratio 2:1:1. The parts of equal masses move a right angles to each other with equal speeds. The speed of the third part after the explosion will be

(A) $2v$ (B) $v\sqrt{2}$

(C) $v/2$ (D) $\sqrt{2}v$

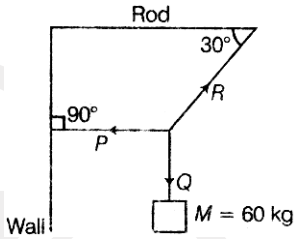
28. Three forces acting on a body are shown in the figure. To have the resultant force only along the x-direction, the magnitude of the minimum additional force needed is



(A) 0.5 N (B) 1.5 N

(C) $\frac{\sqrt{3}}{4}N$ (D) $\sqrt{3}$ N

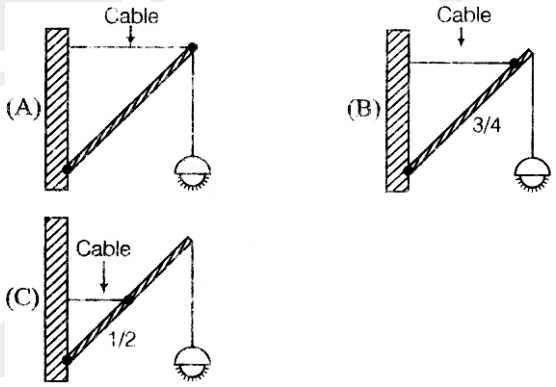
29. A body of mass 60 kg suspended by means of three strings, P,Q and R as shown in the figure is in equilibrium. The tension in the string P is



(A) 130.9 gN (B) 60 gN

(C) 50 gN (D) 103.9 gN

30. If a street light of mass M is suspended from the end of a uniform rod of length L in different possible patterns as shown in figure. then



(A) pattern A is more sturdy

(B) pattern B is more sturdy

(C) pattern C is more sturdy

(D) all will have same sturdiness

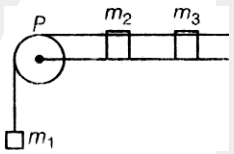
Space for Rough Work

31. Two particles of equal mass are connected to a rope *AB* of negligible mass, such that one is at end *A* and the other dividing the length of the rope in the ratio 1:2 from *B*. The rope is rotated about end *B* in a horizontal plane. Ratio of the tensions in the smaller part to the other is (ignore effect of gravity)

(A) 4:3 (B) 1:4

(C) 1:2 (D) 1:3

32. A system consists of three masses m_1, m_2 and m_3 connected by a string passing over a pulley *P*. The mass m_1 hangs freely and m_2 and m_3 are on a rough horizontal table (the coefficient of friction = μ). The pulley is frictionless and of negligible mass. The downward acceleration of mass m_1 is (assume, $m_1 = m_2 = m_3 = m$)



(A) $\frac{g(1-g\mu)}{9}$ (B) $\frac{2g\mu}{3}$

(C) $\frac{g(1-2\mu)}{3}$ (D) $\frac{g(1-2\mu)}{2}$

33. A person is driving a vehicle at uniform speed of 5 ms^{-1}on a level curved track of radius 5 m. The coefficient of static friction between tyres and road is 0.1. Will the person slip while taking the turn with the same speed ? (take, g = 10 ms^{-2})

(A) A person will slip, if $v^2 = 5\ m^2s^{-2}$

(B) A person will slip, if $v^2 > 5\ m^2s^{-2}$

(C) A person will slip, if $v^2 < 5\ m^2s^{-2}$

(D) A person will not slip, if $v^2 > 5\ m^2s^{-2}$

34. A block of mass 2 kg is placed on the surface of a trolley of mass 20 kg which is on a smooth surface. The coefficient of friction between the block and the surface of the trolley is 0.25. If the horizontal force of 2 N acts on the block, the acceleration of the system in ms^{-2} is (take, g = 10 ms^{-2})

(A) 1.8 (B) 1.0

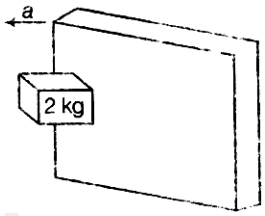
(C) 0.9 (D) 0.09

35. Masses *m* and *M* on pulley move 0.6 m in 4 s. What is ratio of $\frac{m}{M}$?

(A) $\frac{55}{11}$ (B) $\frac{113}{117}$

(C) $\frac{57}{55}$ (D) $\frac{397}{403}$

36. A rought vertical board has an acceleration *a* so that a 2 kg block pressing against it does not fall. The coefficient of friction between the block and the board should be



(A) $> g/a$ (B) $< g/a$

(C) $= g/a$ (D) $> a/g$

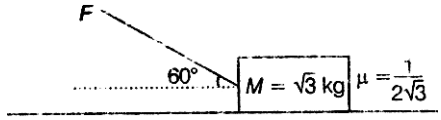
37. A heavy uniform chain lies on a horizontal top of table. If the coefficient of friction between the chain and the table is 0.25, then the maximum percentage of the length of the chain that can hang over one edge of the table is

(A) 20% (B) 25%

(C) 35% (D) 15%

Space for Rough Work

38. What is the maximum value of force *F*, such that the block, shown in the arrangement does not move ?



(A) 20 N (B) 10 N
(C) 12 N (D) 15 N

39. A cubical block of mass *m* rest on a rough horizontal surface, μ is the coefficient of static friction between the block and the surface. A force mg acting on the cube at an angle θ with vertical side of the cube pulls the block. If the block is to be pulled along the surface, then the value $\cot(\theta/2)$ is

(A) less than μ (B) greater than μ
(C) equal to μ (D) not dependent on μ

40. A wooden block of mass 8 kg slides down an inclined plane of inclination 30° to the horizontal with constant acceleration 0.4 m/s^2. The force of friction between the block and inclined plane is (take, g = 10 m/s^2)

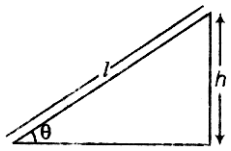
(A) 12.2 N (B) 24.4 N
(C) 36.8 N (D) 48.8 N

41. A body of mass m is placed on a rough surface with coefficient of friction μ inclined at θ. If the mass is in equilibrium, then

(A) $\theta = \tan^{-1}\mu$ (B) $\theta = \tan^{-1}\left(\frac{1}{\mu}\right)$

(C) $\theta = \tan^{-1}\frac{m}{\mu}$ (D) $\theta = \tan^{-1}\frac{\mu}{m}$

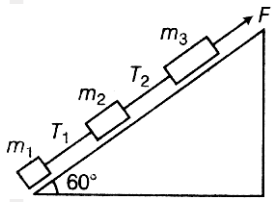
42. A smooth inclined plane is inclined at an angle θ with the horizontal. A body starts from rest and slides down the inclined surface, then the time taken by the body to reach the bottom is



(A) $\sqrt{\frac{2h}{g}}$ (B) $\sqrt{\frac{2l}{g}}$

(C) $\frac{1}{\sin\theta}\sqrt{\frac{2h}{g}}$ (D) $\sin\theta\sqrt{\frac{2h}{g}}$

43. Three blocks of masses $m_1 = 2.0, m_2 = 4.0$ and $m_3 = 6.0$ kg are connected by strings on a frictionless inclined plane of 60°, as shown in the figure. A force *F* = 120 N is applied upward along the incline to the uppermost block, causing an upward movement of the blocks. The connecting cords are light. The values of tensions T_1 and T_2 in the cords are



(A) $T_1 = 20N, T_2 = 60N$
(B) $T_1 = 60N, T_2 = 60N$
(C) $T_1 = 30N, T_2 = 50N$
(D) $T_1 = 20N, T_2 = 100N$

44. A block of wood of 1 kg resting on an inclined plane of angle 30°, just starts moving down. If the coefficient of friction is 0.2, its velocity (in ms^{-1}) after 5 s is take, g = 10 ms^{-2})

(A) 12.75 (B) 16.35
(C) 18.25 (D) 20

Space for Rough Work

45. The force required to just move a body up an inclined plane is double the force required to just prevent it from sliding down. If θ is the angle of friction and ϕ is the angle which the plane makes with horizontal, then

(A) $\tan\phi = 2\tan\theta$ (B) $\tan\phi = 3\tan\theta$

(C) $\tan\phi = \tan\theta$ (D) $\tan\theta = 3\tan\phi$

[CHEMISTRY]

46. If *a* is the length of the side of a cube, the distance between the body-centred atom and one corner atom in the cube will be

(A) $\frac{2}{\sqrt{3}}a$ (B) $\frac{4}{\sqrt{3}}a$

(C) $\frac{\sqrt{3}}{4}a$ (D) $\frac{\sqrt{3}}{2}a$

47. Copper crystallises in a face centred cubic lattice with a unit cell length of 361 pm. What is the radius of copper atom in pm ?

(A) 157 (B) 181
(C) 108 (D) 128

48. A solid AB has NaCl structure. If the radius of cation A^+ is 170 pm. Calculate the maximum possible radius of the anion B^-

(A) 210.3 pm (B) 397.4 pm
(C) 410.6 pm (D) 347.9 pm

49. The appearance of colour in solid alkali metal halides is generally due to

(A) Frenkel defect (B) interstitial positions
(C) F-centres (D) Schottky defect

50. The percentages of void space for simple cubic, body centred cubic and hexagonal close packed arranged respectively are

(A) 48, 32, 26 (B) 48, 26, 32
(C) 26, 48, 32 (D) 32, 48, 26

51. Volume occupied by single CsCl ion pair in a crystal is 7.014×10^{-23} cm^3. The smallest Cs —Cs internuclear distance is equal to length of the side of the cube corresponding to volume of one CsCl ion pair. The smallest Cs to Cs internuclear distance is nearly

(A) 4.4Å (B) 4.3Å
(C) 4 Å (D) 4.5Å

52. The metal has a fcc lattice. The edge length of the unit cell is 404 pm. The density of the metal is 2.72 g/cm^3. The molar mass of the metal is

(N_A = Avogadro's constant = 6.02×10^{23}mol^{-1})

(A) 40 g/mol (B) 30 g/mol
(C) 27 g/mol (D) 20 g/mol

53. The metal crystallises with a face-centred cubic lattice. The edge of the unit cell is 408 pm. The diameter of the metal atom is

(A) 288 pm (B) 408 pm
(C) 144 pm (D) 204 pm

54. The number of octahedral void (s) per atom present in a cubic close packed structure is

(A) 1 (B) 3
(C) 2 (D) 4

55. Structure of a mixed oxide is cubic close packed (ccp). The cubic unit cell of mixed oxide is composed of oxide ions. One fourth of the tetrahedral voids are occupied by divalent metal A and the octahedral voids are occupied by a monovalent metal B. The formula of oxide is

(A) ABO_2 (B) A_2BO_2

(C) $A_2B_3O_4$ (D) AB_2O_2

56. If in a crystal lattice of a compound, each corner of a cube is enjoyed by sodium, each edge of a cube has oxygen and centre of cube is enjoyed by tungsten (W), then give its formula

(A) Na_2WO_4 (B) $NaWO_3$
(C) Na_3WO_3 (D) Na_2WO_3

57. *AB* crystallises in a body-centred cubic lattice with edge '*a*' equal to 387 pm. The distance between two oppositely charged ions in the lattice is

(A) 300 pm (B) 335 pm
(C) 250 pm (D) 200 pm

58. Number of unit cells in 4 g of X (atomic mass = 40) which crystallises in bcc pattern is (N_A = Avogadro number)

(A) $0.1N_A$ (B) $2\times0.1N_A$

(C) $\frac{0.1N_A}{2}$ (D) $2\times N_A$

Space for Rough Work

59. Sodium metal crystallises in body centred cubic lattice with cell edge, 4.29Å. What is the radius of sodium atom ?
(A) 2.86Å (B) 6.81Å
(C) 1.68Å (D) 1.86Å

60. Percentage of cation in ammonium dichromate $(NH_4)_2Cr_2O_7$ is
(A) 41.29% (B) 14.29%
(C) 20.29% (D) None of these

61. Total number of voids in 0.5 mole of a compound forming hexagonal closed packed structure are
(A) 6.022×10^{23} (B) 3.011×10^{23}
(C) 9.033×10^{23} (D) 4.516×10^{23}

62. A solid is formed by two elements P and Q. The element Q forms cubic close packing and atoms of P occupy one third of tetrahedral voids. The formula of the compound is
(A) PQ_3 (B) P_3Q
(C) P_2Q_3 (D) P_3Q_2

63. Which kind of defect is shown by the given crystal ?

K^+ Cl^- K^+ Cl^- K^+ Cl^-
Cl^- □ Cl^- K^+ □ K^+
K^+ Cl^- □ Cl^- K^+ Cl^-
Cl^- K^+ Cl^- K^+ □ K^+

(A) Schottky defect
(B) Frenkel defect
(C) Schottky and Frenkel defects
(D) Substitution disorder

64. Copper crystallises in face centred cubic lattice with a unit cell length of 361 pm. What is the radius of copper atom in pm ?
(A) 128 (B) 157
(C) 181 (D) 108

65. Sodium crystallises in bcc arrangement with the interfacial separation between the atoms at the edge 53 pm. The density of the solid is
(A) 1.23 g/cc (B) 485 g/cc
(C) 4.85 g/cc (D) 123 g/cc

66. In which crystal, alternate tetrahedral voids are occupied ?
(A) NaCl (B) CaF_2
(C) ZnS (D) Na_2O

67. Three elements A, B and C crystallise into a cubic solid lattice. Atom A occupy the corners, B atom, the cube centres and C atom, the edge. The formula of the compound is
(A) ABC (B) ABC_2
(C) ABC_3 (D) ABC_4

68. A compound contains two types of atoms X and Y. It crystallises in a cubic lattice with atoms X at the corners of the unit cell and atoms Y at the body centre. The simplest possible formula of this compound is
(A) X_8Y (B) X_2Y
(C) XY (D) XY_8

69. Which of the following statements is not correct ?
(A) The fraction of the total volume occupied by the atoms in a primitive cell is 0.48
(B) Molecular solids are generally volatile
(C) The number of carbon atoms in a unit cell of diamond is 4
(D) The number of Bravais lattices in which a crystal can be categorised is 14

70. If 'a' stands for the edge length of the cubic systems : simple cubic, body centred cubic and face centred cubic, then the ratio of radius of the spheres in these systems will be respectively,
(A) $\frac{1}{2}a : \frac{\sqrt{3}}{4}a : \frac{1}{2\sqrt{2}}a$
(B) $\frac{1}{2}a : \sqrt{3}a : \frac{1}{\sqrt{2}}a$
(C) $\frac{1}{2}a : \frac{\sqrt{3}}{2}a : \frac{\sqrt{2}}{2}a$
(D) $1a : \sqrt{3}a : \sqrt{2}a$

Space for Rough Work

71. With which one of the following elements silicon should be doped so as to give p-type of semiconductor ?
(A) Germanium (B) Arsenic
(C) Selenium (D) Boron

72. **Assertion** (A) No compound has both Schottky and Frenkel defects.
Reason (R) Both defects change the density of the solid.
(A) Both A and R are correct and R is the correct explanation of A
(B) Both A and R are correct but R is not the correct explanation of A
(C) A is correct but R is incorrect
(D) Both A and R are incorrect

73. In a closed packed structure
(A) tetrahedral voids are bigger than octahedral
(B) tetrahedral voids are smaller than octahedral
(C) tetrahedral voids are equal in size as octahedral
(D) None of the above

74. The fraction of total volume occupied by the atoms present in a simple cube is
(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{3\sqrt{2}}$
(C) $\frac{\pi}{4\sqrt{2}}$ (D) $\frac{\pi}{4}$

75. If NaCl is doped with 10^{-4} mole % of $SrCl_2$, the concentration of cation vacancies will be $(N_A = 6.02 \times 10^{23} mol^{-1})$
(A) $6.02\times10^{15} mol^{-1}$ (B) $6.02\times10^{16} mol^{-1}$
(C) $6.02\times10^{17} mol^{-1}$ (D) $6.02\times10^{14} mol^{-1}$

76. If AgI crystallises in zinc blende structure with I^- ions at lattice points. What fraction of tetrahedral voids is occupied by Ag^+ ions ?
(A) 25% (B) 50%
(C) 100% (D) 75%

77. A fcc unit cell of aluminium contains the equivalent of how many atoms ?
(A) 1 (B) 2
(C) 3 (D) 4

78. Ag crystallises as fcc. If radius of Ag is 144 pm then its density will be
(A) 10 g cm^{-3} (B) 5 g cm^{-3}
(C) 15 g cm^{-3} (D) 6.5 g cm

79. Coordination number of a body centred cubic is
(A) 6 (B) 8
(C) 10 (D) 12

80. CsBr crystallises in a body-centred cubic lattice. The unit cell length is 436.6 pm. Given that the atomic mass of Cs = 133 u and that of Br = 80 u and Avogadro's number being 6.02×10^{23} mol^{-1}, the density of CsBr is
(A) 42.5 g/cm^3 (B) 0.425 g/cm^3
(C) 8.25 g/cm^3 (D) 4.25 g/cm^3

81. The Ca^{2+} and F^- are located in CaF_2 crystal, respectively at body centred cubic lattice points and in
(A) tetrahedral voids (B) half of tetrahedral voids
(C) octahedral voids (D) half of octahedral voids

82. **Assertion** (A) Graphite is an example of tetragonal crystal system.
Reason (R) For a tetragonal system, $a = b \neq c$, $\alpha = \beta = 90°, \gamma = 120°$.
(A) Both A and R are correct but R is the correct explanation of A
(B) Both A and R are correct but R is not the correct explanation of A
(C) A is correct but R is incorrect
(D) Both A and R are incorrect

83. Na and Mg crystallise in bcc and fcc type crystals respectively, then the number of atoms of Na and Mg present in the unit cell of their respective crystal is
(A) 4 and 2 (B) 9 and 14
(C) 14 and 9 (D) 2 and 4

Space for Rough Work

84. A metallic element has a cubic lattice. Each edge of the unit cell is 2Å. The density of the metal is 2.5 g cm^{-3}. The unit cells in 200 g of metal are

(A) 1×10^{24} (B) 1×10^{20}

(C) 1×10^{22} (D) 1×10^{25}

85. The radius of Na^+ and Cl^- ions are 95 pm and 181 pm respectively. The edge length of NaCl unit cell is

(A) 276 pm (B) 138 pm

(C) 552 pm (D) 415 pm

86. Some of the polar crystals when heated produces small electrical current. This phenomenon is called

(A) ferroelectricity (B) pyroelectricity

(C) piezoelectricity (D) anti-ferroelectricity

87. In a face centred cubic lattice, a unit cell is shared equally by how many unit cells ?

(A) 8 (B) 4

(C) 2 (D) 6

88. If Z is the number of atoms in the unit cell that represents the closest packing sequence ... *ABC ABC*..., the number of tetrahedral voids in the unit cells is equal to

(A) Z (B) 2 Z

(C) $\frac{Z}{2}$ (D) $\frac{Z}{4}$

89. When electrons are trapped into the crystal in anion vacancy, the defect is known as

(A) Schottky defect

(B) Frenkel defect

(C) stoichiometric defect

(D) F-centres

90. Which of the following unit cell having maximum number of atoms ?

(A) bcc (B) hcp

(C) fcc (D) Cubic

[ZOOLOGY]

91. In which one of the following pairs of terms both represent one and the same thing ?

(A) Plasma – Serum

(B) Atrioventricular node – Pacemaker

(C) Leucocytes – Lymphocytes

(D) Mitral valve – Bicuspid valve

92. Consider the following four statements (i) - (iv) and select the correct option.

(i) SA node is natural pacemaker of heart.

(ii) Human heart has inter-auricular foramen.

(iii) Right atrioventricular valve is a semilunar valve.

(iv) Normal systolic and diastolic pressure of humans is 120 and 60 mm Hg respectively.

	(i)	**(ii)**	**(iii)**	**(iv)**
(A)	F	F	T	F
(B)	F	F	T	T
(C)	T	T	F	T
(D)	T	F	F	F

93. The blood cells which help in the transportation of fats are

(A) Erythrocytes (B) Lymphocytes

(C) Monocytes (D) Neutrophils

94. Myogenic heart is not present in which of the following?

(A) Man (B) Limulus

(C) Frog (D) Mussel

95. One of the following is the characteristics feature of leucocytes

(A) Anucleated

(B) Diapedesis

(C) Agranular cytoplasm

(D) Coloured

Space for Rough Work

96. Blood pressure is defined as the force with which blood
(A) Pushes against the wall of the blood vessels
(B) Is pushed to the legs
(C) Comes out of the atrium
(D) Comes out of the ventricle

97. Heart beats are accelerated by
(A) Cranial nerves and acetylcholine
(B) Sympathetic nerves and acetylcholine
(C) Cranial nerves and adrenaline
(D) Sympathetic nerves and epinephrine

98. Blood will lose most of the oxygen through
(A) Arteries (B) Veins
(C) Capillaries (D) Lungs

99. Myocardial infarction is caused by
(A) Hardening of arteries
(B) Lumpy thickness develops in the inner walls of heart
(C) Clot may occur in the lumen of a coronary artery
(D) Sudden interruption of blood flow towards a portion of heart

100. In a cardiac output of 5250 ml per minute, with 75 heart beats per minute, the stroke volume is
(A) 55 ml (B) 60 ml
(C) 70 ml (D) 80 ml

101. Heart sound which is longer is
(A) lubb
(B) dupp
(C) both equal
(D) sometimes (A) and sometimes (B)

102. Tricuspid valves are found in
(A) All mammals (B) All vertebrates
(C) Prototherians (D) Walrus

103. The conduction of impulse from SA node moves to
(A) AV-node (B) Bundle of His
(C) Purkinje fibres (D) Cardiac muscles

104. The heart sound 'dup' is produced when
(A) Tricuspid valve is opened
(B) Mitral valve is opened
(C) Mitral valve is closed
(D) Semilunar valves at the base of aorta get closed

105. 'P' wave of ECG occurs before the
(A) Onset of ventricular ejection
(B) End of arterial contraction
(C) Beginning of atrial contraction
(D) None of the above

106. The difference between pulmonary arteries and veins is that
(A) Former is associated with lungs and latter with heart
(B) Arteries have thicker walls
(C) Veins are more elastic
(D) Veins have valves

107. Which layer of the wall of blood vessel is made up of circular smooth muscles ?
(A) Outer (B) Middle
(C) Inner (D) Both (A) and (B)

108. Plasma protein also does the work of
(A) Nutritive functioning
(B) Physiochemical functioning
(C) Transportive functioning
(D) All of the above

109. One of the following blood vessels is without valves
(A) Artery (B) Pulmonary artery
(C) Vein (D) Aorta

Space for Rough Work

110. Which of the following are the first to have closed circulatory system ?
(A) Molluscs (B) Annelids
(C) Cardiac (D) Enhinoderms

111. Heart beats are affected by
(A) Carbon dioxide (B) Oxygen
(C) Vagus nerve (D) All of these

112. If the systolic pressure is 120 mm Hg and diastolic pressure is 80 mm Hg, the pulse pressure is _____ .
(A) 120 × 80 = 9600 mm Hg
(B) 120 + 80 = 200 mm Hg
(C) 120 – 80 = 40 mm Hg
(D) 120 / 80 = 1.5 mm Hg

113. The coronary sinus in the heart is situated along its
(A) Left margin
(B) Right margin
(C) Diaphragmatic surface
(D) Lower border of the heart

114. Systolic pressure is higher than diastolic pressure because
(A) Arteries are contracting during systole
(B) Blood is pumped with a pressure in the arteries by the heart during systole but not during diastole
(C) Arteries resist during systole only
(D) Volume of blood is higher in systole than that of diastole in the heart.

115. During circulation, blood passes from the inferior vena cava into the diastolic atrium of the heart because of
(A) Pushing of venous valves
(B) A pressure differential between the atrium and the vena cava
(C) The beating of the sinoatrial node
(D) Gravitational pull

116. In the cardiac cycle, diastole is
(A) The number of heart beats per minute
(B) The relaxation period after contraction of the heart
(C) The forceful pumping action of the heart
(D) The contraction period after relaxation of the heart

117. The cardiac cycle time during normal heart beat is 0.8 seconds which includes both systole and diastole. In the event of fast running, the heart starts beating faster leading to decrease in cardiac cycle timings.
This decrease is due to
(A) Proportional decrease in the duration of diastole as well as systole
(B) Less duration of diastole and more duration of systole
(C) Same duration of diastole and less duration of systole
(D) Much more decrease in the duration of diastole than that of systole

118. The heart usually pumps blood with greater force in old people than the young because
(A) The oxygen content per unit volume of the blood decreases
(B) The elasticity of the arteries decreases
(C) The elasticity of the arteries increases
(D) The nutrient content per unit of blood decreases

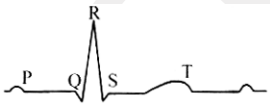
119. A portal system is that in which
(A) A vein begins from an organ and ends in heart
(B) An artery breaks up in an organ and restarts by the union of its capillaries
(C) The blood from gut is brought into the kidneys before it is poured into the heart
(D) A vein breaks up in an organ into capillaries and restarts by their union as a new vein in the same organ.

Space for Rough Work

120. A vein has large lumen because
(A) Tunica interna and tunica media appear like a single coat
(B) Tunica media and tunica externa appear like a single coat
(C) Tunica media is a single coat
(D) Tunica interna, media and externa are thin

121. Innominate is
(A) A nerve and artery
(B) Skeleton part and artery
(C) A nerve and a vein
(D) A muscle and artery

122. Examine the diagrammatic representation of strandard ECG. Select an option with correct matching.



	P-Wave	QRS complex	T-wave
(A)	Repolarisation of the atria	Repolarisation of the ventricles	Depolarisation of the atria
(B)	Depolarisation of the atria	Depolarisation of the ventricles	Repolarisation of the ventricles
(C)	Repolarisation of the ventricles	Repolarisation of the atria	Depolarisation of the ventricles
(D)	Depolarisation of the ventricles	Depolarisation of atria	Repolarisation of atria

123. In connection with circulatory system, valves are present
(A) Not only in heart and blood vessels of vertebrates and invertebrates, but in vertebrate lymphatics as well
(B) Vertebrate heart only
(C) Vertebrate heart and invertebrate hearts only
(D) Vertebrate hearts, invertebrate hearts and their blood vessels

124. In an old man's ECG, T-waves shall be
(A) Flat (B) Inverted
(C) Very prominent (D) Same as in adults

125. Heart rate is increased by all of the following except
(A) Anoxia
(B) Moderate CO_2 excess
(C) Elevated body temperature
(D) Increased intracranial pressure

126. Vasa vasorum supplies blood to
(A) Pericardium
(B) Blood vessels
(C) Tunica adventitia and external part of tunica media
(D) Vas deferens

127. Blood pressure is measured by
(A) sphygmomanometer
(B) stethoscope
(C) electrocardiogram
(D) phenocardiogram

128. All of the following are vasoconstrictor agents except
(A) Norepinephrine (B) Angiotensin
(C) Vasopressin (D) Prostaglandins

129. Wenckebach phenomenon is seen in
(A) Complete heart block
(B) Partial heart block
(C) Ventricular fibrillation
(D) Myocardial infarction

130. Nature of blood plasma is
(A) Acidic (B) Alkaline
(C) Neutral (D) None of the above

131. Mark the odd one out.
(A) Lymphocytes (B) Monocytes
(C) Leucocytes (D) Neutrophils

132. A mature human erythrocyte has the typical characteristics of
(A) A eukaryote cell
(B) A prokaryote cell
(C) Both a eukaryote cell and a prokaryote cell
(D) Neither a eukaryote nor a prokaryote cell

Space for Rough Work

133. Buffer salts present in blood are
(A) Potassium
(B) Sodium
(C) Sodium and potassium both
(D) Cobalt, sodium and potassium

134. The mechanism of blood clotting was first described by
(A) Morawitz (B) Landsteiner
(C) Willaim-Harvey (D) James Watson

135. If haemoglobin instead of staying within the corpuscles remains free in the plasma, then
(A) The viscosity of blood will rise
(B) It will cause acidosis
(C) Oxygen-carrying capacity of blood will be reduced
(D) All of the above.

[BOTANY]

136. CAM helps the plants in
(A) secondary growth
(B) disease resistance
(C) reproduction
(D) conserving water

137. Of the total incident solar radiation the proportion of PAR is
(A) about 60% (B) less than 50%
(C) more than 80% (D) about 70%

138. Cyclic photophosphorylation links to
(A) PS-II (B) PS-I
(C) dark reaction (D) both (A) and (B)

139. In C_3 cycle for the fixation of every CO_2 molecules, the reduction and regeneration steps required
(A) 3 ATP and 2 $NADPH_2$
(B) 2 ATP and 2 $NADPH_2$
(C) 2 ATP and 3 $NADPH_2$
(D) 3 ATP and 1 $NADPH_2$

140. Which of the following is true for photosynthesis ?
(A) Reduction of CO_2 and water
(B) Oxidation of CO_2 and water
(C) Reduction of CO_2 and oxidation of water
(D) Oxidation of CO_2 and reduction of water

141. Which of the following is wrongly matched ?
(A) Sorghum – Kranz anatomy
(B) PEP carboxylase – Mesophyll cells
(C) Blackman – Law of limiting factors
(D) Photosystem-II – P_{700}

142. Cyclic-photophosphorylation results in the formation of
(A) NADPH
(B) ATP AND NADPH
(C) ATP, NADPH and oxygen
(D) ATP

143. In an experiment demonstrating the evolution of oxygen in Hydrilla, sodium bicarbonate is added to water in the experimental set-up. What would happen if all other conditions are favourable ?
(A) Amount of oxygen evolved decreases as carbon dioxide in water is absorbed by sodium bicarbonate.
(B) Amount of oxygen evolved increases as the availability of carbon dioxide increases.
(C) Amount of oxygen evolved decreases as the availability of carbon dioxide increases.
(D) Amount of oxygen evolved increases as carbon dioxide in water is absorbed by sodium bicarbonate.

144. In C_3-plants, the first stable compound formed after carbon dioxide fixation is
(A) phosphoglyceraldehyde
(B) malic acid
(C) oxaloacetic acid
(D) 3-phosphoglycerate

Space for Rough Work

145. The mineral involved in the photolysis of water are

I. Manganese II. Calcium
III. Magnesium IV. Chloride

(A) I and II only (B) I, II and IV only
(C) I, II and III only (D) I and IV only

146. Photolysis of water during photosynthesis occurs with the help of

(A) PS-II (B) PS-I
(C) ferredoxin (D) cytochrome

147. Chlorophyll-a and b differ in having

(A) chlorophyll-a has a methyl group and chlorophyll-b has aldehyde group in position X
(B) chlorophyll-a has an aldehyde group and chlorophyll-b has a methyl group in position X
(C) chlorophyll-a has a carboxyl group and chlorophyll-b has an aldehyde group in position X
(D) chlorophyll-a has an ethyl group and chlorophyll-b has an aldehyde group in position X

148. Match the phenomenon listed under column-II. Select the correct answer from the given options.

	Column-I		Column-II
(A)	Warburg effect	(1)	Change in gene frequency by chance
(B)	Pasteur effect	(2)	Postponing severance in the leaves by applying cytokinin
(C)	Emerson effect	(3)	Decline in the consumption of respiratory substrate due to a change from anaerobic to aerobic respiration.
(D)	Wright effect	(4)	Inhibitory effect of oxygen on photosynthesis
		(5)	Enhancement of photosynthesis by subjecting chlorophyll to the effect of two different wavelengths of light.

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

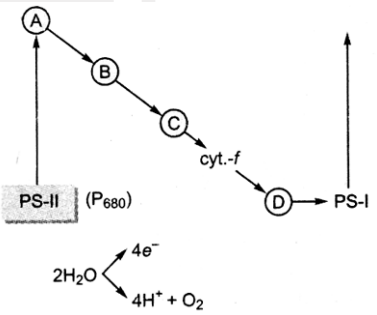
149. The net requirement of assimilatory power for the formation of 6 hexose molecules in maize plant is

(A) 72 ATP, 48 NADPH
(B) 90 ATP, 60 NADPH
(C) 108 ATP, 72 NADPH
(D) 180 ATP, 72 NADPH

150. Ammonia releases from

(A) photorespiration (B) dark respiration
(C) CAM (D) all of these

151.

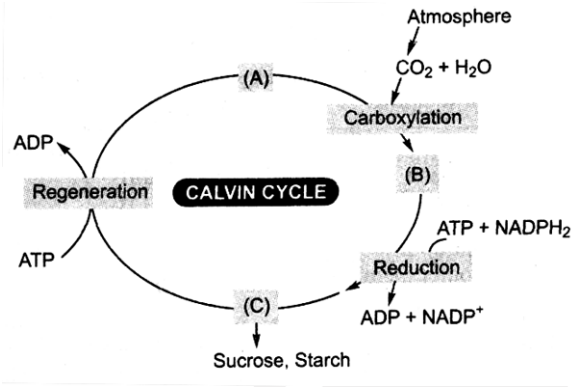


In the above schematic diagram, which is plastocyanin ?

(A) C (B) D
(C) A (D) B

Space for Rough Work

152. Choose the correct combination of labelling the carbohydrate molecule involved in the Calvin cycle.



(A) A-RuBP, B–Triose phosphate, C–PGA
(B) A–PGA, B–RuBP, C–Triose phosphate
(C) A–PGA, B–Triose phosphate, C–RuBP
(D) A–RuBP, B–PGA, C–Triose phosphate

153. Photolysis of each water molecule in light reaction will yield
(A) 2 electrons and 4 protons
(B) 4 electrons and 4 protons
(C) 4 electrons and 3 protons
(D) 2 electrons and 2 protons

154. Identify the correct combinations of the following :

	Substrate	Enzyme	Product
I.	Phosphoenol pyruvate	PEP carboxylase	C_4 acid
II.	Malate	Malic enzyme	C_4 acid
III.	RuBP	Ribulose-5-phosphate kinase	C_3 acid
IV.	Pyruvate	Pyruvate dikinase	C_3 acid

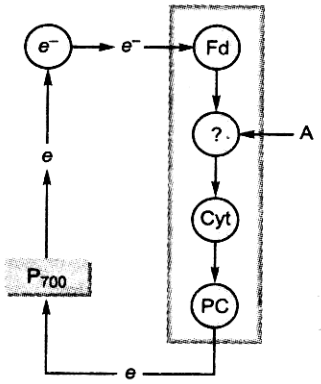
(A) III and IV (B) I and II
(C) II and III (D) I and IV

155. Cyclic photophosphorylation produces
(A) NADPH (B) ATP
(C) ATP + $NADPH_2$ (D) ATP + $NADPH_2$ + O_2

156. Adenosine diphosphate contains
(A) one high energy bonds
(B) two high energy bonds
(C) three high energy bonds
(D) four high energy bonds

157. Compensation point refers to
(A) little photosynthesis
(B) beginning of photosynthesis
(C) rate of photosynthesis equals to the rate of respiration
(D) None of these

158. In the given chart of photophosphorylation. What does 'A' represent ?



(A) PC (B) FRS
(C) PQ (D) Cyt - a_3

159. The special structure present in C_4 - plants is
(A) thin cuticle (B) multi-layered epidermis
(C) Kranz type body (D) one-layered epidermis

160. Core of chlorophyll is formed by
(A) iron (B) manganese
(C) methyl group (D) magnesium

Space for Rough Work

161. Photochemical reactions in the chloroplasts are directly involved in
(A) fixation of carbon dioxide
(B) synthesis of glucose and starch
(C) formation of phosphoglyceric acid
(D) photolysis of water and phosphorylation of ADP to ATP

162. Solarisation is
(A) formation of chlorophyll
(B) destruction of chlorophyll
(C) utilisation of sunlight
(D) effects of solar light

163. Match the following with correct combination.

	Column-I		Column-II
A.	Carboxylation	(1)	Oxygen evolution
B.	Phosphorylation	(2)	Photorespiration
C.	Photolysis of water	(3)	RUBISCO
D.	Phosphoglycolate	(4)	Chemosynthesis
E.	Nitrosomonas	(5)	ATP

	A	B	C	D	E
(A)	1	2	3	4	5
(B)	3	5	1	2	4
(C)	2	3	5	4	1
(D)	1	3	4	2	5

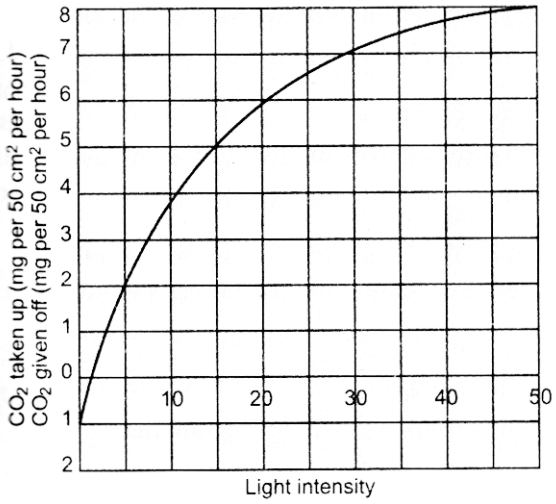
164. Radioactive C^{14} is given to carbon dioxide and released to atmosphere. This carbon dioxide is taken by RuBP in a C_3-plant. First radioactive C^{14} is seen, in which compound.
(A) PGAL (B) PEP
(C) RMP (D) PGA

165. In Hatch and Slack pathway,
(A) chloroplasts are of same type.
(B) Kranz anatomy occurs where mesophyll have small chloroplasts whereas bundle sheath have granal chloroplasts.
(C) Kranz anatomy occurs where mesophyll have small chloroplasts whereas bundle sheath have larger, agranal chloroplasts.
(D) Kranz anatomy where mesophyll cells are diffused.

166. Quantasomes occur on the surface of
(A) cristae (B) plasmalemma
(C) nuclear envelope (D) thylakoids

167. To form one molecule of glyceraldehyde phosphate in Calvin cycle
(A) 9 ATP and 36 NADPH are required
(B) 6 ATP and 6 NADPH are required
(C) 3 ATP and 3 NADPH are required
(D) 9 ATP and 6 NADPH are required

168. The graph below 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) Only photosynthesis is taking place at this intensity of light
(D) The rate of photosynthesis is equivalent to the rate of respiration

Space for Rough Work

169. Photorespiration could easily be detected in

(A) C_3 - plants (B) C_4 - plants

(C) Both (A) and (B) (D) None of these

170. Which one of the following is wrong in relation to photorespiration ?

(A) It is a characteristic of C_4 - plants

(B) It is a characteristic of C_3 - plants

(C) It occurs in chloroplasts

(D) It occurs in day-time only

171. Grana is ill developed or absent in the chloroplast in the

(A) stem of Hydrilla

(B) leaf of sunflower

(C) bundle sheath of sugarcane leaf

(D) mesophyll of grasses

172. Malic acid (4-C) is produced in which plant without Kranz anatomy ?

(A) Bryophyllum (B) Kalanchoe

(C) Opuntia (D) All of these

173. The two pigment system theory of photosynthesis was proposed by

(A) Blackman (B) Hill

(C) Emerson (D) Amon

174. Who proved that oxygen evolved in photosynthesis comes from water ?

(A) Calvin

(B) Mayer

(C) Blackman

(D) Ruben, Hassid and Kamen.

Direction for (Q. No. 175 to Q. Nos. 180)

(A) If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(B) If both Assertion and Reason are true but Reason is not correct explanation of Assertion.

(C) If Assertion is true but Reason is false.

(D) If both Assertion and Reason are false.

175. **Assertion :** Cyclic pathway of photosynthesis first appeared in some eubacterial species.

Reason : Oxygen started accumulating in the atmosphere after the non-cyclic pathway of photosynthesis evolved.

176. **Assertion :** Photosynthetically, C_4-plants are less efficient than C_3-plants

Reason : The operation of C_4-pathway requires the involvement of only bundle-sheath cells.

177. **Assertion :** Under conditions of high light intensity and limited carbon dioxide supply, photorespiration has a useful role in protecting the plants from photoxidative damage.

Reason : If enough carbon dioxide is not available to utilize light energy for carboxylation to processed, the excess energy may not cause damage to plants.

178. **Assertion :** C_4 - photosynthetic pathway is more efficient than the C_3 - pathway.

Reason : Photorespiration is suppressed in C_4 - plants.

179. **Assertion :** The atmospheric concentration of carbon dioxide at which photosynthesis just compensated for respiration is referred to as carbon dioxide compensation point.

Reason : The carbon dioxide compensation point is reached when the amount of carbon dioxide uptake is less than that generated through respiration because the level of carbon dioxide in the atmosphere is more than that required for achieving carbon dioxide compensation point.

180. **Assertion :** Photorespiration decreases net photosynthesis.

Reason : Rate of respiration in dark and light is almost same in all plants.

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Space for Rough Work