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Date : 13/09/2015

Test No.: 0 5

Subject Code.: 2 2 2

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

HORIZON TEST SERIES

for

Medical Entrance Exam. 2016

[Test No. 5]

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. 5

Topics of The Test

Physics	Motion in 1D & 2D.
Chemistry	Chemical Bonding.
Biology	Zoology : Respiration system in human. Botany : Plant Respiration.

Test No. 5

[PHYSICS]

1. Which of the following statements is incorrect ?
   (A) Path length is a scalar quantity whereas displacement is a vector quantity.
   (B) The magnitude of displacement is always equal to the path length traversed by an object over a given time interval.
   (C) The displacement depends only on the end points whereas path length depends on the actual path followed.
   (D) The path length is always positive whereas displacement can be positive, negative and zero.
2. A drunkard is walking along a straight road. He takes 5 steps forward and 3 steps backward and so on. Each step is 1 m long and takes 1 s. There is a pit on the road 11 m away from the starting point. The drunkard will fall into the pit after
   (A) 21 s (B) 29 s
   (C) 31 s (D) 37 s
3. A cyclist moving on a circular track of radius 40 m completes half a revolution in 40 s. Its average velocity is
   (A) zero (B) 4π m s^{-1}
   (C) 2 m s^{-1} (D) 8π m s^{-1}
4. A body moving along a straight line travels one third of the total distance with a speed of 3.0 m s^{-1}. The remaining distance is covered with a speed of 4.0 m s^{-1} for half the time and 5.0 m s^{-1} for the other half of the time. The average speed during the motion is
   (A) 4.0 m s^{-1} (B) 6.0 m s^{-1}
   (C) 3.8 m s^{-1} (D) 2.4 m s^{-1}
5. A motorboat covers the distance between two spots on the river in 8 h and 12 h downstream and upstream respectively. The time required by the boat to cover this distance in still water is
   (A) 6.3 h (B) 9.6 h
   (C) 3.2 h (D) 18.12 h
6. The position x of a particle with respect to time t along x-axis is given by $x = 9t^2 - t^3$ where x is in metres and t in seconds. What will be the position of this particle when it achieves maximum speed along the + x direction ?
   (A) 54 m (B) 81 m
   (C) 24 m (D) 32 m
7. A car starts from rest, attains a velocity of 36 km h^{-1} with an acceleration of 0.2 m s^{-2}, travels 9 km with this uniform velocity and then comes to halt with a uniform deceleration of 0.1 m s^{-2}. The total time of travel of the car is
   (A) 1050 s (B) 1000 s
   (C) 950 s (D) 900 s
8. A particle moving along a straight line has a velocity v m s^{-1}, when it cleared a distance of x m. These two are connected by the relation $v = \sqrt{49 + x}$. When its velocity is 1 m s^{-1}, its acceleration is
   (A) 2 m s^{-2} (B) 7 m s^{-2}
   (C) 1 m s^{-2} (D) 0.5 m s^{-2}
9. A particle moving with uniform acceleration has average velocities v_1, v_2 and v_3 over the successive intervals of time t_1, t_2 and t_3 respectively. The value of $\frac{(v_1 - v_2)}{(v_2 - v_3)}$ will be
   (A) $\frac{t_1 - t_2}{t_2 - t_3}$ (B) $\frac{t_1 - t_2}{t_2 + t_3}$
   (C) $\frac{t_1 + t_2}{t_2 - t_3}$ (D) $\frac{t_1 + t_2}{t_2 + t_3}$

Space for Rough Work

10. A body sliding on a smooth inclined plane requires 4 seconds to reach the bottom, Starting from rest at the top. How much time does it take to cover one-fourth the distance starting from rest at the top ?
(A) 1 s (B) 4 s
(C) 2 s (D) 16 s

11. A body A starts from rest with an acceleration a_1. After 2 seconds, another body B starts from rest with an acceleration a_2. If they travel equal distances in the 5th second, after the start of A, then the ratio $a_1 : a_2$ is equal to
(A) 5 : 9 (B) 5 : 7
(C) 9 : 5 (D) 9 : 7

12. An auto travelling along a straight road increases its speed from 30.0 m s^{-1} to 50.0 m s^{-1} in a distance of 180 m. If the acceleration is constant, how much time elapses while the auto moves this distance ?
(A) 6.0 s (B) 4.5 s
(C) 3.6 s (D) 7.0 s

13. Two parallel rail tracks run north-south. On one track train A moves north with a speed of 54 km h^{-1} and on the other track train B moves south with a speed of 90 km h^{-1}. The velocity of train A with respect to train B is
(A) 10 m s^{-1} (B) 15 m s^{-1}
(C) 25 m s^{-1} (D) 40 m s^{-1}

14. A bird is tossing (flying to and fro) between two cars moving towards each other on a straight road. One car has speed of 27 km h^{-1} while the other has the speed of 18 km h^{-1}. The bird starts moving from first car towards the other and is moving with the speed of 36 km h^{-1} when the two cars were separated by 36 km. The total distance covered by the bird is
(A) 28.8 km (B) 38.8 km
(C) 48.8 km (D) 58.8 km

15. A ball A is thrown vertically upwards with speed u. At the same instant another ball B is released from rest at height h. At time t, the speed of A relative to B is
(A) u (B) $u - 2gt$
(C) $\sqrt{u^2 - 2gh}$ (D) $u - gt$

16. Which of the following statements is false regarding the vectors ?
(A) The magnitude of a vector is always a scalar.
(B) Each component of a vector is always a scalar.
(C) Two vectors having different magnitudes cannot have their resultant zero.
(D) Vectors obey triangle law of addition.

17. Which of the following is not a scalar quantity ?
(A) Temperature (B) Coefficient of friction
(C) Charge (D) Impulse

18. Consider the quantities, pressure, power, energy, impulse, gravitational potential, electrical charge, temperature, acceleration. Out of these, the only vector quantities are
(A) impulse, pressure and acceleration
(B) impulse and acceleration
(C) acceleration and gravitational potential
(D) impulse and pressure

19. Which of the following is not a property of a null vector?
(A) $\vec{A} + \vec{0} = \vec{A}$
(B) $\lambda\vec{0} = \vec{0}$ where λ is a scalar
(C) $0\vec{A} = \vec{A}$
(D) $\vec{A} - \vec{A} = \vec{0}$

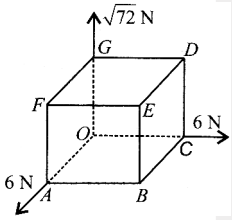
20. The component of vector $\vec{A} = 2\hat{i} + 3\hat{j}$ along the direction of $(\hat{i} - \hat{j})$ is
(A) $\frac{1}{\sqrt{2}}$ (B) $-\frac{1}{\sqrt{2}}$
(C) $\frac{1}{2}$ (D) $-\frac{1}{2}$

Space for Rough Work

21. Two vectors $\vec{A}$ and $\vec{B}$ inclined at an angle θ have a resultant $\vec{R}$ which makes an angle α with $\vec{A}$. If the directions of $\vec{A}$ and $\vec{B}$ are interchanged, the resultant will have the same
(A) direction
(B) magnitude
(C) direction as well as magnitude
(D) none of these

22. The direction cosines of $\hat{i}+\hat{j}+\hat{k}$ are
(A) 1,1,1 (B) 2,2,2
(C) $\frac{1}{\sqrt{2}},\frac{1}{\sqrt{2}},\frac{1}{\sqrt{2}}$ (D) $\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}}$

23. Three forces of magnitudes 6 N, 6 N and $\sqrt{72}$ N act at corners of cube along three sides as shown in figure. Resultant of these forces is



(A) 12 N along OB (B) 18 N along OA
(C) 18 N along OC (D) 12 N along OE

24. The (x,y,z) coordinates of two points A and B are given respectively as (0, 4,–2) and (–2, 8,–4). The displacement vector from A to B is
(A) $-2\hat{i}+4\hat{j}-2\hat{k}$ (B) $2\hat{i}-4\hat{j}+2\hat{k}$
(C) $2\hat{i}+4\hat{j}-2\hat{k}$ (D) $-2\hat{i}-4\hat{j}-2\hat{k}$

25. If $\vec{A}$ is a vector of magnitude 5 units due east. What is the magnitude and direction of a vector $-5\vec{A}$?
(A) 5 units due east (B) 25 units due west
(C) 5 units due west (D) 25 units due east

26. A river is flowing due east with a speed 3 m s^{-1}. A swimmer can swim in still water at a speed of 4 m s^{-1}. If swimmer starts swimming due north, then the resultant velocity of the swimmer is
(A) 3 m s^{-1} (B) 5 m s^{-1}
(C) 7 m s^{-1} (D) 2 m s^{-1}

27. Resultant of two vectors $\vec{A}$ and $\vec{B}$ is of magnitude P. If $\vec{B}$ is reversed, then resultant is of magnitude Q. What is the value of P^2+Q^2 ?
(A) $2(A^2+B^2)$ (B) $2(A^2-B^2)$
(C) A^2-B^2 (D) A^2+B^2

28. The position of a particle is given by $\vec{r}=3t\hat{i}+2t^2\hat{j}+5\hat{k}$, where t is in seconds and the coefficients have the proper units for $\vec{r}$ to be in metres. The direction of velocity of the particle at t = 1 s is
(A) 53° with x-axis (B) 37° with x-axis
(C) 30° with y-axis (D) 60° with the y-axis

29. A bird flies from (–3 m, 4 m, –3 m) to (7 m ,–2 m, –3m) in the xyz- coordinates. The bird's displacement in unit vector is given by
(A) $(4\hat{i}+2\hat{j}-6\hat{k})$ (B) $(10\hat{i}-6\hat{j})$
(C) $(4\hat{i}-2\hat{j})$ (D) $(10\hat{i}+6\hat{j}-6\hat{k})$

30. A fighter plane is flying horizontally at an altitude of 1.5 km with speed 720 km h^{-1}. At what angle of sight (w.r.t horizontal) when the target is seen, should the pilot drop the bomb in order to attack the target ? (Take g = 10 m s^{-2}, tan23° = 0.43)
(A) 23° (B) 32°
(C) 12° (D) 42°

31. If $\vec{A}=2\hat{i}-3\hat{j}-\hat{k}$ and $\vec{B}=4\hat{i}-6\hat{j}-2\hat{k}$. Which of the following is correct ?
(A) $\vec{A}$ and $\vec{B}$ are equal vectors.
(B) $\vec{A}$ and $\vec{B}$ are perpendicular vectors.
(C) $\vec{A}$ and $\vec{B}$ are parallel vectors.
(D) The dot product of $\vec{A}$ and $\vec{B}$ is zero.

Space for Rough Work

32. A Particle starts from origin at t = 0 with a velocity $5\hat{i}$ m s^{-1} and moves in x-y plane under the action of force which produces a constant acceleration of $3\hat{i}+2\hat{j}$ m s^{-2}. The y-coordinate of the particle at the instant when its x-coordinate is 84 m is

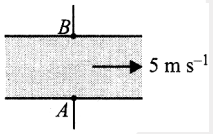
(A) 12 m (B) 24 m
(C) 36 m (D) 48 m

33. In the question number 32, the speed of the particle at this time is

(A) 16 m s^{-1} (B) 26 m s^{-1}
(C) 36 m s^{-1} (D) 46 m s^{-1}

34. A river is flowing from west to east with a speed of 5 m s^{-1}. A swimmer can swim in still water at a speed of 10 m s^{-1}.

If he wants to start from point A on south bank and reach opposite point B on north bank, in what direction should he swim ?



(A) 30° east of north (B) 60° east of north
(C) 30° west of north (D) 60° west of north

35. A girl riding a bicycle with a speed of 5 m s^{-1} towards north direction, observes rain falling vertically down. If she increases her speed to 10 m s^{-1}, rain appears to meet her at 45° to the vertical. What is the speed of the rain ?

(A) $5\sqrt{2}$ m s^{-1} (B) 5 m s^{-1}
(C) $10\sqrt{2}$ m s^{-1} (D) 10 m s^{-1}

36. Suppose that two objects A and B are moving with velocities $\vec{v}_A$ and $\vec{v}_B$ (each with respect to some common frame of reference). Let $\vec{v}_{AB}$ represent the velocity of A with respect to B. Then

(A) $\vec{v}_{AB}+\vec{v}_{BA}=0$ (B) $\vec{v}_{AB}-\vec{v}_{BA}=0$
(C) $\vec{v}_{AB}=\vec{v}_A+\vec{v}_B$ (D) $|\vec{v}_{AB}|\neq|\vec{v}_{BA}|$

37. A cricketer can throw a ball to a maximum horizontal distance of 100 m. With the same speed how much high above the ground can the cricketer throw the same ball ?

(A) 50 m (B) 100 m
(C) 150 m (D) 200 m

38. A cricketer can throw a ball to a maximum horizontal distance of 100 m. How high above the ground can the cricketer throw the same ball ?

(A) 100 m (B) 50 m
(C) 25 m (D) 5 m

39. The ceiling of a hall is 40 m high. For maximum horizontal distance, the angle at which the ball may be thrown with a speed of 56 m s^{-1} without hitting the ceiling of the hall is

(A) 25° (B) 30°
(C) 45° (D) 60°

40. If R and H represent horizontal range and maximum height of the projectile, then the angle of projection with the horizontal is

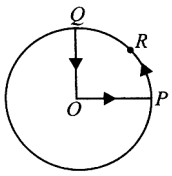
(A) $\tan^{-1}\left(\frac{H}{R}\right)$ (B) $\tan^{-1}\left(\frac{2H}{R}\right)$
(C) $\tan^{-1}\left(\frac{4H}{R}\right)$ (D) $\tan^{-1}\left(\frac{4R}{H}\right)$

41. The speed of a projectile at its maximum height is $\frac{\sqrt{3}}{2}$ times its initial speed. If the range of the projectile is P times of the maximum height attained by it, then P equals

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

Space for Rough Work

42. A cyclist starts from centre O of a circular park of radius 1 km and moves along the path OPRQO as shown in figure. If he maintains constant speed of 10 m s^{-1}, what is his acceleration at point R ?



(A) 10 m s^{-2} (B) 0.1 m s^{-2}

(C) 0.01 m s^{-2} (D) 1 m s^{-2}

43. A stone tied to the end of a string 100 cm long is whirled in a horizontal circle with a constant speed. If the stone makes 14 revolutions in 22 s, then the acceleration of the stone is

(A) 16 m s^{-2} (B) 4 m s^{-2}

(C) 12 m s^{-2} (D) 8 m s^{-2}

44. For a particle performing uniform circular motion, choose the incorrect statement from the following.

(A) Magnitude of particle velocity (speed) remains constant.

(B) Particle velocity remains directed perpendicular to radius vector.

(C) Direction of acceleration keeps changing as particle moves.

(D) Magnitude of acceleration does not remain constant.

45. What is approximately the centripetal acceleration (in units of acceleration due to gravity on earth, g = 10 m s^{-2}) of an air-craft flying at a speed of 400 m s^{-1} through a circular arc of radius 0.6 km ?

(A) 26.7 (B) 16.9

(C) 13.5 (D) 30.2

[CHEMISTRY]

46. The electronic configuration of four atoms are given in brackets :

$L(1s^2 2s^2 2p^1)$; $M(1s^2 2s^2 2p^5)$;

$Q(1s^2 2p^2 2p^6 3s^1)$; $R(1s^2 2s^2 2p^2)$

The element that would most readily form a diatomic molecule is

(A) Q (B) M

(C) R (D) L

47. How many and what types of bonds are present in NH_4^+ ?

(A) Four covalent bonds

(B) Three covalent bonds and one ionic bond

(C) Four ionic bonds

(D) Three covalent bonds and one coordinate bond

48. In which of the following molecules octet rule is not followed ?

(A) NH_3 (B) CH_4

(C) CO_2 (D) NO

49. Two elements P and Q combine to form a compound. If P has 2 and Q has 6 electrons in their outermost shell, what will be the formula of the compound formed?

(A) PQ (B) P_2Q

(C) P_2Q_3 (D) PQ_2

50. How many number of electrons are involved in the formation of a nitrogen molecule ?

(A) Three (B) Four

(C) Eight (D) Six

51. During a coordinate bond formation,

(A) one electron from an atom is transferred to other

(B) one electron each is lost from both the atoms

(C) a pair of electrons is contributed by one atom and shared by both the atoms

(D) a pair of electrons is transferred to the other atom.

Space for Rough Work

52. Sodium chloride has a crystalline structure made up of Na^+ and Cl^- ions. Why does NaCl not conduct electricity in solid state ?
(A) Solids do not conduct electricity.
(B) The ions of NaCl become mobile only in molten state and are not free to move in solid state.
(C) The crystalline structure does not have ions.
(D) When a bond is formed between ions they lose their charge.

53. In which of the following species the bond is non-directional ?
(A) NCl_3 (B) RbCl
(C) $BeCl_2$ (D) BCl_3

54. Which of the following is non-polar ?
(A) SO_2 (B) CO_2
(C) H_2O (D) NH_3

55. Which of the following molecules does not show any resonating structures ?
(A) NH_3 (B) CO_3^{2-}
(C) O_3 (D) SO_3

56. Which of the following elements forms predominantly covalent compounds as compared to other elements which form ionic compounds ?
(A) Be (B) Mg
(C) Ca (D) Sr

57. Which of the following are arranged in the decreasing order of dipole moment ?
(A) CH_3Cl, CH_3Br, CH_3F
(B) CH_3Cl, CH_3F, CH_3Br
(C) CH_3Br, CH_3Cl, CH_3F
(D) CH_3Br, CH_3F, CH_3Cl

58. What is the correct dipole moment of NH_3 and NF_3 respectively ?
(A) 4.90×10^{-30} C m and 0.80×10^{-30} C m
(B) 0.80×10^{-30} C m and 4.90×10^{-30} C m
(C) 4.90×10^{-30} C m and 4.90×10^{-30} C m
(D) 0.80×10^{-30} C m and 0.80×10^{-30} C m

59. Match the bond enthalpies given in column II with the molecules given in column I and mark the appropriate choice.

	Column I		Column II
(A)	Hydrogen (H_2)	(i)	498.0 kJ mol^{-1}
(B)	Oxygen (O_2)	(ii)	946.0 kJ mol^{-1}
(C)	Nitrogen (N_2)	(iii)	435.8 kJ mol^{-1}

(A) (A) → (i), (B) → (ii), (C) → (iii)
(B) (A) → (iii), (B) → (ii), (C) → (i)
(C) (A) → (i), (B) → (iii), (C) → (ii)
(D) (A) → (iii), (B) → (i), (C) → (ii)

60. In water molecule, the two $O-H$ bonds are oriented at an angle of 104.5°. In BF_3, the three $B-F$ bonds are oriented at an angle of 120°. In BeF_2, the two $Be-F$ bonds are oriented at an angle of 180°. Which of the following will have highest dipole moment ?
(A) BeF_2
(B) BF_3
(C) H_2O
(D) All have zero dipole moment.

61. Which of the following will be the strongest bond ?
(A) $F-O$ (B) $O-Cl$
(C) $N-H$ (D) $O-H$

Space for Rough Work

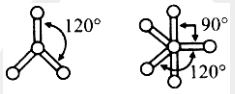
62. What is common between the following molecules:

SO_3, CO_3^{2-}, NO_3^- ?

(A) All have linear shape.
(B) All have trigonal planar shape.
(C) All have tetrahedral shape.
(D) All have trigonal pyramidal shape.

63. Oxygen molecule is formed by
(A) one axial s-s overlap and one p-p axial overlap
(B) two p-p axial overlaps
(C) two p-p sidewise overlaps
(D) one p-p axial and one p-p sidewise overlap

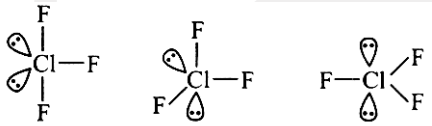
64. Which molecule is depicted by the given ball and stick models ?



(i) (ii)

(A) (i) $BeCl_2$, (ii) CH_4 (B) (i) BF_3, (ii) PCl_5
(C) (i) BF_4, (ii) CH_4 (D) (i) $BeCl_2$, (ii) PCl_5

65. The most stable shape of ClF_3 is shown by


(i) (ii) (iii)

(A) (i) only (B) (i) and (iii)
(C) (ii) only (D) (iii) only

66. According to VSEPR theory,
(A) the shape of the molecule depends upon the bonded electron pairs
(B) pair of electrons attract each other in valence shells
(C) the pairs of electrons tend to occupy such positions that minimise repulsions
(D) the pairs of electrons tend to occupy such positions that minimise distances from each other.

67. Which of the following statements is not true ?
(A) Ionic bonds are non-directional while covalent bonds are directional.
(B) Formation of π-bond shortens the distance between the two concerned atoms.
(C) Ionic bond is possible between similar and dissimilar atoms.
(D) Linear overlapping of atomic p-orbitals leads to a sigma bond.

68. How many sigma and pi bonds are present in toluene?
(A) 10σ and 3π bonds
(B) 12σ and 3π bonds
(C) 15σ and 3π bonds
(D) 6σ and 3π bonds

69. Which of the following is the most stable state when two atoms come closer to each other to form a molecule?


(i) (ii) (iii)

(A) (i), when the bond is formed, the energy is minimum.
(B) (ii), when the atoms touch each other, the energy is zero.
(C) (iii), when the atoms are isolated, the energy is minimum.
(D) (ii), when the attractive forces are more than repulsive forces.

70. The BCl_3 is a planar molecule whereas NCl_3 is pyramidal, because
(A) $B-Cl$ bond is more polar than $N-Cl$ bond
(B) $N-Cl$ bond is more covalent than $B-Cl$ bond
(C) nitrogen atom is smaller than boron atoms
(D) BCl_3 has no lone pair but NCl_3 has a lone pair of electrons.

Space for Rough Work

71. Which of the following pairs are isostructural ?

(A) SO_4^{2-} and BF_4^- (B) NH_3 and NH_4^+

(C) CO_3^{2-} and CO_2 (D) CH_4 and BF_3

72. Which type of hybridisation is shown by carbon atoms from left to right in the given compound :

$CH_2 = CH - C \equiv N$?

(A) sp^2, sp^2, sp (B) sp^2, sp, sp

(C) sp, sp^2, sp^3 (D) sp^3, sp^2, sp

73. The molecules like BrF_5 and $XeOF_4$ are square pyramidal in shape. What is the type of hybridisation shown in these molecules ?

(A) dsp^3 (B) dsp^2

(C) sp^3d (D) sp^3d^2

74. Which of the following statements is true about hybridisation ?

(A) The hybridised orbitals have different energies for each orbital.

(B) The number of hybrid orbitals is equal to the number of atomic orbitals that are hybridised.

(C) Hybrid orbitals form multiple bonds.

(D) The orbitals with different energies undergo hybridisation.

75. Order of size of sp, sp^2 and sp^3 orbitals is

(A) $sp^3 < sp^2 < sp$ (B) $sp < sp^2 < sp^3$

(C) $sp^2 < sp < sp^3$ (D) $sp^2 < sp^3 < sp$

76. The ground state electronic configuration of S is $3s^2 3p^4$. How does it form the compound SF_6 ?

(A) Due to octahedral shape of S atoms

(B) Due to presence of vacant 3d-orbitals which provide 6 unpaired electrons in excited state

(C) Due to sp^3 hybridisation of S atom which provides 6 electrons to 6 F atoms

(D) Due to presence of 3 sigma and 3 pi bonds between S and F

77. Hybridisation state of Xe in XeF_2, XeF_4 and XeF_6 respectively are

(A) sp^2, sp^3d, sp^3d^2

(B) sp^3d, sp^3d^2, sp^3d^3

(C) sp^3d^2, sp^3d, sp^3d^3

(D) sp^2, sp^3, sp^3d

78. According to molecular orbital theory, which of the following will not exist ?

(A) H_2^+ (B) Be_2

(C) B_2 (D) C_2

79. Bond order of N_2^+, N_2^- and N_2 will be

(A) 2.5, 2.5 and 3 respectively

(B) 2, 2.5 and 3 respectively

(C) 3, 2.5 and 3 respectively

(D) 2.5, 2.5 and 2.5 respectively

80. The conditions for the combination of atomic orbitals to form molecular orbitals are stated below. Mark the incorrect condition mentioned here.

(A) The combining atomic orbitals must have nearly same energy.

(B) The combining atomic orbitals must overlap to maximum extent.

(C) Combining atomic orbitals must have same symmetry about the molecular axis.

(D) Pi (π) molecular orbitals are symmetrical around the bond axis.

81. What is the order of stability of N_2 and its ions ?

(A) $N_2 > N_2^+ = N_2^- > N_2^{2-}$

(B) $N_2^+ > N_2^- > N_2 > N_2^{2-}$

(C) $N_2^- > N_2^+ > N_2 > N_2^{2-}$

(D) $N_2^{2-} > N_2^- = N_2^+ > N_2$

Space for Rough Work

82. What will be the bond order of the species with electronic configuration $1s^2 2s^2 2p^5$?
(A) One (B) Two
(C) Three (D) Zero

83. 2*s* and 2*p* atomic orbitals combine to give how many molecular orbitals ?
(A) 2 (B) 4
(C) 8 (D) 6

84. Which of the following molecules is paramagnetic in nature ?
(A) H_2 (B) Li_2
(C) B_2 (D) N_2

85. Oxygen molecule is paramagnetic in nature. What is the paramagnetic content in terms of magnetic moment in O_2^-?
(A) 1.732 (B) 3
(C) 1.5 (D) 2.5

86. The ice floats on water because
(A) solids have lesser density than liquids
(B) it has open-cage like structure in which lesser molecules are packed per mL than water
(C) of hydrogen bonding ice is lighter than water
(D) when ice is formed water molecules come closer and start floating.

87. Which of the following compounds shows maximum hydrogen bonding ?
(A) HF (B) H_2O
(C) NH_3 (D) CH_3OH

88. Which of the following molecules shows intramolecular hydrogen bonding ?
(A) o-Nitrophenol (B) p-Nitrophenol
(C) Benzoic acid (D) Ethanol

89. Which of the following statements is true about hydrogen bonding ?
(A) Cl and N have comparable electronegativities yet there is no H-bonding in HCl because size of Cl is large.
(B) Intermolecular H-bonding results in decrease in m.p. and b.p.
(C) Ice has maximum density at 0°C due to H-bonding.
(D) $KHCl_2(HCl_2^-)$ exists but $KHF_2(HF_2^-)$ does not exist due to lack of H-bonding in HCl.

90. Which of the following statements is not true ?
(A) Intermolecular hydrogen bonds are formed between two different molecules of compounds.
(B) Intramolecular hydrogen bonds are formed between two different molecules of the same compound.
(C) Intramolecular hydrogen bonds are formed within the same molecule.
(D) Hydrogen bonds have strong influence on the physical properties of a compound.

[ZOOLOGY]

91. What happens to the diaphragm when a person exhales?
(A) relaxes and arches
(B) relaxes and flattens
(C) contracts and arches
(D) contracts and flattens

92. Oxygen binds to the ____ of deoxyhaemoglobin
(A) alpha chains (B) beta chains
(C) globin portion (D) heme groups

93. Swim bladder in fishes functions as
(A) Accessory respiratory organ
(B) Hydrostatic organ
(C) Organ of sound production and sound perception
(D) All of the above

94. The tracheal cartilagenous rings in mammals are
(A) Complete rings
(B) Incomplete rings
(C) Incomplete dorsally
(D) Incomplete laterally

95. Which of the following has no blood but respires.
(A) Earthworm (B) Hydra
(C) Cockroach (D) Fish

Space for Rough Work

96. In man, the structures with a function similar to spiracles of cockroach are
(A) Lungs (B) Alveoli
(C) Bronchioles (D) Nostrils

97. Myoglobin differs from adult hemoglobin (a) in which of the following ways ?
(A) glutamic acid is replaced by valine in the beta chain
(B) the two beta chains are replaced by gamma chains
(C) it has two heme groups instead of four
(D) it consists of only a single globin chain and heme group

98. Carbon dioxide is carried in the blood in all of the following ways except as
(A) dissolved gas
(B) bicarbonate ion
(C) carbaminohaemoglobin
(D) carboxyhaemoglobin

99. Which ion replaces HCO_3^- when it diffuses out of the red blood cells into the plasma in systemic capillaries?
(A) hydrogen ion (H^+)
(B) hydroxyl ion (OH^-)
(C) chloride ion (Cl^-)
(D) CO_2

100. Phagocytic cells found in alveolar walls are called as:
(A) Kupffer cells
(B) Pulmonary reticulocytes
(C) Surfactant cells
(D) Dust cell

101. The amount of air left in the lungs after a forceful expiration is called the
(A) residual volume
(B) vital capacity
(C) tidal volume
(D) tidal volume

102. The lungs of birds are more efficient than the lungs of humans because :
(A) bird lungs use countercurrent exchange.
(B) bird lungs have more surface area than human lungs.
(C) bird lungs are able to concentrate the oxygen to much higher levels.
(D) bird lungs use a one-way rather than an in-out air flow system.

103. Consider the following :
I. A given volume of air is easier to move through the respiratory system than the same volume of water.
II. Air holds more oxygen per unit of volume than does water.
III. O_2 diffuses faster in air than it does in water.
IV. Water breathers have more difficulty getting rid of CO_2 because it does not dissolve well in water.
The correct statement include :
(A) I, II, III, IV (B) I, II, III
(C) II, III, IV (D) I, III, IV

104. Medullary inspiratory centre is always under direct.
(A) Chemical control
(B) Physical control
(C) Nervous control
(D) All of the above

105. The partial pressure of oxygen in systemic arteries is approximately :
(A) 104 mm Hg (B) 100 mm Hg
(C) 95 mm Hg (D) 40 mm Hg

106. Which of the following does not shift the oxy-haemoglobin dissociation curve to the right ?
(A) increased pH
(B) increased carbon dioxide
(C) increased temperature
(D) 2,3 – DPG

Space for Rough Work

107. What is the primary function of the pneumotaxic center?
(A) controls switch off point of inspiration
(B) increases the respiratory rate
(C) causes over-inflation of lungs
(D) decreases the respiratory drive

108. In a patient of chronic obstructive pulmonary disease, which of the following is likely to be increased ?
(A) FRC
(B) Residual volume
(C) Vital capacity
(D) Tidal volume

109. The basic respiratory rhythm is established by :
(A) dorsal group of respiratory nuclei
(B) ventral group of respiratory nuclei
(C) pneumotaxis center
(D) apneustic center

110. Among mammals, the efficiency of ventilation of lungs as compared to reptiles and birds is better developed by the presence of
(A) Ribs and costal muscles
(B) Only ribs
(C) Costal muscles
(D) Diaphragm

111. Growth of male larynx is controlled by
(A) Prolactin (B) Thyroxin
(C) Progesterone (D) Testosterone

112. In birds during inspiration.
(A) Air passes through the trachea into the posterior air sac.
(B) Air moves from the lungs in the anterior air sacs.
(C) Both (a) and (b)
(D) Air flows from posterior air sacs into the lungs.

113. The trachea is lined by the :
(A) transitional epithelium
(B) cuboidal epithelium
(C) columnar epithelium
(D) psuedo-stratified epithelium

114. Methemoglobin is :
(A) deoxygenated haemoglobin
(B) oxygenated haemoglobin
(C) reduced haemoglobin
(D) oxidized haemoglobin

115. The Bohr shift describes
(A) the outward movement of Cl^- from the blood cell in exchange for HCO_3^- moving into the cell.
(B) the leftward shift of the entire oxygen equilibrium curve when temperature rises.
(C) the rightward shift of the entire oxygen equilibrium curve when pH rises.
(D) the rightward shift of the entire oxygen equilibrium curve when pH falls.

116. In man, enlarged pharyngeal tonsils are called
(A) Epithelial bodies
(B) Infundibular folds
(C) Adenoids
(D) Arytenoids

117. The following can be measured with spirometer except.
(A) Tidal volume
(B) Inspiratory reserve volume
(C) Vital capacity
(D) Functional residual capacity

118. What important buffer in blood plasma neutralizes the H^+ if its concentration rises above normal in blood plasma ?
(A) haemoglobin (B) hydroxyl ion
(C) carbonic acid (D) bicarbonate ion

119. Overinflation of the lungs results in the :
(A) Haldane effect
(B) Bohr effect
(C) Herring-Breuer reflex
(D) Hamburger phenomenon

Space for Rough Work

120. In normal lungs
(A) Physiological dead space is always greater than anatomical dead space.
(B) Dead space volume may increases by more than half during a maximal inspiration.
(C) Oxygen transfer can always be explained by passive diffusion.
(D) All of the above

121. Which of the following would have the same O_2 content?
(A) blood entering the lungs and blood leaving the lungs
(B) blood entering the right side of the heart and blood entering the left side of the heart
(C) blood entering the tissue capillaries and blood leaving the tissue capillaries
(D) blood entering the right side of the heart and blood leaving the right side of the heart

122. Consider the following statements :
I. Vocal cords are not involved in the prevention of the food entering into the wind pipe during swallowing.
II. During swallowing, the epiglottis prevents food entering the wind pipe.
III. Uvula prevents the entry of food into the nasal cavity during swallowing.
The correct statements are :
(A) I, II, III (B) I and II
(C) II and III (D) I and III

123. Chemical regulation of respiration is maximally affected
(A) O_2 (B) CO_2
(C) H^+ ions (D) Lactic acid

124. The Presence of CO_2 in blood will lower pH because CO_2 combines with ....., with the rate of reaction is increased by .....
(A) H_2O to form H^+ and HCO_3^-, carbonic anhydrase
(B) H_2O to form only HCO_3^-, carbonic anhydrase
(C) H_2O to form only H^+, carbonic ions.
(D) H^+ form HCO_3^-, oxyhaemoglobin

125. The percentage of total lung capacity which cannot be emptied out is about.
(A) 50 (B) 46
(C) 24 (D) 12

126. Consider the following animals :
I. Bear
II. Salmon
III. Frog
IV. Lizard
Endotherms are
(A) I only (B) I and III
(C) II and III (D) II, III and IV

127. A person has a dead space air of 100ml; a respiratory rate of 11 per minute and a tidal volume of 400 ml. What would be his alveolar ventilation ?
(A) 6000 ml (B) 4200 ml
(C) 3300 ml (D) 3000 ml

128. Consider the following :
I. a drop in the pH of the blood
II. stretch receptors in the lungs
III. impulses from the breathing centers in the medulla
IV. Severe deficiencies of oxygen.
Which of the following is not involved in speeding up breathing ?
(A) I and II (B) I, II and III
(C) II and III (D) IV only

129. Given below are the partial pressures (in mm Hg) of various gases analyzed at a certain point in the respiratory passage ;
Oxygen – 100
Carbon dioxide – 40
Nitrogen – 543
This air is most likely :
(A) Inspired air (B) Alveolar air
(C) Expired air (D) Nasal cavity air

Space for Rough Work

130. As the blood passes through the systemic capillaries

(A) Its pH rises

(B) Its oxygen dissociation curve shift to the left

(C) Carbonate ions pass from the RBC to the plasma

(D) The concentration of chloride ions in RBC falls

131. Cyanosis is seen when concentration of

(A) deoxygenated Hb increases

(B) deoxygenated Hb decreases

(C) oxygenated Hb increases

(D) oxygenated Hb decreases

132. The functional residual capacity is :

(A) Tidal volume (TV) + Inspiratory reserve volume (IRV)

(B) IRV + Expiratory reserve volume (ERV)

(C) IRV + TV + ERV

(D) ERV + Residual volume (RV)

133. The diffusing capacity of the respiratory membrane is _____ times ____ than that of the oxygen because carbon dioxide is _____ lipid soluble than oxygen.

(A) 250, Higher, Less (B) 250, Lesser, More

(C) 20, Higher, More (D) 20, Lesser, Less

134. The respiratory disorder characterized by wheezes during expiration and caused by hypersensitivity of respiratory passages to allergen, is called as :

(A) Chronic bronchitis

(B) Emphysema

(C) Bronchial asthma

(D) Pneumonitis

135. The occupational pneumoconiosis, that can lead to the development of mesothelioma of lung, is

(A) Anthracosis (B) Silicosis

(C) Bagassosis (D) Asbestosis

[BOTANY]

136. Respiration in plants

(A) Occurs only during day

(B) Results in the formation of vitamins

(C) Is characteristic of all living cells

(D) Often requires CO_2

137. In plants energy is produced during the process of–

(A) Photosynthesis

(B) Transpiration

(C) Respiration

(D) Water absorption

138. A very important feature of respiration is that –

(A) It liberates energy

(B) It provides O_2

(C) Utilize CO_2

(D) Synthesize complex compounds

139. 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 di-oxide.

(C) To combine with carbon from organic molecules to produce carbon dioxide.

(D) To combine with hydrogen from organic molecules to produce water.

140. 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.

Space for Rough Work

141. 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.

142. The tissue of highest respiratory activity is
(A) Meristems (B) Ground tissue
(C) Phloem (D) Mechanical tissue

143. 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.

144. Respiration is an
(A) Endothermic process
(B) Exothermic process
(C) Anabolic process
(D) Endergonic process

145. Apparatus to measure rate of respiration and R.Q. is
(A) auxanometer (B) potometer
(C) respirometer (D) manometer

146. In some succulent plants like Opuntia the R.Q is zero because
(A) CO_2 is released without any absorption of O_2
(B) O_2 is absorbed but CO_2 is not released
(C) There is often compensation point in these plants due to thick phylloclades.
(D) None of these.

147. R.Q. of fatty substances is generally
(A) Unity
(B) Less than one
(C) Greater than one
(D) Zero

148. The R.Q. value of Oxalic acid is
(A) 1.0 (B) 0.7
(C) 1.5 (D) ∞

149. 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

150. How many ATP molecules could maximally be generated from one molecule of glucose, if the complete oxidation of one mole of glucose in 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

151. 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.

152. The overall goal of glycolysis, krebs cycle and the electron system is the formation of
(A) ATP in one large oxidation reaction
(B) sugars
(C) nucleic acids
(D) ATP in small stepwise units.

Space for Rough Work

153. 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

154. In germinating seeds fatty acids are degraded exclusively in the
(A) proplastids (B) glyoxysomes
(C) peroxisomes (D) mitochondria

155. Aerobic respiratory pathway is appropriately termed :
(A) parabolic (B) amphibolic
(C) anabolic (D) catabolic

156. Which of the following statements regarding metabolic pathways is incorrect ?
(A) Many of the steps of glycolysis can run in reverse
(B) Starch, sucrose or glycogen must be hydrolysed before it can enter the glycolysis.
(C) After fats are digested, glycogen enters glycolysis by forming DHAP.
(D) After fat digestion, fatty acids can no longer participate in cellular respiration.

157. A single ATP produce
(A) 8 kcal (B) 10 kcal
(C) 12 kcal (D) 100 kcal

158. Decarboxylation is not involved in
(A) Electron transport system
(B) Glycolysis
(C) Kreb's cycle
(D) Alcoholic fermentation

159. Respiratory enzymes are located in
(A) Mitochondrial matrix (mitochondria)
(B) Perimitochondrial space
(C) Cristae
(D) Outer membrane

160. The correct sequence of electron acceptor in ATP synthesis is
(A) Cyt a_3 a b c (B) Cyt b c a a_3
(C) Cyt b c a_3 a (D) Cyt c b a a_3

161. $FADH_2$ 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

162. Which of the following is non-enzymatic phosphorylation?
(A) Formation of fructose 1, 6-diphosphate
(B) Formation of dihydroxyacetone phosphate
(C) Formation of 1, 3-diphosphogylceraldehyde
(D) All the above

163. In Kreb cycle GTP is formed in
(A) Substrate level phosphorylation
(B) Oxidative phosphorylation
(C) Photophosphorylation
(D) Decarboxylation

164. What is active glucose?
(A) FAD – glucose
(B) NAD – glucose
(C) Phosphoglucose
(D) Glycerophosphate

Space for Rough Work

165. Match Column-I with Column-II and select the correct option from the codes given below.

	Column - I		Column - II
(A)	Glycolysis	(i)	Inner mitochondrial membrane
(B)	TCA cycle	(ii)	Mitochondrial matrix
(C)	ETS	(iii)	Cytoplasm

(A) A – (iii), B – (i), C – (ii)
(B) A – (iii), B – (ii), C – (i)
(C) A – (i), B – (ii), C – (iii)
(D) A – (ii), B – (i), C – (iii)

166. Select the wrong statement with respect to glycolysis.
(A) It occurs outside mitochondria.
(B) It is an anaerobic phase.
(C) Glucose undergoes partial oxidation to form 2 molecules of pyruvic acid.
(D) Glucose is phosphorylated to glucuse-6-phosphate by isomerase enzyme.

167. Which of the following steps during glycolysis is associated with utilization of ATP ?
(A) Glucose ® Glucose-6-phosphate
(B) Fructose-6-phosphate ® Fructose-1, 6-biphosphate
(C) PEP ® Pyruvic acid
(D) both (A) and (B)

168. Identify A and B in the given reaction :

$$\text{Pyruvic acid} + \text{CoA} + \text{NAD}^+ \xrightarrow[\text{Pyruvate dehydrogenase}]{Mg^{2+}} A + B + \text{NADH} + H^+$$

	A	B
(A)	PEP	CO_2
(B)	Acetyl CoA	CO_2
(C)	CO_2	H_2O
(D)	Acetyl CoA	H_2O

169. Substrate level phosphorylation occurs during which step of Krebs' cycle ?
(A) Succinyl - CoA ® Succinic acid
(B) Isocitric acid ® Oxalosuccinic acid
(C) Oxalosuccinic acid ® α -keto glutaric acid
(D) Malic acid ® OAA

170. Phosphorylation of glucose during glycolysis is catalyzed by
(A) phosphoglucomutase
(B) phosphoglucoisomerase
(C) hexokinase
(D) phosphorylase.

171. Electron Transport System (ETS) is located in mitochondrial
(A) Outer membrane (B) Inter membrane space
(C) inner membrane (D) matrix.

172. The end product of oxidation phosphorylation is
(A) NADH (B) Oxygen
(C) ADP (D) ATP + H_2O

173. Match Column - I with Column - II and select the correct option from the codes given below.

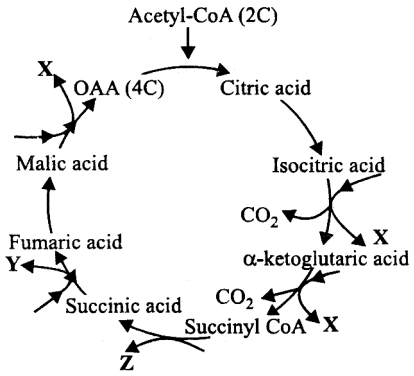
	Column - I		Column - II
A.	Molecular oxygen	(i)	α -Ketoglutaric acid
B.	Electron acceptor	(ii)	Hydrogen acceptor
C.	Pyruvate dehydrogenase	(iii)	Cytochrome C
D.	Decarboxylation	(iv)	Acetyl CoA

(A) A - (ii), B - (iii), C - (iv), D - (i)
(B) A - (iii), B - (iv), C - (ii), D - (i)
(C) A - (ii), B - (i), C - (iii), D - (iv)
(D) A - (iv), B - (iii), C - (i), D - (ii).

Space for Rough Work

174. The first 5-C dicarboxylic acid in Krebs' cycle which is used in nitrogen metabolism is
(A) OAA
(B) citric acid
(C) α -ketoglutaric acid
(D) acetyl coenzyme A.

175. Identify X, Y and Z in the given diagram of citric acid cycle and select the correct option.



	X	Y	Z
(A)	GTP	$NADH_2$	$FADH_2$
(B)	$FADH_2$	$NADH_2$	GTP
(C)	$NADH_2$	$FADH_2$	GTP
(D)	CO_2	$NADH_2$	ADP

176. Match Column-I with Column-II and select the correct option from the codes given below :

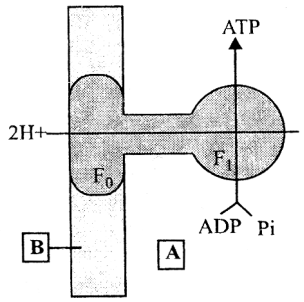
	Column I		Column II
(a)	TCA cycle	(i)	Inner mitochondrial membrane
(b)	$F_0 - F_1$ particles.	(ii)	Hans Krebs.
(c)	End product of glycolysis.	(iii)	Oxidative decarboxylation.
(d)	Pyruvate - dehydrogenase.	(iv)	Pyruvic acid.

Codes :
(A) a – (ii), b – (i), c – (iv), d – (iii)
(B) a – (i), b – (ii), c – (iv), d – (iii)
(C) a – (ii), b – (iii), c – (iv), d – (i)
(D) a – (iii), b – (ii), c – (i), d – (iv)

177. Which step is called gateway step/link reaction in aerobic respiration ?
(A) Glycolysis
(B) Formation of acetyl coenzyme A
(C) Citric acid formation
(D) ETS terminal oxidation

178. When two molecules of acetyl-CoA enter the TCA cycle, net gain at the end of the cycle is
(A) $2NADH_2 + 2FADH_2 + 1GTP$
(B) $3NADH_2 + 2FADH_2 + 2GTP$
(C) $6NADH_2 + 2FADH_2 + 2GTP$
(D) $3NADH_2 + IFADH_2 + 4GTP$

179. 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

180. Read the given statements and select the correct option.
Statement 1 : Glycolysis occurs in mitochondrial matrix.
Statement 2 : Krebs' cycle occurs on cristae of mitochondria.
(A) Both statements 1 and 2 are correct and statement 2 is the correct explanation of statement 1.
(B) Both statements 1 and 2 are correct but statement 2 is not the correct explanation of statement 1.
(C) Statement 1 is correct and statement 2 is incorrect.
(D) Both statements 1 and 2 are incorrect.

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Space for Rough Work