27/03/2024

Phase-I
CODE-B

Aakash
Medical | IIT-JEE | Foundations

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FINAL TEST SERIES for NEET-2024

MM : 720 **Test-2** **Time : 3 Hrs. 20 Mins.**

Topics covered :

Physics **:** Laws of Motion, Work, Energy and Power, System of Particles and Rotational Motion
Chemistry **:** Chemical Bonding and Molecular Structure, Thermodynamics
Botany **:** Morphology of Flowering Plants, Anatomy of Flowering Plants
Zoology **:** Structural Organization in Animals, Biomolecules

Instructions :

(i) There are two sections in each subject, i.e. Section-A & Section-B. You have to attempt all 35 questions from Section-A & only 10 questions from Section-B out of 15.
(ii) Each question carries 4 marks. For every wrong response 1 mark shall be deducted from the total score. Unanswered / unattempted questions will be given no marks.
(iii) Use blue/black ballpoint pen only to darken the appropriate circle.
(iv) Mark should be dark and completely fill the circle.
(v) Dark only one circle for each entry.
(vi) Dark the circle in the space provided only.
(vii) Rough work must not be done on the Answer sheet and do not use white-fluid or any other rubbing material on the Answer sheet.

PHYSICS

Choose the correct answer :

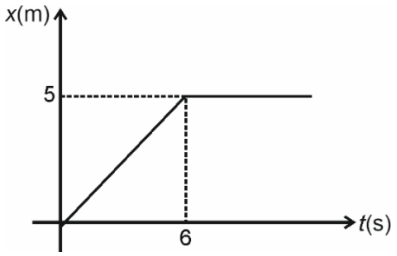
SECTION - A

1. The velocity (v) of a particle under a force F depend on its position (x) from the origin as $v \propto \frac{1}{x}$. Which of the following correctly represents the variation of magnitude of force (F) on the particle with position (x)?

(1) $F \propto \frac{1}{x^{3/2}}$ (2) $F \propto \frac{1}{x}$

(3) $F \propto \frac{1}{x^3}$ (4) $F \propto x$

2. The position time graph of a particle of mass 4 kg is shown. The magnitude of impulse (in MKS units) at t = 6 second is

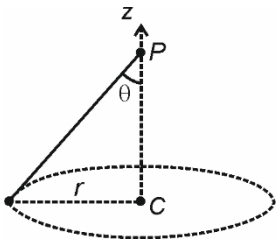


(1) 6.31 (2) 3.33
(3) 3.78 (4) 6.20

3. A body of mass 4 kg is rotating with uniform angular speed of π rad s^{-1} in a circular path of radius 1 m. The magnitude of centripetal force acting on the body is

(1) $8\pi^2$ N (2) $4\pi^2$ N
(3) π^2 N (4) Zero

4. A conical pendulum of length L makes an angle θ w.r.t. z-axis and moves in a circle in the xy plane. The radius of the circle is r and its centre is vertically below point P as shown in figure. The speed of the pendulum, in its circular path will be



(1) $\sqrt{rg}$ (2) $\sqrt{rg\tan\theta}$

(3) $\sqrt{rg/\tan\theta}$ (4) $\sqrt{\frac{r}{g\tan\theta}}$

5. A 6 N force acts on a 18 kg body initially at rest. The work done by the force in the third second of its motion is equal to

(1) 3 J (2) 5 J

(3) 1 J (4) 7 J

6. A rod of mass m and length l lying horizontally on ground is made to stand at an angle of 30° with horizontal. If the potential energy of rod is assumed to be zero while lying horizontally then the potential energy of rod in this position is

(1) mgl (2) $\frac{mgl}{2}$

(3) $\frac{mgl}{4}$ (4) $\frac{mgl}{\sqrt{2}}$

7. A particle is released from a height S. At certain height its kinetic energy is two times of its potential energy. The height of the particle at that instant is

(1) $\frac{S}{4}$ (2) $\frac{S}{2}$

(3) $\frac{2S}{3}$ (4) $\frac{S}{3}$

8. The linear momentum of the system is conserved in

(1) Elastic collision only

(2) Inelastic collision only

(3) Both elastic and inelastic collision

(4) Neither elastic nor inelastic collision

9. A bob of mass M attached to an inextensible string of length l is suspended from a vertical support. The bob rotates in a horizontal circle with uniform angular speed ω rad s^{-1} about the vertical axis. About the point of suspension.

(1) There is only change in magnitude of angular momentum

(2) There is only change in direction of angular momentum

(3) Both the magnitude as well as the direction of angular momentum changes

(4) Neither the magnitude nor the direction of angular momentum changes

10. A thin uniform rod of length l and mass m is swinging freely about a horizontal axis passing through its end. If its centre of mass rises to a maximum height of H, then the maximum angular speed is

(1) $\sqrt{\frac{3gH}{l^2}}$ (2) $\sqrt{\frac{6gH}{l^2}}$

(3) $\sqrt{\frac{6gl^2}{H}}$ (4) $\sqrt{\frac{5gH}{l}}$

11. A wheel rotating at 10 revolutions per second is brought to rest in 4 s. The average angular deceleration in (rad s^{-2}) of the wheel during this process is

(1) 4π (2) $\frac{1}{\pi}$

(3) π (4) 5π

Space for Rough Work

12. The moment of inertia of a circular disc of mass *M* and diameter *D* about the axis passing through center and perpendicular to plane of disc is

(1) $\frac{MD^2}{8}$ (2) $\frac{MD^2}{2}$

(3) MD^2 (4) $\frac{MD^2}{16}$

13. The shape of the graph between angular momentum and rotational kinetic energy of a rigid body about a given axis is

(1) Straight line (2) Hyperbola

(3) Parabola (4) Exponential

14. The rotational analogue of the equation $F = \frac{dp}{dt}$ is (Where symbols have their usual meaning)

(1) $\tau = \frac{dL}{dt}$ (2) $\tau = \frac{dL}{dt}\omega$

(3) $\tau = LI$ (4) $\tau = \frac{dI}{dt}\omega$

15. A mass of 1 kg is moving on a circular path of radius 1 m at 30 revolution per minute. The kinetic energy of the mass (in Joule) is

(1) π^2 (2) $\frac{\pi^2}{2}$

(3) $4\pi^2$ (4) $\frac{\pi^2}{8}$

16. When a body moves in uniform circular motion, then

(1) Net force acting on the body is zero

(2) It has no acceleration

(3) The velocity remains constant

(4) No work is done on it

17. Internal forces can change

(1) Kinetic energy of system

(2) Total momentum of system

(3) Total angular momentum of system

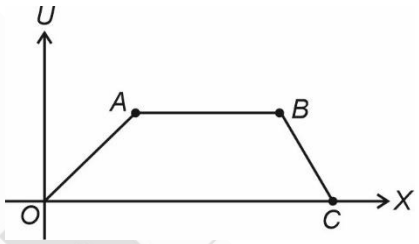
(4) All of these

18. Which of the following is a vector quantity?

(1) Power (2) Energy

(3) Momentum (4) Potential

19. A particle is in conservative field whose potential energy (*U*) varies with the position as shown. The net force on the particle is zero during



(1) *O* to *A* (2) *A* to *B*

(3) *B* to *C* (4) All of these

20. If the maximum acceleration of a train up to which a box lying on its floor remains stationary is 2 m/s^2. Then the coefficient of static friction between box and train's floor is

(1) 0.5 (2) 0.2

(3) 0.72 (4) 0.6

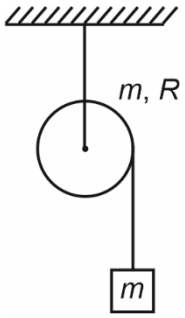
21. A body of mass 5 kg under the action of constant force $\vec{F} = F_0\hat{i}$ has velocity at t = 0 equal to $2\hat{j}$ m/s and at t = 5 s equal to $\vec{v} = 6\hat{i} + 2\hat{j}$ m/s then the value of F_0 is

(1) 0 (2) 4 N

(3) 6 N (4) 3 N

Space for Rough Work

22. A block of mass m is supported by a massless string wound around a uniform solid cylinder of mass m and radius R. If the string does not slip on cylinder, then the acceleration with which the block will fall is



(1) $\frac{2g}{3}$ (2) $\frac{g}{2}$

(3) $\frac{5g}{6}$ (4) g

23. A block is moving on an inclined plane of an angle of inclination of 45° with the horizontal and coefficient of friction is μ. If the force required to just push it up the inclined plane is 3 times the force required to just prevent it from sliding down, then value of coefficient of friction is

(1) $\frac{1}{2}$ (2) $\frac{1}{8}$

(3) $\frac{3}{4}$ (4) $\frac{5}{7}$

24. The frictional force acting between two surfaces in contact is fundamentally

(1) Electromagnetic (2) Gravitational

(3) Weak nuclear force (4) Strong nuclear force

25. **Assertion :** More external force is required to start motion than to maintain it.

Reason : Static friction is said to possess self-adjusting property.

In the light of above statement choose the correct answer.

(1) Both Assertion & Reason are true and the Reason is the correct explanation of the Assertion

(2) Both Assertion & Reason are true and Reason is not the correct explanation of Assertion

(3) Assertion is true statement but Reason is false

(4) Both Assertion & Reason are false statements

26. If $\vec{A} = \hat{i} + \hat{j} + 2\hat{k}$ and $\vec{B} = 2\hat{i} - 2\hat{j} + \hat{k}$, then unit vector perpendicular to both $\vec{A}$ and $\vec{B}$ will be

(1) $\hat{i} + \frac{3}{5}\hat{j} - \frac{4}{5}\hat{k}$

(2) $\frac{2}{5}\hat{i} + \frac{2}{5}\hat{j} - \frac{4}{5}\hat{k}$

(3) $\frac{1}{\sqrt{2}}\hat{i} + \frac{3}{5\sqrt{2}}\hat{j} - \frac{4}{5\sqrt{2}}\hat{k}$

(4) $\frac{2}{5\sqrt{2}}\hat{i} + \frac{2}{\sqrt{2}}\hat{j} - \frac{4}{\sqrt{2}}\hat{k}$

27. The value of $\left|\vec{A}\times\vec{B}\right|^2 + \left|\vec{A}.\vec{B}\right|^2$ is equal to

(1) $2A^2B^2$ (2) $A^2 + B^2$

(3) Zero (4) A^2B^2

28. Two balls are thrown simultaneously in air. The acceleration of the centre of mass of the two balls while in air

(1) Is equal to g

(2) Is equal to $g/2$

(3) Depends on the masses of the two balls

(4) Depends on the direction of motion of the ball

Space for Rough Work

29. The instantaneous angular position of a point on a rotating wheel is given by the equation $\theta(t) = (2t^3 - 6t^2)$ rad, where t is in second. The magnitude of angular velocity at the instant when angular acceleration becomes zero is

(1) 2 rad/s (2) 4 rad/s

(3) 3 rad/s (4) 6 rad/s

30. A rope is wound around a hollow cylinder of mass 5 kg and radius 20 cm. If rope is pulled with a force of 20 N, the angular acceleration of the cylinder will be

(1) 20 rad/s^2 (2) 30 rad/s^2

(3) 40 rad/s^2 (4) 10 rad/s^2

31. A football has lesser inertia than stone of same size because

(1) Football has more mass than stone

(2) Both have same mass

(3) Football has less mass than stone

(4) Inertia depends on volume of the body

32. Which of the following statement is correct regarding friction?

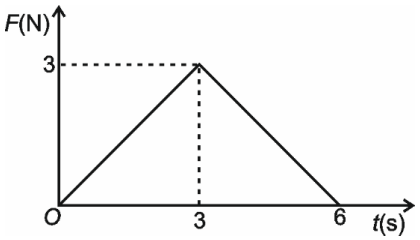
(1) Static friction is a self adjusting force

(2) Maximum value of static friction is called limiting friction

(3) Kinetic friction is always less than static friction

(4) Both (1) and (2)

33. The force F acting on a particle of mass 2 kg is indicated by the force-time graph as shown in figure. The magnitude of change in momentum of the particle over the time interval from 1 s to 5 s is



(1) 9 N s (2) 8.5 N s

(3) 8 N s (4) 7.5 N s

34. A block of mass m is revolving in a smooth groove on a smooth horizontal plane with constant speed v. If the radius of the circular path is R, then net contact force on the block is

(1) $\frac{mv^2}{R}$ (2) mg

(3) $m\sqrt{\frac{v^4}{R^2} + g^2}$ (4) $mg + \frac{mv^2}{R}$

35. Shyam (40 kg) and his father (80 kg) are standing at two opposite ends of a 4 m long plank (20 kg), kept at the surface of a still water body. If they both move towards each other to meet exactly at the centre of plank. The distance moved by plank is

(1) $\frac{2}{7}$ m (2) $\frac{4}{7}$ m

(3) 1 m (4) $\frac{2}{3}$ m

SECTION - B

36. The bob of a pendulum at rest is given a horizontal velocity of $\sqrt{\frac{3}{4}gl}$, where l is length of string of pendulum. Which of the statement is correct based upon above information?

(1) The bob will complete the vertical circle

(2) The bob will follow parabolic path after leaving the circle

(3) The bob will oscillate in lower half of circle

(4) The tension in the string at the topmost point would be zero

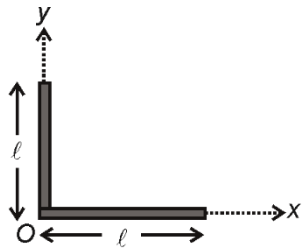
Space for Rough Work

37. The force exerted on an object is described by relation $F = f_0\left(\frac{x}{a} - 1\right)$ (where f_0 and a are constants). The work done in moving the object from $x = 0$ to $x = 3a$ is

(1) $\frac{3}{2}f_0a$ (2) $\frac{1}{2}f_0a$

(3) f_0a (4) Zero

38. A frame is made by joining two uniform rods each of mass m and length ℓ as shown in figure. The coordinates of centre of mass is given by



(1) $\left(\frac{\ell}{2}, \frac{\ell}{2}\right)$ (2) $\left(\frac{\ell}{3}, \frac{\ell}{3}\right)$

(3) $\left(\frac{\ell}{2}, \frac{\ell}{3}\right)$ (4) $\left(\frac{\ell}{4}, \frac{\ell}{4}\right)$

39. The force exerted by a person on the floor of an elevator is more than weight of the person if the elevator is

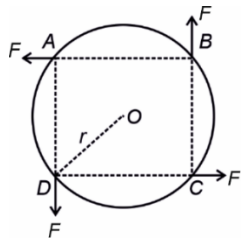
(1) Going up and slowing down

(2) Going up with constant velocity

(3) Going down and slowing down

(4) Going down with constant velocity

40. A uniform ring of mass 2.0 kg and radius 0.5 m is initially at rest on a horizontal frictionless surface. Four forces of equal magnitude F = 1.0 N are applied simultaneously along the four sides of an square $ABCD$ with its vertices on the circumference of the ring as shown in figure. The magnitude of angular acceleration of the ring at this instant is



(1) 2 rad s^{-2}

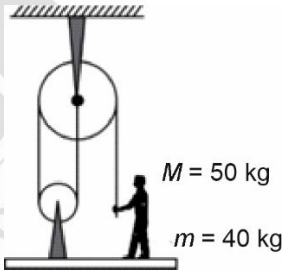
(2) 1 rad s^{-2}

(3) $3\sqrt{2}$ rad s^{-2}

(4) $2\sqrt{2}$ rad s^{-2}

41. What force the man must exert on the rope to keep platform in equilibrium as shown in figure?

(where M denotes mass of man and m denotes mass of platform) (g = 10 m/s^2)



(1) 900 N (2) 450 N

(3) 300 N (4) 200 N

42. A car of mass 900 kg negotiates a banked curve of radius 90 m on a frictionless road. If the banking angle is 45°, the optimum speed of the car is (g = 10 m/s^2)

(1) 5 m/s (2) 10 m/s

(3) 15 m/s (4) 30 m/s

Space for Rough Work

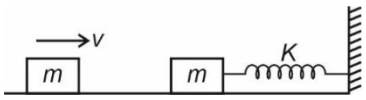
43. A graph is drawn between force acting and time for which it acts on particle. The area under the curve between time interval t_1 and t_2 gives
    (1) Momentum of particle
    (2) Force acting on particle
    (3) Change in momentum of particle
    (4) Acceleration of the particle

44. For a system to be in rotational equilibrium, the torques acting on it must zero. This is true only if the torques are taken about
    (1) The centre of the system
    (2) The centre of mass of the system
    (3) Any point on the system
    (4) Any point on the system or outside it

45. When no external force is acting on a system, then centre of mass of the system
    (1) Always remains at rest
    (2) Must move with constant velocity
    (3) May move with constant velocity or may remain at rest
    (4) Move with variable velocity

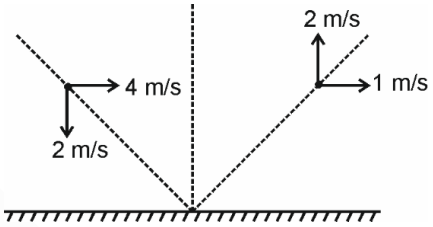
46. Two masses m and $2m$ are at a distance r and if they revolve due to their mutual attraction then the ratio of their linear velocity respectively is
    (1) 1 : 1 (2) 2 : 3
    (3) 3 : 5 (4) 1 : 2

47. A block of mass m is moving with speed v towards a spring block system of mass (m) and spring constant (K) as shown in figure. If the collision is perfectly elastic then maximum compression in the spring will be (Assume all the surfaces to be smooth)



    (1) $v\sqrt{\frac{m}{K}}$ (2) $v\sqrt{\frac{2m}{K}}$
    (3) $m\sqrt{\frac{v}{2K}}$ (4) $v\sqrt{\frac{m}{2K}}$

48. A ball rebounds from the floor as shown in figure. The coefficient of restitution for the collision between the ball and ground is



    (1) $\frac{1}{4}$ (2) $\frac{1}{2}$
    (3) 1 (4) $\frac{1}{8}$

49. The correct representation of power is (where symbols have their usual meaning)
    (1) $P = \left|\vec{F} \times \vec{v}\right|$ (2) $P = \frac{|\vec{F}|}{|\vec{v}|}$
    (3) $P = \vec{F} \cdot \vec{v}$ (4) $P = \frac{|\vec{F}|}{|\vec{v}|^2}$

50. A child stands at centre of turntable with his two arms outstretched. The turntable is set rotating with angular speed of 40 rad s^{-1}. The angular speed of child if he folds his hands back reducing moment of inertia to $\frac{4}{5}$ times the initial value is
    (1) 40 rad s^{-1} (2) 50 rad s^{-1}
    (3) 30 rad s^{-1} (4) 70 rad s^{-1}

Space for Rough Work

CHEMISTRY

SECTION - A

51. Which among the following has same shape as $I_3^{\ominus}$?

(1) H_2O (2) SO_2

(3) XeF_2 (4) NO_3^-

52. The correct order of stability of the given species is

(1) $O_2^- < O_2 < O_2^+$ (2) $O_2^- < O_2^+ < O_2$

(3) $O_2^+ < O_2^- < O_2$ (4) $O_2^+ < O_2 < O_2^-$

53. Total number of antibonding electrons present in B_2 molecule is

(1) 6 (2) 4

(3) 2 (4) 8

54. Given below are two statements.

Statement I: For most of the ionic compounds, $\Delta_{sol}H^o$ is negative.

Statement II: Born-Haber cycle is used to calculate the lattice enthalpy of an ionic compound indirectly.

In the light of above statements, choose the correct option among the following.

(1) Both statement-I and statement-II are correct

(2) Both statement-I and statement-II are incorrect

(3) Statement-I is correct but statement-II is incorrect

(4) Statement-I is incorrect but statement-II is correct

55. For which of the following reactions, $\Delta H - \Delta U = 0$?

(1) $PCl_5(g) \longrightarrow PCl_3(g) + Cl_2(g)$

(2) $N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$

(3) C(graphite) (s) + $O_2(g) \longrightarrow CO_2(g)$

(4) $2NO_2(g) \longrightarrow N_2O_4(g)$

56. Expanded octet is observed in which molecule?

(1) Cl_2 (2) CO_2

(3) CH_4 (4) PF_5

57. Path function among the following is

(1) Internal energy (2) Gibbs energy

(3) Work (4) Entropy

58. Which among the following has minimum bond angle?

(1) CO_3^{2-} (2) CO_2

(3) CH_4 (4) SO_3

59. A system after absorbing 100 J of heat does 500 J of work. The change in internal energy of the system is

(1) 600 J (2) –600 J

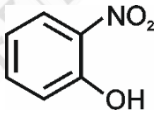
(3) –400 J (4) 400 J

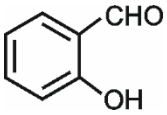
60. For the reaction, A(l) $\rightarrow$ 2B(g) + C(g) if ΔU = 4.8 kcal, ΔS = 60 cal K^{-1} at 300 K then ΔG of the reaction will be

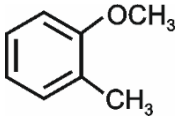
(1) – 5.72 kcal (2) – 11.4 kcal

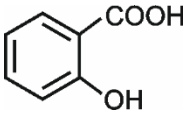
(3) – 2.25 kcal (4) 7.5 kcal

61. Intramolecular hydrogen bond is absent in

(1) 

(2) 

(3) 

(4) 

62. Correct order of dipole moment of the given compounds is

(1) $NH_3 > BF_3 > NF_3$ (2) $BF_3 > NH_3 > NF_3$

(3) $NF_3 > NH_3 > BF_3$ (4) $NH_3 > NF_3 > BF_3$

Space for Rough Work

63. The compound in which all the atoms are coplanar is

(1) $CH_3 - CH = CH - CH_3$

(2) $CH_2 = CH - CH_2 - CH_3$

(3) $CH_2 = CH - CH = CH_2$

(4) $CH_2 = C = CH_2$

64. $\Delta_r H$ of which of the following reactions represents $\Delta_f H^o$?

(1) $CO(g) + \frac{1}{2} O_2(g) \longrightarrow CO_2(g)$

(2) $C(\text{graphite})(s) + \frac{1}{2} O_2(g) \longrightarrow CO(g)$

(3) $CO_2(g) + C(s) \longrightarrow 2CO(g)$

(4) $C(\text{diamond})(s) + O_2(g) \longrightarrow CO_2(g)$

65. Bond energies of C – H, C ≡ C, C = C and H – H bonds are 414, 827, 606 and 430 kJ mol^{-1} respectively. The enthalpy of hydrogenation of $C_2H_2(g)$ to $C_2H_4(g)$ will be

(1) –127 kJ mol^{-1} (2) –215 kJ mol^{-1}

(3) –177 kJ mol^{-1} (4) –285 kJ mol^{-1}

66. At 300 K, 0.1 mol of an ideal gas is expanded at constant external pressure of 1 atm from 1 L to 10 L. The work done in the process will be nearly

(1) –910 J (2) – 9 J

(3) – 455 J (4) – 4.5 J

67. Consider the following processes

$A \rightarrow 2B$, $\Delta H = +100$ kJ mol^{-1}

$B \rightarrow C + 3D$, $\Delta H = -75$ kJ mol^{-1}

$2D \rightarrow F$, $\Delta H = +130$ kJ mol^{-1}

For $F + 4C + 10D \rightarrow 2A$, ΔH will be

(1) +35 (2) –15

(3) –30 (4) +30

68. Among the following, mean multiple bond enthalpy is minimum for

(1) N ≡ N (2) C ≡ N

(3) C ≡ C (4) C ≡ O

69. Which among the following follows octet rule?

(1) NO_2 (2) SF_6

(3) H_2SO_4 (4) SCl_2

70. Which among the following has shortest bond length?

(1) C – H (2) N – O

(3) C – C (4) C – O

71. In which of the following species, all bond lengths are equal?

(1) PF_5 (2) ClF_3

(3) SeF_4 (4) SF_6

72. In which of the following species, the central atom contains lowest number of lone pair of electrons?

(1) XeF_4 (2) I_3^-

(3) H_2O (4) PCl_3

73. Given below are two statements.

Statement I: Octet theory does not account for the shape of molecules.

Statement II: NO is an odd electron molecule.

In light of the above statements, choose the correct option.

(1) Statement I is correct but statement II is incorrect

(2) Statement I is incorrect but statement II is correct

(3) Both statement I and statement II are incorrect

(4) Both statement I and statement II are correct

74. Match Column-I with Column-II and choose the correct answer.

	Column-I		**Column-II**
a.	$[ICl_4]^-$	(i)	Pentagonal bipyramidal
b.	ClF_5	(ii)	Pyramidal
c.	XeO_3	(iii)	Square planar
d.	IF_7	(iv)	Square pyramidal

Space for Rough Work

(1) a(iii), b(i), c(ii), d(iv)

(2) a(iii), b(iv), c(ii), d(i)

(3) a(iv), b(iii), c(ii), d(i)

(4) a(iii), b(ii), c(iv), d(i)

75. The heat necessary to raise the temperature of 60 g of aluminium from 45°C to 65°C is [Given: Molar heat capacity of Al is 24 J mol^{-1} K^{-1}]

(1) 0.86 kJ (2) 1.92 kJ

(3) 1.07 kJ (4) 2.76 kJ

76. Enthalpy change during isothermal expansion of 2 mol of an ideal gas from 1 L to 10 L is

(1) –13.82 cal (2) +13.82 cal

(3) Zero (4) Infinite

77. Given below are two statements one is labelled as assertion (A) and other is labelled as reason (R).

Assertion (A): PCl_5 is a non polar molecule with polar bonds.

Reason (R): Vector sum of all bond moments is zero in case of PCl_5.

In the light of above statements choose the correct answer.

(1) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(2) (A) is true but (R) is false

(3) (A) is false but (R) is true

(4) Both (A) and (R) are true and (R) is the correct explanation of (A)

78. Amount of heat released when 0.1 mol of HNO_3 is neutralised by 0.1 mol of KOH in water is nearly

(1) 57.1 kJ (2) 13.7 kJ

(3) 5.71 kJ (4) 1.37 kJ

79. The number of π bonds and σ bonds present in $CH_2(CN)_2$ respectively are

(1) 2, 4 (2) 4, 4

(3) 4, 6 (4) 6, 6

80. If 2 mole of an ideal gas expanded isothermally and reversibly at 300 K from 5 litre volume to 50 litre volume then work done in this process will be

(1) –11.49 kJ (2) +11.49 kJ

(3) 4.99 kJ (4) –4.99 kJ

81. Given below are two statements.

Statement I: Sigma molecular orbitals are symmetrical around the bond-axis while pi(π) molecular orbitals are not symmetrical.

Statement II: The linear combination of atomic orbitals to form molecular orbitals takes place only if the combining atomic orbitals have the same or nearly the same energy.

In light of the above statements, choose the correct answer.

(1) Statement I is correct but statement II is incorrect

(2) Statement I is incorrect but statement II is correct

(3) Both statements I and II are incorrect

(4) Both statements I and II are correct

82. Correct order of standard enthalpy changes of fusion for the given substances is

(1) $HCl > NH_3 > H_2O$ (2) $NH_3 > H_2O > HCl$

(3) $H_2O > NH_3 > HCl$ (4) $HCl > H_2O > NH_3$

83. $d\pi - p\pi$ bond(s) is/are present in

(1) NH_3 (2) NO_3^-

(3) PCl_3 (4) PO_4^{3-}

84. Work done in the chemical process

$CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$, for decomposition of one mole of $CaCO_3$ at 27°C is

(1) –30R (2) –300

(3) –600 (4) –300R

Space for Rough Work

85. For the reaction

$C_2H_4(g) + 3O_2(g) \rightarrow 2CO_2(g) + 2H_2O(l)$

Enthalpy change $\Delta_rH°$ is

(Given : $\Delta_fH°$ of $C_2H_4(g), CO_2(g)$ and $H_2O(l)$ respectively are –x, –y and –z kJ mol^{-1})

(1) x + y + 2z kJ mol^{-1}

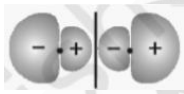
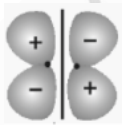
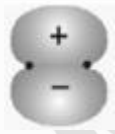
(2) x – 2y – 2z kJ mol^{-1}

(3) y – x + 2z kJ mol^{-1}

(4) y + z – x kJ mol^{-1}

SECTION - B

86. Match molecular orbitals given in List-I with their shape in List-II

	List-I		List-II
a.	$\pi 2p_x$	(i)	
b.	$\pi^* 2p_x$	(ii)	
c.	$\sigma^* 2s$	(iii)	
d.	$\sigma^* 2p_z$	(iv)	

Choose the correct answer from options given below.

(1) a(ii), b(iii), c(i), d(iv)

(2) a(iv), b(iii), c(i), d(ii)

(3) a(ii), b(i), c(iii), d(iv)

(4) a(iv), b(i), c(iii), d(ii)

87. What is the bond order of N–O bond in NO_3^- ion?

(1) 1.25 (2) 1.33

(3) 1.50 (4) 1.75

88. Given below are two statements.

Statement I: Energy of resonance hybrid is always more than the energy of any single canonical structure.

Statement II: The canonical forms have no real existence.

In the light of above statements choose the correct option among the following.

(1) Statement I is incorrect but statement II is correct

(2) Statement I is correct but statement II is incorrect

(3) Both statement I and statement II are incorrect

(4) Both statement I and statement II are correct

89. Which among the following statements are correct conditions for hybridization?

(i) The orbitals present in the valence shell of the atom are hybridized.

(ii) The orbitals undergoing hybridization should have almost equal energy.

(iii) Promotion of electron is not essential condition prior to hybridization.

(iv) It is necessary that only half field orbitals participate in hybridization.

(1) (i) and (ii) only (2) (i), (ii) and (iii) only

(3) (i), (ii), (iii) and (iv) (4) (iii) and (iv) only

90. In the formation of O_2 from the O_2^-, the last electron is removed from which one of the following orbitals?

(1) σ^* (2) π^*

(3) σ (4) π

Space for Rough Work

91. Consider the process : $A \rightarrow B \rightarrow C \rightarrow D$

$\Delta S_{A \rightarrow B}$ is +10 J K^{-1}, $\Delta S_{B \rightarrow C}$ is +20 J K^{-1}, $\Delta S_{D \rightarrow C}$ is +25 J K^{-1} then $\Delta S_{D \rightarrow A}$ is

(1) 5 J K^{-1}

(2) –5 J K^{-1}

(3) 45 J K^{-1}

(4) –45 J K^{-1}

92. The enthalpy of vaporisation for 10 g of water from the following data is

(i) $H_2(g) + \frac{1}{2} O_2(g) \rightarrow H_2O(g); \Delta H = -57.8$ kcal mol^{-1}

(ii) $H_2(g) + \frac{1}{2} O_2(g) \rightarrow H_2O(l); \Delta H = -68.3$ kcal mol^{-1}

(1) 10.5 kcal

(2) 0.58 kcal

(3) 5.8 kcal

(4) 0.18 kcal

93. Intensive property among the following is

(1) Entropy

(2) Enthalpy

(3) Density

(4) Internal energy

94. Dipole moment is usually expressed in Debye Units (D). The conversion factor is

(1) 1 D = 3.33564×10^{-33} C m

(2) 1 D = 6.53354×10^{-32} C m

(3) 1 D = 6.53554×10^{-30} C m

(4) 1 D = 3.33564×10^{-30} C m

95. The species which does not exist is

(1) C_2 (2) B_2

(3) He_2 (4) H_2

96. Given below are two statements.

Statement I: O_2^+ and C_2 have identical bond order.

Statement II: B_2 is paramagnetic is nature.

In light of the above statements, choose the correct answer.

(1) Statement I is correct but statement II is incorrect

(2) Statement I is incorrect but statement II is correct

(3) Both statement I and statement II are incorrect

(4) Both statement I and statement II are correct

97. 5 g of benzene is burnt at 25°C and liberates 12.5 kJ heat. Heat of combustion of benzene at 25°C is

(1) –25 kJ mol^{-1}

(2) –195 kJ mol^{-1}

(3) –150 kJ mol^{-1}

(4) –75 kJ mol^{-1}

98. Which of the following has its standard enthalpy of formation zero at 298 K?

(1) $Br_2(g)$

(2) HI(g)

(3) $C_{(diamond)}$

(4) $I_{2(solid)}$

99. Which of the following processes is always an exothermic process?

(1) Acid-base neutralisation

(2) Sublimation

(3) Formation of a compound

(4) Atomisation

100. C_p and C_v for a gas respectively are 0.125 cal/g and 0.075 cal/g. Which one of the following gas has these values?

(1) H_2 (2) Ar

(3) O_2 (4) CH_4

Space for Rough Work

BOTANY

SECTION - A

101. Lodicules are found in
(1) Cotton
(2) Wheat
(3) Cauliflower
(4) Mustard

102. Imbricate aestivation of petals is seen in
(1) China rose
(2) Lady's finger
(3) *Cassia*
(4) Bean

103. Bark includes all the below given tissues, **except**
(1) Periderm
(2) Secondary xylem
(3) Pericycle
(4) Secondary phloem

104. Cylindrical meristems which are responsible for producing secondary tissues are
(1) Shoot apical meristems
(2) Intercalary meristems
(3) Lateral meristems
(4) Root apical meristems

105. Monocot root differs from dicot root as the latter
(a) Has small and inconspicuous pith
(b) Does not undergo secondary growth due to absence of cambium
(c) Has usually more than six xylem bundles
Choose the **correct** ones.
(1) (b) and (c) only (2) (a) and (b) only
(3) (c) only (4) (a) only

106. Match List-I with List-II and select the **correct** match.

	List-I		List-II
a.	Subsidiary cells	(i)	Sclerenchymatous cells
b.	Casparian strips	(ii)	Parenchymatous cells
c.	Bast fibres	(iii)	Endodermal cells
d.	Phelloderm	(iv)	Specialised epidermal cells

(1) a-(iii), b-(ii), c-(iv), d-(i)
(2) a-(iv), b-(iii), c-(i), d-(ii)
(3) a-(iii), b-(iv), c-(ii), d-(i)
(4) a-(i), b-(ii), c-(iii), d-(iv)

107. Read the following statements and choose the option which is **correct** for them.
Statement A: A mature sieve element possesses a peripheral cytoplasm, a large vacuole and conspicuous nucleus.
Statement B: The trichomes in the root system are usually multicellular.
(1) Both statements A and B are incorrect
(2) Only statement A is correct
(3) Only statement B is correct
(4) Both statements A and B are correct

108. Select the **incorrectly** matched pair.
(1) Swollen root of turnip – Modified root
(2) Thorns in *Bougainvillea* – Modified stem
(3) Tuber of potato – Modified stem
(4) Tendrils in peas – Modified stem

Space for Rough Work

109. State **true** (T) or **False** (F) to the given statements.

(A) The hilum is a scar on the seed coat through which the developing seeds were attached to the fruit.

(B) In Mango, endocarp and mesocarp both are hard and stony

	(A)	(B)
(1)	F	F
(2)	F	T
(3)	T	F
(4)	T	T

110. Read the following statements and select the **correct** option.

Assertion (A): In racemose type of inflorescence, flowers are borne in a basipetal order.

Reason (R): When main floral axis continues to grow then young flowers appear at the bottom.

(1) Both (A) are (R) are true but (R) is not the correct explanation of (A)

(2) Both (A) and (R) are false

(3) Both (A) and (R) are true and (R) is the correct explanation of (A)

(4) (A) is true but (R) is false

111. Select the **correct** option w.r.t. stem modification found in zaminkand.

(1) It grows vertically above soil surface

(2) It represents the organ of perennation

(3) Scaly leaves are absent

(4) It protects plants from browsing animals

112. Lateral roots arise from

(1) Cambium ring (2) Epiblema

(3) Pericycle (4) Endodermis

113. In pitcher plant, 'pitcher' is modified

(1) Leaf base (2) Leaf apex

(3) Leaf blade (4) Axillary bud

114. Which of the following statements is **incorrect**?

(1) Parthenocarpic fruits are formed from ovary without fertilisation

(2) Seed coat is membranous and generally fused with the fruit wall in gram

(3) Cells of aleurone layer is proteinaceous in maize

(4) Coleoptile is the sheath that encloses plumule in monocot seed

115. Which type of placentation is exhibited by *Dianthus*?

(1) Axile (2) Free central

(3) Parietal (4) Basal

116. Read the given statements and choose the **correct** option.

Statement-A : The apical buds in *Citrus* lose the ability to grow and form hard thread-like structures to protect the plants from browsing animals.

Statement-B : The veinlets in leaf form a network called reticulate venation as in dicot such as Peepal.

(1) Only statement A is correct

(2) Only statement B is correct

(3) Both statements A and B are correct

(4) Both statements A and B are incorrect

117. Vascular cambium in stem is formed of

(a) Cork cambium

(b) Interfascicular cambium

(c) Intrafascicular cambium

(1) Only (a) and (b) (2) Only (b) and (c)

(3) Only (a) and (c) (4) All (a), (b) and (c)

Space for Rough Work

118. Find the **odd** one out w.r.t. androecium.
    (1) Androecium is outermost whorl of the flower and it is a male reproductive system
    (2) Stamen consists of a filament and anther
    (3) A sterile stamen is called staminode
    (4) When the stamens are free, then they are called polyandrous

119. Which of the given functions is generally **not** performed by roots?
    (1) Absorption of water
    (2) Absorption of minerals
    (3) Providing anchorage to the plant parts
    (4) Synthesis of food materials

120. Which of the following is an elastic, living mechanical tissue present in growing parts of the plant such as young stem and petiole of a leaf?
    (1) Parenchyma (2) Sclereids
    (3) Collenchyma (4) Xylem parenchyma

121. Select the **odd** one out w.r.t. perigynous flowers.
    (1) Plum (2) Peach
    (3) Brinjal (4) Rose

122. The floral formula given below belongs to which family?

    $Epi_{5-7} \oplus ⚥ K_{(5)} \overset{\frown}{C_5 A_{(\infty)}} \underline{G}_{(5)}$

    (1) Malvaceae (2) Solanaceae
    (3) Asteraceae (4) Fabaceae

123. All of the following plants have non-endospermic seeds **except**
    (1) Gram (2) Orchids
    (3) Pea (4) Castor

124. Which element of xylem store food materials in the form of starch or fat and also involved in radial conduction of water?
    (1) Tracheids (2) Vessels
    (3) Xylem parenchyma (4) Xylem fibres

125. ______ regulate the opening and closing of stomata.
    Select the **correct** option to fill in the blank.
    (1) Bulliform cells
    (2) Guard cells
    (3) Bundle sheath cells
    (4) Subsidiary cells

126. How many plants among *Alstonia*, guava, China rose, sunflower, *Calotropis* and mustard have alternate type of phyllotaxy?
    (1) Four (2) One
    (3) Three (4) Six

127. Which of the following features help to differentiate stems from roots?
    (1) The former shows the absence of multicellular epidermal appendages
    (2) Former shows positively phototropic growth
    (3) The former shows absence of nodes and internodes
    (4) The former shows presence of thimble-like structure at apex

128. Identify the **incorrect** statements and choose the option accordingly.
    (a) Members of Solanaceae are widely distributed in tropics, sub-tropics and even temperate zones.
    (b) In *Primrose*, ovary is one-chambered but it becomes two chambered due to formation of false septum.
    (c) A bud is always present in the axil of leaflets of compound leaf.
    (d) The cells proximal to meristematic region undergo rapid elongation and enlargement.
    (1) (a) and (c) only (2) All except (d)
    (3) (a) and (d) only (4) (b) and (c) only

Space for Rough Work

129. Which of the following is **not** true for sapwood?
(1) Lighter in colour
(2) Involved in water conduction
(3) Hard, durable and resistant to attacks of microbes
(4) Peripheral region of secondary xylem

130. In a dicot stem showing secondary growth, at which of the following locations oldest layer of primary phloem is found?
(1) At the periphery of pith
(2) Just inside the vascular cambium
(3) Just outside the vascular cambium
(4) Just inner to pericycle

131. Monocot stems usually lack
(1) Companion cell
(2) Phloem parenchyma
(3) Vessel
(4) Conjoint vascular bundles

132. Read the following anatomical features :
a. Pericycle as semi-lunar patches of sclerenchyma.
b. Endodermis is referred to as the starch sheath.
c. Presence of water containing cavities in vascular bundles.
d. Collenchymatous hypodermis.
How many of the given features is/are **true** for T.S. of dicot stem?
(1) Four (2) Three
(3) Two (4) One

133. Find the **odd** one out w.r.t. endodermis of root.
(1) It is a single layer of compactly arranged cells
(2) Its cells appear barrel-shaped
(3) It constitutes stele
(4) It is the innermost layer of cortex

134. Vessels differ from tracheids, as
(1) Vessel is a single celled structure
(2) Tracheid is composed of fused cells
(3) Vessel is composed of many fused cells
(4) Tracheids are living cells

135. Select the **incorrect** statement regarding bulliform cells.
(1) They are modified adaxial epidermal cells
(2) Cells are large, empty and colourless
(3) When turgid they make the leaves curl outwards to minimize water loss
(4) They are present along the veins of leaves in grasses

SECTION - B

136. Stele does **not** include
(1) Pericycle (2) Vascular bundles
(3) Pith (4) Cortex

137. Asymmetric flowers are found in
(1) Gulmohur (2) *Datura*
(3) *Canna* (4) Chilli

138. Match List-I with List-II.

	List-I		List-II
(a)	Suckers	(i)	*Oxalis*
(b)	Offsets	(ii)	Mint
(c)	Runners	(iii)	*Pistia*
(d)	Stolons	(iv)	Pineapple

Choose the **correct** option.
(1) a(i), b(ii), c(iv), d(iii)
(2) a(iv), b(iii), c(i), d(ii)
(3) a(iii), b(i), c(ii), d(iv)
(4) a(ii), b(iv), c(iii), d(i)

Space for Rough Work

139. **Assertion (A):** In a dicot leaf, the size of the vascular bundles are dependent on size of the veins.

Reason (R): The vascular bundles are surrounded by a layer of thin walled bundle sheath cells in a dorsiventral leaf.

In the light of above statements, choose the **correct** option.

(1) Both (A) and (R) are false

(2) (A) is true but (R) is false

(3) Both (A) are (R) is true but (R) is not the correct explanation of (A)

(4) Both (A) and (R) is true and (R) is the correct explanation of (A)

140. In *Colchicum autumnale*

(1) Petals show vexillary aestivation

(2) Ovary is inferior

(3) Seeds are endospermous

(4) Leaves are stipulated with reticulate venation

141. How many of given characters is/are **true** for the members of compositae family?

(a) Basal placentation

(b) Parallel venation in leaves

(c) Presence of pappus

(d) Presence of bracteate or ebracteate flowers

(e) Racemose inflorescence

(1) 2 (2) 3

(3) 4 (4) 1

142. Endarch and exarch xylem are respectively found in

(1) Dicot stem and dicot root

(2) Monocot root and dicot root

(3) Dicot root and monocot leaf

(4) Monocot root and dicot stem

143. The mesophyll is **not** differentiated into palisade and spongy parenchyma in leaves of

(1) Pea (2) Gram

(3) Maize (4) Castor

144. Match the following columns and select the **correct** answer.

	Column-I		**Column-II**
(a)	Maize	(i)	Respiratory roots
(b)	*Rhizophora*	(ii)	Stilt root
(c)	Sweet potato	(iii)	Prop roots
(d)	Banyan tree	(iv)	Storage roots

(1) a(ii), b(i), c(iv), d(iii) (2) a(iv), b(i), c(ii), d(iii)

(3) a(ii), b(iii), c(i), d(iv) (4) a(iv), b(ii), c(iii), d(i)

145. In gamosepalous condition

(1) Corolla has fused petals

(2) Corolla has free petals

(3) Calyx is fused with petals

(4) Calyx has fused sepals

146. Choose the **correct** match.

(1) Hypodermis – Sclerenchymatous in monocot stem

(2) Endodermis – Multilayered and parenchymatous in monocot stem

(3) Pith – Large and well developed in dicot root

(4) Epiblema – Leaf epidermis

147. Which of the following features is **not** true for sclerenchyma?

(1) Its cells are usually dead

(2) Its cells are without protoplasm

(3) It provides mechanical strength

(4) This tissue is absent in pulp of guava

Space for Rough Work

148. Find the **odd** one out w.r.t. apical meristem.
(1) Cells are always in active state of division
(2) It is found at the apices of stem, root or branches
(3) Increase the length as well as girth of stems and roots
(4) It is primary meristem

149. The companion cells in phloem of angiosperms
(1) Help in maintaining the pressure gradient in the sieve tubes
(2) Are connected with tracheids by pit fields present between their common radial walls
(3) Possess peripheral cytoplasm and a large vacuole but lacks a nucleus
(4) Store food materials and substances like resins and latex

150. In which of the following plants, petioles expand and become green to synthesize food?
(1) *Euphorbia* (2) Australian *acacia*
(3) *Nerium* (4) *Opuntia*

ZOOLOGY

SECTION - A

151. Choose the **odd** one w.r.t. paired structures in cockroaches.
(1) Maxilla (2) Mandible
(3) Antenna (4) Labrum

152. In *Periplaneta americana*, the prothoracic segment bears
(1) A pair of legs and hind wings
(2) A pair of legs and tegmina
(3) Only a pair of legs located dorsally
(4) Only a pair of legs located ventrally

153. Genital chamber of the male cockroach contains
(1) Dorsal gonapophysis and ventral anus
(2) Dorsal male genital pore and ventral anus
(3) Dorsal anus and ventral male genital pore
(4) Dorsal male genital pore and gonapophysis

154. Match Column I with Column II w.r.t. structures and their functions in a cockroach.

	Column I		Column II
a.	Crop	(i)	Acts as tongue
b.	Gizzard	(ii)	Secrete digestive juice
c.	Hepatic caeca	(iii)	Grinding the food particles
d.	Hypopharynx	(iv)	Used for storing of food

Select the **correct** option.
(1) a(i), b(ii), c(iii), d(iv) (2) a(iv), b(iii), c(ii), d(i)
(3) a(iii), b(iv), c(ii), d(i) (4) a(ii), b(i), c(iv), d(iii)

155. Blindness in cockroach is associated with the damage of
(1) Thoracic ganglion
(2) Abdominal ganglion
(3) Supra-oesophageal ganglion
(4) Sub-oesophageal ganglion

156. Read the following characteristics w.r.t. tendons
(a) Attach skeletal muscles to bones
(b) Formed only by non-proteinaceous fibres
(c) Belongs to the specialised connective tissue
(d) Collagen fibres are arranged in rows between many parallel bundles of fibres
How many of the above given characteristics are **correct**?
(1) Four (2) Three
(3) Two (4) One

Space for Rough Work

157. Complete the analogy w.r.t. cells of specialised connective tissues.

Cartilage : Chondrocytes : : Bones : _____

Select the **correct** option.

(1) Fibroblasts

(2) Osteocytes

(3) Collagen

(4) Lacunae

158. The muscle fibres that can alter the diameter of the blood vessels are

(1) Branched (2) Striated

(3) Uninucleated (4) Voluntary

159. The type of epithelium which helps to move ovum through the oviduct is also present in

(1) Blood vessels

(2) Bronchioles

(3) Oesophagus

(4) Moist surface of buccal cavity

160. Cells of specialised tissue 'X' are enclosed in small cavities within the matrix secreted by them. Identify the tissue 'X' and choose the **correct** option.

(1) Blood (2) Ligament

(3) Tendon (4) Bone

161. An enzyme obtained from a plant source has been classified and allocated its unique four digit number as 1.2.1.4. The above described enzyme belongs to the class?

(1) Ligases

(2) Oxidoreductases

(3) Hydrolases

(4) Isomerases

162. Sensory receptors are chemically similar to

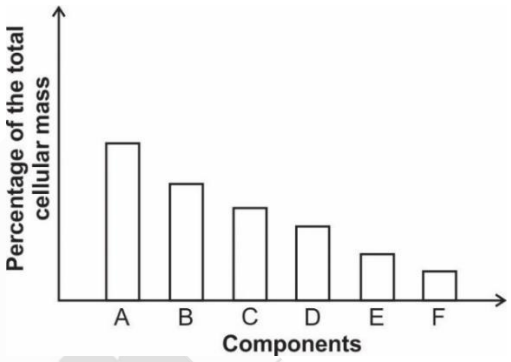
(1) Trypsin

(2) Adenosine

(3) Glycerol

(4) Exoskeleton of arthropods

163. The below given bar diagram represents the cellular components w.r.t. their per cent of the total cellular mass. If B represents protein components, then which of the following bar will represent the nucleic acids?



(1) A (2) C

(3) D (4) E

164. Which of the following forms coordination bonds with the active site of the enzyme as well as with the substrate at the same time?

(1) Prosthetic group (2) Co-enzyme

(3) Metal ion (4) NADP

165. During competitive inhibition of succinic dehydrogenase by malonate

(1) K_m value increases for the enzymatic reaction

(2) V_{max} value decreases for the enzymatic reaction

(3) K_m value of succinate decreases for the enzyme

(4) V_{max} value increases for the enzymatic reaction

Space for Rough Work

166. **Assertion (A):** Lipids are found in the retentate upon chemical analysis of a living tissue.

Reason (R): When we grind a tissue, membranes containing lipids get fragmented and form water insoluble vesicles.

In the light of above statements, select the **correct** option.

(1) Both (A) and (R) are true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

167. Choose the amino acid that contains the alcoholic 'R' group.

(1) Lysine (2) Serine

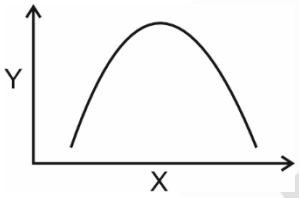
(3) Valine (4) Glutamic acid

168. The element which forms 3.3 per cent weight of the human body is

(1) Nitrogen (2) Silicon

(3) Sodium (4) Carbon

169. What does the 'X' and 'Y' represent in the graph given below?



	X	Y
(1)	pH	Substrate concentration
(2)	pH	Enzyme activity
(3)	Temperature	pH
(4)	Temperature	Substrate concentration

170. Choose the pair which contains heterocyclic compounds as their structural constituents.

(1) RNA, Cytidylic acid

(2) DNA, Glycine

(3) Cellulose, Arachidonic acid

(4) Nucleic acid, Alanine

171. How many compounds given in the box below are polymeric secondary metabolites?

Rubber, Morphine, Cellulose, Monoterpene, Gums, Carotenoid

Select the **correct** option.

(1) Five

(2) Six

(3) Two

(4) Three

172. A section of a human tissue was stained and studied under the microscope. Upon observation, chondrocytes were found in the lacunae but lamellae were absent. This tissue could have been taken most probably from

(1) Pelvic bone

(2) Scapula

(3) Skin epidermis

(4) Ear pinna

173. Choose the **odd** one w.r.t. polymeric compounds.

(1) Collagen

(2) Glycogen

(3) Chitin

(4) Cholesterol

174. In the B-DNA model, the two antiparallel polynucleotide strands are joined together by

(1) Sugar-phosphate bonds

(2) Phosphodiester bonds

(3) Hydrogen bonds

(4) Glycosidic bonds

Space for Rough Work

175. Read the statements given below:

(a) The activity of carbonic anhydrase declines both below and above its optimum pH/temperature.

(b) In proteins, only left handed helices are observed.

(c) An active site of an enzyme is a crevice or pocket into which the substrate fits.

(d) Enzymes remain unchanged after the chemical reaction.

Choose the **correct** option.

(1) Only (a) and (b) are correct

(2) Only (a), (b) and (c) are correct

(3) Only (c) and (d) are incorrect

(4) Only (a), (c) and (d) are correct

176. A student made a table of differences between the male and female frogs. Select the **incorrect** difference enlisted by him.

	Male frogs	**Female frogs**
(1)	Copulatory pad present	Copulatory pad absent
(2)	Vocal sacs present	Vocal sacs absent
(3)	Urinogenital duct present	Urinogenital duct absent
(4)	No functional connection exists between testes and kidneys	Functional connection exists between ovaries and kidneys

177. Read the statements given below w.r.t. frogs.

Statement A: They maintain ecological balance.

Statement B: They serve as an important link of food chain and food web in the ecosystem.

Choose the **correct** option.

(1) Both statements A and B are incorrect

(2) Both statements A and B are correct

(3) Only statement A is incorrect

(4) Only statement B is incorrect

178. A scientist was analysing the sense organs present in frogs. He observed the structures under the microscope and came to the conclusion that

(1) Sensory papillae and eyes are well organised structures

(2) Tympanum and taste buds are present as cellular aggregates around nerve endings

(3) Eyes and internal ears are well organised structures

(4) Nasal epithelium and eyes are present as cellular aggregates around nerve endings

179. In frogs, the thin-walled urinary bladder is present ____ to the rectum.

Choose the **correct** option to fill in the blank.

(1) Dorsal

(2) Ventral

(3) Anterior

(4) Posterior

180. Select the **odd** one w.r.t. the excretory system of *Rana tigrina*.

(1) Kidney

(2) Urinary bladder

(3) Cloaca

(4) Anus

181. Peptide bond is present between the monomeric units of

(1) Starch

(2) Glycogen

(3) Lecithin

(4) RuBisCO

Space for Rough Work

182. Consider the statements given below:

Statement A: Inulin is a heteropolysaccharide.

Statement B: The right end of the inulin chain is called the non-reducing end.

Choose the **correct** option.

(1) Both statements A and B are correct

(2) Only statement A is incorrect

(3) Only statement B is incorrect

(4) Both statements A and B are incorrect

183. Choose the **correct** match w.r.t. proteins.

(1)	Primary structure	–	Necessary for enzymatic activities of protein
(2)	Secondary structure	–	Exists as α-helix and β-plated sheet
(3)	Tertiary structure	–	Adult haemoglobin exhibits this level of organisation only
(4)	Quaternary structure	–	Gives positional information of amino acids in proteins

184. Fructose are characterized by two functional groups. These groups are

(1) Carbonyl and methyl

(2) Hydroxyl and methyl

(3) Carboxyl and phosphate

(4) Carbonyl and hydroxyl

185. Read the statements given below and choose the option that **correctly** states them as true **(T)** or false **(F)**.

(a) Glucagon is a heteropolymer.

(b) Glycerol is trihydroxy propane.

(c) Rate of reaction doubles or decreases by half for every 10°C change in either direction.

(d) The number of amino groups present in the structure of valine is less than the number of carboxyl groups present in it.

	(a)	(b)	(c)	(d)
(1)	F	T	F	T
(2)	T	T	F	F
(3)	T	T	T	F
(4)	F	F	T	T

SECTION - B

186. Given below are some features

(a) Dicondylic skull

(b) Enucleated RBCs

(c) Hepatic portal system

(d) Renal portal system

(e) Ureotelism

(f) Pulmonary respiration

How many of the above mentioned features are common in both humans and frogs?

(1) Five

(2) Four

(3) Six

(4) Three

187. Choose the **incorrect** statement w.r.t. the heart of frogs.

(1) It is myogenic in nature like humans.

(2) It is surrounded by pericardium.

(3) It comprises of two ventricles and one atrium.

(4) It contains additional chambers called sinus venosus and conus arteriosus.

Space for Rough Work

188. Select the **correct** sequence of structures through which food passes in cockroaches.
(1) Mouth → Oesophagus → Pharynx → Gizzard → Crop
(2) Mouth → Pharynx → Oesophagus → Gizzard → Crop
(3) Mouth → Pharynx → Oesophagus → Crop → Gizzard
(4) Mouth → Oesophagus → Crop → Pharynx → Gizzard

189. In male cockroaches, the sperms are stored in the 'X' and are glued together in the form of bundles called 'Y'.
Choose the **correct** option to fill the blanks 'X' and 'Y' respectively.
(1) Mushroom glands; Spermatheca
(2) Seminal vesicles; Spermatophores
(3) Testes; Gonapophysis
(4) Vas deferens; Vestibulum

190. Goblet cells are modified columnar epithelial cells found in the
(1) PCT
(2) Intestine
(3) Buccal cavity
(4) Pancreatic ducts

191. The total number of glycosidic bonds present in three full turns of a double stranded B-DNA is
(1) 90 (2) 70
(3) 60 (4) 50

192. In an enzymatic reaction, the "transition state structure" of the substrate formed is
(1) Permanent and stable
(2) Transient and unstable
(3) Permanent but unstable
(4) Transient but stable

193. Rate of a chemical reaction refers to
(1) Substrate formed in time δt
(2) Reactants present at the end of the reaction
(3) Amount of reactants before the reaction
(4) Amount of product formed per unit time

194. Hydrolysis of guanosine will release all, **except**
(1) A phosphate group
(2) A purine base
(3) Heterocyclic compounds
(4) A ribose sugar

195. **Assertion (A):** The enzyme carboxypeptidase, that helps in proteolysis, requires zinc for its activity.
Reason (R): The removal of co-factor does not affect the catalytic activity of enzymes.
In the light of above statements, select the **correct** option.
(1) Both (A) and (R) are true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are true but (R) is not the correct explanation of (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

196. Select the bond that is not involved in stabilizing the structure of myoglobin.
(1) Hydrogen bonds
(2) Electrostatic interactions
(3) Hydrophilic interactions
(4) Glycosidic bonds

197. Uridine differs from uridylic acid in
(1) Presence of nitrogenous base
(2) Type of pentose sugar
(3) Absence of phosphate group
(4) Presence of OH at 2′ position of sugar moiety

Space for Rough Work

198. Choose the **incorrect** match.

(1) Gingelly oil	–	Has lower melting point as compared to fats
(2) Lecithin	–	Classified as simple lipid
(3) Saturated fatty acids	–	Possess C-C bonds
(4) Palmitic acid	–	The carboxyl group present in it reacts with – OH of glycerol for esterification

199. During the chemical analysis of living tissues, the acid-insoluble fraction will contain all of the given molecules, **except**
(1) Myosin
(2) Starch
(3) GLUT-4
(4) Glycine

200. In the polynucleotide chain of DNA, a thymine is linked to the – OH of
(1) 5′C pentose sugar
(2) 3′C pentose sugar
(3) 1′C pentose sugar
(4) 2′C pentose sugar

❑ ❑ ❑

Space for Rough Work

27/03/2024

Phase-I
CODE-B

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FINAL TEST SERIES for NEET-2024

MM : 720 **Test - 2** **Time : 3 Hrs. 20 Mins.**

Answers

1. (3)	41. (3)	81. (4)	121. (3)	161. (2)
2. (2)	42. (4)	82. (3)	122. (1)	162. (1)
3. (2)	43. (3)	83. (4)	123. (4)	163. (2)
4. (2)	44. (4)	84. (4)	124. (3)	164. (3)
5. (2)	45. (3)	85. (2)	125. (2)	165. (1)
6. (3)	46. (4)	86. (2)	126. (3)	166. (1)
7. (4)	47. (1)	87. (2)	127. (2)	167. (2)
8. (3)	48. (3)	88. (1)	128. (4)	168. (1)
9. (2)	49. (3)	89. (2)	129. (3)	169. (2)
10. (2)	50. (2)	90. (2)	130. (4)	170. (1)
11. (4)	51. (3)	91. (2)	131. (2)	171. (4)
12. (1)	52. (1)	92. (3)	132. (2)	172. (4)
13. (3)	53. (2)	93. (3)	133. (3)	173. (4)
14. (1)	54. (4)	94. (4)	134. (3)	174. (3)
15. (2)	55. (3)	95. (3)	135. (3)	175. (4)
16. (4)	56. (4)	96. (2)	136. (4)	176. (4)
17. (1)	57. (3)	97. (2)	137. (3)	177. (2)
18. (3)	58. (3)	98. (4)	138. (2)	178. (3)
19. (2)	59. (3)	99. (1)	139. (2)	179. (2)
20. (2)	60. (2)	100. (2)	140. (3)	180. (4)
21. (3)	61. (3)	101. (2)	141. (2)	181. (4)
22. (1)	62. (4)	102. (3)	142. (1)	182. (4)
23. (1)	63. (3)	103. (2)	143. (3)	183. (2)
24. (1)	64. (2)	104. (3)	144. (1)	184. (4)
25. (2)	65. (3)	105. (4)	145. (4)	185. (3)
26. (3)	66. (1)	106. (2)	146. (1)	186. (2)
27. (4)	67. (3)	107. (1)	147. (4)	187. (3)
28. (1)	68. (3)	108. (4)	148. (3)	188. (3)
29. (4)	69. (4)	109. (3)	149. (1)	189. (2)
30. (1)	70. (1)	110. (2)	150. (2)	190. (2)
31. (3)	71. (4)	111. (2)	151. (4)	191. (3)
32. (4)	72. (4)	112. (3)	152. (4)	192. (2)
33. (3)	73. (4)	113. (3)	153. (3)	193. (4)
34. (3)	74. (2)	114. (2)	154. (2)	194. (1)
35. (2)	75. (3)	115. (2)	155. (3)	195. (3)
36. (3)	76. (3)	116. (2)	156. (3)	196. (4)
37. (1)	77. (4)	117. (2)	157. (2)	197. (3)
38. (4)	78. (3)	118. (1)	158. (3)	198. (2)
39. (3)	79. (3)	119. (4)	159. (2)	199. (4)
40. (4)	80. (1)	120. (3)	160. (4)	200. (3)

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FINAL TEST SERIES for NEET-2024

MM : 720 **Test - 2** **Time : 3 Hrs. 20 Mins.**

Answers and Solutions

PHYSICS

SECTION - A

1. Answer (3)

$v \propto \frac{1}{x} \Rightarrow v = \frac{k}{x}, \frac{dv}{dx} = \frac{-k}{x^2}, a = \frac{vdv}{dx} = \frac{k}{x}\left(\frac{-k}{x^2}\right)$

$a = \frac{-k^2}{x^3} \Rightarrow a \propto \frac{1}{x^3} \Rightarrow F \propto \frac{1}{x^3}$

2. Answer (2)

Impulse = Change in momentum

$= \Delta p = 4(0) - 4\left(\frac{5}{6}\right) = \frac{-20}{6} = -3.33$

3. Answer (2)

$F_{centripetal} = \frac{mv^2}{r} = m\omega^2 r = 4 \times \pi^2 \times 1 = 4\pi^2$

4. Answer (2)

$T\cos\theta = mg$ and $T\sin\theta = \frac{mv^2}{r} \Rightarrow \tan\theta = \frac{v^2}{rg}$

$\Rightarrow \quad v = \sqrt{rg\tan\theta}$

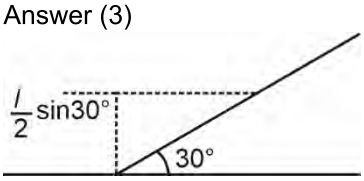
5. Answer (2)

$a = \frac{F}{m} = \frac{6}{18} = \frac{1}{3}, s_n = u + \frac{1}{2}a(2n-1)$

$s_3 = \frac{1}{2} \times \frac{1}{3}(5)$

Work done = $6 \times \frac{5}{6} = 5$ J

6. Answer (3)



$\Rightarrow \quad U = mg\frac{l}{2} \times \frac{1}{2} = \frac{mgl}{4}$

7. Answer (4)

$\frac{1}{2}mv^2 = 2mgh$ also $v^2 = 2g(S-h) \Rightarrow S - h = 2h$

$\Rightarrow \quad 3h = S \Rightarrow h = \frac{S}{3}$

8. Answer (3)

Linear momentum is conserved in both elastic and inelastic collision.

9. Answer (2)

About point of suspension there is only change in direction of angular momentum.

10. Answer (2)

Using conservation of energy, $mgH = \frac{1}{2}I(\omega_{max})^2$

$\Rightarrow \quad \omega_{max} = \sqrt{\frac{2mgH.3}{ml^2}}$

$\Rightarrow \quad \omega_{max} = \sqrt{\frac{6gH}{l^2}}$

11. Answer (4)

$\omega_i = 10 \times 2\pi = 20\pi$ rad/s

$\omega_f = \omega_i - \alpha t \Rightarrow \alpha t = \omega_i \Rightarrow \alpha = \frac{\omega_i}{t} = \frac{20\pi}{4} = 5\pi$

12. Answer (1)

$I = \frac{MR^2}{2}$ and $D = 2R \Rightarrow I = \frac{M}{2} \times \frac{D^2}{4} = \frac{MD^2}{8}$

13. Answer (3)

$K = \frac{1}{2}I\omega^2$ and $L = I\omega \Rightarrow \omega = \frac{L}{I}$

$\Rightarrow K = \frac{1}{2} \times I \times \frac{L^2}{I^2} = \frac{L^2}{2I}$

$\Rightarrow K \propto L^2 \Rightarrow$ Parabola

14. Answer (1)

The rotational analogue of the equation

$$F = \frac{dp}{dt} \text{ is } \tau = \frac{dL}{dt}$$

15. Answer (2)

$K = \frac{1}{2} \times I \times \omega^2$ *and* $\omega = \frac{30 \times 2\pi}{60} = \pi$ rad/s

and $I = 1(1)^2 = 1$

$K = \frac{1}{2} \times 1 \times \pi^2 = \frac{\pi^2}{2}$ J

16. Answer (4)

When a body moves in uniform circular motion, then the work done is zero as the speed of the particle remains constant.

17. Answer (1)

Internal force can change kinetic energy of the system.

18. Answer (3)

Among the given quantities momentum is vector quantity.

19. Answer (2)

$F_{cons} = \frac{-dU}{dx}$ *i.e.* the force will be zero when slope of potential energy vs position curve is zero. It is zero from *A* to *B*.

20. Answer (2)

$F_{max} = ma = \mu mg \Rightarrow a = \mu g \Rightarrow \mu = \frac{2}{10} = 0.2$

21. Answer (3)

$a = \frac{F_0}{m} = \frac{F_0}{5}$,

Using equations of uniformly accelerated motion,

$v = u + at$

$v = at \Rightarrow 6 = \frac{F_0}{5} \times 5 \Rightarrow F_0 = 6$ N

22. Answer (1)

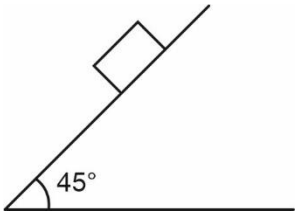
$mg - T = ma$ ...(1)

$T \times R = \frac{mR^2}{2} \times \frac{a}{R} \Rightarrow T = \frac{ma}{2} \Rightarrow mg = ma + \frac{ma}{2}$

$\Rightarrow g = \frac{3a}{2}$

$\Rightarrow g = \frac{2g}{3}$

23. Answer (1)



Force required to just push up

$= mg\sin\theta + \mu mg\cos\theta$

Force required to prevent it to prevent from sliding down

$= mg\sin\theta - \mu mg\cos\theta$

$\Rightarrow mg\sin\theta + \mu mg\cos\theta = 3(mg\sin\theta - \mu mg\cos\theta)$

$\Rightarrow mg\sin\theta = 2\mu mg\cos\theta \Rightarrow \mu = \frac{1}{2}$

24. Answer (1)

The frictional force acting between two surfaces in contact is fundamentally electromagnetic.

25. Answer (2)

Both assertion and reason are correct but reason is not the correct explanation as the correct reason is that the value of kinetic friction is less than limiting friction.

26. Answer (3)

$\vec{A} \times \vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 1 & 2 \\ 2 & -2 & 1 \end{vmatrix}$

$= \hat{i}(1+4) - \hat{j}(1-4) + \hat{k}(-2-2)$

$= 5\hat{i} + 3\hat{j} - 4\hat{k}$

$\Rightarrow$ Unit vector $= \frac{5\hat{i} + 3\hat{j} - 4\hat{k}}{5\sqrt{2}}$

27. Answer (4)

$\left|\vec{A} \times \vec{B}\right|^2 + \left|\vec{A}.\vec{B}\right|^2 = (AB\sin\theta)^2 + (AB\cos\theta)^2$

$= A^2B^2(\sin^2\theta + \cos^2\theta)$

$= A^2B^2$

28. Answer (1)

$\vec{a}_{cm} = \frac{m_1(g)\hat{j} + m_2(g)\hat{j}}{m_1 + m_2}$

$= g(\hat{j})$

29. Answer (4)

$\theta = 2t^3 - 6t^2$

$\omega = 6t^2 - 12t$

$\alpha = 12t - 12$

When $\alpha = 0$

t = 1 s

$\omega = 6(1)^2 - 12(1)$

= –6 rad/s

30. Answer (1)

$\tau = I\alpha$

$20 \times 20 \times 10^{-2} = 5(20)^2 \times 10^{-4}\alpha$

$4 = 5 \times 4 \times 10^{-2}\alpha$

α = 20 rad/s^2

31. Answer (3)

Football has less mass than stone hence football has lesser inertia.

32. Answer (4)

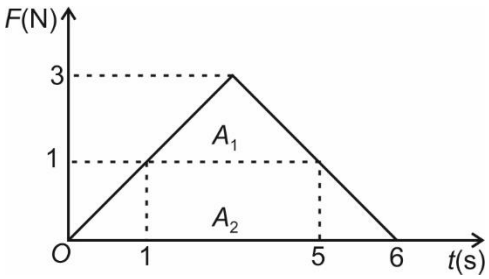
- Static friction is self adjusting force.
- $(f_s)_{max} \rightarrow$ limiting friction

33. Answer (3)

Area under F-t graph gives change in momentum.

At t = 1 s $\rightarrow F$ = 1 N

t = 5 s $\rightarrow F$ = 1 N



$\therefore$ $A = A_1 + A_2$

$= \frac{1}{2} \times 4 \times 2 + 4 \times 1$

= 4 + 4 = 8 N s

34. Answer (3)

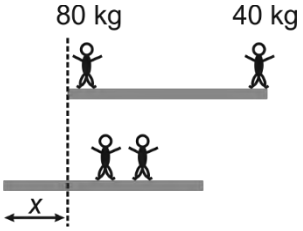
$\vec{F}_{net} = m\vec{a}$

$N_2 = mg$ and $N_1 = \frac{mv^2}{r}$

$\therefore$ $N = \sqrt{N_1^2 + N_2^2}$

$= m\sqrt{\left(\frac{v^4}{R^2} + g^2\right)}$

35. Answer (2)



$\Delta x_{com} = \frac{m_1\Delta x_1 + m_2\Delta x_2 + m_3\Delta x_3}{m_1 + m_2 + m_3}$

$0 = \frac{80(2-x) + 40(-2-x) + 20(-x)}{140}$

$160 - 80x - 80 - 40x - 20x = 0$

$140x = 80$

$x = \frac{80}{140}$

$x = \frac{4}{7}$ m

SECTION - B

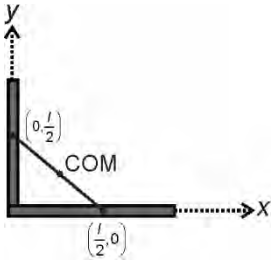
36. Answer (3)

Since the velocity given to bob is less than $\sqrt{2gl}$ hence the bob will oscillate in lower half of circle.

37. Answer (1)

$W = \int_0^{3a} F dx = \left[\frac{f_0 x^2}{2a} - f_0 x\right]_0^{3a} = \frac{3f_0 a}{2}$

38. Answer (4)



$x_{cm} = \frac{m_1x_1 + m_2x_2}{m_1 + m_2}$

$x_{cm} = \frac{\frac{m\ell}{2} + m \times 0}{m + m} = \frac{\ell}{4}$

$y_{cm} = \frac{m_1y_1 + m_2y_2}{m_1 + m_2 + m_3}$

$= \frac{m \times 0 + m \times \frac{\ell}{2}}{m + m} = \frac{\ell}{4}$

39. Answer (3)

The force exerted will be more than weight of person if elevator is going down slowing down.

40. Answer (4)

$\vec{\tau} = I\vec{\alpha}$

$4Fr\sin 45° = Mr^2 \times \alpha$

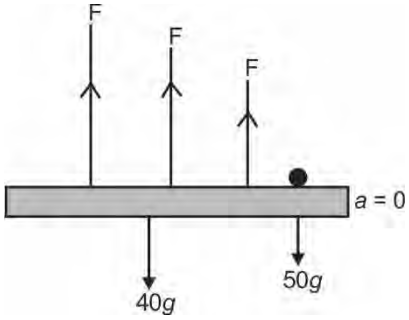
$4 \times 1 \times \frac{1}{\sqrt{2}} = 2 \times 0.5 \times \alpha$

$\alpha = 2\sqrt{2}$ rad/s^2

41. Answer (3)

If man exert a force F

From FBD of platform



$3F = 50g + 40g$

$3F = 900$

$F = 300$ N

42. Answer (4)

$\tan\theta = \frac{v^2}{rg}$

$\therefore\ v = \sqrt{rg\tan\theta}$

$= \sqrt{90 \times 10 \times 1}$ = 30 m/s

43. Answer (3)

Area = $F \times \Delta t = J$ = impulse

$\Delta A = F \times \Delta t = J = \Delta p$ (by impulse momentum theorem)

$\therefore$ Area gives change in momentum.

44. Answer (4)

If the system is in rotational equilibrium then torque can be zero about any point on system or outside it.

45. Answer (3)

IF the net external force acting on system is zero then the system may remain at rest or may move with constant velocity.

46. Answer (4)

Both the bodies will revolve about their COM.

$\frac{G \times m \times 2m}{r^2} = \frac{m \times v_1^2}{\left(\frac{2r}{3}\right)}$ ...(1)

and $\frac{G \times m \times 2m}{r^2} = \frac{2m \times v_2^2}{\left(\frac{r}{3}\right)}$ ...(2)

From equation (1) and (2)

$\frac{v_1}{v_2} = \frac{1}{2}$

47. Answer (1)

Since the collision is perfectly elastic hence the block attached to spring will attain velocity v.

$\Rightarrow\ \frac{1}{2}mv^2 = \frac{1}{2}kx^2 \Rightarrow x = \sqrt{\frac{m}{K}}v$

48. Answer (3)

$e = \frac{\text{Velocity of separation}}{\text{Velocity of approach}} = \frac{2}{2} = 1$

49. Answer (3)

$P = \vec{F} \cdot \vec{v}$

50. Answer (2)

$I\omega = \text{constant} \Rightarrow I \times 40 = \frac{4I}{5} \times \omega_1$

$\Rightarrow \omega_1 = \frac{5 \times 40}{4} = 50$ rad s^{-1}

CHEMISTRY

SECTION - A

51. Answer (3)

Both I_3^- and XeF_2 are linear in shape.

52. Answer (1)

Greater the bond order (B.O) lesser is the bond length and more is the stability.

	O_2^+	O_2	O_2^-
B.O =	2.5	2	1.5

53. Answer (2)

$B_2(10e^-) : (\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 \left(\pi 2p_x^1 \equiv \pi 2p_y^1\right)$

Number of antibonding electrons = 4

54. Answer (4)

- For most of the ionic compounds, $\Delta_{sol}H°$ is positive.
- Max born and Fritz Haber gave Born-Haber cycle method based on Hess's law for the calculation of lattice enthalpy.

55. Answer (3)

If $\Delta n_g = 0$

$\Delta H = \Delta U$

For C(graphite) (s) + $O_2(g) \rightarrow CO_2(g)$

$\Delta n_g = 0$

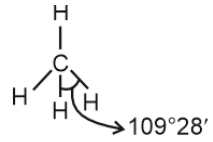
56. Answer (4)

In PF_5, expanded octet is observed.

57. Answer (3)

Work is a path function. It depends on the path followed by the system.

58. Answer (3)



59. Answer (3)

$\Delta U = Q + W = (+100) + (-500) = -400$ J

60. Answer (2)

$\Delta H = \Delta U + \Delta n_g RT$

$= 4.8 + 3 \times 2 \times 300 \times 10^{-3}$

$= 4.8 + 1.8$

$= 6.6$ kcal

$\Delta G = \Delta H - T\Delta S$

$= 6.6 - 300 \times 60 \times 10^{-3}$

$= 6.6 - 18.0$

$= -11.4$ kcal

61. Answer (3)

Intramolecular hydrogen bond is formed when hydrogen atom is in between the two highly electronegative (F, O, N) atoms present within the same molecule.

62. Answer (4)

Molecules	Dipole moment (D)
NH_3	1.47
NF_3	0.23
BF_3	0

63. Answer (3)

$\underset{sp^2}{CH_2} = \underset{sp^2}{CH} - \underset{sp^2}{CH} = \underset{sp^2}{CH_2}$

All of the atoms are in same plane

64. Answer (2)

$\Delta_f H^\circ$ is defined when one mole of a compound is formed from its elements in their most stable states of aggregation.

65. Answer (3)

$$H - C \equiv C - H(g) + H - H(g) \rightarrow \underset{H}{\overset{H}{>}} C = C \overset{H}{<} (g)$$

$\Delta_r H = \Sigma(BE)_R - \Sigma(BE)_P$

$= (2\,BE_{C-H} + BE_{C \equiv C} + BE_{H-H}) -$

$(4\,BE_{C-H} + BE_{C=C})$

$= (2 \times 414 + 827 + 430) - (4 \times 414 + 606)$

$= -177$ kJ mol^{-1}

66. Answer (1)

$W = -P(V_2 - V_1) = -1(10 - 1) = -9$ L-atm

$= -9 \times 101.3 \simeq -910$ J

67. Answer (3)

$A \rightarrow 2B$, $\Delta H_1 = +100$ kJ mol^{-1}

$B \rightarrow C + 3D$, $\Delta H_2 = -75$ kJ mol^{-1}

$2D \rightarrow F$, $\Delta H_3 = +130$ kJ mol^{-1}

Applying 2x (i) + 4 × (ii) + (iii), we get

$2A \rightarrow 4C + F + 10\,D$

$\Delta H = 2\Delta H_1 + \Delta H_2 + \Delta H_3$

$200 - 300 + 130$

$= +30$

How reversing the reaction

$\Delta H' = -\Delta H = -30$ kJ mol^{-1}

68. Answer (3)

Bond	N ≡ N	C ≡ N	C ≡ C	C ≡ O
Mean bond enthalpy (kJ mol^{-1})	946	891	837	1070

69. Answer (4)

SCl_2 follows octet rule

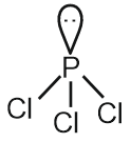
70. Answer (1)

Bond type	Covalent bond length (pm)
C – H	107
N – O	136
C – C	154
C – O	143

71. Answer (4)

SF_6 is octahedral in shape hence all S–F bond lengths in SF_6 are equal.

72. Answer (4)



PCl_3 contains one lone pair of electrons on central iodine atom.

73. Answer (4)

The molecule contains unpaired electron

74. Answer (2)

Compound	Shape
$[ICl_4]^-$	Square planar
ClF_5	Square pyramidal
XeO_3	Pyramidal
IF_7	Pentagonal bipyramidal

75. Answer (3)

$Q = nC\Delta T = \frac{60}{27} \times 24 \times 20 \text{ J} = 1.07 \text{ kJ}$

76. Answer (3)

$\Delta T = 0$ then $\Delta H = 0$

77. Answer (4)

Due to electronegativity difference P – Cl bond will be polar and for PCl_5 vector summation of all the bond moments is zero hence it is nonpolar compound.

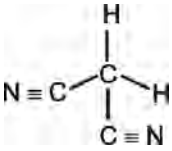
78. Answer (3)

Heat of neutralisation = –57.1 kJ mol^{-1},

so, for 0.1 mol heat of neutralisation = 0.1 × 51.7

= – 5.17 kJ

79. Answer (3)



π bonds = 4

σ bonds = 6

80. Answer (1)

During expansion, maximum work done will be in reversible process.

Hence, $w = -2.303 \text{ nRT} \log\left(\frac{V_2}{V_1}\right)$

$= -2.303 \times 2 \times 8.314 \times 300 \log\left(\frac{50}{5}\right)$

= –11.49 kJ

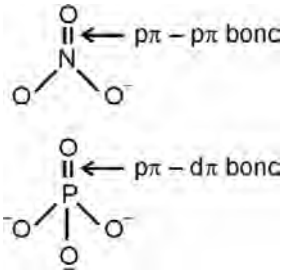
81. Answer (4)

Molecular orbitals of diatomic molecules are designated as σ(sigma), π(pi), δ(delta), etc. In this nomenclature, the sigma (σ) molecular orbitals are symmetrical around the bond-axis while pi(π) molecular orbitals are not symmetrical.

82. Answer (3)

Substance	$\Delta_{fus}H°$ (kJ mol^{-1})
NH_3	5.65
H_2O	6.01
HCl	1.99

83. Answer (4)



84. Answer (4)

$w = -\Delta n_g RT$

$= -1 \times RT$

$= -R \times 300 = -300R$

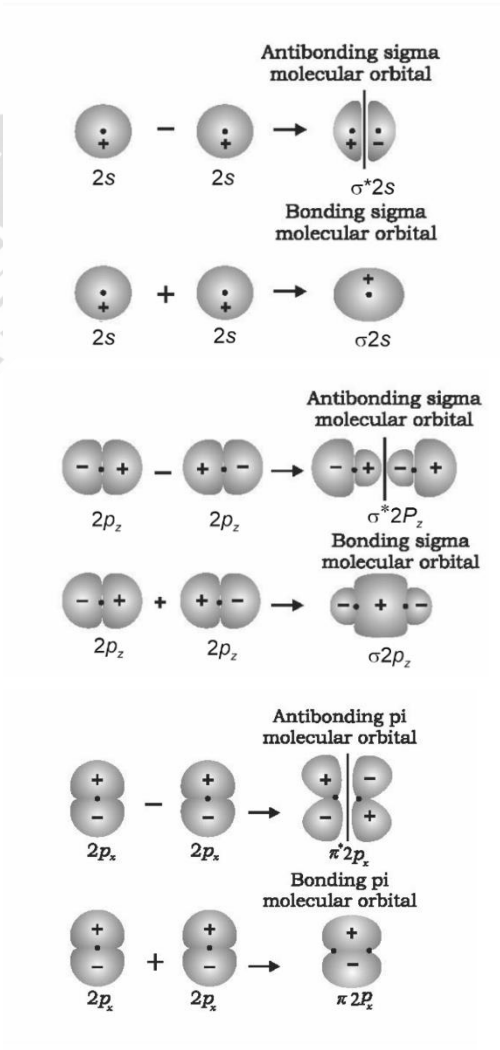
85. Answer (2)

$\Delta H_r^\circ = \Sigma \Delta H_f^\circ$ of products $-\Sigma \Delta H_f^\circ$ of reactants.

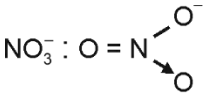
= [(–y) + 2(–z)] – [(–x) + 0] = x – y – 2z kJ mol^{-1}

SECTION - B

86. Answer (2)



87. Answer (2)



Bond order = $\frac{2+1+1}{3} = 1.33$

88. Answer (1)

Energy of resonance hybrid is always less than the energy of any single canonical structure.

89. Answer (2)

Important conditions for hybridization:

(i) The orbitals present in the valence shell of the atom are hybridized.

(ii) The orbitals undergoing hybridization should have almost equal energy.

(iii) Promotion of electron is not essential condition prior to hybridization.

(iv) It is not necessary that only half filled orbitals participate in hybridization. In some cases, even filled orbitals of valence shell take part in hybridization.

90. Answer (2)

$O_2^-(17e^-): (\sigma 1s)^2 (\sigma^*1s)^2 (\sigma 2s)^2 (\sigma^*2s)^2 (\sigma 2p_z)^2$
$(\pi 2p_x^2, \pi 2p_y^2)(\pi^* 2p_x^2, \pi^* 2p_y^1)$

Electron removed from O_2^- ion will be from π^* orbital.

91. Answer (2)

$\Delta S_{A\to D} = \Delta S_{A\to B} + \Delta S_{B\to C} + \Delta S_{C\to D}$

$= 10 + 20 - 25 = 5\ JK^{-1}$

$\Delta S_{D\to A} = -\Delta S_{A\to D} = -5\ JK^{-1}$

92. Answer (3)

$H_2O(l) \to H_2O(g)$,

$\Delta_{vap}H = (-57.8) - (-68.3)$

$= 10.5\ kcal\ mol^{-1}$

$= \frac{10.5}{18}\ kcal\ g^{-1}$

$= 0.58\ kcal$

For 10 g = 0.58 × 10 = 5.8 kcal

93. Answer (3)

Density is an intensive property means does not depend on mass of the system.

94. Answer (4)

1 D = 3.33564 × 10^{-30} C m

95. Answer (3)

Bond order in He_2 is zero hence it does not exist.

96. Answer (2)

$B_2(10e^-): (\sigma 1s)^2 (\sigma^*1s)^2 (\sigma 2s)^2 (\sigma^*2s)^2 (\pi 2p_x^1 = \pi 2p_y^1)$

B_2 has two unpaired electrons.

97. Answer (2)

$\Delta_c H$ = Heat liberated due to combustion of 1 mol benzene *i.e.*, 78 g benzene.

$\Delta_c H = \frac{12.5}{5} \times 78 = 195\ kJ\ mol^{-1}$

98. Answer (4)

At 298 K, naturally occurring, thermodynamically most stable form of a species, assumed to have its $\Delta H_f = 0$.

99. Answer (1)

Acid-base neutralisation is always exothermic.

100. Answer (2)

$(C_p - C_v)M = R$

$(0.125 - 0.075)M = 2$

$\therefore$ M = 40 *i.e.* Ar

BOTANY

SECTION - A

101. Answer (2)

In members of Poaceae, perianth represented by membranous scales are called lodicules e.g. wheat.

102. Answer (3)

If the margins of sepals or petals overlap one another but not in any particular direction as in *Cassia* and gulmohur, the aestivation is called imbricate.

103. Answer (2)

All tissues exterior to the vascular cambium constitute bark. It does not include secondary xylem.

104. Answer (3)

Lateral meristems are cylindrical meristems responsible for producing secondary tissues.

105. Answer (4)

In dicot root, pith is small and inconspicuous. Cambium develops at the time of secondary growth. Vascular bundles are usually two to four in number.

106. Answer (2)

Subsidiary cells are specialised epidermal cells surrounding the guard cells. Casparian strips are found in endodermal cells of roots.

Bast fibres are made up of sclerenchymatous cells. Cells of phelloderm or secondary cortex are parenchymatous.

107. Answer (1)

Mature sieve elements lack nucleus. Trichomes in the shoot system are usually multicellular.

108. Answer (4)

Leaves are modified into tendrils for climbing as in peas.

109. Answer (3)

In mango, endocarp is stony hard and mesocarp is edible and fleshy.

110. Answer (2)

In cymose inflorescence, main axis terminates in a flower. The flowers are borne in a basipetal order. Hence, main axis growth is limited.

111. Answer (2)

Underground stems of zaminkand are modified to store food in them. They also act as organ of perennation to tide over conditions unfavorable for growth.

112. Answer (3)

Lateral roots arise from pericycle.

113. Answer (3)

Pitcher or 'pot shaped' structure in pitcher plant is modified lamina of leaf.

114. Answer (2)

In the seeds of cereals such as maize the seed coat is membranous and generally fused with the fruit wall.

115. Answer (2)

Dianthus exhibit free central placentation.

116. Answer (2)

The axillary buds of plants like *Citrus* lose their ability to grow and form hard, woody and pointed structure called thorns.

117. Answer (2)

Both interfascicular cambium and intrafascicular cambium form the vascular cambium in stem.

118. Answer (1)

Outermost whorl of flower is called calyx.

119. Answer (4)

Synthesis of food material is generally not performed by roots.

120. Answer (3)

Collenchyma is an elastic, living mechanical tissue present in growing parts of the plant such as young stem and petiole of a leaf.

121. Answer (3)

Brinjal is an example of hypogynous flower.

122. Answer (1)

Floral formula of Malvaceae family is

$$Epi_{5-7} \oplus \male\female K_{(5)} \overset{\frown}{C_5 A_{(\infty)}} \underline{G}_{(5)}$$

123. Answer (4)

In castor seeds, the endosperm formed as a result of double fertilisation, is a food storing tissue and called endospermic seeds.

124. Answer (3)

Xylem parenchyma is the only living element of xylem which is involved in radial conduction of water and storage of food.

125. Answer (2)

Guard cells regulate the opening and closing of stomata.

126. Answer (3)

In alternate type of phyllotaxy, a single leaf arises at each node in alternate manner as in China rose, mustard and sunflower plants.

127. Answer (2)

Stems show the presence of multicellular hairs, nodes and internodes, and positively phototropic growth. Thimble-like structure at apex of root is root cap.

128. Answer (4)

Bud is not present in the axil of leaflets of the compound leaf. In *Primrose*, the placentation is free central. Ovules are borne on central axis and septa are absent in free central placentation.

129. Answer (3)

Heartwood is hard, durable and resistant to attacks of microbes due to deposition of organic compounds like tannins, resins, oils, gums, aromatic substances and essential oils.

130. Answer (4)

The oldest layer of primary phloem lies just inner to pericycle.

131. Answer (2)

Monocot plants lack phloem parenchyma.

132. Answer (2)

Water containing cavities are present in vascular bundles of monocot stem.

133. Answer (3)

Xylem, phloem, pith and pericycle constitute stele.

134. Answer (3)

Many vessel elements are fused to form the vessel.

135. Answer (3)

Bulliform cells make the leaves curl inwards to minimize water loss.

SECTION - B

136. Answer (4)

All tissues on the inner side of endodermis constitute the stele.

137. Answer (3)

Asymmetric flowers cannot be divided into two similar halves by any vertical plane passing through centre as in *Canna*.

138. Answer (2)

Sub-aerial modified stem in pineapple is sucker, in *Pistia* it is offset, in *Oxalis* it is runner and in mint it is stolon.

139. Answer (2)

In a dicot leaf, vascular bundles are surrounded by a layer of thick walled bundle sheath cells.

140. Answer (3)

It is a member of Liliaceae family in which leaves are exstipulated with parallel venation. Ovary is superior. Perianth is a characteristic of this family.

141. Answer (2)

Members of compositae family shows capitulum inflorescence along with reticulate venation.

142. Answer (1)

Endarch xylem is found in stems while exarch xylem is found in roots.

143. Answer (3)

Mesophyll is not differentiated into palisade and spongy parenchyma in monocot leaves.

144. Answer (1)

Maize stem	–	Stilt roots
Rhizophora	–	Pneumatophores (Respiratory roots)
Sweet potato	–	Storage roots
Banyan tree	–	Prop roots

145. Answer (4)

Gamosepalous refers to a condition with fused sepals.

146. Answer (1)

Pith is small in dicot root but large and well developed in monocot root.

147. Answer (4)

Sclerenchyma is present in pulp of fruits like guava, pear and sapota.

148. Answer (3)

Apical meristem is a primary meristem, so it does not increase the girth of stems.

149. Answer (1)

Sieve tube and companion cells are connected through pit fields on longitudinal walls. The companion cell retain a nucleus throughout their life.

150. Answer (2)

Petioles of Australian *acacia* expand and become green to synthesize food.

ZOOLOGY

SECTION - A

151. Answer (4)

Antennae, maxillae and mandibles are paired structures in cockroaches. The labrum is known as the upper lip. It is an unpaired structure.

152. Answer (4)

In cockroaches, the prothoracic legs are attached with the prothorax. These legs are located ventrally or on the underside of the body. Wings are found attached with mesothorax and metathorax.

153. Answer (3)

In a male cockroach, the genital chamber contains dorsal anus, ventral male genital pore and gonapophysis.

154. Answer (2)

Crop	–	Storage of food
Gizzard	–	Grinding of food particles
Hepatic caeca	–	Secrete digestive juices
Hypopharynx	–	Acts as tongue

155. Answer (3)

In cockroaches, the supra-oesophageal ganglion supply nerves to antennae (antennal nerves) and compound eyes (optic nerves).

156. Answer (3)

Tendons are mainly formed by collagen fibres (collagen is proteinaceous in nature) with some elastic fibres as well. Orientation of fibres in tendons show a regular arrangement.

157. Answer (2)

Cells of cartilage are called chondrocytes whereas bone cells are called osteocytes.

158. Answer (3)

The walls of blood vessels contain smooth muscle fibres which are fusiform in shape, unstriated, uninucleated, unbranched and involuntary in nature.

159. Answer (2)

Cilia on ciliated epithelium in fallopian tubes help to move ovum from ovary to the uterus. It is also present in the inner surface of the hollow organs like bronchioles.

160. Answer (4)

Osteocytes in bones are enclosed in small cavities within the matrix secreted by them.

161. Answer (2)

The described enzyme belongs to class 1 – Oxidoreductases [Code - (1). 2. 1. 4]

↓

Indicates the class to which the enzyme belongs

162. Answer (1)

Trypsin and sensory receptors are proteinaceous in nature.

163. Answer (2)

Component	% of the total cellular mass
Water	– 70-90
Proteins	– 10-15
Carbohydrates	– 3
Nucleic acids	– 5-7

164. Answer (3)

A number of enzymes require metal ions for their activity which form coordination bonds with side chains at the active site and at the same time form one or more coordination bonds with the substrate. For example, zinc is a co-factor for carboxypeptidase enzyme.

165. Answer (1)

During the competitive inhibition of succinic dehydrogenase by malonate, malonate competes with the substrate (succinate) for the enzyme's active site.

As a result, the apparent K_m value (Michaelis constant) increases as more substrate is required to reach half of the maximum velocity ($V_{max}/2$).

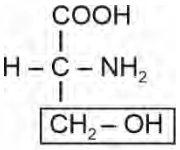
However, the value of V_{max} remains unchanged in the presence of a competitive inhibitor.

166. Answer (1)

Lipids are indeed small molecular weight compounds and are present not only as such but also arranged into structures like cell membrane and other membranes. When we grind a tissue, we are disrupting the cell structure. Cell membrane and other membranes are broken into pieces, and form vesicles which are not water soluble. Therefore, these membrane fragments in the form of vesicles get separated along with the acid-insoluble pool and hence in the macromolecular fraction. Lipids are not strictly macromolecules.

167. Answer (2)

Serine contains hydroxy methyl as the 'R' group.



Serine

168. Answer (1)

Element	% Weight of	
	Earth's crust	Human body
Hydrogen (H)	0.14	0.5
Carbon (C)	0.03	18.5
Oxygen (O)	46.6	65.0
Nitrogen (N)	very little	3.3
Sulphur (S)	0.03	0.3
Sodium (Na)	2.8	0.2
Calcium (Ca)	3.6	1.5
Magnesium (Mg)	2.1	0.1
Silicon (Si)	27.7	Negligible

169. Answer (2)

The given graph represents the change in enzyme action w.r.t. change in pH.

170. Answer (1)

Nitrogenous bases are heterocyclic compounds.

171. Answer (4)

Pigments	Carotenoids, Anthocyanins, *etc.*
Alkaloids	Morphine, Codeine, *etc.*
Terpenoides	Monoterpenes, Diterpenes *etc.*
Essential oils	Lemon grass oil, *etc.*
Toxins	Abrin, Ricin

Lectins	Concanavalin A
Drugs	Vinblastin, curcumin, *etc.*
Polymeric substances	Rubber, gums, cellulose

172. Answer (4)

Cartilage lacks lamellae, which are concentric layers found in the structure of bones.

Elastic cartilage constitutes pinna of ear, epiglottis and eustachian tube. Its matrix is considerably pliable.

173. Answer (4)

Cholesterol is a derived lipid and lipids are not polymeric compounds.

174. Answer (3)

The two antiparallel strands of DNA are held together by hydrogen bonds joining the bases of each complementary nucleotide.

[A = T; G ≡ C]

In a nucleic acid, a phosphate moiety links the 3′-carbon of one sugar of one nucleotide to the 5′-carbon of the sugar of the succeeding nucleotide. The bond between the phosphate and hydroxyl group of sugar is an ester bond.

175. Answer (4)

For any enzyme, the activity declines both below and above the optimum value of pH and temperature.

In proteins, only right handed helices are observed.

Enzymes remain unchanged after catalysing a chemical reaction. The enzyme releases the products of the reaction and the free enzyme is ready to bind to another molecule of the substrate and run through the catalytic cycle once again.

176. Answer (4)

Frogs exhibit sexual dimorphism. Male frogs can be distinguished by the presence of sound producing vocal sacs and also a copulatory pad on the first digit of the fore limbs which are absent in female frogs.

In males, the vasa efferentia enter the kidneys on their side and open into the Bidder's canal.

In females, the ovaries are situated near kidneys and there is no functional connection with kidneys.

177. Answer (2)

Frogs maintain the ecological balance because they serve as an important link of food chain and food web in the ecosystem.

178. Answer (3)

Frogs have different types of sense organs, namely organs of touch (sensory papillae), taste (taste buds), smell (nasal epithelium), vision (eyes) and hearing (tympanum with internal ears). Out of these, eyes and internal ears are well-organised structures and the rest are cellular aggregations around nerve endings.

179. Answer (2)

In frogs, the thin-walled urinary bladder is present ventral to the rectum which also opens in the cloaca.

180. Answer (4)

In frogs, the excretory system consists of paired kidneys, ureters and unpaired cloaca and urinary bladder. Anus is absent in frogs.

181. Answer (4)

RuBisCO is the most abundant protein in whole of the biosphere. Amino acids are monomeric unit of proteins and are linked to each other by peptide bonds.

182. Answer (4)

Inulin is a polymer of fructose. It is a homopolysaccharide. In a polysaccharide chain, the right end is called the reducing end and the left end is called the non-reducing end.

183. Answer (2)

Primary structure of proteins – Gives positional information of amino acids in a protein structure.

Adult haemoglobin – Exhibits quaternary level of structural organisation.

184. Answer (4)

The two functional groups characteristics of fructose are the hydroxyl group (– OH), which is responsible for their water solubility and ability to form hydrogen bonds, and the carbonyl group (C = 0).

185. Answer (3)

A protein is a heteropolymer and not a homopolymer. Glucagon is a protein hormone.

Glycerol is trihydroxy propane.

Valine is a neutral amino acid, thus, the number of NH_2 group present in its structure will be equal to the number of carboxyl group present in it.

A general rule of thumb is that the rate of reaction doubles or decreases by half for every 10°C change in either direction.

SECTION - B

186. Answer (2)

Common features between humans and frogs are-

(1) Presence of dicondylic skull

(2) Presence of hepatic portal system

(3) Both exhibit ureotelic mode of excretion

(4) Both perform pulmonary respiration

187. Answer (3)

In frogs, the heart is a muscular structure situated in the upper part of the body cavity. It has three chambers, two atria and one ventricle and is covered by a membrane called pericardium. A triangular structure called the sinus venosus and a sac-like structure called the conus arteriosus are present as additional chambers in the heart of frogs.

188. Answer (3)

In cockroaches, the mouth opens into a short tubular pharynx, leading to a narrow tubular passage called oesophagus.

Oesophagus in turn, opens into a sac-like structure, called crop which is used for storing of food. The crop is followed by gizzard or proventriculus.

189. Answer (2)

In male cockroaches, the sperms are stored in the seminal vesicles and are glued together in the form of bundles called spermatophores which are discharged during copulation.

190. Answer (2)

Some of the columnar or cuboidal cells get specialised for secretion and are called glandular epithelium. They are mainly of two types: unicellular, consisting of isolated glandular cells (goblet cells of the alimentary canal), and multicellular, consisting of cluster of cells (salivary gland).

191. Answer (3)

The bond present between sugar and nitrogenous base is the glycosidic bond which is also known as N-glycosidic linkage.

In one turn of B-DNA, there are 20 glycosidic bonds (10 base pairs).

Thus, in both strands of B-DNA for 3 turns :

$20 \times 3 = 60$ glycosidic bonds will be present.

192. Answer (2)

During the state where the substrate is bound to the active site of the enzyme, a new structure of the substrate called the 'transition state structure', is formed. Very soon, after the expected bond breaking/making is completed, the product is released from the active site. In other words, the structure of substrate gets transformed into the structure of product(s). The pathway of this transformation must go through the so-called transition state structure. There could be many more 'altered structural states' between the stable substrate and the product. Implicit in this statement is the fact that all other intermediate structural states are unstable.

193. Answer (4)

Rate of a physical or chemical process refer to the amount of product formed per unit time. It can be expressed as:

$$\text{Rate} = \frac{\delta P}{\delta t}$$

194. Answer (1)

Guanosine is a nucleoside which is composed of guanine base and a ribose sugar. It does not possess any phosphate groups.

195. Answer (3)

A number of enzymes require metal ions for their activity which form coordination bonds with side chains at the active site and at the same time form one or more coordination bonds with the substrate, *e.g.*, zinc is a co-factor for the proteolytic enzyme carboxypeptidase.

Catalytic activity is lost when the co-factor is removed from the enzyme which testifies that they play a crucial role in the catalytic activity of the enzyme.

196. Answer (4)

Glycosidic bonds are least likely to be involved in stabilizing the structure of myoglobin. The three-dimensional structure of proteins is stabilized by hydrogen bonds, ionic bonds (results from electrostatic interaction) and hydrophilic interactions.

197. Answer (3)

Uridine is a nucleoside. It does not possess phosphate group.

198. Answer (2)

Oils have lower melting point (*e.g.*, gingelly oil) and hence, they remain as oil in winters.

Lecithin contains a phosphate group, hence, they are called as conjugated lipids.

Fatty acids could be saturated (without double bond) or unsaturated (with one or more C = C double bonds).

Palmitic acid contains ester bonds.

199. Answer (4)

The molecules present in the acid-insoluble fraction with the exception of lipids are polymeric substances with molecular weights in the range of ten thousand daltons and above.

Myosin – Polypeptide

Starch – Polysaccharide

Glycine – Amino acid (will be found in the acid soluble pool)

200. Answer (3)

In the polynucleotide chain of DNA, a nitrogenous base is linked to the 1′ carbon of the deoxyribose sugar. This linkage occurs through a glycosidic bond between the 1′ carbon of the deoxyribose in the nucleotide and the nitrogenous base.

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