24/03/2023

Phase-1
CODE-B

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FINAL TEST SERIES for NEET-2023

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, States of Matter: Gases and Liquids, Thermodynamics

Botany : Morphology of Flowering Plants, Anatomy of Flowering Plants

Zoology : Structural Organization in Animals, Biomolecules

Instructions :

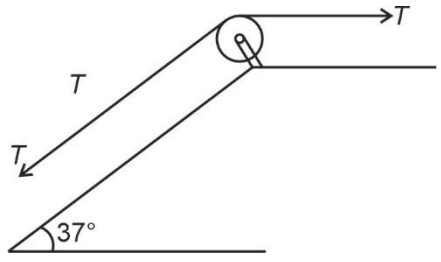
(i) There are two sections in each subject, i.e. Section-A & Section-B. You have to attempt all 35 questions from Section-A & only 10 questions from Section-B out of 15.
(ii) Each question carries 4 marks. For every wrong response 1 mark shall be deducted from the total score. Unanswered / unattempted 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

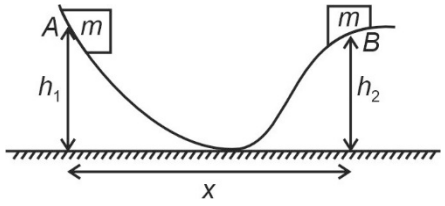
1. Consider the situation given in the figure, the force on pulley due to tension in the string will be



(1) $\frac{\sqrt{2}}{5}T$ (2) $\sqrt{\frac{2}{5}}T$

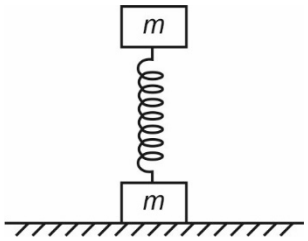
(3) $\frac{2}{\sqrt{5}}T$ (4) $\frac{2}{5}T$

2. A body of mass m starts from rest moving along a curved path as shown in the diagram. If coefficient of friction between the block and surface is μ then the work done by friction force will be, (body is also at rest at point B)



(1) μmgx
(2) $mg(h_2 - h_1)$
(3) $-\mu mgx$
(4) All of these

3. A system consists of two identical blocks, each of mass m connected by a massless spring of force constant k. Initially the system is in equilibrium as shown in the figure. The further compression that must be provided to the spring such that the lower block just lifts off the ground is



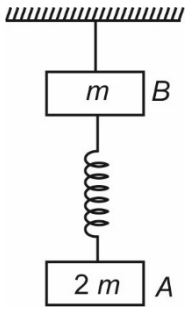
(1) $\frac{mg}{k}$

(2) $\frac{3mg}{k}$

(3) $\frac{4mg}{k}$

(4) $\frac{2mg}{k}$

4. Two blocks A and B of mass $2m$ and m respectively are suspended with the help of a string and a spring as shown in the figure. The magnitude of acceleration of B, immediately after cutting the string is



(1) g (2) $3g$

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

5. A spring of force constant 200 N/m is cut into three parts of lengths in ratio 1 : 2 : 3. The smallest spring is further cut into two parts of equal length. The force constant of the shortest spring formed will be

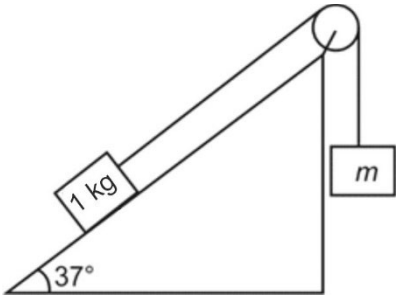
(1) 400 N/m

(2) 1200 N/m

(3) 600 N/m

(4) 2400 N/m

6. The value of mass m for which the 1 kg block would remain in equilibrium is (Take g = 10 m/s^2)



(1) 0.8 kg

(2) 0.6 kg

(3) 0.3 kg

(4) 0.25 kg

7. A block A kept on an inclined surface just begins to slide if angle of inclination is 30°. The block is replaced by another block B and it is found that it just begins to slide if angle of inclination is 40°. Then choose the correct conclusion among the following. (Given that μ_A and μ_B are friction coefficient between blocks and inclined plane)

(1) Mass of A > mass of B

(2) Mass of A < mass of B

(3) $\mu_A > \mu_B$

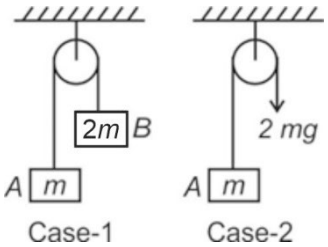
(4) $\mu_A < \mu_B$

8. A body of mass 2 kg, moving with a speed of 10 m/s hits a wall and rebounds with same speed. If the contact-time is $\left(\frac{1}{50}\right)$ s, then force applied on the wall by the body is

(1) 2 kN (2) 4 kN

(3) 200 N (4) 80 N

9. If acceleration of block A in case 1 is a_1, in case 2 is a_2, then $a_1 : a_2$ is



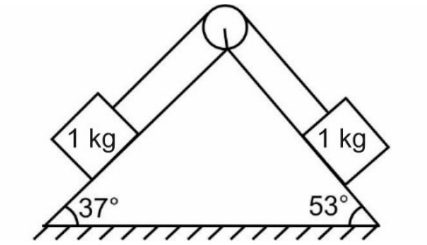
(1) 1 : 3

(2) 3 : 1

(3) 4 : 1

(4) 2 : 1

10. The acceleration of the masses placed over a fixed inclined plane as shown in the figure is (g = 10 m/s^2)



(1) 2 m/s^2 (2) 1 m/s^2

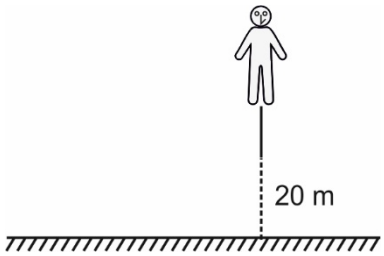
(3) 10 m/s^2 (4) 15 m/s^2

11. A diwali rocket is ejecting 0.04 kg of gas per second at a velocity of 200 m/s with respect to ground. The accelerating force on the rocket due to ejection of gases is

(1) 10 N (2) 4 N

(3) 6 N (4) 8 N

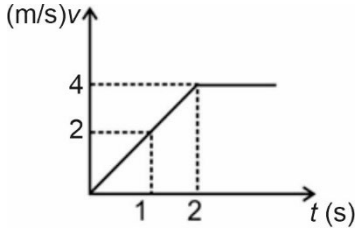
12. A man of mass 50 kg is in a gravity free space at a height of 20 m above the floor. He throws a stone of 0.5 kg downwards with a speed of 36 km/h straight towards floor. When the stone reaches the floor, the distance of man from the floor is



(1) 20.2 m (2) 20.8 m

(3) 20.6 m (4) 19.9 m

13. An elevator of mass 600 kg (along with passengers) is moving upwards such that its velocity versus time graph is as shown in the figure. The power generated by the cable, pulling the elevator, at time t = 1.5 s will be (g = 10 ms^{-2})



(1) 21.6 kW (2) 30 kW

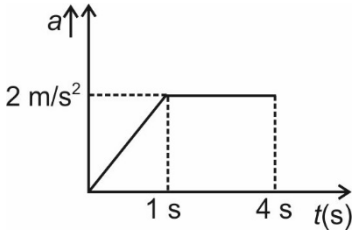
(3) 25 kW (4) 34.2 kW

14. The work done by kinetic frictional force may be

(1) Negative (2) Positive

(3) Zero (4) All of these

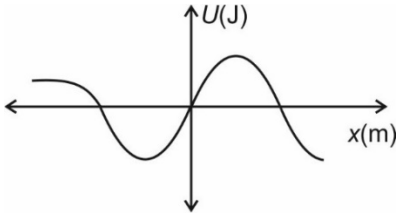
15. The acceleration-time graph of a block of mass 4 kg moving along x-axis is as shown in the figure. If the initial velocity of block is 2 m/s, then the power delivered to the block at t = 4 s will be



(1) 72 W (2) 36 W

(3) 49 W (4) 16 W

16. Variation of potential energy of a particle with position is represented in the following graph. If the particle is released from rest at origin, then it will start to move



(1) Along negative x-axis

(2) Along positive x-axis

(3) The particle will stay at origin

(4) Either (2) or (3)

17. A body under the action of a force $\vec{F} = (3\hat{i} - 4\hat{j} + 10\sqrt{2}\hat{k})$ N, acquires an acceleration of 5 m/s^2. The mass of this body must be

(1) 10 kg (2) 2 kg

(3) 3 kg (4) 5 kg

18. A small ball of mass m is attached at one end of a light rigid rod of length l which is hinged at its another end. The system is suspended in equilibrium such that the rod is vertical and free to rotate in vertical plane. The bob would complete vertical circular motion if the minimum horizontal speed imparted to the bob is

(1) $\sqrt{4gl}$

(2) $\sqrt{5gl}$

(3) $\sqrt{3gl}$

(4) All of these

19. A particle of mass m is driven by a machine that delivers a constant power P. If the particle starts from rest, then its velocity as a function of time is

(1) $\left(\sqrt{\frac{2P}{3m}}\right)t$ (2) $\left(\sqrt{\frac{2P}{3m}}\right)t^{3/2}$

(3) $\left(\sqrt{\frac{2P}{m}}\right)t$ (4) $\sqrt{\frac{2Pt}{m}}$

20. A small block of mass m is suspended with the help of a spring from ceiling of an elevator which is accelerating downwards with acceleration a. The block is in equilibrium with respect to the elevator. The work done by the spring, as observed by a man in the elevator, on the block in time t will be

(1) $\frac{1}{2}m(g-a)at^2$ (2) $\frac{1}{2}m(g+a)at^2$

(3) mg^2t^2 (4) Zero

21. A bullet, moving horizontally with speed u, strikes a vertically suspended bob of same mass and emerges with 80% of initial speed. The maximum height attained by the bob is 20 m (assume bob remains below its suspension point). Then u is equal to

(1) 80 m/s (2) 100 m/s

(3) 140 m/s (4) 60 m/s

22. A uniform rope of mass m and length l is placed on a smooth table such that one-fourth of its length hangs down. The rope begins to slide down. The speed of the chain when it completely slips off the table is

(1) $\sqrt{\frac{3gl}{8}}$ (2) $\sqrt{\frac{15gl}{16}}$

(3) $\sqrt{15gl}$ (4) $\sqrt{\frac{gl}{15}}$

23. Two small balls A and B, of mass 2 kg and 4 kg are moving with velocity $(2\hat{i}+4\hat{j})$m/s and $(2\hat{i})$ m/s respectively. After the balls collide, the velocity of ball A is $(2\hat{i}+\hat{j})$ m/s, then the velocity of ball B will be

(1) $(2\hat{i}+2\hat{j})$ m/s

(2) $(2\hat{i}+1.5\hat{j})$ m/s

(3) $(\hat{i}+\hat{j})$ m/s

(4) $(\hat{i}+2\hat{j})$ m/s

24. A solid sphere is rotating freely about its axis of symmetry in free space. The radius of sphere starts decreasing keeping its mass same. Which of the following option is correct?

(1) Angular momentum will decrease

(2) Angular speed will increase

(3) Rotational kinetic energy will increase

(4) Both (2) and (3)

25. A force $F\hat{k}$ acts at the origin of the co-ordinate system. The torque of the force about a point having co-ordinate (1, –1) is

(1) $-F(\hat{i}-\hat{j})$

(2) $F(\hat{i}-\hat{j})$

(3) $-F(\hat{i}+\hat{j})$

(4) $F(\hat{i}+\hat{j})$

26. The moment of inertia of thin uniform circular ring about an axis passing through its centre of mass and perpendicular to plane of ring is 50 kg m^2. Moment of inertia of ring about one of its diameter will be

(1) 25 kg m^2 (2) 12.5 kg m^2

(3) 5 kg m^2 (4) 50 kg m^2

27. The moment of inertia of a body about an axis is 1.2 kg m^2. Initially the body is at rest but free to rotate about the given axis. In order to produce a rotational energy of 1500 J, an acceleration of 25 rad/s^2 must be applied about that axis for the duration of

(1) 1 s (2) 4 s

(3) 2 s (4) 16 s

28. A particle moves on a straight line with a uniform velocity. Its angular momentum

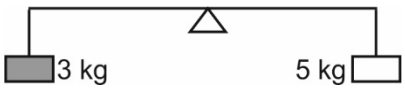
(1) Is zero about a point on the straight line

(2) Is not zero about a point away from straight line

(3) Is constant about any given point

(4) All above statements are correct

29. A light rod of length 1 m is pivoted at its centre as shown in figure. Initially rod is horizontal. The angular acceleration of rod just after release is



(1) 5 rad/s^2 (2) 7 rad/s

(3) 6.5 rad/s (4) 7.5 rad/s

30. A cubical block of mass M and edge length l slides down a rough inclined plane of inclination θ with a uniform velocity. The magnitude of friction force acting on the block is

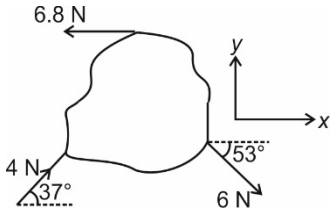
(1) Zero

(2) $mg\tan\theta$

(3) $mg\sin\theta$

(4) $mg\cos\theta$

31. A body of mass 1.2 kg is subjected to the forces as shown. If all forces are in xy plane, then translational acceleration of centre of mass of the body is



(1) 1.0 m/s^2

(2) 2.0 m/s^2

(3) 1.5 m/s^2

(4) 2.5 m/s^2

32. A hollow cylinder of mass m and radius R is kept on a rough surface after giving its centre a horizontal speed v_0. The speed of centre of the cylinder when it starts pure rolling is

(1) $\frac{2v_0}{3}$

(2) $\frac{2v_0}{5}$

(3) $\frac{v_0}{3}$

(4) $\frac{v_0}{2}$

33. Linear impulse on a body is equal to

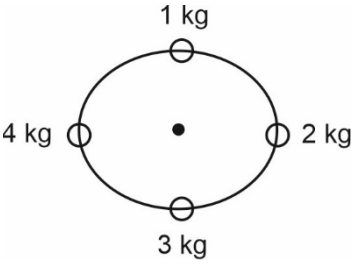
(1) Change in linear momentum

(2) Force × acceleration

(3) Force × speed

(4) Rate of change of momentum

34. Four small balls having masses 1 kg, 2 kg, 3 kg and 4 kg are attached to the periphery of massless ring of radius 1 m. The moment of inertia of system about an axis through the centre and perpendicular to plane of ring is



(1) 22 kg m^2 (2) 18 kg m^2

(3) 10 kg m^2 (4) 17 kg m^2

35. A shell following a parabolic path explodes somewhere in its flight. The centre of mass of fragments will move in

(1) Vertical direction

(2) Same parabolic path

(3) Horizontal direction

(4) Any arbitrary direction

SECTION - B

36. A force of 100 dynes is acted on a body of mass 10 g which is initially at rest, for a time interval of 3 s. The average impulse that acted on the body is

(1) 300 N s

(2) 3 mN s

(3) 4 N s

(4) 400 mN s

37. Natural length of a spring is 80 cm, and its spring constant is 400 N/m. A mass of 10 kg is hung from it. The extension produced in the spring when the mass attains equilibrium, is (g = 10 m/s^2)

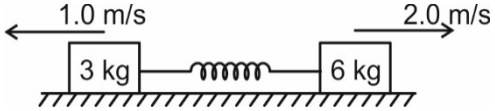
(1) 50 cm

(2) 25 cm

(3) 80 cm

(4) 10 cm

38. Two blocks of masses 3 kg and 6 kg respectively are placed on a smooth horizontal surface. They are connected by a light spring of force constant k = 200 N/m. Initially the spring is unstretched. The indicated velocities are imparted to the blocks. Find the maximum extension in the spring.

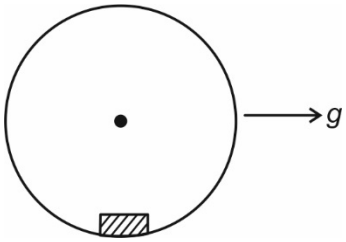


(1) 30 cm (2) 20 cm

(3) 10 cm (4) 5 cm

39. A small block of mass m is placed inside a smooth hollow sphere of radius R at lowest position. Initially system was at rest as shown in the figure. Now the sphere is given a constant horizontal acceleration g by an external agent.

The maximum angular displacement of block with vertical, w.r.t. sphere is



(1) 60° (2) 30°

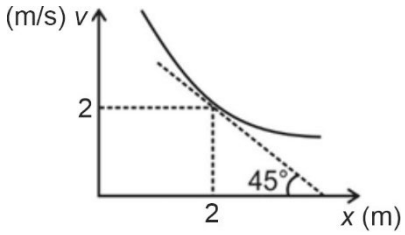
(3) 45° (4) 90°

40. A man is standing on a rough horizontal disc rotating with constant angular velocity of 10 rad/s. The distance from the centre of disc where he should stand so that he does not slip on the disc is (coefficient of friction between disc and feet of man is 0.4)

(1) $R \geq 0.04$ m (2) $R \leq 0.02$ m

(3) $R \leq 0.04$ m (4) $R \geq 0.02$ m

41. The velocity-position graph for a particle of mass 2 kg is shown. The power delivered to the particle at x = 2 m will be



(1) –4 W (2) –14 W

(3) –10 W (4) –8 W

42. A particle moves from x = 0 to x = 5, under the influence of a force F given by expression $F = 3x^2 - 2x + 7$. (Where F is in N and x is in m)

The work done by this force is

(1) 121 J (2) 135 J

(3) 99 J (4) 105 J

43. A ball is released from the top of a high building from rest. The average power delivered to the ball, by the gravity in first, second and third second of motion is

(1) 1 : 6 : 8 (2) 2 : 4 : 8

(3) 1 : 1 : 1 (4) 1 : 3 : 5

44. An electric motor creates a tension of 4500 N in hoisting cable and reels it at the rate of 2 m/s. What is the power of electric motor?

(1) 90 kW

(2) 9 kW

(3) 225 kW

(4) 9000 kW

45. Work done by the force $\vec{F} = (x\hat{j} + y\hat{i})$ N in displacing a body from (0, 0) m to (0, 2) m is

(1) 8 J (2) 1 J

(3) 2 J (4) Zero

46. A solid cube of mass 4 kg is moving on a horizontal surface with a velocity 5 m/s collides with a spring of force constant 400 N/m. The maximum compression produced in the spring is

(1) 0.2 m (2) 0.3 m

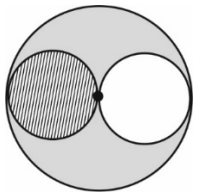
(3) 0.4 m (4) 0.5 m

47. The linear density of a rod of length L = 1 m varies as $\rho(x) = \alpha + \beta x$, where $0 \leq x \leq 1$. The centre of mass of the rod will be at

(1) $\frac{3\alpha + 2\beta}{6\alpha + 3\beta}$ (2) $\frac{2\alpha + 3\beta}{3\alpha + 2\beta}$

(3) $\frac{3\alpha + 2\beta}{2\alpha + \beta}$ (4) $\frac{\alpha + 3\beta}{2\alpha + 3\beta}$

48. A small disc of radius $\frac{R}{2}$ is removed from a larger disc of radius R such that rim of smaller disc passes through the centre of the larger disc and it is glued on the other side of the larger disc as shown in the figure



Initially, if moment of inertia of larger disc about an axis passing through centre and perpendicular to disc was I, then moment of inertia of the new system formed will be

(1) Greater than I

(2) Less than I

(3) Equal to I

(4) Maybe less or greater than I

49. All the particles of a body are situated at a distance R from the origin. The distance of centre of mass of body from origin is

(1) $2R$

(2) $\leq R$

(3) $> R$

(4) $\geq R$

50. A rigid body rotates about a stationary axis according to the equation $\theta = 12t - 4t^3$. Its angular acceleration, when its angular velocity becomes zero, is (θ is angular displacement and t is time)

(1) -12 rad/s^2 (2) -24 rad/s^2

(3) -6 rad/s^2 (4) -10 rad/s^2

CHEMISTRY

SECTION - A

51. In which of the following processes, entropy decreases?

(1) Sublimation of camphor

(2) Melting of ice

(3) Liquification of CO_2 (gas)

(4) Thermal decomposition of $CaCO_3$

52. If for a reaction, $A_2(g) + B_2(g) \rightleftharpoons 2AB(g)$, $\Delta H = 60$ kJ mol^{-1}, $\Delta S = 200$ J K^{-1} mol^{-1}, then temperature at which reaction is at equilibrium will be

(1) 400 K

(2) 300 K

(3) 200 K

(4) 100 K

53. Non-polar molecule among the following is

(1) H_2O

(2) PCl_3

(3) CCl_4

(4) CH_2Cl_2

54. **Statement I:** The total pressure exerted by the mixture of non-reactive gases is equal to the sum of the partial pressures of individual gases at constant T and V.

Statement II: Pressure exerted by saturated water vapour is called aqueous tension.

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

(1) Both statements I and II are true

(2) Both statements I and II are false

(3) Statement I is true but statement II is false

(4) Statement I is false but statement II is true

55. Which of the following is not a characteristic of gases?

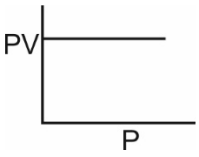
(1) Gases are highly compressible

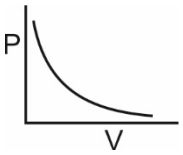
(2) Gases exert pressure in all directions equally

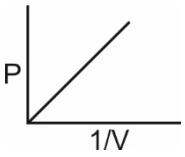
(3) Gases cannot mix evenly and completely in all proportions without any mechanical aid

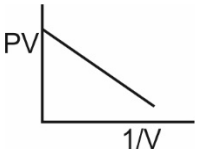
(4) The volume and shape of gases are not fixed

56. Select the incorrect graph regarding Boyle's law.

(1) 

(2) 

(3) 

(4) 

57. If volumes of a gas at 0°C and t°C respectively are V_0 and V_t, then select the correct relation.

(1) $V_t = \dfrac{V_0}{273.15}$

(2) $V_t = \dfrac{V_0 + t}{273.15}$

(3) $V_0 = V_t\left(1 + \dfrac{t}{273.15}\right)$

(4) $V_t = V_0\left(1 + \dfrac{t}{273.15}\right)$

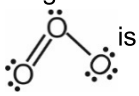
58. Equal masses of O_2 and SO_2 are mixed in an empty container at 25°C. If total pressure of the container is 9 atm, then the partial pressure of O_2 gas is
(1) 1 atm
(2) 3 atm
(3) 4.5 atm
(4) 6 atm

59. Mass of 11.2 L CH_4 gas at S.T.P. is
(1) 4 g
(2) 8 g
(3) 16 g
(4) 32 g

60. Real gas behaves as an ideal gas at
(1) Low temperature and high pressure
(2) Low temperature and low pressure
(3) High temperature and low pressure
(4) High temperature and high pressure

61. Among the following gases, the value of van der Waals constant 'b' is maximum for
(1) CO_2 (2) He
(3) H_2 (4) N_2

62. Dipole-dipole interactions are present in which of the following pairs?
(1) HCl and CCl_4 (2) H_2O and HCl
(3) H_2O and Ne (4) He and Ne

63. Formal charge on central oxygen atom in O_3 molecule  is
(1) –2 (2) –1
(3) 0 (4) +1

64. Example of a compound containing an element with expanded octet is
(1) PF_5 (2) PF_3
(3) NCl_3 (4) CCl_4

65. Molecule in which all the bond angles are not equal is
(1) BeF_2 (2) CH_4
(3) BF_3 (4) PCl_5

66. Molecule or ion having bond order equal to 2.5 is
(1) N_2 (2) C_2^{2-}
(3) F_2 (4) N_2^+

67. Match the compounds in list-I with the hybridisation of their central atom in list-II.

List-I	List-II
a. SF_4	(i) sp^3d^2
b. H_2O	(ii) sp^3d
c. CO_2	(iii) sp
d. XeF_4	(iv) sp^3

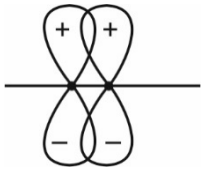
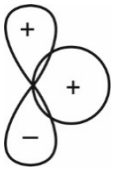
(1) a(i), b(ii), c(iii), d(iv)
(2) a(iv), b(ii), c(iii), d(i)
(3) a(i), b(iv), c(iii), d(ii)
(4) a(ii), b(iv), c(iii), d(i)

68. Species with zero dipole moment is
(1) NH_3
(2) NF_3
(3) NH_4^+
(4) H_2S

69. Which among the following is not a linear molecule?
(1) $BeCl_2$
(2) CO_2
(3) $HgCl_2$
(4) SO_2

70. The correct order of stability is
(1) $N_2 < N_2^+ < N_2^{2+}$ (2) $N_2^{2+} < N_2 < N_2^+$
(3) $N_2 < N_2^{2+} < N_2^+$ (4) $N_2^{2+} < N_2^+ < N_2$

71. Diamagnetic species among the following is
(1) O_2 (2) B_2
(3) C_2^{2+} (4) O_2^{2-}

72. Which diagram shows zero overlap?
(1) 
(2) 
(3) 
(4) 

73. The total number of lone pair(s) of electrons around central atom in BrF_5 is
(1) Five (2) Zero
(3) Two (4) One

74. Select the correct statements regarding PCl_5
I. P is sp^3d hybridised
II. Geometry is trigonal bipyramidal
III. All P – Cl bonds are equivalent
IV. P expands its octet
(1) I, II, III and IV (2) I, II and III only
(3) I, II and IV only (4) II, III and IV only

75. Enthalpy change for the reaction, $4O(g) \rightarrow 2O_2(g)$ is –a kJ. The dissociation energy of O-O bond is
(1) –4a kJ
(2) –a/2 kJ
(3) a/2 kJ
(4) 2a kJ

76. Bomb calorimeter is used to calculate
(1) ΔU
(2) ΔG
(3) ΔH
(4) ΔS

77. Latent heat of fusion of a compound is 3000 J/mol at 27°C. Entropy change will be
(1) 12 J K^{-1} mol^{-1}
(2) 10 J K^{-1} mol^{-1}
(3) 0.1 J K^{-1} mol^{-1}
(4) 1.5 J K^{-1} mol^{-1}

78. Which of the following is not true for a cyclic process?
(1) $\Delta G = 0$
(2) $\Delta H = 0$
(3) W = 0
(4) $\Delta U = 0$

79. Equal volumes of two diatomic gases, A and B, at same temperature and pressure are mixed. The ratio of specific heats $\left(\frac{C_p}{C_v}\right)$ of the mixture will be
(1) 1.66 (2) 1.40
(3) 1.33 (4) 1.25

80. In which of the following processes pressure remains constant?
(1) Isothermal process
(2) Isobaric process
(3) Isochoric process
(4) Adiabatic process

81. Which of the following is an intensive property?
(1) Pressure
(2) Enthalpy
(3) Internal energy
(4) Heat capacity

82. Which of the following is correct expression for 1st law of thermodynamics under isothermal condition?
(1) $\Delta U = q - w$
(2) $\Delta U = w$
(3) $q = -w$
(4) $q = w$

83. For which of the following, the standard enthalpy of formation is zero?
(1) $I_2(g)$ (2) $P_4(g)$
(3) $O_3(g)$ (4) $Br_2(l)$

84. Bond energies for A – A, B – B and A – B are x, y and z kJ mol^{-1} respectively. The $\Delta_r H$ for the reaction $A_2 + B_2 \longrightarrow 2AB$ will be
(1) x – y – 2z (2) 2z – x – y
(3) x + y – 2z (4) x + y + 2z

85. Under what conditions, the reaction will be spontaneous at all temperature?
(1) $\Delta H > 0, \Delta S > 0$ (2) $\Delta H < 0, \Delta S < 0$
(3) $\Delta H > 0, \Delta S < 0$ (4) $\Delta H < 0, \Delta S > 0$

SECTION - B

86. Total number of electrons present in antibonding molecular orbitals in N_2 is
(1) 2 (2) 4
(3) 6 (4) 8

87. Strongest H-bonding takes place in
(1) HF (2) H_2O
(3) NH_3 (4) CH_3OH

88. Minimum bond length is in
(1) O_2 (2) O_2^-
(3) O_2^+ (4) O_2^{2-}

89. For the following reaction,

$$2C_4H_{10}(g) + 13O_2(g) \longrightarrow 8CO_2(g) + 10H_2O(g)$$

The sign of ΔH, ΔS and ΔG respectively would be

(1) (–), (+), (–)

(2) (+), (–), (+)

(3) (–), (–), (–)

(4) (+), (–), (–)

90. In London forces, the interaction energy is inversely proportional to the (r = distance between two particles)

(1) r (2) r^2

(3) r^3 (4) r^6

91. van der Waals equation for one mole of a gas at high pressure is

(1) $PV + \frac{a}{V} = RT$

(2) PV = Pb – RT

(3) $PV - \frac{a}{V} = RT$

(4) PV = Pb + RT

92. The correct order of most probable speed (C*), average speed ($\overline{C}$) and root mean square speed (C) of CH_4 at 27°C is

(1) $C < \overline{C} < C^*$

(2) $C^* < \overline{C} < C$

(3) $C < C^* < \overline{C}$

(4) $C^* < C < \overline{C}$

93. The temperature at which CO_2 has the same root mean square speed as that of O_2 at 27°C is

(1) 450.5 K (2) 298.5 K

(3) 412.5 K (4) 316.5 K

94. The density of CO_2 gas at 760 mm Hg pressure and 47°C is

[Given that 1 atm = 760 mm Hg] [R = 0.082 L atm mol^{-1} K^{-1}]

(1) 0.97 g/L (2) 1.23 g/L

(3) 0.82 g/L (4) 1.67 g/L

95. **Assertion (A):** Temperature is a state function.

Reason (R): Change in temperature depends upon the initial and final state of the system and not on the path followed.

Select the correct option.

(1) A is true and R is 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) A is false but R is true

96. Which among the following is the correct relation for the work done of an isothermal reversible process?

(1) $W = -2.303\ nRT \log \frac{P_i}{P_f}$

(2) $W = 2.303\ nRT \log \frac{V_f}{V_i}$

(3) $W = -2.303\ nRT \log \frac{P_f}{P_i}$

(4) $W = -2.303\ nRT \log \frac{V_i}{V_f}$

97. For H_2 gas, $C_p - C_v = a$ and for O_2 gas, $C_p - C_v = b$, so the relation between a and b is

(1) a = 16b

(2) a = 4b

(3) a = b

(4) 2a = b

98. For which of the following reactions, $\Delta H = \Delta U$, at a particular temperature?

(1) $CCl_4(g) + 2H_2O(g) \rightarrow CO_2(g) + 4HCl(g)$

(2) $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$

(3) $PCl_3(g) + Cl_2(g) \rightarrow PCl_5(g)$

(4) $H_2(g) + I_2(g) \rightarrow 2HI(g)$

99. Under isothermal conditions, a gas at 27°C expands from 0.5 L to 2.5 L against constant external pressure of 2 bar. The work done by the gas is [1 L bar = 100 J]

(1) –500 J

(2) –200 J

(3) – 400 J

(4) – 150 J

100. Energy required to dissociate 4 g of gaseous H_2 into free gaseous atoms is 872 kJ at 25°C. The bond energy of H – H bond will be

(1) 238 kJ (2) 436 kJ

(3) 872 kJ (4) 618 kJ

BOTANY

SECTION - A

101. Inferior ovary is found in
(1) Cucumber and ray florets of sunflower
(2) Brinjal and peach
(3) Mustard and brinjal
(4) China rose and rose

102. Stilt roots are found in
(1) Sugarcane and carrot
(2) Turnip and radish
(3) *Rhizophora*
(4) Sugarcane and maize

103. Which of the following is a medicinal plant of Solanaceae family?
(1) Muliathi (2) *Aloe*
(3) Belladonna (4) *Sesbania*

104. 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

105. Roots are said to be A geotropic and B phototropic. Here A and B are,
(1) A-Positively, B-Negatively
(2) A-Positively, B-Positively
(3) A-Negatively, B-Positively
(4) A-Negatively, B-Negatively

106. Choose the **odd** one out w.r.t. underground stem modifications.
(1) Potato (2) Ginger
(3) Cactus (4) Zaminkand

107. In *Primrose*
(1) Ovules are borne on central axis and septa are absent in the ovary
(2) Ovary is one-chambered but false septum is present
(3) Placenta is present in axial position and ovary is multilocular
(4) Placenta forms a ridge along the ventral suture of ovary

108. In pitcher plant, 'pitcher' is
(1) Modified leaf base
(2) Modified leaf apex
(3) Modified leaf blade
(4) Modified axillary bud

109. Which of the following symbols is used to denote zygomorphic flower in floral formula?
(1) % (2) ⊕
(3) ♀ (4) ♂

110. Read the following statements and select the **correct** option.
(A) Pericarp is the fruit wall and can be differentiated into endocarp, mesocarp and epicarp.
(B) Nucellus remains persistent in the seeds of black pepper and is called perisperm.
(1) Both (A) and (B) are false
(2) Only (A) is true
(3) Only (B) is true
(4) Both (A) and (B) are true

111. In monocots seed plumule and radicle are enclosed in sheaths which are respectively called
(1) Scutellum and hilum
(2) Coleoptile and coleorhiza
(3) Scutellum and aleurone layer
(4) Pericarp and scutellum

112. Which of the following pair is **correctly** matched w.r.t. placentation?

	Placentation		**Example**
(1)	Marginal	–	Pea
(2)	Parietal	–	Sunflower
(3)	Basal	–	Dianthus
(4)	Free central	–	Marigold

113. Find the **odd** one out w.r.t. endodermis of root
(1) Is a single layer of compactly arranged cells
(2) Cells appear barrel-shaped
(3) Constitutes stele
(4) Is the innermost layer of cortex

114. Aleurone layer
(1) Is proteinaceous and found in all dicot seeds
(2) Contains carbohydrates and found in all monocot seeds
(3) Is proteinaceous outer covering of endosperm in seeds such as maize
(4) Is made up of multinucleate cells and surrounds the plumule

115. In majority of flowers of Fabaceae family outermost whorl is
(1) Gamosepalous (2) Gamopetalous
(3) Gamotepalous (4) Polysepalous

116. Which of the following is **not** true about isobilateral leaf?
(1) Stomata are present on both the surfaces in near equal numbers
(2) Lower epidermis contain bulliform cells which helps in rolling of leaves
(3) Mesophyll is not differentiated into the palisade and spongy parenchyma
(4) Each vascular bundle is surrounded by a layer of thin-walled cells called bundle sheath

117. Read the following statements and select the correct option accordingly.
Statement (A): Actinomorphic flowers have radial symmetry.
Statement (B): Asymmetric flowers are found in canna.
(1) Both (A) and (B) are correct statements
(2) Only (A) is correct statement
(3) Only (B) is correct statement
(4) Both (A) and (B) are incorrect statements

118. Root arising from the base of stem in *Allium cepa* is
(1) Tap root (2) Prop root
(3) Fibrous root (4) Respiratory root

119. Heartwood in dicot stems
(1) Is hard, durable and sensitive to microbial attacks
(2) Does not conduct water due to deposition of tannis, oils, resins and aromatic substances
(3) Is found in outer regions of stems
(4) Is lighter in colour due to absence of organic compounds

120. In gamosepalous condition
(1) Corolla has fused petals
(2) Corolla has free petals
(3) Calyx is fused with petals
(4) Calyx has fused sepals

121. The tissue forming the major component within various organs of plants is
(1) Meristematic
(2) Parenchyma
(3) Collenchyma
(4) Sclerenchyma

122. Select the **incorrect** one w.r.t. lenticels.
(1) Small portion of periderm produced due to the activity of phellogen
(2) Formed as a result of primary growth of plant
(3) Lens-shaped opening present on the bark
(4) Occurred in most woody trees and permit the exchange of gases

123. 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 branch
(3) Increase the length as well as girth of stems and roots
(4) It is primary meristem

124. 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 monocots

125. All are **true** for trichomes, **except**
(1) They may be branched or unbranched
(2) They may be soft or stiff
(3) They help in transpiration
(4) These are epidermal hairs of stem

126. Find the **correct** match.
(1) Coconut – Fleshy mesocarp
(2) Apple – False fruit
(3) Pear – True fruit
(4) Mango – Dry fruit

127. 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

128. All are true about vessels, **except**
(1) Each vessel member has lignified cell wall and large central cavity
(2) They are devoid of protoplasm and are dead
(3) Vessel is a long single cell and has tapered ends
(4) They are present in angiosperms

129. Interfascicular cambium
(1) Is a primary meristem
(2) Is a differentiated tissue
(3) Is a secondary meristem
(4) Forms primary xylem

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

Assertion (A): The first formed primary xylem is called protoxylem having vessels with narrow diameter.

Reason (R): The first formed primary xylem has vessels with large central vacuole and thin peripheral cytoplasm at maturity.
(1) Both A and R are true but R is not correct explanation of A
(2) Both A and R are true and R is correct explanation of A
(3) A is true but R is false
(4) Both A and R are false

131. Endarch and exarch xylem found respectively 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

132. Component of phloem which is absent in most of the monocots is
(1) Companion cells
(2) Phloem fibres
(3) Phloem parenchyma
(4) Sieve tubes

133. All tissues given below are lateral meristem, **except**
(1) Interfascicular cambium
(2) Intrafascicular cambium
(3) Cork cambium
(4) Intercalary meristem

134. The albuminous cells occur in the gymnosperms in place of
(1) Sieve tubes (2) Vessels
(3) Companion cells (4) Tracheids

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

SECTION - B

136. Dicot root differs from monocot root as the former
(1) Has single layered hypodermis
(2) Has protoxylem towards (epidermis) outerside
(3) Has radial vascular bundles
(4) Usually has two to four xylem and phloem patches

137. _____ is impervious to water molecules in the areas where suberin is present in cell walls.

Select the **correct** option to fill in the blank.
(1) Epidermis of roots
(2) Endodermis of root
(3) Cortex cells of roots
(4) Pericycle of roots

138. Which of the following statements are **correct** w.r.t. dicot stem?
a. Sclerenchymatous hypodermis.
b. Scattered vascular bundles.
c. Cortex consists of three sub-zones.
d. Conjoint, collateral and open vascular bundles.
e. Water containing cavities in vascular bundles.
(1) Only a and b
(2) Only b and c
(3) Only c and d
(4) Only d and e

139. Find the **mismatched** pair.

(1) Monocots – Vascular cambium absent

(2) Roots – Epiblema present

(3) Leaves – Secondary growth absent

(4) Monocot root – Pith absent

140. Read the following statements stating true **(T)** or false **(F)** and select the **correct** option

A. Xylem parenchyma helps in radial conduction of water.

B. Tracheids are found only in angiosperms.

C. Xylem also provides mechanical strength to plant parts.

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

141. Cells of which of the following layers give rise to lateral roots in dicots?

(1) Endodermis (2) Epidermis

(3) Hypodermis (4) Pericycle

142. Endodermis of roots differs from epidermis of roots in

(1) Being single layered

(2) Having specialised meristematic function

(3) Being parenchymatous in nature

(4) Having casparian strips

143. Vascular bundles in a dicot leaf are/have

(1) Conjoint and closed

(2) Conjoint and open

(3) Radial

(4) Same size

144. Which of the following statements are **correct** w.r.t. cymose inflorescence?

a. Floral axis never terminates with a flower.

b. Flowers are borne in basipetal succession on floral axis.

c. Length of floral axis is limited.

d. It is found in *Solanum*.

e. Youngest flower is present at the top.

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

(3) Only b, c and d (4) Only a, d, and e

145. Which of the following are examples of pinnately compound and palmately compound leaves respectively?

(1) Mango and Neem

(2) Neem and Silk cotton

(3) Silk cotton and Neem

(4) Neem and Mango

146. Variation in the length of filaments within a flower is seen in

(1) China rose (2) Mustard

(3) Pea (4) *Citrus*

147. Which of the following floral formula is **incorrectly** matched to the family?

(1) $\% \male K_{2+4}\, C_4\, A_{2+4}\, \underline{G}_{(2)}$ – Brassicaceae

(2) $\oplus \male K_{(5)}\, \overset{\frown}{C_{(5)}\, A_5}\, \underline{G}_{(2)}$ – Solanaceae

(3) $\% \female K_{(5)}\, C_{1+2+(2)}\, A_{(9)+1}\, \underline{G}_1$ – Fabaceae

(4) $Br \oplus \female \overset{\frown}{P_{(3+3)}\, A_{3+3}}\, \underline{G}_{(3)}$ – Liliaceae

148. How many of the following belong to Fabaceae family?

a. *Indigofera* b. *Trifolium*

c. *Gloriosa* d. *Petunia*

e. *Asparagus*

(1) Two (2) Four

(3) Five (4) Three

149. When all the four whorls are present in a flower, then it is said to be

(1) Trimerous (2) Complete

(3) Tetramerous (4) Actinomorphic

150. Which of the following flowers can be divided into two equal halves by more than one vertical plane passing through its centre?

(1) Gulmohur

(2) *Cassia*

(3) Chilli

(4) Pea

ZOOLOGY

SECTION - A

151. Endothelium of blood vessels is composed of
(1) Simple squamous epithelium
(2) Simple cuboidal epithelium
(3) Simple columnar epithelium
(4) Pseudostratified epithelium

152. If a tissue is fully burnt, _____ remains which mainly contains _____.
Fill in the blanks respectively by choosing the correct option.
(1) Dried mass; oxides of carbon
(2) Ash; organic compound
(3) Dried mass; organic compounds
(4) Ash; inorganic elements

153. A common feature of all compounds present in the acid soluble pool is that they
(1) Are polymeric compounds
(2) Have approximate molecular weight ranging from 18-800 Da
(3) Have molecular weight greater than 1000 Da
(4) Are soluble in organic solvents

154. Compound epithelium is present in all of the given locations except
(1) Dry surface of the skin
(2) Moist surface of buccal cavity
(3) Inner surface of bronchioles
(4) Inner lining of salivary ducts

155. A section of a human tissue was stained and studied under the microscope. Upon observation, chondrocytes were found in lacunae but lamellae were absent. This tissue could have been taken most probably from
(1) Pelvic bone (2) Scapula
(3) Epidermis of skin (4) Pinna of ear

156. Uracil when attached with 'A' forms 'B' hydrogen bonds. Select the correct option for 'A' and 'B' respectively.
(1) Guanine and three
(2) Adenine and two
(3) Thymine and three
(4) Adenine and three

157. In all connective tissues except ____, the cells secrete fibres of structural protein called ____.
Fill in the blanks respectively by choosing the correct option.
(1) Muscles; collagen or reticular
(2) Neural tissue; reticular or elastin
(3) Blood; collagen or elastin
(4) Bones; collagen or elastin

158. Brush bordered cuboidal epithelium is present in
(1) Gastric mucosa
(2) Trachea
(3) Fallopian tubes
(4) PCT of nephron

159. Choose the **odd** one w.r.t. amino acids
(1) Phenylalanine
(2) Tyrosine
(3) Cytosine
(4) Tryptophan

160. Complete the analogy by choosing the **correct** option.
Perform cementing to keep neighbouring cells together : Adhering junction :: Stops substances from leaking across tissues : ____.
(1) Gap junction
(2) Compound epithelium
(3) Tight junction
(4) Adipose tissue

161. Triglycerides contain
(1) Three glycerols esterified with three fatty acids
(2) Three glycerols esterified with one fatty acid
(3) One glycerol esterified with three fatty acids
(4) Two glycerols esterified with one fatty acid

162. Inulin is a X of Y. Identify X and Y and choose the option which correctly represents them respectively?
(1) Homopolymer; Fructose
(2) Heteropolymer; Glucose
(3) Heteropolymer; Fructose
(4) Homopolymer; Glucose

163. Read the given statements w.r.t. cockroach and choose the **correct** option.

Statement I: Head is triangular and lies anteriorly, perpendicular to longitudinal axis of the body.

Statement II: It is formed by fusion of 6 segments and has flexible neck.

(1) Both statement I and II are correct

(2) Only statement I is correct

(3) Only statement II is correct

(4) Both statement I and II are incorrect

164. Select the **incorrect** statement w.r.t. essential amino acids.

(1) They are substituted methanes

(2) They are not synthesised by our body

(3) They join to form a homopolymeric structure

(4) Dietary proteins are their source for the body

165. Arachidonic acid has _____ carbon atoms excluding the carboxyl carbon.

Choose the option that fills the blank **correctly**.

(1) 18

(2) 20

(3) 17

(4) 19

166. **Assertion (A):** Blood vascular system of cockroach is open type. Blood vessels are poorly developed and open into haemocoel.

Reason (R): Exchange of gases takes place at tracheoles by diffusion.

In the light of above statements, choose the **correct** answer from the options given below.

(1) Both (A) and (R) are correct, (R) explains (A)

(2) Both (A) and (R) are correct, (R) does not explain (A)

(3) (A) is correct but (R) is incorrect

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

167. The biomolecules present in least quantity, among following, in average composition of living cells are

(1) Proteins

(2) Lipids

(3) Carbohydrates

(4) Nucleic acids

168. What is the function of GLUT-4?

(1) It is a hormone that, regulates metabolic functions

(2) It is an intracellular ground substance

(3) It enables glucose transport into the cells

(4) Agent for fighting infectious agents

169. Choose the **incorrect** statement.

(1) The nervous system of cockroach consists of series of fused, segmentally arranged ganglia.

(2) These ganglia are joined together by single longitudinal connectives.

(3) Three ganglia lie in thorax, and six in abdomen.

(4) Nervous system of cockroach is spread throughout the body.

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

(1) Collagen (2) Cellulose

(3) Chitin (4) Cholesterol

171. Which structure is explained by Watson and Crick model of B-DNA?

(1) Primary (2) Secondary

(3) Tertiary (4) Quaternary

172. The eye of cockroach consists of about X ommatidia, which are Y .

Choose the option which fills the blanks correctly.

	X	Y
(1)	200	Round
(2)	2000	Round
(3)	2000	Hexagonal
(4)	2000	Octagonal

173. All of the following are paired structures in a cockroach except

(1) Mandible (2) Maxilla

(3) Hypopharynx (4) Anal cerci

174. Choose the **correct** statement w.r.t. neuroglia.

(1) They are the unit of neural system.

(2) When stimulated, they generate action potential which travels through axons.

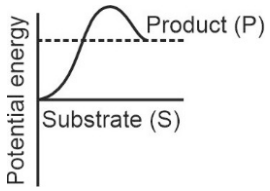
(3) They make up more than half the volume of neural tissue in our body.

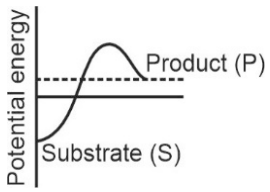
(4) They are excitable cells.

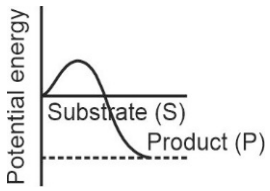
175. The chitinous asymmetrical structure in the cockroach is represented by
(1) Common oviduct
(2) Male external genitalia
(3) Testes
(4) Midgut

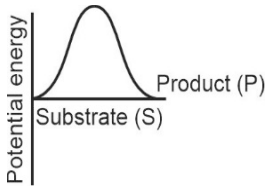
176. Each ovary in female cockroach is made up of how many ovarioles?
(1) 8
(2) 6
(3) 4
(4) 2

177. Which of the following is an exothermic reaction w.r.t. to enzyme action?

(1) 

(2) 

(3) 

(4) 

178. In human body, cartilage is **not** present in
(1) Tip of nose
(2) Intervertebral disc
(3) Joints
(4) Tongue

179. The number of polypeptide subunits in adult human haemoglobin is
(1) 4
(2) 6
(3) 8
(4) 2

180. Match the following columns A and B and choose the **correct** option.

	A		B
a.	Lining of diffusion membrane in lungs	(i)	Cuboidal epithelium
b.	Cells almost dimensionally equal with centrally placed large nucleus	(ii)	Squamous epithelium
c.	Nuclei located at the base	(iii)	Compound epithelium
d.	Protection against mechanical and chemical stresses	(iv)	Columnar epithelium

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

181. Select the correct pair of purines from the following.
(1) Adenine and uracil
(2) Adenine and guanine
(3) Thymine and uracil
(4) Thymine and guanine

182. The ciliated epithelium lining the inner wall of fallopian tubes also lines
(1) Stomach (2) Intestine
(3) Bronchioles (4) Oesophagus

183. Which of the following secondary metabolites is a toxin?
(1) Spices
(2) Scents
(3) Polymeric substances
(4) Ricin

184. Out of the following which option does not belong to category of macromolecules?
(1) Proteins (2) Amino acids
(3) Polysaccharides (4) Nucleic acids

185. Secretion of mast cells in connective tissue includes all **except**

(1) Heparin (2) Serine

(3) Histamine (4) Serotonin

SECTION - B

186. In B-DNA model, the two anti-parallel polynucleotide strands are joint together by

(1) Sugar-phosphate bonds

(2) Diester bonds

(3) Hydrogen bonds

(4) Glycosidic bonds

187. Which tissue exerts the greatest control over the body's responsiveness to changing conditions?

(1) Muscular

(2) Neural

(3) Epithelial

(4) Connective

188. Complete the analogy by choosing the correct option.

Acid soluble pool : Fructose : : Acid insoluble pool :

(1) Nucleotides

(2) Lipids

(3) Glycine

(4) Glucose

189. **Assertion (A):** Cellulose forms secondary helical structures.

Reason (R): Cellulose gives blue colour with iodine.

In the light of above statements, choose the **correct** answer from the options given below

(1) Both (A) and (R) are correct, (R) explains (A)

(2) Both (A) and (R) are correct, (R) does not explain (A)

(3) (A) is correct, (R) is incorrect

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

190. Choose the **incorrect** statement w.r.t. areolar tissue.

(1) It is the most abundant specialised tissue in the body.

(2) It is present beneath the skin.

(3) It serves as support framework for epithelium.

(4) Its fibres are loosely arranged in a semi fluid ground substance.

191. Which of the following is not a polysaccharide?

(1) Cellulose

(2) Glycogen

(3) Chitin

(4) Sucrose

192. Rate of a chemical reaction can also be called __X__ if __Y__ is specified.

Choose the correct option by identifying X and Y respectively.

	X	Y
(1)	Catalysing	K_m value
(2)	In equilibrium	Velocity
(3)	Velocity	Direction
(4)	Accelerated	Metabolic pathway

193. Substrate binds to the enzyme at

(1) Transformation site

(2) Structural site

(3) Active site

(4) Restriction site

194. The dry weight of a living tissue may includes the weight of all, **except**

(1) Stored starch (2) Stored glycogen

(3) Water molecules (4) Proteins

195. The catalytic cycle of an enzyme action can be described in the following steps:

A. The binding of the substrate induces the enzyme to alter its shape, fitting more tightly around the substrate.

B. The substrate binds to the active site of the enzyme, fitting into the active site.

C. 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.

D. The active site of the enzyme, now in close proximity of the substrate breaks the chemical bonds of the substrate and the new enzyme- product complex is formed.

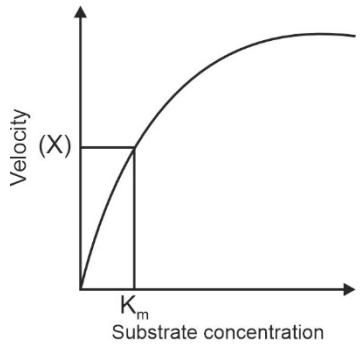
(1) A → B → D → C

(2) B → A → D → C

(3) B → D → A → C

(4) A → C → D → B

196. Select the **correct** option for (X) w.r.t. enzymatic reactions.



(1) v_{max} (2) $v_{max}/4$

(3) $v_{max}/3$ (4) $v_{max}/2$

197. The velocity of reaction versus substrate concentration graph attains a plateau because

(1) All the substrate has been used up

(2) All the active sites of enzyme have been occupied

(3) Enzyme starts loosing structure after long time

(4) Substrate molecule change their shape leading to demand of new enzyme

198. Inhibition of succinic dehydrogenase by malonate is an example of

(1) Non-competitive inhibition

(2) Competitive inhibition

(3) Allosteric modulation

(4) Substrate inhibition

199. Identify the reaction and choose the correct option for class of enzymes used in this reaction.

$S - G + S' \rightarrow S + S' - G$

(1) Lyases

(2) Hydrolases

(3) Transferases

(4) Isomerases

200. The non-protein part of an enzyme is known as

(1) Apoenzyme

(2) Active site

(3) Co-factor

(4) Holoenzyme

❑ ❑ ❑

24/03/2023

CODE-B

Corporate Office: Aakash Tower, 8, Pusa Road, New Delhi-110005, Ph.011-47623456

FINAL TEST SERIES for NEET-2023

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

Answers

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

Aakash BYJU'S

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FINAL TEST SERIES for NEET-2023

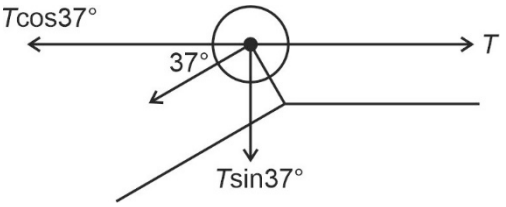
MM : 720 **Test - 2** **Time : 3 Hrs. 20 Mins.**

Answers and Solutions

PHYSICS

SECTION - A

1. Answer (2)



resulting force on pulley

$$\sqrt{\left(\frac{3T}{5}\right)^2+\left(\frac{T}{5}\right)^2}=\sqrt{\frac{2}{5}}T$$

2. Answer (2)

$W_f + W_{mg} = 0$

$W_f = -W_{mg} = mg\,(h_2 - h_1)$

3. Answer (4)

The lower block would just lift if the extension in the spring becomes $\frac{mg}{k}$.

Using conservation of mechanical energy

$$-mg(x_0)+\frac{1}{2}k(x_0)^2=mg\left(\frac{mg}{k}\right)+\frac{1}{2}k\left(\frac{mg}{k}\right)^2$$

{x_0 : is total initial compression}

$$\frac{1}{2}kx_0^2-mgx_0=\frac{m^2g^2}{k}+\frac{m^2g^2}{2k}$$

$$\Rightarrow\quad x_0^2-\frac{2mg}{k}x_0-\frac{3m^2g^2}{k^2}=0$$

$$x_0^2-\frac{3mg}{k}x_0+\frac{mg}{k}x_0-\frac{3m^2g^2}{k^2}=0$$

$$\left(x_0-\frac{3mg}{k}\right)\left(x_0+\frac{mg}{k}\right)=0$$

$$x_0=\frac{3mg}{k}$$

Further compression = $\frac{3mg}{k}-\frac{mg}{k}=\frac{2mg}{k}$

4. Answer (2)

Spring force = $F = 2\,mg$

$$a_B=\frac{2mg+mg}{m}=3g$$

5. Answer (4)

$$k'=6k=6\times200=1200\text{ N/m}$$

$$k''=2k'=2400\text{ N/m}$$

6. Answer (2)

Tension = 10cos53° = 6 N

and $T = mg$

$\Rightarrow$ $6 = m \times 10$

$\Rightarrow$ $m = 0.6$ kg

7. Answer (4)

Angle of repose is different for the blocks of different material and it doesn't depend on mass of the block. Since angle of repose is more for block B hence $\mu_B > \mu_A$.

8. Answer (1)

$$F = \frac{2mv}{t} = \frac{2 \times 2 \times 10}{1/50} = 50 \times 10 \times 4 = 2\text{ kN}$$

9. Answer (1)

$$a_1 = \frac{2m - m}{2m + m} g = \frac{g}{3}$$

$$a_2 = \frac{2mg - mg}{m} = g$$

Hence $a_1 : a_2 = 1 : 3$

10. Answer (2)

$$a = \frac{g\sin(53°) - g\sin(37°)}{2} = \frac{g}{2}\left(\frac{4}{5} - \frac{3}{5}\right) = 1\,\text{m/s}^2$$

11. Answer (4)

$$F = u\frac{dm}{dt} = 200 \times 0.04 = 8\text{ N}$$

12. Answer (1)

Mass of stone m = 0.5 kg

Mass of man M = 50 kg

Applying conservation of linear momentum in vertical direction

$$0 = 0.5 \times 10 + 50\vec{v}$$

$$\vec{v} = -\frac{1}{10}\text{ m/s}$$

Time taken to reach ground $= \frac{20}{10} = 2$ s

Height of man after 2 s

$$h = 20 + \frac{1}{10} \times 2 = 20.2\text{ m}$$

13. Answer (1)

Tension (T) = $m(g + a)$

= 600 (10 + 2) = 12 × 600 = 7200 N

$P = Tv$ = 7200 × 3 = 21600 W

= 21.6 kW

14. Answer (4)

Work done by kinetic friction may be positive, negative or zero.

15. Answer (1)

$$\Delta V = \frac{1}{2} \times (1) \times (2) + (2) \times (3) = 7\text{ m/s}$$

V = (7 + 2) m/s = 9 m/s

$P = Fv = mav$ = (4 × 2) (9) = 72 W

16. Answer (1)

$$F = -\frac{\partial U}{\partial x} < 0$$

Hence particle will move along negative x-axis

17. Answer (3)

$$\left|\vec{F}\right| = \sqrt{9 + 16 + 200} = \sqrt{225} = 15\text{ N}$$

15 = m × 5 $\Rightarrow$ m = 3 kg

18. Answer (1)

$$\frac{1}{2}mv^2 = mg \cdot 2l$$

$$v^2 = \sqrt{4gl}$$

19. Answer (4)

$$Pt = \frac{1}{2}mv^2$$

$$v = \sqrt{\frac{2Pt}{m}}$$

20. Answer (4)

Displacement in frame of elevator is zero

$\therefore$ Work done = zero

21. Answer (2)

Speed of bob after collision

$= \sqrt{2 \times g \times h} = \sqrt{2 \times 10 \times 20} = 20$ m/s

20% of u = 20

u = 100 m/s

22. Answer (2)

Using conservation of energy

$$-\frac{mg}{4}\frac{l}{8} = \frac{1}{2}mv^2 - \frac{mgl}{2}$$

$$\frac{1}{2}mv^2 = mg\frac{l}{2} - \frac{mgl}{32} = \frac{15mgl}{32} \Rightarrow v = \sqrt{\frac{15gl}{16}}$$

23. Answer (2)

Linear momentum conservation

$$m_1\vec{u}_1 + m_2\vec{u}_2 = m_1\vec{v}_1 + m_2\vec{v}_2$$

$$2(2\hat{i} + 4\hat{j}) + 4(2\hat{i}) = 2(2\hat{i} + \hat{j}) + 4\vec{v}$$

$$4\hat{i} + 8\hat{j} + 8\hat{i} = 4\hat{i} + 2\hat{j} + 4\vec{v}$$

$$\frac{8\hat{i} + 6\hat{j}}{4} = \vec{v}$$

$$\left(2\hat{i} + \frac{3}{2}\hat{j}\right) = \vec{v}$$

24. Answer (4)

$L = I\omega = \text{constant}$

$\omega \propto \frac{1}{I}$

Moment of inertia goes on decreasing, hence angular speed and rotational kinetic energy will increase.

25. Answer (4)

$\vec{\tau} = \vec{r} \times \vec{F}$

$= (-\hat{i} + \hat{j}) \times F\hat{k}$

$= F(\hat{i} + \hat{j})$

26. Answer (1)

$I_x + I_y = I_z \Rightarrow 2I_x = I_z \Rightarrow I_x = \frac{I_z}{2} = 25 \text{ kg-m}^2$

27. Answer (3)

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

$\frac{1500 \times 2}{1.2} = \omega^2$

$\omega^2 = 2500$

$\omega = 50 \text{ rad/s}$

$\omega = \omega_0 + \alpha t$

$50 = 25t$

$t = 2 \text{ s}$

28. Answer (4)

For any point lying on straight line the perpendicular distance between point and line of motion of linear momentum is zero.

Also angular momentum is going to remain constant about a point away from line.

29. Answer (1)

$\tau = I\alpha$

$2 \times g \times \frac{1}{2} = [3 \times 0.25 + 5 \times 0.25]\alpha$

$20 \times 0.5 = 2.0\,\alpha$

$\alpha = \frac{20 \times 0.5}{2} = 5 \text{ rad/s}^2$

30. Answer (3)

Since the block is moving with uniform velocity hence, $f = mg\sin\theta$.

31. Answer (2)

$F_x = 6 \times \frac{3}{5} + 4 \times \frac{4}{5} - 6.8 = 0$

$F_y = 4\sin37° - 6\sin53°$

$= 4 \times \frac{3}{5} - 6 \times \frac{4}{5} = 2.4 - 4.8 = -2.4 \text{ N}$

$|\vec{a}| = \frac{2.4}{1.2} = 2 \text{ m/s}^2$

32. Answer (4)

From angular momentum conservation about contact point

$mv_0R = mvR + mR^2\omega$

$mv_0R = mvR + mvR$

$v = \frac{v_0}{2}$

33. Answer (1)

Impulse on a body is equal to change in linear momentum.

34. Answer (3)

$I_{system} = \Sigma mr^2$

$= 10 \times 1^2$

$= 10 \text{ kg m}^2$

35. Answer (2)

The COM will continue moving in same parabolic path.

SECTION - B

36. Answer (2)

$F = 100 \times 10^{-5} = 10^{-3} \text{ N}$

Impulse = $F\Delta t = 10^{-3} \times 3 = 3 \text{ mN s}$

37. Answer (2)

In equilibrium

$mg = kx$

$10 \times 10 = 400\,x$

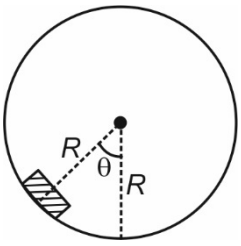
$\Rightarrow \quad x = \frac{1}{4} = 0.25 \text{ m}$

38. Answer (1)

$\frac{1}{2}kx^2 = \frac{1}{2}\mu v_{rel}^2$

$\frac{1}{2}(200)(x^2) = \frac{1}{2}\left(\frac{6 \times 3}{6+3}\right)(3)^2 \Rightarrow x = 0.3 \text{ m}$

39. Answer (4)



The work done by normal reaction is always zero

$mgR\sin\theta - mgR(1-\cos\theta) = 0$

$\sin\theta - 1 + \cos\theta = 0$

$\Rightarrow \sin\theta + \cos\theta = 1$

$\Rightarrow$ Either $\theta = 90°$ or $0°$

40. Answer (3)

$m\omega^2 R = f$

and $f \le \mu N$

$\Rightarrow m\omega^2 R \le \mu N$

$R \le \dfrac{\mu g}{\omega^2}$

$R \le \dfrac{0.4\times 10}{10\times 10}$

$R \le 0.04$ m

41. Answer (4)

$a = v\dfrac{dv}{dx} = -2$ m/s^2

$v = 2$ m/s

Power = $mav = 2 \times (-2) \times (2) = -8$ W

42. Answer (2)

$w = \int_0^5 F dx = \int_0^5 (3x^2 - 2x + 7)dx$

$w = \left|x^3 - x^2 + 7x\right|_0^5 125 - 25 + 35 = 135$ J

43. Answer (4)

Ratio of displacements

$d_1 : d_2 : d_3 = 1 : 3 : 5$

$\Rightarrow$ Ratio of average power in first, second and third second = 1 : 3 : 5

44. Answer (2)

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

$= 4500 \cdot 2 = 9000 = 9$ kW

45. Answer (4)

$w = \int_{0,0}^{0,2} \vec{F}.d\vec{r} = \int_{0,0}^{0,2} (x\hat{j} + y\hat{i}).(dx\hat{i} + dy\hat{j} + dz\hat{k})$

$= [xy]_{0,0}^{0,2}$

$= 0$

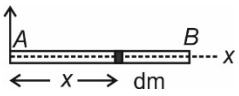
46. Answer (4)

$\dfrac{1}{2}mv^2 = \dfrac{1}{2}kx^2$

$x = v\sqrt{\dfrac{m}{k}}$

$= 0.5$ m

47. Answer (1)



$X_{cm} = \dfrac{\int x dm}{\int dm}$

$= \dfrac{\int_0^1 (\alpha + \beta x)x\, dx}{\int_0^1 (\alpha + \beta x)\, dx}$

$= \dfrac{3\alpha + 2\beta}{6\alpha + 3\beta}$

48. Answer (3)

As the same mass is removed then same mass is glued hence the mass distribution remains same.

49. Answer (2)

When all the particles are uniformly distributed at distance R from origin then COM will lie at the origin.

When all the particle lie at single point at a distance 'R' from origin then COM will lie at distance R.

In case of non-uniform distribution it will be less than the distance R as it lies close to heavier particle.

50. Answer (2)

$\theta = 12t - 4t^3$

$\omega = \dfrac{d\theta}{dt} = 12 - 12t^2$

$\omega = 0$, when $t = 1$ s

$\alpha = \dfrac{d\omega}{dt} = -24t$

$[\alpha]_{t=1} = -24$ rad/s^2

CHEMISTRY

SECTION - A

51. Answer (3)

In liquification of CO_2, i.e. $CO_2(g) \rightarrow CO_2(l)$, the degree of randomness is decreased, therefore entropy decrease.

52. Answer (2)

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

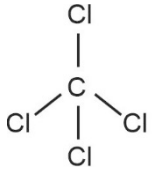
At equilibrium, $\Delta G = 0$

So, $\Delta H = T\Delta S$

$\therefore\ T = \frac{\Delta H}{\Delta S} = \frac{60,000}{200}$

$= 300\ K$

53. Answer (3)



$\mu = 0$
(non-polar molecule)

54. Answer (1)

Dalton's law of partial pressure for non-reactive gases, $P_T = p_1 + p_2 + p_3$ ----- (at constant T, V)

55. Answer (3)

Gases mix uniformly in all directions without any mechanical aid.

56. Answer (4)

According to Boyle's law PV = k.

57. Answer (4)

$\frac{V_1}{T_1} = \frac{V_2}{T_2}$

$\frac{V_0}{273.15} = \frac{V_t}{273.15 + t}$

58. Answer (4)

Suppose wt. of O_2 and SO_2 each are mixed together.

$x_{O_2} = \frac{n_{O_2}}{n_{O_2} + n_{SO_2}} = \frac{\frac{w}{32}}{\frac{w}{32} + \frac{w}{64}} = \frac{2}{3}$

$P_{O_2} = P_T \cdot x_{O_2} = 9 \times \frac{2}{3} = 6\ atm$

59. Answer (2)

11.2 L gas at STP = $\frac{1}{2}$ mol CH_4 = 8 g CH_4

60. Answer (3)

At high temperature and low pressure, real gas behaves as ideal gas.

61. Answer (1)

van der Waals constant, b depends upon size of particle.

62. Answer (2)

H_2O and HCl both are polar molecules, so dipole-dipole interaction are present.

63. Answer (4)

Formal charge = number of valence e^- – Non-bonded e^- $-\frac{1}{2}$ (Bonded e^-)

$= 6 - 2 - \frac{1}{2}(6) = +1$

64. Answer (1)

In PF_5, P has 10 electrons.

65. Answer (4)

In BeF_2, bond angle = 180°.

In CH_4, all angles are 109.5°.

In BF_3 all bond angles are 120°.

In PCl_5,

Axial Cl – P – Cl angle = 180°

Equatorial Cl – P – Cl angle = 120°

66. Answer (4)

Ions or molecules	Bond order
F_2	1
N_2	3
C_2^{2-}	3
N_2^+	2.5

67. Answer (4)

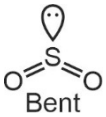
	Hybridisation of central atom
SF_4	sp^3d
H_2O	sp^3
CO_2	sp
XeF_4	sp^3d^2

68. Answer (3)

NH_4^+ is tetrahedral ion in which all the bond dipoles cancel each other.

	Dipole moment
NH_3	1.47
NF_3	0.23
H_2S	0.95

69. Answer (4)



70. Answer (4)

Higher the bond order, higher will be the stability.

	Bond order
N_2	3
N_2^+	2.5
N_2^{2+}	2

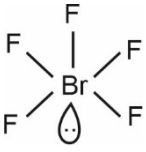
71. Answer (4)

- $B_2 : \sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \begin{cases} \pi 2p_x^1 \\ \pi 2p_y^1 \end{cases}$
- $C_2^{2+} : \sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \begin{cases} \pi 2p_x^1 \\ \pi 2p_y^1 \end{cases}$
- $O_2 : \sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \sigma 2p_z^2 \begin{cases} \pi 2p_x^2 \begin{cases} \pi^* 2p_x^1 \\ \pi 2p_y^2 \end{cases} \begin{cases} \pi^* 2p_y^1 \end{cases} \end{cases}$
- O_2^{2-} has no unpaired electrons therefore diamagnetic in nature.

72. Answer (4)

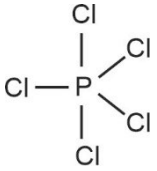
Lateral overlap of *p* orbital with *s* orbital is not possible due to different orientation direction of approach.

73. Answer (4)



5 bond pairs and 1 lone pair of electrons.

74. Answer (3)



In PCl_5, 3 bonds are equatorial and 2 bonds are axial bonds, and axial bonds are longer than equatorial bonds.

75. Answer (3)

$4O(g) \rightarrow 2O_2(g),\ \Delta_r H = -a$ kJ

$$BDE(O-O) = \frac{-\Delta_r H}{2} = \frac{-(-a)}{2}$$

$$= \frac{a}{2} \text{ kJ}$$

76. Answer (1)

Bomb calorimeter measures heat content at constant volume i.e. change in internal energy.

77. Answer (2)

$$\Delta S = \frac{\text{Latent Heat}}{\text{Temperature}}$$

$$= \frac{3000 \text{ J/mol}}{300 \text{ K}}$$

$= 10 \text{ J K}^{-1} \text{ mol}^{-1}$

78. Answer (3)

w is a path function, therefore will not be zero for a cyclic process whereas all state functions will be zero.

79. Answer (2)

For diatomic gas, $\gamma = 1.40$

80. Answer (2)

The process in which pressure remains constant is isobaric process.

81. Answer (1)

Intensive properties do not depend upon the quantity or size of matter.

82. Answer (3)

According to 1st law of thermodynamics

$\Delta U = q + w$

Under isothermal conditions,

$\Delta U = 0$

$\therefore q = -w$

83. Answer (4)

$\because$ Standard enthalpy for formation of an elements in reference state i.e. its most stable state of aggregation is taken as zero.

84. Answer (3)

$\Delta_r H = \Sigma BE_{reactant} - \Sigma BE_{products}$

$= BE_{A_2} + BE_{B_2} - 2BE_{AB}$

$= x + y - 2z$

85. Answer (4)

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

For spontaneous process, $\Delta G < 0$

$\therefore$ $\Delta H < 0$, And $\Delta S > 0$

SECTION - B

86. Answer (2)

$\sigma 1s^2\ \sigma^* 1s^2\ \sigma 2s^2\ \sigma^* 2s^2 \begin{cases} \pi 2p_x^2 \\ \pi 2p_y^2 \end{cases} \sigma 2p_z^2$

No. of e^- in antibonding molecular orbitals = 4.

87. Answer (1)

Strength of H-bonding is more in HF due to highly electronegative F.

88. Answer (3)

Greater is the bond order lesser is the bond length.

89. Answer (1)

Combustion reactions are exothermic in nature.

$\therefore$ $\Delta H < 0$

Since number of gaseous moles are increasing $\therefore$ $\Delta S > 0$.

Overall reaction will be spontaneous and $\Delta G < 0$

90. Answer (4)

London force is weakest intermolecular force.

Interaction energy $\propto \frac{1}{r^6}$

91. Answer (4)

For real gas, $\left(P + \frac{an^2}{V^2}\right)(V - nb) = nRT$

For 1 mole gas at high P, P >>> $\frac{a}{V^2}$

$\therefore$ $P + \frac{a}{V^2} \simeq P$

$\Rightarrow$ $P(V - b) = RT$

$PV - Pb = RT$

$PV = Pb + RT$

92. Answer (2)

For a particular gas, at a particular temperature, $C^* < \overline{C} < C$

93. Answer (3)

$u(CO_2) = u(O_2)$ at 27°C

$\sqrt{\frac{3RT_1}{M_{CO_2}}} = \sqrt{\frac{3RT_2}{M_{O_2}}}$

$\frac{T_1}{M_{CO_2}} = \frac{T_2}{M_{O_2}}$

$T_1 = \frac{300 \times 44}{32}$

$T_1 = 412.5$ K

94. Answer (4)

$d = \frac{PM}{RT}$

$= \frac{1 \times 44}{0.0821 \times 320}$

$= 1.67\ g\ L^{-1}$

95. Answer (1)

State function depends only on the state of a system.

96. Answer (1)

$W = -2.303\ nRT \log \frac{P_1}{P_2} = -2.303\ nRT \log \frac{V_2}{V_1}$

97. Answer (3)

For 1 mole of gas, $C_p - C_v = R$

Since both are diatomic gases, therefore a = b

98. Answer (4)

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

If $\Delta n_g = 0$, $\Delta H = \Delta U$

99. Answer (3)

$W = -P\Delta V$

$= -2[2.5 - 0.5]$

$= -2 \times 2 = -4$ L bar

$= -4(100)$ J

$= -400$ J

100. Answer (2)

$H_2(g) \rightarrow 2H(g)$

Mole of $H_2 = \frac{4}{2} \Rightarrow 2$ mol

Energy require to break 2 mole of H_2 gas = 872 kJ

$\Delta_{H-H} H = \frac{1}{2} \times 872$

$= 436\ kJ\ mol^{-1}$.

BOTANY

SECTION - A

101. Answer (1)

Cucumber and ray florets of sunflower have inferior ovary.

102. Answer (4)

Stilt roots are found in sugarcane and maize.

103. Answer (3)

Belladonna is a medicinal plant of Solanaceae family.

104. Answer (1)

Outermost whorl of flower is called calyx.

105. Answer (1)

Roots are positively geotropic and negatively phototropic.

106. Answer (3)

Cactus exemplifies phylloclade; which is an aerial modification.

107. Answer (1)

Free central placentation is found in *Primrose*.

108. Answer (3)

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

109. Answer (1)

% is used to denote zygomorphic flower in floral formula.

110. Answer (4)

Perisperm is remains of nucellus persistent in some seeds.

111. Answer (2)

In monocot seeds, plumule and radicle are enclosed in coleoptile and coleorhiza respectively.

112. Answer (1)

Marginal placentation is seen in pea and parietal placentation is seen in mustard and *Argemone*.

113. Answer (3)

Xylem, phloem, pith and pericycle constitute stele.

114. Answer (3)

Aleurone layer is proteinaceous outer covering of endosperm.

115. Answer (1)

Calyx in Fabaceae family show gamosepalous condition, that is fused sepals.

116. Answer (2)

Upper or adaxial epidermis contains bulliform cells.

117. Answer (1)

Flowers in canna are irregular or asymmetric.

118. Answer (3)

In *Allium cepa*, primary root is short lived and is replaced by a bunch of fibre like roots arising from the base of stem and is known as fibrous root system.

119. Answer (2)

Heartwood does not conduct water due to depositions of organic compounds that cause blockage of the xylary elements.

120. Answer (4)

Gamosepalous refers to a condition with fused sepals.

121. Answer (2)

Parenchyma is the tissue forming the major component within various organs of the plants.

122. Answer (2)

Lenticel is formed during secondary growth.

123. Answer (3)

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

124. Answer (4)

Sclerenchyma is present in monocots.

125. Answer (3)

Trichomes prevent transpiration.

126. Answer (2)

Coconut is a drupe fruit with fibrous mesocarp.

Apple and pear are false fruit.

Mango is a fleshy fruit.

127. 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.

128. Answer (3)

Vessel is long tube-like structure made up of many cells. Tracheids have tapering ends.

129. Answer (3)

Interfascicular cambium is a secondary meristem and dedifferentiated tissue.

130. Answer (3)

The first formed primary xylem is called protoxylem and its vessels are dead at maturity.

131. Answer (1)

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

132. Answer (3)

Phloem parenchyma is absent in most of the monocots.

133. Answer (4)

Intercalary meristem is primary meristem which adds the length to stem.

134. Answer (3)

The albuminous cells occur in the gymnosperms in place of albuminous cells.

135. Answer (3)

Many vessel elements are fused to form the vessel.

SECTION - B

136. Answer (4)

Dicot roots usually have two to four xylem patches while monocot roots have polyarch condition.

137. Answer (2)

Endodermis has casparian strips that are impervious to water.

138. Answer (3)

Sclerenchymatous hypodermis, scattered vascular bundles and water containing cavities in vascular bundles are features of monocot stem.

Conjoint, collateral and open vascular bundles are present in dicot stem. Its cortex has three sub-zones, hypodermis, cortical layer and endodermis.

139. Answer (4)

Pith is large and well developed in monocot root.

140. Answer (1)

Tracheids are found in all vascular plants.

141. Answer (4)

Cells of pericycle layer give rise to lateral roots in dicots.

142. Answer (4)

Endodermis of roots differs from epidermis of roots in having casparian strips.

143. Answer (1)

Vascular bundles in dicot leaves are conjoint and closed.

They are different in size due to reticulate venation.

144. Answer (3)

In cymose inflorescence, floral axis always terminates with a flower thus, length of floral axis is limited.

Younger flowers are present towards the base.

145. Answer (2)

Neem shows pinnately compound leaves while palmately compound leaves are seen in silk cotton.

146. Answer (2)

Variation in length of filaments in a flower is seen in mustard, *Salvia* etc.

147. Answer (1)

$\oplus$ or $\%\,\male\, K_{2+4}\, C_{\times 4}\, A_{2+4}\, \underline{G}_{(2)}$ is the correct floral formula of Brassicaceae family.

148. Answer (1)

Indigofera and *Trifolium* belong to Fabaceae family.

149. Answer (2)

When all the four whorls are present in a flower, then it is a complete flower.

150. Answer (3)

Flower of chilli is radially symmetrical. It can be divided into two equal halves by more than one vertical plane passing through its centre.

ZOOLOGY

SECTION - A

151. Answer (1)

The tunica intima of blood vessels is constituted by simple squamous epithelium called endothelium.

152. Answer (4)

Dried and burnt tissue when subjected to high temperature, the organic structures are damaged and it produces ash. Ash mainly consists of inorganic elements (Ca^{2+}, Mg^{2+} *etc.*).

153. Answer (2)

The acid soluble pool roughly represents the cytoplasmic composition. They are monomeric compounds soluble in polar solvents.

154. Answer (3)

Compound epithelium is found in dry surface of skin, moist surface of buccal cavity, inner lining of ducts of salivary glands and pharynx.

155. Answer (4)

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

156. Answer (2)

Adenine forms two hydrogen bonds with thymine or uracil.

157. Answer (3)

Blood does not contain fibres.

158 Answer (4)

PCT possesses microvilli which facilitate reabsorption of useful substances through it.

159. Answer (3)

Aromatic amino acids possess an aromatic ring. Cytosine is a nitrogenous base.

160. Answer (3)

Tight junction stops substances from leaking across tissues while gap junctions allow inter-cellular communication and rapid transfer of ions.

161. Answer (3)

Glycerol is trihydroxypropane. In fats, glycerol is found esterified with fatty acids. They can be monoglycerides, diglycerides and triglycerides.

162. Answer (1)

Inulin is a homopolymer of fructose and is used to determine the glomerular filtration rate.

163. Answer (1)

Head is triangular in shape and lies anteriorly at right angle to the longitudinal body axis. It is formed by the fusion of six segments and shows great mobility in all directions due to flexible neck.

164. Answer (3)

Proteins are heteropolymers.

165 Answer (4)

Palmitic acid has 16 C, including the carboxyl carbon.

166. Answer (2)

Blood vascular system of cockroach is an open type. Blood vessels are poorly developed and open into space (haemocoel).

The respiratory system consists of a network of trachea, that open through 10 pairs of small holes called spiracles present on the lateral side of the body. Thin branching tubes (tracheal tubes subdivided into tracheoles) carry oxygen from the air to all the parts.

167. Answer (2)

Lipids make up about 2 per cent of total cellular mass.

168. Answer (3)

GLUT-4 facilitates transport of glucose in intestinal mucosa.

Collagen is intercellular ground substance.

Insulin is a hormone.

Antibody fights against infectious agents.

169. Answer (2)

Second option is incorrect because nervous system of cockroach consists of a series of fused, segmentally arranged ganglia joined by paired longitudinal connectives on the ventral side. Three ganglia lie in the thorax, and six in the abdomen. The nervous system of cockroach is spread throughout the body.

170. Answer (4)

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

171. Answer (2)

The Watson and Crick model suggests a secondary structure of DNA that exists as a double helix and the two strands of polynucleotides are anti-parallel to each other.

172. Answer (3)

Each eye consists of about 2000 hexagonal ommatidia (sing.: ommatidium). With the help of several ommatidia, a cockroach can receive several images of an object.

173. Answer (3)

Hypopharynx act as a tongue.

174. Answer (3)

Neuroglial cells are not excitable, they are supporting cells.

175. Answer (2)

The male external genitalia are represented by male gonapophysis or phallomere (chitinous asymmetrical structures, surrounding the male gonopore).

176. Answer (1)

In female cockroach, each ovary is made up of 8 ovarioles.

177. Answer (3)

The y-axis represents the potential energy content. The x-axis represents the progression of the structural transformation or states through the 'transition state'. If 'P' is at a lower level than 'S', the reaction is an exothermic reaction. One need not supply energy (by heating) in order to form the product.

178. Answer (4)

Tongue is a muscular organ covered by epithelium.

179. Answer (1)

Adult human haemoglobin consists of 4 subunits. Two of these are identical to each other. Hence, two subunits of α type and two subunits of β type together constitute the human haemoglobin (Hb).

180. Answer (1)

Squamous epithelium forms diffusion boundaries, while protection is the function of compound epithelium. Cube-like cells are present in cuboidal epithelium.

181. Answer (2)

There are two hydrogen bonds between A and T and three hydrogen bonds between G and C. Adenine and guanine are purines.

182. Answer (3)

Fallopian tubes and most of the bronchioles are lined by ciliated epithelium.

183. Answer (4)

Ricin and abrin are toxins. Spices, scents and gums are useful to humans.

184. Answer (2)

Amino acids, simple sugars *etc* are micro molecules. They generally have lesser molecular weight.

185. Answer (2)

Serine is an amino acid to form proteins but not secreted in our body.

SECTION - B

186. Answer (3)

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.

187. Answer (2)

Neural tissue exerts the greatest control over the body's responsiveness to changing conditions. Neurons, the unit of neural system are excitable cells.

188. Answer (2)

Lipids are generally water insoluble. Acid insoluble pool consists of proteins, nucleic acids, polysaccharides and lipids.

189. Answer (4)

Starch forms helical secondary structures. In fact, starch can hold I_2 molecules in the helical portion. The starch-I_2 is blue in colour. Cellulose does not contain complex helices and hence cannot hold I_2.

190. Answer (1)

Areolar tissue is loose connective tissue and is the most abundant of all connective tissues. It is not a specialised connective tissue.

191. Answer (4)

Sucrose is a disaccharide, composed of glucose and fructose as its monomeric units.

192. Answer (3)

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

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

Rate can also be called velocity if the direction is specified. Rates of physical and chemical processes are influenced by temperature among other factors.

193. Answer (3)

Every enzyme has an active site to which substrate binds.

194. Answer (3)

Dry weight is obtained when all the water of the tissue has evaporated.

195. Answer (2)

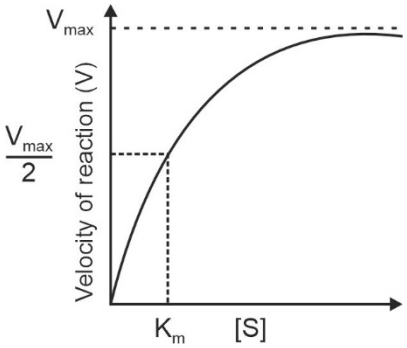
B. First, the substrate binds to the active site of the enzyme, fitting into the active site.

A. The binding of the substrate induces the enzyme to alter its shape, fitting more tightly around the substrate.

D. The active site of the enzyme, now in close proximity of the substrate breaks the chemical bonds of the substrate and the new enzyme-product complex is formed.

C. 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.

196. Answer (4)



197. Answer (2)

With the increase in substrate concentration, the velocity of the enzymatic reaction rises at first. The reaction ultimately reaches a maximum velocity (V_{max}) which is not exceeded by any further rise in concentration of the substrate. This is because the enzyme molecules are fewer than the substrate molecules and after saturation of these molecules, there are no free enzyme molecules to bind with the additional substrate molecules.

198. Answer (2)

Due to its close structural similarity with the substrate, the inhibitor competes with the substrate for the substrate binding site of the enzyme. Consequently, the substrate cannot bind and as a result, the enzyme action declines, e.g., inhibition of succinic dehydrogenase by malonate which closely resembles the substrate succinate in structure.

199. Answer (3)

Enzymes catalysing a transfer of a group, G (other than hydrogen) between a pair of substrate S and S' e.g., $S - G + S' \rightarrow S + S' - G$.

200. Answer (3)

Enzymes are composed of one or several polypeptide chains. However, there are a number of cases in which non-protein constituents called co-factors are bound to the enzyme to make the enzyme catalytically active. Protein part of holoenzyme is known as apoenzyme.

❑ ❑ ❑