



As Per
NMC
New
Syllabus

1 New Syllabus **Mock Test** *for* **NEET** **2024**



DISHATM
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New Syllabus NEET Mock Test 2024

INSTRUCTIONS

1. Number of Questions: Total of 200 questions have to be answered in this mock test. This test is divided into 4 parts and each part is further divided into two sections. Candidates can solve any section based on their choice.
2. Exam Mode: The Exam for NEET will be conducted in offline mode only. (Pen and paper-based mode). The candidates are advised to have practice solving the modal sample paper.
3. Subjects: Questions will be asked from four subjects which are Physics, Chemistry & Biology (Zoology & Botany).
4. Type of Question: The Paper will consist of only objective type questions in which out of four options only one correct answer will be there.
5. Exam Duration: The duration of exam will be 3 hours and 20 minutes.
6. Marking Scheme: Four marks will be given for each correct answer (+4 Marks).
7. Negative Marking: One mark will be deducted for each wrong answer from the total score (-1 Mark).
8. Total Marks of Examination: The Exam will be Total of 720 Marks (Each Section of equal marks i.e. 180 Marks).
9. Questions in different Sections: The division of Questions in four subjects i.e. Physics, Chemistry, Zoology and Botany.

MOCK TEST



Time : 3 Hrs. 20 Min.

Max. Marks : 720

PART-I : PHYSICS

SECTION-A

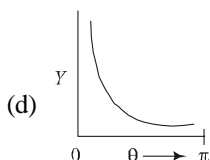
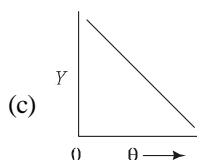
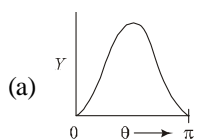
- If the electric potential at any point (x, y, z) m in space is given by $V = 3x^2$ volt. The electric field at the point $(1, 0, 3)$ m will be :
 (a) 3 Vm^{-1} , directed along positive x -axis.
 (b) 3 Vm^{-1} , directed along negative x -axis.
 (c) 6 Vm^{-1} , directed along positive x -axis.
 (d) 6 Vm^{-1} , directed along negative x -axis.

- The graph which depicts the results of Rutherford gold foil experiment with α -particles is:

θ : Scattering angle

Y : Number of scattered α -particles detected

(Plots are schematic and not to scale)



- The electric current in a circular coil of four turns produces a magnetic induction 32 T at its centre. The coil is unbound and is rewound into a circular coil of single turn, the magnetic induction at the centre of the coil by the same current will be :

(a) 8T (b) 4T (c) 2T (d) 16T

- The radius R of a nucleus of mass number A can be estimated by the formula $R = (1.3 \times 10^{-15}) A^{1/3}$ m. It follows that the mass density of a nucleus is of the order of :

$$(M_{\text{prot.}} \cong M_{\text{neut.}} \approx 1.67 \times 10^{-27} \text{ kg})$$

(a) 10^3 kg m^{-3} (b) $10^{10} \text{ kg m}^{-3}$
 (c) $10^{24} \text{ kg m}^{-3}$ (d) $10^{17} \text{ kg m}^{-3}$

- Match List I with List II :

List-I

(A) 3 Translational degrees of freedom

List-II

(I) Monoatomic gases

- (B) 3 Translational, 2 rotational degrees of freedom
 (C) 3 Translational, 2 rotational and 1 vibrational degrees of freedom
 (D) 3 Translational, 3 rotational and more than one vibrational degrees of freedom
 (II) Polyatomic gases
 (III) Rigid diatomic gases
 (IV) Nonrigid diatomic gases

Choose the correct answer from the options given below:

- (a) (A) – (IV), (B) – (III), (C) – (II), (D) – (I)
 (b) (A) – (IV), (B) – (II), (C) – (I), (D) – (III)
 (c) (A) – (I), (B) – (III), (C) – (IV), (D) – (II)
 (d) (A) – (I), (B) – (IV), (C) – (III), (D) – (II)

- The kinetic energy of an electron, α -particle and a proton are given as 4K, 2K and K respectively. The de-Broglie wavelength associated with electron (λ_e) α -particle (λ_α) and the proton (λ_p) are as follows:

- (a) $\lambda_\alpha = \lambda_p < \lambda_e$ (b) $\lambda_\alpha > \lambda_p > \lambda_e$
 (c) $\lambda_\alpha < \lambda_p < \lambda_e$ (d) $\lambda_\alpha = \lambda_p > \lambda_e$

- Two bodies are having kinetic energies in the ratio 16 : 9. If they have same linear momentum, the ratio of their masses respectively is:

(a) 4 : 3 (b) 3 : 4 (c) 16 : 9 (d) 9 : 16

- Eight equal drops of water are falling through air with a steady speed of 10 cm/s. If the drops coalesce, the new velocity is:

(a) 10 cm/s (b) 40 cm/s (c) 16 cm/s (d) 5 cm/s

- The dimensions of $a \times b$ in the relation $E = \frac{b - x^2}{at}$, where E is the energy, x is the displacement and t is time are

- (a) ML^2T (b) $\text{M}^{-1}\text{L}^2\text{T}$
 (c) ML^2T^{-2} (d) MLT^{-2}

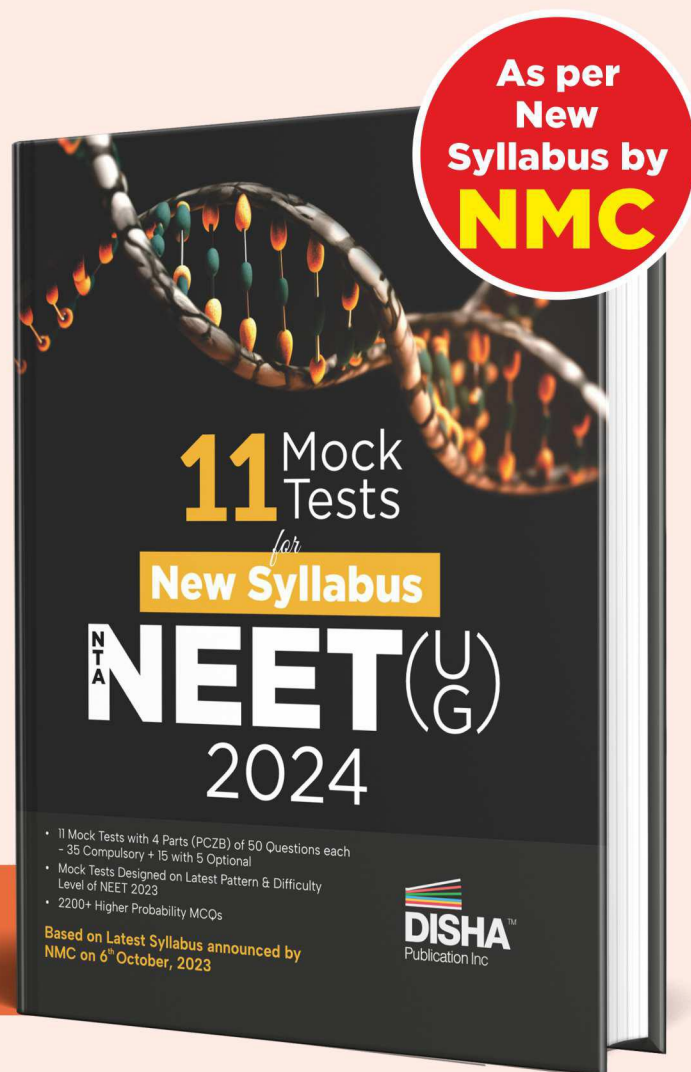
- A particle starting with certain initial velocity and uniform acceleration covers a distance of 12 m in first 3 seconds and a distance of 30 m in next 3 seconds. The initial velocity of the particle is

- (a) 3 ms^{-1} (b) 2.5 ms^{-1}
 (c) 2 ms^{-1} (d) 1 ms^{-1}

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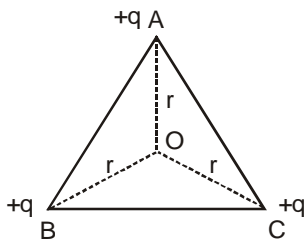
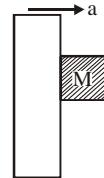


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11. A particle undergoes simple harmonic motion having time period T . The time taken in $3/8$ th oscillation is
 (a) $\frac{3}{8}T$ (b) $\frac{5}{8}T$ (c) $\frac{5}{12}T$ (d) $\frac{7}{12}T$
12. When current in a coil changes from 5 A to 2 A in 0.1 s, average voltage of 50 V is produced. The self-inductance of the coil is :
 (a) 6 H (b) 0.67 H (c) 3 H (d) 1.67 H
13. The work function of aluminium is 4.2 eV. If two photons each of energy 3.5 eV strike an electron of aluminium, then emission of electron will
 (a) depend upon the density of the surface
 (b) possible
 (c) not possible
 (d) None of these
14. Two wires A and B of the same material, having radii in the ratio 1 : 2 and carry currents in the ratio 4 : 1. The ratio of drift speed of electrons in A and B is
 (a) 16 : 1 (b) 1 : 16 (c) 1 : 4 (d) 4 : 1
15. Plates of area A are arranged as shown. The distance between each plate is d , the net capacitance is
 (a) $\frac{\epsilon_0 A}{d}$ (b) $\frac{7\epsilon_0 A}{d}$ (c) $\frac{6\epsilon_0 A}{d}$ (d) $\frac{5\epsilon_0 A}{d}$
16. An object undergoing SHM takes 0.5 s to travel from one point of zero velocity to the next such point. The distance between those points is 50 cm. The period, frequency and amplitude of the motion is
 (a) 1s, 1Hz, 25 cm (b) 2s, 1Hz, 50 cm
 (c) 1s, 2Hz, 25 cm (d) 2s, 2Hz, 50 cm
17. ABC is an equilateral triangle. Charges $+q$ are placed at each corner as shown in fig. The electric intensity at centre O will be

 (a) $\frac{1}{4\pi\epsilon_0} \frac{q}{r}$ (b) $\frac{1}{4\pi\epsilon_0} \frac{q}{r^2}$
 (c) $\frac{1}{4\pi\epsilon_0} \frac{3q}{r^2}$ (d) zero
18. A metallic bar is heated from 0°C to 100°C . The coefficient of linear expansion is 10^{-5} K^{-1} . What will be the percentage increase in length?
 (a) 0.01% (b) 0.1%
 (c) 1% (d) 10%
19. A rough vertical board has an acceleration a along the horizontal so that a block of mass M pressing against it does not fall. The coefficient of friction between block and the board is

 (a) $> \frac{a}{g}$ (b) $< \frac{g}{a}$
 (c) $= \frac{a}{g}$ (d) $> \frac{g}{a}$
20. A bullet of mass 5 g, travelling with a speed of 210 m/s, strikes a fixed wooden target. One half of its kinetic energy is converted into heat in the bullet while the other half is converted into heat in the wood. The rise of temperature of the bullet if the specific heat of its material is $0.030 \text{ cal/(g } ^\circ\text{C)}$ ($1 \text{ cal} = 4.2 \times 10^7 \text{ ergs}$) close to:
 (a) 87.5°C (b) 83.3°C
 (c) 119.2°C (d) 38.4°C
21. A plane wave of wavelength 6250 \AA is incident normally on a slit of width $2 \times 10^{-2} \text{ cm}$. The width of the principal maximum on a screen distant 50 cm will be
 (a) $312.5 \times 10^{-3} \text{ cm}$ (b) $312.5 \times 10^{-6} \text{ m}$
 (c) $312.5 \times 10^{-3} \text{ m}$ (d) $312.5 \times 10^{-6} \text{ cm}$
22. The heat radiated per unit area in 1 hour by a furnace whose temperature is 3000 K is ($\sigma = 5.7 \times 10^{-8} \text{ W m}^{-2} \text{ K}^{-4}$)
 (a) $1.7 \times 10^{10} \text{ J}$ (b) $1.1 \times 10^{12} \text{ J}$
 (c) $2.8 \times 10^8 \text{ J}$ (d) $4.6 \times 10^6 \text{ J}$
23. Two isolated conducting spheres S_1 and S_2 of radius $\frac{2}{3}R$ and $\frac{1}{3}R$ have $12 \mu\text{C}$ and $-3 \mu\text{C}$ charges, respectively, and are at a large distance from each other. They are now connected by a conducting wire. A long time after this is done the charges on S_1 and S_2 are respectively :
 (a) $4.5 \mu\text{C}$ on both
 (b) $+4.5 \mu\text{C}$ and $-4.5 \mu\text{C}$
 (c) $3 \mu\text{C}$ and $6 \mu\text{C}$
 (d) $6 \mu\text{C}$ and $3 \mu\text{C}$
24. A gun fires two bullets at 60° and 30° with horizontal. The bullets strike at some horizontal distance. The ratio of maximum height for the two bullets is in the ratio of
 (a) 2 : 1 (b) 3 : 1 (c) 4 : 1 (d) 1 : 1

25. A generator has an e.m.f. of 440 Volt and internal resistance of 400 Ohm. Its terminals are connected to a load of 4000 Ohm the voltage across the load is

(a) 220 volt (b) 440 volt
(c) 200 volt (d) 400 volt

26. The path difference between the two waves :

$$y_1 = a_1 \sin\left(\omega t - \frac{2\pi x}{\lambda}\right)$$

$$\text{and } y_2 = a_2 \sin\left(\omega t - \frac{2\pi x}{\lambda} + \phi\right) \text{ will be}$$

(a) $\frac{2\pi}{\lambda} \phi$ (b) $\frac{2\pi}{\lambda} \left(\phi - \frac{\pi}{2}\right)$
(c) $\frac{\lambda}{2\pi} \phi$ (d) $\frac{2\pi}{\lambda} \left(\phi + \frac{\pi}{2}\right)$

27. A body of mass 10 kg and velocity 10 m/s collides with a stationary body of mass 5 kg. After collision both bodies stick to each other, velocity of the bodies after collision will be

(a) $\frac{3}{10}$ m/s (b) $\frac{18}{3}$ m/s
(c) $\frac{9}{20}$ m/s (d) $\frac{20}{3}$ m/s

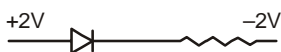



28. Two particles of mass m_1 and m_2 ($m_1 > m_2$) attract each other with a force inversely proportional to the square of the distance between them. If the particles are initially held at rest and then released, the centre of mass will

(a) move towards m_1 (b) move towards m_2
(c) remain at rest (d) Nothing can be said

29. The r.m.s. velocity of oxygen molecule at 16°C is 474 m/sec. The r.m.s. velocity in m/s of hydrogen molecule at 127°C is

(a) 1603 (b) 1896
(c) 2230.59 (d) 2730

30. The forward biased diode connection is:

(a) 
(b) 
(c) 
(d) 

31. The oscillating electric and magnetic field vectors of electromagnetic wave are oriented along

(a) the same direction and in phase
(b) the same direction but have a phase difference of 90°
(c) mutually perpendicular directions and are in same phase
(d) mutually perpendicular directions but has a phase difference of 90°

32. At 0°K which of the following properties of a gas will be zero?

(a) Kinetic energy (b) Potential energy
(c) Vibrational energy (d) Density

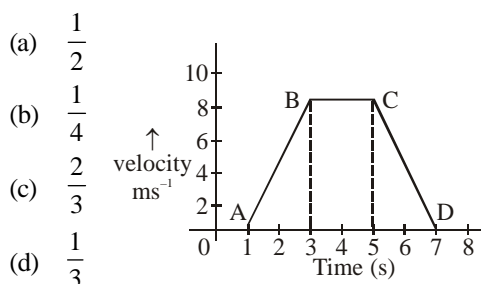
33. If two soap bubbles of different radii are connected by a tube. Then

(a) air flows from the smaller bubble to the bigger bubble
(b) air flows from bigger bubble to the smaller bubble till the sizes are interchanged
(c) air flows from the bigger bubble to the smaller bubble till the sizes become equal
(d) there is no flow of air.

34. A string 2.0 m long and fixed at its ends is driven by a 240 Hz vibrator. The string vibrates in its third harmonic mode. The speed of the wave and its fundamental frequency is:

(a) 180 m/s, 80 Hz (b) 320 m/s, 80 Hz
(c) 320 m/s, 120 Hz (d) 180 m/s, 120 Hz

35. For the velocity time graph shown in the figure below the distance covered by the body in the last two seconds of its motion is what fraction of the total distance travelled by it in all the seven seconds?

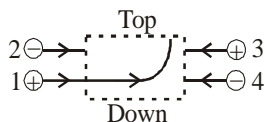


SECTION-B

36. Two wires are made of the same material and have the same volume. However wire 1 has cross-sectional area A and wire 2 has cross-sectional area $9A$. If the length of wire 1 increases by Δx on applying force F , how much force is needed to stretch wire 2 by the same amount?

(a) $16F$ (b) $25F$ (c) $81F$ (d) $64F$

37. The figure shows the path of a positively charged particle 1 through a rectangular region of uniform electric field as shown in the figure. What is the direction of electric field and the direction of particles 2, 3 and 4 ?



- (a) Top, down, top, down
(b) Top, down, down, top
(c) Down, top, top, down
(d) Down; top, down, down
38. A circular disc A of radius r is made from an iron plate of thickness t and another circular disc B of radius $4r$ is made from an iron plate of thickness $t/4$. The relation between the moments of inertia I_A and I_B is

- (a) $I_A > I_B$
(b) $I_A = I_B$
(c) $I_A < I_B$
(d) depends on the actual value of t and r

39. The threshold frequency for a photosensitive metal is 3.3×10^{14} Hz. If light of frequency 8.2×10^{14} Hz is incident on this metal, the cut-off voltage for the photoelectric emission is nearly

- (a) 2V (b) 3V (c) 5V (d) 1V

40. Given below are two statements:

Statement I: For diamagnetic substance $-1 \leq \chi < 0$, where χ is the magnetic susceptibility.

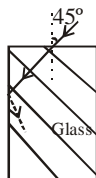
Statement II: Diamagnetic substances when placed in an external magnetic field, tend to move from stronger to weaker part of the field.

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

- (a) Both Statement I and Statement II are false.
(b) Both Statement I and Statement II are true.
(c) Statement I is incorrect but Statement II is true.
(d) Statement I is correct but Statement II is false.

41. A light ray falls on a rectangular glass slab as shown. The index of refraction of the glass, if total internal reflection is to occur at the vertical face, is

- (a) $\sqrt{3/2}$ (b) $\frac{(\sqrt{3}+1)}{2}$
(c) $\frac{(\sqrt{2}+1)}{2}$ (d) $\sqrt{5/2}$



42. During an adiabatic compression, 830 J of work is done on 2 moles of a diatomic ideal gas to reduce its volume by 50%. The change in its temperature is nearly: ($R = 8.3 \text{ JK}^{-1} \text{ mol}^{-1}$)
- (a) 40 K (b) 33 K (c) 20 K (d) 14 K

43. On a temperature scale 'X'. The boiling point of water is 65°X and the freezing point is -15°X . Assume that the X scale is linear. The equivalent temperature corresponding to -95°X on the Fahrenheit scale would be:

- (a) -63°F (b) -112°F
(c) -48°F (d) -148°F

44. When the rms voltages V_L , V_C and V_R are measured respectively across the inductor L, the capacitor C and the resistor R in a series LCR circuit connected to an AC source, it is found that the ratio $V_L : V_C : V_R = 1 : 2 : 3$. If the rms voltage of the AC sources is 100 V, the V_R is close to:

- (a) 50V (b) 70V
(c) 90V (d) 100V

45. The gravitational field in a region is given by $\vec{g} = 5\text{N/kg}\hat{i} + 12\text{N/kg}\hat{j}$. The change in the gravitational potential energy of a particle of mass 1 kg when it is taken from the origin to a point (7 m, -3 m) is:

- (a) 71 J (b) $13\sqrt{58}\text{J}$
(c) 71 J (d) 1 J

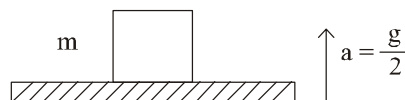
46. A galvanometer coil has a resistance of 15Ω and gives full scale deflection for a current of 4 mA. To convert it to an ammeter of range 0 to 6 A

- (a) $10 \text{ m}\Omega$ resistance is to be connected in parallel to the galvanometer
(b) $10 \text{ m}\Omega$ resistance is to be connected in series with the galvanometer
(c) 0.1Ω resistance is to be connected in parallel to the galvanometer
(d) 0.1Ω resistance is to be connected in series with the galvanometer

47. The magnifying power of a telescope is 9. When it is adjusted for parallel rays, the distance between the objective and the eye piece is found to be 20 cm. The focal length of lenses are

- (a) 18 cm, 2 cm (b) 11 cm, 9 cm
(c) 10 cm, 10 cm (d) 15 cm, 5 cm

48. A block of mass m is kept on a platform which starts from rest with constant acceleration $g/2$ upward, as shown in fig. work done by normal reaction on block in time t is:



- (a) $-\frac{m g^2 t^2}{8}$ (b) $\frac{m g^2 t^2}{8}$
(c) 0 (d) $\frac{3m g^2 t^2}{8}$

49. In a building there are 15 bulbs of 45 W, 15 bulbs of 100 W, 15 small fans of 10 W and 2 heaters of 1 kW. The voltage of electric main is 220 V. The minimum fuse capacity (rated value) of the building will be:

- (a) 10 A (b) 25 A (c) 15 A (d) 20 A

50. A uniform thin rope of length 12 m and mass 6 kg hangs vertically from a rigid support and a block of mass 2 kg is attached to its free end. A transverse short wave-train of wavelength 6 cm is produced at the lower end of the rope. What is the wavelength of the wavetrain (in cm) when it reaches the top of the rope ?

- (a) 3 (b) 6 (c) 12 (d) 9

PART-II : CHEMISTRY

SECTION-A

51. Match Column-I with Column-II.

Column-I (Physical quantity)	Column-II (Unit)
(A) Molarity	(p) mol
(B) Mole fraction	(q) Unitless
(C) Mole	(r) mol L ⁻¹
(D) Molality	(s) mol kg ⁻¹
(a) A – (r), B – (q), C – (s), D – (p)	
(b) A – (r), B – (p), C – (q), D – (s)	
(c) A – (r), B – (q), C – (p), D – (s)	
(d) A – (q), B – (r), C – (p), D – (s)	

52. **Statement I :** Magnetic quantum number determines the size of the orbital.

Statement II: Spin quantum number of an electron determines the orientation of the spin of electron relative to the chosen axis.

- (a) Both statement I and II are correct.
(b) Both statement I and II are incorrect.
(c) Statement I is correct but statement II is incorrect.
(d) Statement II is correct but statement I is incorrect.

53. BF₃ is planar and electron deficient compound. Hybridization and number of electrons around the central atom, respectively are :

- (a) sp² and 8 (b) sp³ and 4
(c) sp³ and 6 (d) sp² and 6

54. **Assertion :** Acetanilide is less basic than aniline.

Reason : Acetylation of aniline results in decrease of electron density on nitrogen.

- (a) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
(b) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
(c) If the Assertion is correct but Reason is incorrect.
(d) If the Assertion is incorrect and Reason is correct.

55. Match Column-I with Column-II.

Column-I (Ion)	Column-II (Mcalculated)
(A) Ti ²⁺	(p) 2.84
(B) Zn ²⁺	(q) 5.92
(C) Mn ²⁺	(r) 0
(D) Sc ³⁺	(s) 4.90
(a) A – (s), B – (p), C – (q), D – (r)	
(b) A – (r), B – (p), C – (q), D – (s)	
(c) A – (p), B – (r), C – (q), D – (s)	
(d) A – (p), B – (s), C – (q), D – (r)	

56. **Statement I :** The elements silicon, germanium and arsenic are called metalloids.

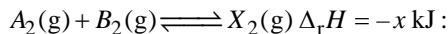
Statement II : Metalloids have properties quite different from those of metals and non-metals.

- (a) Both statement I and II are correct.
(b) Both statement I and II are incorrect.
(c) Statement I is correct but statement II is incorrect.
(d) Statement II is correct but statement I is incorrect.

57. Which of the following statements is/are not correct for combination of atomic orbitals?

- (i) The combining atomic orbitals must have the same or nearly the same energy.
(ii) Greater the extent of overlap, the greater will be the electron density between the nuclei of a molecular orbital.
(iii) 2p_z orbital of one atom can combine with either of 2p_x, 2p_y or 2p_z orbital of other atom as these orbitals have same energy.
(iv) Overlapping in case of σ-bond takes place to a larger extent as compared to π-bond.
(a) (i) and (ii) (b) (iii) only
(c) (iv) only (d) (ii) and (iii)

58. Which one of the following conditions will favour maximum formation of the product in the reaction,



- (a) Low temperature and high pressure
(b) Low temperature and low pressure
(c) High temperature and low pressure
(d) High temperature and high pressure

59. Oxidation number of potassium in K_2O , K_2O_2 and KO_2 , respectively, is:

- (a) +2, +1 and $+\frac{1}{2}$ (b) +1, +1 and +1
(c) +1, +4 and +2 (d) +1, +2 and +4

60. Match the laws given in the Column-I with expression given in Column-II.

Column-I	Column-II
(A) Henry's law	(p) $\Delta T_f = K_f m$
(B) Elevation of boiling point	(q) $\pi = CRT$
(C) Depression in freezing point	(r) $\Delta T_b = K_b m$
(D) Osmotic pressure	(s) $P = K_H \cdot x$
(a) A - (s), B - (r), C - (p), D - (q)	
(b) A - (q), B - (r), C - (q), D - (s)	
(c) A - (p), B - (s), C - (r), D - (q)	
(d) A - (s), B - (p), C - (q), D - (r)	

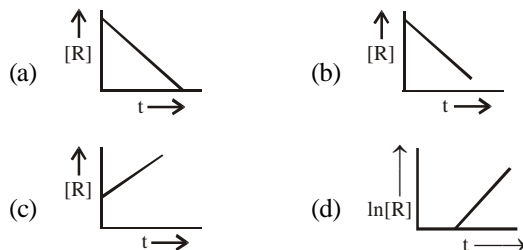
61. **Statement I :** Galvanised iron does not rust.

Statement II : Zinc has a more negative electrode potential than iron.

- (a) Both statement I and II are correct.
(b) Both statement I and II are incorrect.
(c) Statement I is correct but statement II is incorrect.
(d) Statement II is correct but statement I is incorrect.
62. Kjeldahl method is not applicable to which of the following?

- (a) Nitro compounds (b) Azo compounds
(c) Pyridine (d) All of these

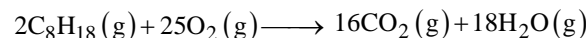
63. The plot that represents the zero order reaction is :



64. The enolic form of a acetone contains

- (a) 9 sigma bonds, 1 pi bond and 2 lone pairs
(b) 8 sigma bonds, 2 pi bonds and 2 lone pairs
(c) 10 sigma bonds, 1 pi bond and 1 lone pair
(d) 9 sigma bonds, 2 pi bonds and 1 lone pair

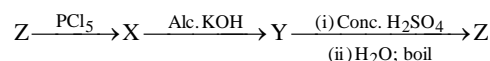
65. Following reaction occurs in an automobile



The sign of ΔH , ΔS and ΔG would be

- (a) +, -, + (b) -, +, -
(c) -, +, + (d) +, +, -

66. What is Z in the following sequence of reactions?



- (a) $CH_3CH_2CH_2OH$
(b) $CH_3CH(OH)CH_3$
(c) $(CH_3CH_2)_2CHOH$
(d) $CH_3CH=CH_2$

67. An example of electrophilic substitution reaction is :

- (a) Chlorination of methane
(b) Conversion of methyl chloride to methyl alcohol
(c) Nitration of benzene
(d) Formation of ethylene from ethyl alcohol.

68. Which of the following does not represent the correct order of the properties indicated?

- (a) $Ni^{2+} > Cr^{2+} > Fe^{2+} > Mn^{2+}$ (size)
(b) $Sc > Ti > Cr > Mn$ (size)
(c) $Mn^{2+} > Ni^{2+} < Co^{2+} < Fe^{2+}$ (unpaired electron)
(d) $Fe^{2+} > Co^{2+} > Ni^{2+} > Cu^{2+}$ (unpaired electron)

69. Match the columns

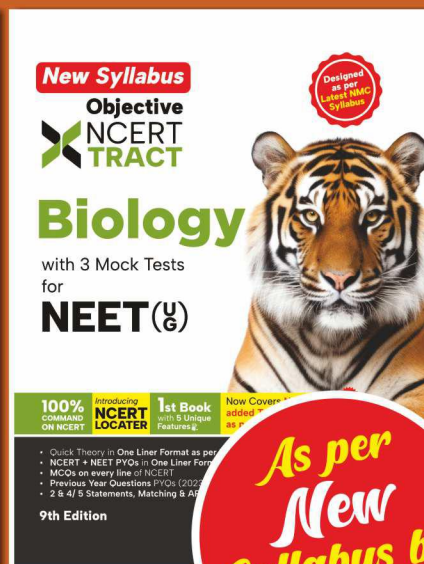
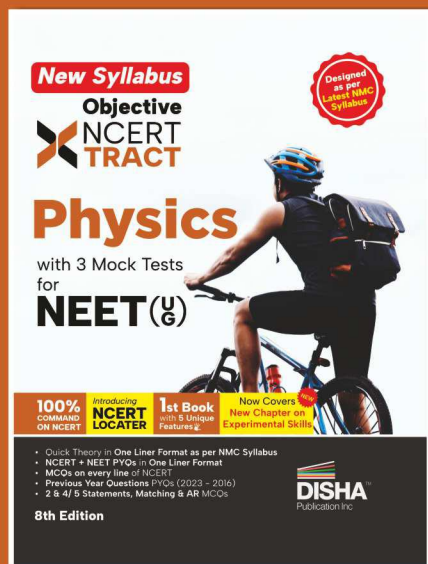
Column - I	Column - II
(A) $C_2H_6 \xrightarrow{Cl_2 / UV \text{ light}} C_2H_5Cl$	(p) Finkelstein reaction
(B) $C_6H_5NH_2 \xrightarrow{NaNO_2 + HCl / Cu_2Cl_2} C_6H_5Cl$	(q) Free radical substitution

- (C) $CH_3Cl + NaI \longrightarrow CH_3I + NaCl$ (r) Swarts reaction
(D) $CH_3 - Br + AgF \longrightarrow CH_3F + AgBr$ (s) Sandmeyer's reaction

- (a) A - (q), B - (s), C - (p), D - (r)
(b) A - (q), B - (r), C - (p), D - (s)
(c) A - (r), B - (p), C - (s), D - (q)
(d) A - (s), B - (r), C - (p), D - (q)

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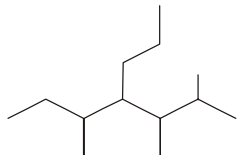
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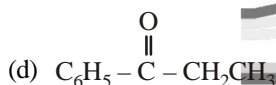
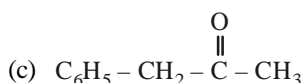
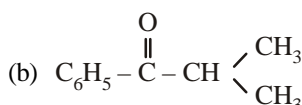
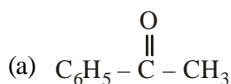
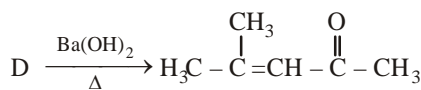
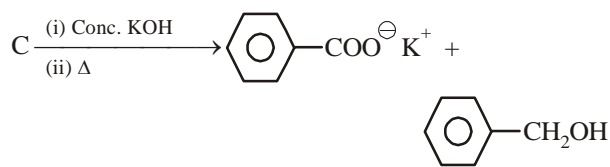
70. The electrons, identified by quantum numbers n and l (i) $n = 4, l = 1$ (ii) $n = 4, l = 0$ (iii) $n = 3, l = 2$ (iv) $n = 3, l = 1$ can be placed in order of increasing energy, from the lowest to highest, as
- (iv) < (ii) < (iii) < (i)
 - (ii) < (iv) < (i) < (iii)
 - (i) < (iii) < (ii) < (iv)
 - (iii) < (i) < (iv) < (ii)
71. In an adiabatic process, no transfer of heat takes place between system and surroundings. Choose the correct option for free expansion of an ideal gas under adiabatic condition from the following.
- $q = 0, \Delta T \neq 0, w = 0$
 - $q \neq 0, \Delta T = 0, w = 0$
 - $q = 0, \Delta T = 0, w = 0$
 - $q = 0, \Delta T < 0, w \neq 0$
72. In which of the following cases, the stability of two oxidation states is correctly represented
- $Ti^{3+} > Ti^{4+}$
 - $Mn^{2+} > Mn^{3+}$
 - $Fe^{2+} > Fe^{3+}$
 - $Cu^{+} > Cu^{2+}$
73. Which is not the disproportionation reaction ?
- $3H_3PO_2 \longrightarrow 2H_3PO_3 + PH_3$
 - $HCHO + OH^- \longrightarrow HCOO^- + CH_3OH$
 - $NH_4NO_3 \longrightarrow N_2O + 2H_2O$
 - $3Cl_2 + 6OH^- \longrightarrow 5Cl^- + ClO_3^- + 3H_2O$
74. The major organic product in the reaction, $CH_3 - O - CH(CH_3)_2 + HI \rightarrow$ Product is
- $ICH_2OCH(CH_3)_2$
 - $CH_3OC(CH_3)_2$
 - $CH_3I + (CH_3)_2CHOH$
 - $CH_3OH + (CH_3)_2CHI$
75. The correct IUPAC name for
- 
- 5-Methyl-4-(1'-2'-dimethylpropyl) heptane
 - 3-Methyl-4-(1',2'-dimethylpropyl) heptane
 - 2,3,5-Trimethyl-4-propylheptane
 - 4-Propyl-2,3,5-trimethylheptane
76. The incorrect statement from the following for borazine is:
- It has electronic delocalization
 - It contains banana bonds
 - It can react with water
 - It is a cyclic compound
77. Which of the following possesses a sp -carbon in its structure ?
- $CH_2 = CCl - CH = CH_2$
 - $CCl_2 = CCl_2$
 - $CH_2 = C = CH_2$
 - $CH_2 = CH - CH = CH_2$
78. Which one of the following complexes will have four different isomers ?
- $[Co(en)_2Cl_2]Cl$
 - $[Co(en)(NH_3)_2Cl_2]Cl$
 - $[Co(PPh_3)_2Cl_2]Cl$
 - $[Co(en)_3]Cl_3$
79. Sucrose in water is dextro-rotatory, $[\alpha]_D = +66.4^\circ$. When boiled with dilute HCl , the solution becomes leavo-rotatory, $[\alpha]_D = -20^\circ$. In this process the sucrose molecule breaks into
- L-glucose + D-fructose
 - L-glucose + L-fructose
 - D-glucose + D-fructose
 - D-glucose + L-fructose
80. Which of the following statement is not true about secondary structure of protein ?
- The alpha helix, beta pleated sheet and beta turns are examples of secondary structure of protein.
 - The ability of peptide bonds to form intramolecular hydrogen bonds is important to secondary structure.
 - The steric influence of amino acid residues is important to secondary structure.
 - The hydrophilic/ hydrophobic character of amino acid residues is important to secondary structure.
81. Which of the following is correct order of acidity?
- $HCOOH > CH_3COOH > ClCH_2COOH > C_2H_5COOH$
 - $ClCH_2COOH > HCOOH > CH_3COOH > C_2H_5COOH$
 - $CH_3COOH > HCOOH > ClCH_2COOH > C_2H_5COOH$
 - $C_2H_5COOH > CH_3COOH > HCOOH > ClCH_2COOH$
82. Which of the following reactions can produce aniline as main product?
- $C_6H_5NO_2 + Zn/KOH$
 - $C_6H_5NO_2 + Zn/NH_4Cl$
 - $C_6H_5NO_2 + LiAlH_4$
 - $C_6H_5NO_2 + Zn/HCl$
83. The unit of equivalent conductivity is
- $S\ cm^{-2}$
 - $ohm\ cm^2\ (g\ equivalent)$
 - $ohm\ cm$
 - $ohm^{-1}cm^2\ (g\ equivalent)^{-1}$

84. Tertiary nitro compounds do not tautomerise because
 (a) there is no double bond.
 (b) there is no α -hydrogen.
 (c) oxygen is more electronegative than hydrogen.
 (d) all of the above.
85. Complex X of composition $\text{Cr}(\text{H}_2\text{O})_6\text{Cl}_n$ has a spin only magnetic moment of 3.83 BM. It reacts with AgNO_3 and shows geometrical isomerism. The IUPAC nomenclature of X is:
 (a) Hexaaqua chromium (III) chloride
 (b) Tetraaquadichlorido chromium (IV) chloride dihydrate
 (c) Dichloridotetraqua chromium (IV) chloride dihydrate
 (d) Tetraaquadichlorido chromium (III) chloride dihydrate

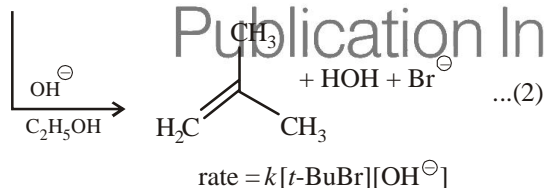
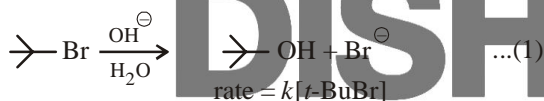
SECTION-B

86. Consider the reactions given below. On the basis of these reactions find out which of the algebraic relationship given in options (a) to (d) is correct?
- $\text{C}(\text{graphite}) + 4\text{H}(\text{g}) \rightarrow \text{CH}_4(\text{g}); \Delta_r H = x \text{ kJ mol}^{-1}$
 - $\text{C}(\text{graphite}) + 2\text{H}_2(\text{g}) \rightarrow \text{CH}_4(\text{g}); \Delta_r H = y \text{ kJ mol}^{-1}$
- (a) $x = y$ (b) $x = 2y$
 (c) $x > y$ (d) $x < y$
87. The reaction quotient (Q) for the reaction
 $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$
 is given by $Q = \frac{[\text{NH}_3]^2}{[\text{N}_2][\text{H}_2]^3}$. The reaction will proceed from right to left if
 (a) $Q = 0$ (b) $Q = K_c$
 (c) $Q < K_c$ (d) $Q > K_c$
88. While charging the lead storage battery
 (a) PbSO_4 anode is reduced to Pb
 (b) PbSO_4 cathode is reduced to Pb
 (c) PbSO_4 cathode is oxidised to Pb
 (d) PbSO_4 anode is oxidised to PbO_2
89. Which of the following is the correct order of increasing field strength of ligands to form coordination compounds?
 (a) $\text{SCN}^- < \text{F}^- < \text{CN}^- < \text{C}_2\text{O}_4^{2-}$
 (b) $\text{F}^- < \text{SCN}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$
 (c) $\text{CN}^- < \text{C}_2\text{O}_4^{2-} < \text{SCN}^- < \text{F}^-$
 (d) $\text{SCN}^- < \text{F}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$
90. The rate constant of a zero order reaction is $2.0 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$. If the concentration of the reactant after 25 seconds is 0.5 M. What is the initial concentration ?
 (a) 0.5 M (b) 1.25 M
 (c) 12.5 M (d) 1.0 M

91. Element not present in Nessler's reagent is:-
 (a) Hg (b) I
 (c) K (d) N
92. Solubility product of a salt AB is 1×10^{-8} in a solution in which the concentration of A^+ ions is 10^{-3} M . The salt will precipitate when the concentration of B^- ions is kept
 (a) between 10^{-8} M to 10^{-7} M
 (b) between 10^{-7} M to 10^{-8} M
 (c) $> 10^{-5} \text{ M}$
 (d) $< 10^{-8} \text{ M}$
93. Vapour pressure of benzene at 30°C is 121.8 mm. When 15 g of a non volatile solute is dissolved in 250 g of benzene its vapour pressure decreased to 120.2 mm. The molecular weight of the solute (Mo. wt. of solvent = 78)
 (a) 356.2 (b) 456.8
 (c) 530.1 (d) 656.7
94. For reaction $a\text{A} \rightarrow x\text{P}$, when $[\text{A}] = 2.2 \text{ mM}$, the rate was found to be 2.4 mM s^{-1} . On reducing concentration of A to half, the rate changes to 0.6 mM s^{-1} . The order of reaction with respect to A is :
 (a) 1.5 (b) 2.0
 (c) 2.5 (d) 3.0
95. Decomposition of H_2O_2 follows a first order reaction. In fifty minutes the concentration of H_2O_2 decreases from 0.5 to 0.125 M in one such decomposition. When the concentration of H_2O_2 reaches 0.05 M, the rate of formation of O_2 will be:
 (a) 2.66 L min^{-1} at STP
 (b) $1.34 \times 10^{-2} \text{ mol min}^{-1}$
 (c) $6.96 \times 10^{-2} \text{ mol min}^{-1}$
 (d) $6.93 \times 10^{-4} \text{ mol min}^{-1}$
96. What is the standard reduction potential (E°) for $\text{Fe}^{3+} \rightarrow \text{Fe}$? Given that :
 $\text{Fe}^{2+} + 2\text{e}^- \rightarrow \text{Fe}; E^\circ_{\text{Fe}^{2+}/\text{Fe}} = -0.47\text{V}$
 $\text{Fe}^{3+} + \text{e}^- \rightarrow \text{Fe}^{2+}; E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}} = +0.77\text{V}$
 (a) -0.057 V (b) $+0.057 \text{ V}$
 (c) $+0.30 \text{ V}$ (d) -0.30 V
97. In which case, van't Hoff factor i remains unchanged ?
 (a) PtCl_4 reacts with aq. KCl
 (b) aq. ZnCl_2 reacts with aq. NH_3
 (c) aq. FeCl_3 reacts with aq. $\text{K}_4[\text{Fe}(\text{CN})_6]$
 (d) KMnO_4 reduced to MnO_2 in alkaline medium
98. The compound A in the following reactions is :
 $\text{A} \xrightarrow[\text{(ii) Conc. H}_2\text{SO}_4 / \Delta]{\text{(i) CH}_3\text{MgBr/H}_2\text{O}}$
 $\text{B} \xrightarrow[\text{(ii) Zn/H}_2\text{O}]{\text{(i) O}_3} \text{C} + \text{D}$



99. Consider the reaction sequence given below :



Which of the following statements is true ?

- (a) Changing the base from OH^- to OR^- will have no effect on reaction (2).
 (b) Changing the concentration of base will have no effect on reaction (1).
 (c) Doubling the concentration of base will double the rate of both the reactions.
 (d) Changing the concentration of base will have no effect on reaction (2).
100. Bond dissociation energy of E-H bond of the “ H_2E ” hydrides of group 16 elements (given below), follows order.
- (A) O (B) S (C) Se (D) Te
- (a) $A > B > C > D$ (b) $A > B > D > C$
 (c) $B > A > C > D$ (d) $D > C > B > A$

PART-III : BOTANY

SECTION-A

101. **Statement I:** Fig and wasp cannot complete their life cycle without each other.

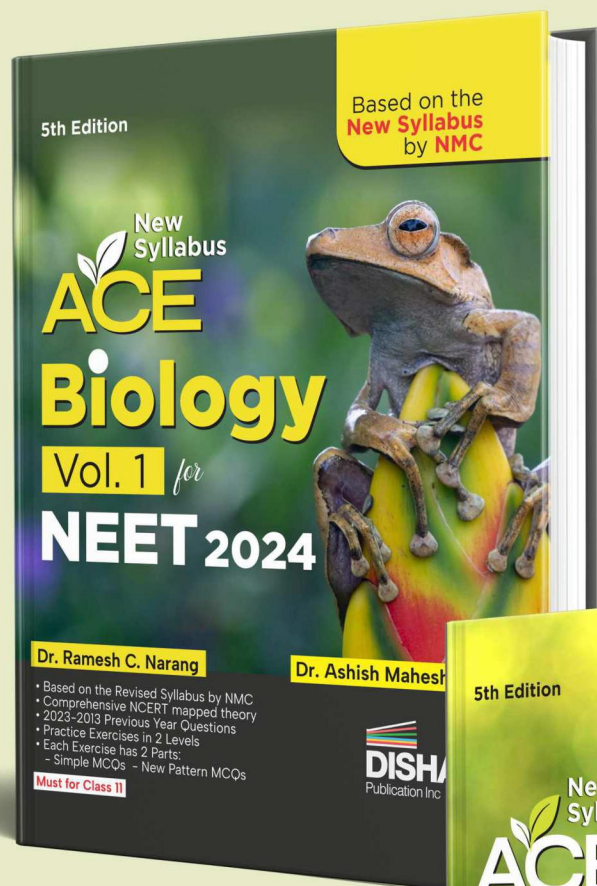
Statement II: It is mutualistic relationship.

- (a) Both Statement I and Statement II are incorrect
 (b) Statement I is correct but Statement II is incorrect
 (c) Statement I is incorrect but Statement II is correct
 (d) Both Statement I and Statement II are correct
102. Read the following statements
- (i) Lower the taxon, more are the characteristics that the members within the taxon share.
 (ii) Order is the assemblage of genera which exhibit a few similar characters.
 (iii) Cat and dog are included in the same family Felidae.
 (iv) Binomial Nomenclature was introduced by Carolus Linnaeus.

Which of the following statements are **NOT** correct?

- (a) (i), (ii) and (iii) (b) (ii), (iii) and (iv)
 (c) (i) and (iv) (d) (ii) and (iii)
103. The term ‘glycocalyx’ is used for
- (a) A layer surrounding the cell wall of bacteria
 (b) A layer present between cell wall and membrane of bacteria
 (c) Cell wall of bacteria
 (d) Bacterial cell glyco-engineered to possess N-glycosylated proteins
104. Cells in G_0 phase :
- (a) exit the cell cycle
 (b) enter the cell cycle
 (c) suspend the cell cycle
 (d) terminate the cell cycle
105. **Assertion:** Net primary productivity is gross primary productivity minus respiration.
Reason: Secondary productivity is produced by heterotrophs.
- (a) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
 (b) (A) is correct but (R) is not correct
 (c) (A) is not correct but (R) is correct
 (d) Both (A) and (R) are correct and (R) is the correct explanation of (A)

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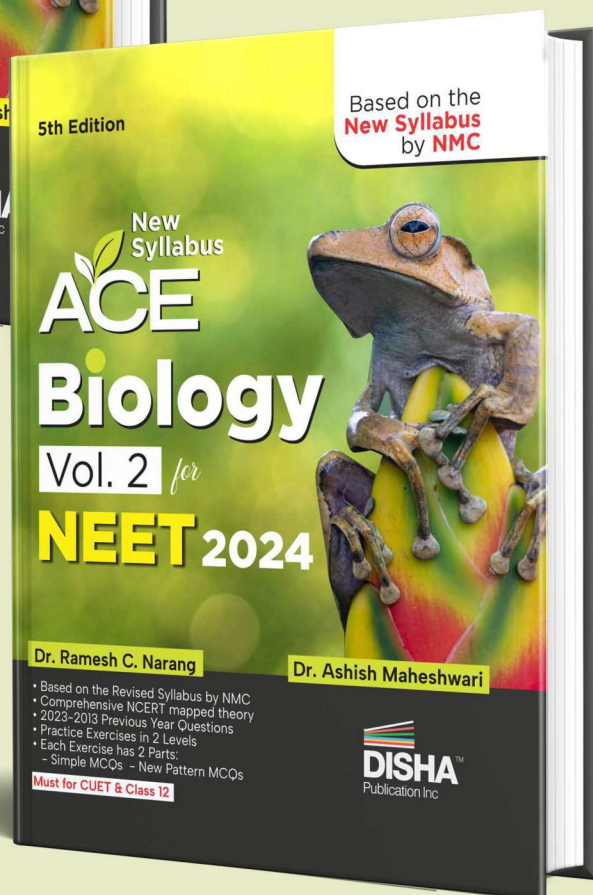
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106. Viroids differ from viruses in having

- (a) DNA molecules without protein coat
- (b) RNA molecules with protein coat
- (c) RNA molecules without protein coat
- (d) DNA molecules with protein coat

107. Match the column I with column II and choose the correct option.

Column-I	Column-II
A. Placentation	I. Arrangement of flowers on the rachis
B. Aestivation	II. Modified shoot for sexual reproduction
C. Inflorescence	III. Arrangement of various whorls in the bud
D. Flower	IV. Arrangement of ovules within an ovary

- (a) A – I; B – II; C – III; D – IV
- (b) A – III; B – I; C – II; D – IV
- (c) A – III; B – I; C – IV; D – II
- (d) A – IV; B – III; C – I; D – II

108. Match the following and choose the correct option.

Column-I	Column-II
A. Standing state	I. Nitrogen, Carbon
B. Gaseous cycles	II. Amount of nutrients
C. Standing crop	III. Sulphur, Phosphorus
D. Sedimentary cycles	IV. Living matter at different trophic levels

- (a) A – II; B – I; C – IV; D – III
- (b) A – I; B – II; C – III; D – IV
- (c) A – III; B – II; C – IV; D – I
- (d) A – I, B – IV; C – III; D – II

109. Statement I: Nuclear envelope remain intact through-out the prophase.

Statement II: At the end of prophase, when viewed under microscope, a cell shows distinct Golgi, ER and nucleolus.

- (a) Both Statement I and Statement II are incorrect
- (b) Statement I is correct but Statement II is incorrect
- (c) Statement I is incorrect but Statement II is correct
- (d) Both Statement I and Statement II are correct

110. Match the following columns.

Column I	Column II
(I) Dodo	(A) Africa
(II) Quagga	(B) Russia
(III) Thylacine	(C) Mauritius
(IV) Stellar's sea cow	(D) Australia

Choose the correct match from the following

- (a) I-A, II-C, III-B, IV-D
- (b) I-D, II-C, III-A, IV-B
- (c) I-C, II-A, III-B, IV-D
- (d) I-C, II-A, III-D, IV-B

111. Connecting link between glycolysis and Krebs cycle is

- (a) oxaloacetate
- (b) phosphoenol pyruvate
- (c) pyruvate
- (d) acetyl CoA

112. Differentiation of shoot is controlled by

- (a) high gibberellin : cytokinin ratio
- (b) high auxin : cytokinin ratio
- (c) high cytokinin : auxin ratio
- (d) high gibberellin : auxin ratio

113. During double fertilization in plants, one sperm fuses with the egg cell and the other sperm fuses with

- (a) synergids cell
- (b) central cell
- (c) antipodal cell
- (d) nucellar cell

114. Female gametophyte of angiosperms is represented by

- (a) Ovule
- (b) Megaspore mother cell
- (c) Embryo sac
- (d) Nucellus

115. Cross between AaBB and aaBB will form

- (a) 1 AaBB : 1 aaBB
- (b) All AaBB
- (c) 3 AaBB : 1 aaBB
- (d) 1 AaBB : 3 aaBB

116. Which of the following is the most stable ecosystem?

- (a) Forest
- (b) Desert
- (c) Mountain
- (d) Ocean

117. Parthenocarpic tomato fruits can be produced by

- (a) treating the plants with low concentrations of gibberellic acid and auxins
- (b) raising the plants from vernalized seeds
- (c) treating the plants with phenylmercuric acetate
- (d) removing androecium of flowers before pollen grains are released

118. Which of the following statement confirm the law of dominance

- (a) 3:1 ratio in F_2 generation
- (b) It is the conclusion of a dihybrid cross
- (c) Alleles do not show any blending and both characters recovered as such in F_2 generation
- (d) Alleles of a pair segregate from each other such that gamete receives only one of the two factors

- 119.** What would happen if in a gene encoding a polypeptide of 50 amino acids, 25th codon (UAU) is mutated to UAA?
- A polypeptide of 24 amino acids will be formed.
 - Two polypeptides of 24 and 25 amino acids will be formed
 - A polypeptide of 49 amino acids will be formed
 - A polypeptide of 25 amino acids will be formed
- 120.** The rate at which light energy is converted to the chemical energy of organic molecules in the ecosystem's is
- net primary productivity
 - gross primary productivity
 - net secondary productivity
 - gross secondary productivity
- 121.** Read the following statement about post-fertilization events in angiospermic plants
- Ovary develop into fruit
 - Ovules develop into embryo sac
 - Embryo develop at the micropylar end of embryo sac
 - Endosperm will never be completely consumed by developing embryo
 - Zygote develop into embryo
- Choose the correct answer from the options below:
- (i), (ii) and (v)
 - (i), (iii) and (v)
 - (ii), (iii) and (iv)
 - (ii), (iv) and (v)
- 122.** Pteridophytes differ from mosses/bryophytes in possessing
- independent gametophyte
 - well developed vascular system
 - archegonia structure
 - flagellate spermatozoids
- 123.** Centrioles and centrosomes occur in the cells of
- green plants
 - animals
 - bacteria and cyanobacteria
 - both (b) and (c)
- 124.** Mycorrhiza is
- a symbiotic association of plant roots and certain fungi.
 - an association of algae with fungi.
 - a fungus parasitising root system of higher plants.
 - an association of *Rhizobium* with the roots of leguminous plants.
- 125.** *Laminaria* (kelp) and *Fucus* (rock weed) are the examples of
- red algae
 - brown algae
 - green algae
 - golden brown algae
- 126.** The outer layer of vacuole is called
- cell wall
 - tonoplast
 - plasma layer
 - leucoplast
- 127.** Which one of the following is not included under *in-situ* conservation?
- Botanical garden
 - Biosphere reserve
 - National park
 - Sanctuary
- 128.** *Monascus purpureus* is a yeast used commercially in the production of :
- ethanol
 - streptokinase for removing clots from the blood vessels.
 - Citric acid
 - blood cholesterol lowering statins
- 129.** Which of the following is considered a hot-spot of biodiversity in India ?
- Indo-Gangetic Plain
 - Eastern Ghats
 - Aravalli Hills
 - Western Ghats
- 130.** Which one of the following shows concept of species-area relationship?
- The number of species in an area increases with the size of the area.
 - Larger species require larger habitat areas than do smaller species.
 - Most species within any given area are endemic.
 - The larger the area, the greater the extinction rate.
- 131.** The regions of the stem where leaves are borne are called _____ while _____ are the portions between two _____.
- nodes, nodes and internodes
 - nodes, internodes and nodes
 - internodes, nodes and nodes
 - internodes, internodes and nodes
- 132.** Chemiosmotic hypothesis given by Peter Mitchell proposes the mechanism of
- synthesis of ATP
 - synthesis of FADH_2
 - synthesis of NADH
 - synthesis of NADPH
- 133. Statement I:** Increase in mass and increase in number of individuals are twin characteristics of growth.
Statement II: Metabolic reactions can be demonstrated outside the body in isolated cell-free systems.

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

- (a) Both Statement I and Statement II are incorrect
(b) Statement I is correct but Statement II is incorrect
(c) Statement I is incorrect but Statement II is correct
(d) Both Statement I and Statement II are correct
- 134.** Which of the following bacteria carry out oxygenic photosynthesis by means of a photosynthetic apparatus similar to the eukaryotes?
(a) Purple sulphur bacteria
(b) Green sulphur bacteria
(c) *Cyanobacteria*
(d) More than one option is correct
- 135.** Consider the following statements with respect to characteristic features of the kingdoms.
(i) In animalia, the mode of nutrition is autotrophic.
(ii) In monera, the nuclear membrane is present.
(iii) In protista, the cell type is prokaryotic.
(iv) In plantae, the cell wall is present.
(v) Fungi show a little diversity in morphology and habitat.
Of the above statements, which one is correct?
(a) (i) only (b) (ii) only
(c) (iii) only (d) (iv) only

SECTION-B

- 136. Statement I:** Cyanobacteria are unicellular organisms and never form colonial structures.
Statement II: As they are good indicators of water pollution, they do not grow in polluted water bodies.
(a) Both Statement I and Statement II are incorrect
(b) Statement I is correct but Statement II is incorrect
(c) Statement I is incorrect but Statement II is correct
(d) Both Statement I and Statement II are correct
- 137.** Which of the following is not the characteristic features of fabaceae?
(a) Tap root system, compound leaves and raceme inflorescence.
(b) Flowers actinomorphic, twisted aestivation and gamopetalous.
(c) Stamens 10, introrse, basifixed, ditheous.
(d) Monocarpellary, ovary superior and bent stigma.
- 138.** Match Column-I with Column-II and select the correct option from the codes given below.

Column-I	Column-II
A. Disintegration of nuclear membrane	(i) Anaphase

- B. Appearance of nucleolus (ii) Prophase
C. Division of centromere (iii) Telophase
D. Replication of DNA (iv) S-phase
(a) A-(ii), B-(iii), C-(i), D-(iv)
(b) A-(ii), B-(iii), C-(iv), D-(i)
(c) A-(iii), B-(ii), C-(i), D-(iv)
(d) A-(iii), B-(ii), C-(iv), D-(i)

- 139.** Match the column I with column II and choose the correct option.

Column-I	Column-II
A. Placentation	(i) Arrangement of flowers on the rachis
B. Aestivation	(ii) Modified shoot for sexual reproduction
C. Inflorescence	(ii) Arrangement of various whorls in the bud
D. Flower	(iv) Arrangement of ovules within an ovary
(a) A-(i), B-(ii), C-(iii), D-(iv)	
(b) A-(iii), B-(i), C-(ii), D-(iv)	
(c) A-(iii), B-(i), C-(iv), D-(ii)	
(d) A-(iv), B-(iii), C-(i), D-(ii)	

- 140. Statement I:** In numerical taxonomy observable characters are not given equal importance.

Statement II: More than 20 characters can't be studied at a time in numerical taxonomy.

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

- (a) Both Statement I and Statement II are incorrect
(b) Statement I is correct but Statement II is incorrect
(c) Statement I is incorrect but Statement II is correct
(d) Both Statement I and Statement II are correct
- 141.** Consider the following statements concerning food chains:
(i) Removal of 80% tigers from an area resulted in greatly increased growth of vegetation.
(ii) Removal of most of the carnivores resulted in an increased population of deers.
(iii) The length of food chains is generally limited to 3-4 trophic levels due to energy loss.
(iv) The length of food chains may vary from 2 to 8 trophic levels.

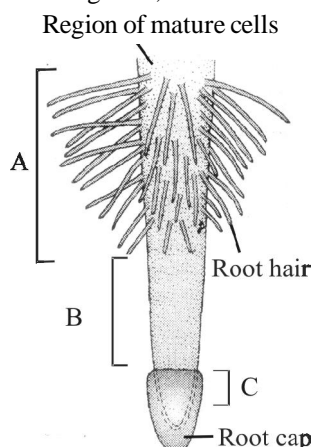
Which two of the above statements are correct?

- (a) (ii) and (iii) (b) (iii) and (iv)
(c) (i) and (iv) (d) (i) and (ii)

142. Match Column-I with Column-II and select the correct answer from the codes given below.

Column-I	Column-II
A. <i>Trichoderma</i>	(i) Nitrification
B. <i>Streptomyces</i>	(ii) Biocontrol agent
C. <i>Nitrosomonas</i>	(iii) Lactic acid
D. <i>Lactobacillus</i>	(iv) Source of antibiotic

- (a) A-(ii), B-(iii), C-(iv), D-(i)
 (b) A-(ii), B-(iv), C-(i), D-(iii)
 (c) A-(iii), B-(i), C-(ii), D-(iv)
 (d) A-(iv), B-(ii), C-(i), D-(iii)
143. Plasmogamy is the fusion of
 (a) two haploid cells including their nuclei.
 (b) two haploid cells without nuclear fusion.
 (c) sperm and egg.
 (d) sperm and two polar nuclei.
144. **Statement I:** The fibrous root system is better adapted than the tap root system for anchorage to the soil.
Statement II: The primary root and its branches constitute tap root system.
 In the light of the above statements, choose the correct answer from the options given below:
 (a) Both Statement I and Statement II are incorrect
 (b) Statement I is correct but Statement II is incorrect
 (c) Statement I is incorrect but Statement II is correct
 (d) Both Statement I and Statement II are correct
145. The given figure shows the regions of root tip with labelling as A, B and C. Choose the option which shows the correct labelling of A, B and C.



- (a) A - Zone of elongation, B - Zone of meiosis, C - Zone of mitosis.

- (b) A - Zone of maturation, B - Zone of meristematic activity, C - Zone of elongation.
 (c) A - Zone of mitosis, B - Zone of elongation, C - Zone of root cap.
 (d) A - Region of maturation, B - Region of elongation, C - Zone of meristematic activity.

146. **Statement I:** Root cap protects the root meristem from the friction of the soil and its outer cells are continuously replaced by newer ones.

Statement II: The effect of the soil-friction damages the outer cells of root cap which are peeled off and replaced by new cells produced by root meristem.

- (a) Both Statement I and Statement II are incorrect
 (b) Statement I is correct but Statement II is incorrect
 (c) Statement I is incorrect but Statement II is correct
 (d) Both Statement I and Statement II are correct

147. **Assertion:** A network of food chains existing together in an ecosystem is known as food web.

Reason: An animal like kite cannot be a part of a food web.

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

- (a) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
 (b) (A) is correct but (R) is not correct
 (c) (A) is not correct but (R) is correct
 (d) Both (A) and (R) are correct and (R) is the correct explanation of (A)
148. A somatic cell that has just completed the S phase of its cell cycle, as compared to gamete of the same species, has :
 (a) same number of chromosomes but twice the amount of DNA
 (b) twice the number of chromosomes and four times the amount of DNA
 (c) four times the number of chromosomes and twice the amount of DNA
 (d) twice the number of chromosomes and twice the amount of DNA
149. Which one of the following concerns photophosphorylation ?

- (a) $\text{AMP} + \text{Inorganic PO}_4 \xrightarrow{\text{Light energy}} \text{ATP}$
 (b) $\text{ADP} + \text{AMP} \xrightarrow{\text{Light energy}} \text{ATP}$
 (c) $\text{ADP} + \text{Inorganic PO}_4 \xrightarrow{\text{Light energy}} \text{ATP}$
 (d) $\text{ADP} + \text{Inorganic PO}_4 \longrightarrow \text{ATP}$

150. In Chlorophyceae, sexual reproduction occurs by

- (a) Isogamy and anisogamy
- (b) Isogamy, anisogamy and oogamy
- (c) Oogamy only
- (d) Anisogamy and oogamy

PART-IV : ZOOLOGY

SECTION-A

151. Which of the following statement is wrong regarding chitin?

- (a) It is a storage polysaccharide.
- (b) It is a complex polysaccharide.
- (c) It is a constituent of arthropods and fungal cell wall.
- (d) They have amino-sugars.

152. Which one of the following statement is correct?

- (a) Amphibians like frogs can respire through their moist skin.
- (b) In all animals only oxygen is transported by blood.
- (c) All animals and plants need oxygen for respiration.
- (d) All of the above

153. Read the following statements and choose the correct option.

Statement I : Atria receive blood from all parts of the body which subsequently flows to ventricles.

Statement II : Action potential generated at sino-atrial node passes from atria to ventricles.

- (a) Action mentioned in statement I is dependent on action mentioned in Statement II
- (b) Action mentioned in Statement II is dependent on action mentioned in Statement I
- (c) Action mentioned in Statement I and II are independent of each other
- (d) Action mentioned in statement I and II are synchronous.

154. Match the following columns.

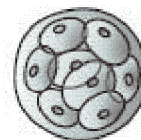
Column I			Column II		
A.	Fast muscle fibre		I.	Myoglobin	
B.	Slow muscle fibres		II.	Lactic acid	
C.	Actin filament		III.	Contractile unit	
D.	Sarcomere		IV.	I-band	
(A)	(B)	(C)	(D)		
(a)	I	II	IV	III	
(b)	II	I	III	IV	
(c)	II	I	IV	III	
(d)	III	II	IV	I	

155. **Statement I:** In vasectomy, a small part of the vas deferens is removed or tied up.

Statement II: In tubectomy, a small part of the fallopian tube is removed or tied up.

- (a) Both Statement I and Statement II are incorrect
- (b) Statement I is correct but Statement II is incorrect
- (c) Statement I is incorrect but Statement II is correct
- (d) Both Statement I and Statement II are correct

156. The given figure represent a stage of embryonic development. Identify the stage with its feature.



- (a) Blastocysts, ready to fertilize with sperm.
- (b) Secondary oocyte, implants on endometrial layer of uterus.
- (c) Morula, formed by mitotic division of zygote.
- (d) Ovary, produce female gamete and secretes hormones like estrogen etc

157. Which of the following statements are correct?

- (i) Somatic nervous system- Conducts impulses from CNS to skeletal muscles.
- (ii) Autonomic nervous system- Conduct impulses from CNS to internal organ muscles.
- (iii) Central nervous system- Consists of brain and spinal cord
- (iv) Visceral nervous system- Consists of nerves carrying impulses to brain and spinal cord only
- (a) Only (ii) and (iii) (b) Only (iii) and (iv)
- (c) Only (i), (ii) and (iii) (d) All of these

158. **Statement I:** Acetylcholine is released when the neural signal reaches to the motor end-plate.

Statement II: Muscle contraction is initiated by signals sent by CNS via a sensory neuron.

- (a) Both Statement I and Statement II are incorrect
- (b) Statement I is correct but Statement II is incorrect
- (c) Statement I is incorrect but Statement II is correct
- (d) Both Statement I and Statement II are correct

159. **Statement I:** All the elements present in a sample of earth's crust are also present in a sample of living tissue.

Statement II: Relative abundance of carbon and hydrogen are same in living organism and in earth crust.

- (a) Both Statement I and Statement II are incorrect
- (b) Statement I is correct but Statement II is incorrect
- (c) Statement I is incorrect but Statement II is correct
- (d) Both Statement I and Statement II are correct

- 160.** The enzyme used for joining two DNA fragments is called:
 (a) ligase
 (b) restriction endonuclease
 (c) DNA polymerase
 (d) gyrase
- 161.** The linking of antibiotic resistance gene with the plasmid vector became possible with
 (a) DNA ligase
 (b) Endonucleases
 (c) DNA polymerase
 (d) Exonucleases
- 162.** Gel electrophoresis is used for
 (a) cutting of DNA into fragments
 (b) separation of DNA fragments according to their size
 (c) construction of recombinant DNA by joining with cloning vectors
 (d) isolation of DNA molecule
- 163.** DNA or RNA segment tagged with a radioactive molecule is called
 (a) Vector (b) Probe
 (c) Clone (d) Plasmid
- 164.** Which ion is essential for muscle contraction?
 (a) Na⁺ (b) K⁺
 (c) Ca²⁺ (d) Cl⁻
- 165.** Which one of the following organs in the human body is most affected due to shortage of oxygen?
 (a) Intestine (b) Skin
 (c) Kidney (d) Brain
- 166.** In the chemistry of vision in mammals, the photosensitive substance is called
 (a) sclerotin (b) retinol
 (c) rhodopsin (d) melanin
- 167.** Vaccine against polio viruses is an example of
 (a) auto-immunization
 (b) passive immunization
 (c) active immunization
 (d) simple immunization
- 168.** Egg is liberated from ovary in
 (a) secondary oocyte stage
 (b) primary oocyte stage
 (c) oogonial stage
 (d) mature ovum stage
- 169.** Animals that can tolerate a narrow range of salinity are
 (a) stenohaline (b) euryhaline
 (c) anadromous (d) catadromous
- 170.** The most important component of the oral contraceptive pills is
 (a) Progesterone
 (b) Growth hormone
 (c) Thyroxine
 (d) Luteinizing hormone
- 171.** Foetal ejection reflex in human female is induced by
 (a) release oxytocin from pituitary
 (b) fully developed foetus and placenta
 (c) differentiation of mammary glands
 (d) pressure exerted by amniotic fluid
- 172.** In human female the blastocyst
 (a) Forms placenta even before implantation
 (b) Gets implanted into uterus 3 days after ovulation
 (c) Gets nutrition from uterine endometrial secretion only after implantation
 (d) Gets implanted in endometrium by the trophoblast cells
- 173.** What was the most significant trend in evolution of modern man (*Homo sapiens*) from his ancestors?
 (a) Upright posture
 (b) Shortening of jaws
 (c) Binocular vision
 (d) Increasing brain capacity
- 174.** **Statement I:** The digestive system in platyhelminthes has only a single opening and serves as both mouth and anus.
Statement II: Organ level of organisation is exhibited by members of platyhelminthes.
 In the light of the above statements, choose the correct answer from the options given below:
 (a) Both Statement I and Statement II are incorrect
 (b) Statement I is correct but Statement II is incorrect
 (c) Statement I is incorrect but Statement II is correct
 (d) Both Statement I and Statement II are correct
- 175.** Myoglobin is present in
 (a) all muscle fibres
 (b) white muscle fibres only
 (c) red muscle fibres only
 (d) both white and red muscle fibres
- 176.** Man, in the life cycle of *Plasmodium*, is
 (a) primary host
 (b) secondary host
 (c) intermediate host
 (d) None of these
- 177.** The most active phagocytic white blood cells are
 (a) neutrophils and monocytes
 (b) neutrophils and eosinophils
 (c) lymphocytes and macrophages
 (d) eosinophils and lymphocytes

178. Human insulin is being commercially produced from a transgenic species of

- (a) *Escherichia*
- (b) *Mycobacterium*
- (c) *Rhizobium*
- (d) *Saccharomyces*

179. Obstacle to large scale transplantation of organs is

- (a) insufficiency of organ donors
- (b) immunological rejection of foreign bodies
- (c) religious or ethnic considerations
- (d) lack of effective surgical techniques

180. Statement I: Exonucleases are restriction enzymes, which cut DNA internally.

Statement II: Endonuclease can destroy both DNA and RNA.

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

- (a) Both Statement I and Statement II are incorrect
- (b) Statement I is correct but Statement II is incorrect
- (c) Statement I is incorrect but Statement II is correct
- (d) Both Statement I and Statement II are correct

181. Toxic substances are detoxified in human body in

- (a) kidney
- (b) lungs
- (c) liver
- (d) stomach

182. Choose the correct option with appropriate medium of circulation and transport against each animal.

Column-I

- A. Hydra
- B. *Octopus*
- C. Prawn
- D. Sponges
- (a) A-(iii)
- (c) B-(ii)

Column-II

- (i) Water surrounding the body
- (ii) Haemolymph
- (iii) Blood
- (iv) Have blood
- (b) B-(iii)
- (d) C-(i)

183. Which cells do not form layer and remain structurally separate?

- (a) Epithelial cells
- (b) Muscle cells
- (c) Nerve cells
- (d) Gland cells

184. In an egg, the type of cleavage is determined by

- (a) shape and size of the sperm
- (b) size and location of the nucleus
- (c) amount and distribution of yolk
- (d) number of egg membranes

185. Select the option including all sexually transmitted diseases.

- (a) Gonorrhoea, Malaria, Genital herpes
- (b) AIDS, Malaria, Filariasis
- (c) Cancer, AIDS, Syphilis
- (d) Gonorrhoea, Syphilis, Genital herpes

SECTION-B

186. Which of the following changes occur in diaphragm and intercostal muscles when expiration of air takes place?

- (a) Internal intercostal muscles relax and diaphragm contracts
- (b) External intercostal muscles and diaphragm relaxes
- (c) Internal intercostal muscles contract and diaphragm relax
- (d) External intercostal muscles and diaphragm contract

187. Match the bones of column A with their corresponding number in column B.

Column A

- A. True ribs
- B. Cervical vertebrae
- C. Cranium bones
- D. Vertebrochondral ribs

Column B

- (i) 14
- (ii) 7
- (iii) 8
- (iv) 6

- (a) A-(ii), B-(iii), C-(i), D-(iv)
- (b) A-(i), B-(ii), C-(iii), D-(iv)
- (c) A-(ii), B-(iii), C-(iv), D-(iii)
- (d) A-(i), B-(iii), C-(ii), D-(iv)

188. The stage transferred into the uterus after induced fertilization of ova in the laboratory is

- (a) Zygote
- (b) Embryo at 4 blastomere stage
- (c) Embryo at 2 blastomere stage
- (d) Morula

189. Match the following columns.

Column I

- A. Fast muscle fibre
- B. Slow muscle fibres
- C. Actin filament
- D. Sarcomere

Column II

- (i) Myoglobin
- (ii) Lactic acid
- (iii) Contractile unit
- (iv) I-band

- (a) A-(i), B-(ii), C-(iv), D-(iii)
- (b) A-(ii), B-(i), C-(iii), D-(iv)
- (c) A-(ii), B-(i), C-(iv), D-(iii)
- (d) A-(iii), B-(ii), C-(iv), D-(i)

190. Statement I: The head of sperm contains materials which helps in sex-determinate in foetus.

Statement II: The function of mitochondria in sperm is to provide energy for the movement of sperm.

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

- (a) Both Statement I and Statement II are incorrect
- (b) Statement I is correct but Statement II is incorrect
- (c) Statement I is incorrect but Statement II is correct
- (d) Both Statement I and Statement II are correct

191. Reproductive health in society can be improved by –

- (i) Introduction of sex education in schools.
- (ii) Increased medical assistance.
- (iii) Awareness about contraception and STDs.
- (iv) Equal opportunities to male and female child.
- (v) Ban on aminocentesis.

- (a) All of these
- (b) (i), (ii) and (iv)
- (c) (i), (ii), (iii), (iv) and (v)
- (d) (ii) and (v)

192. Choose the wrong statement regarding urine formation

- (a) Filtration is non-selective process performed by glomerulus
- (b) The glomerular capillary blood pressure causes filtration of blood through three layers
- (c) GFR in a healthy individual is approximately 125 ml/min
- (d) The ascending limb of the Henle's loop is permeable to water but allows transport of electrolytes actively or passively

193. Adaptive radiation refers to

- (a) evolution of different species from a common ancestor
- (b) migration of members of a species to different geographical areas
- (c) power of adaptation in an individual to a variety of environments
- (d) adaptations due to geographical isolation.

194. Match the following and choose the correct options.

Column I	Column II
A. Trophoblast	(i) Embedding of blastocyst in the endometrium
B. Cleavage	(ii) Group of cells that would differentiate as embryo

C. Inner cell mass

(iii) Outer layer of blastocyst attached to the endometrium

D. Implantation

(iv) Mitotic division of zygote

- (a) A-(ii), B-(i), C-(iii), D-(iv)
- (b) A-(iii), B-(iv), C-(ii), D-(i)
- (c) A-(iii), B-(i), C-(ii), D-(iv)
- (d) A-(ii), B-(iv), C-(iii), D-(i)

195. The incorrect statement with regard to Haemophilia is :

- (a) It is a recessive disease
- (b) It is a dominant disease
- (c) A single protein involved in the clotting of blood is affected
- (d) It is a sex-linked disease

196. Which of the following forms the basis of DNA finger printing?

- (a) The relative proportions of purines and pyrimidines in DNA.
- (b) Satellite DNA occurring as highly repeated short DNA segments.
- (c) The relative difference in the DNA occurrence in blood, skin and saliva.
- (d) The relative amount of DNA in the ridges and grooves of the fingerprints.

197. Match column-I (function) with column-II (types of enzymes) and select the correct option.

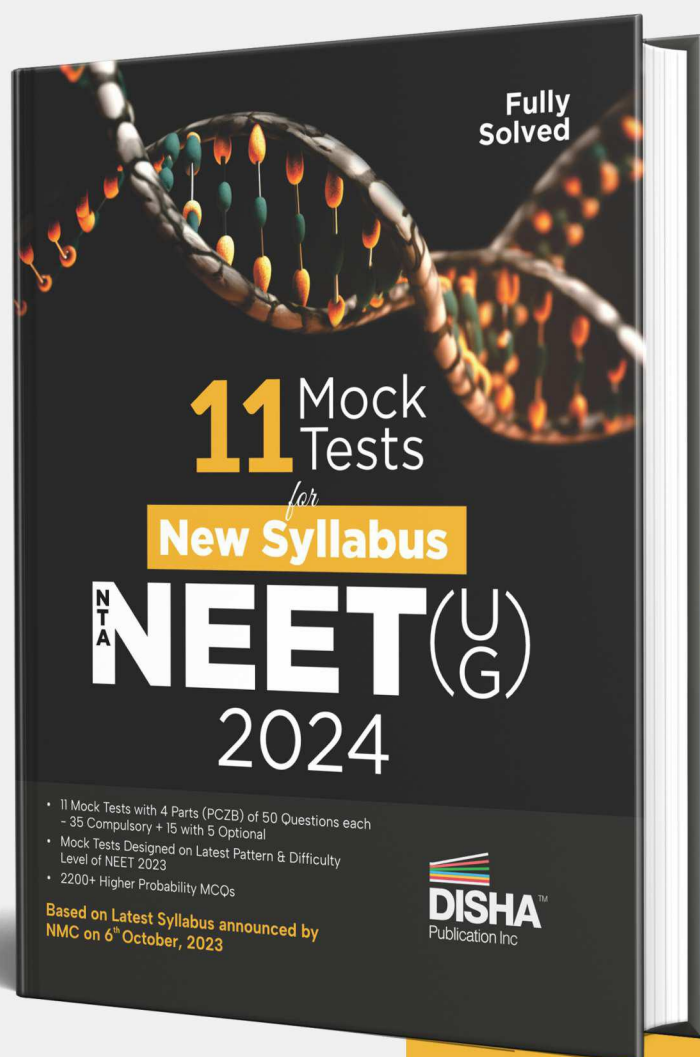
Column-I (Function)	Column-II (Types of enzymes)
A. Enzyme catalyses breakdown without addition of water.	(i) Isomerases
B. Enzyme catalyses the conversion of an aldose sugar to a ketose sugar.	(ii) Oxido-reductase
C. Enzyme catalyses transfer of electrons from one molecule to another.	(iii) Ligases
D. Enzyme catalyses bonding of two components with the help of ATP.	(iv) Lyases

- (a) A-(i), B-(iv), C-(iii), D-(ii)
(b) A-(i), B-(iv), C-(ii), D-(iii)
(c) A-(iv), B-(i), C-(ii), D-(iii)
(d) A-(iv), B-(i), C-(iii), D-(ii)
- 198.** In which of the following options the types of heart is correctly matched to their respective group of animals?
(a) Two chambered heart- Fishes and amphibians
(b) Three chambered heart- Amphibians and birds
(c) Four chambered heart- Birds and mammals
(d) Three chambered heart- Reptiles and mammals
- 199.** Diabetes insipidus is a condition in which a person is unable to produce sufficient levels of the hormone ADH. The hormone increases the permeability to water of the second (distal) convoluted tubule and collecting duct in the kidney nephrons. What is produced as a result?
- (a) large volumes of concentrated urine
(b) large volumes of dilute urine
(c) small volumes of concentrated urine
(d) small volumes of dilute urine
- 200.** Thorn of *Bougainvillea* and tendrils of cucurbita are example of
(a) analogous organs
(b) homologous organs
(c) vestigial organs
(d) retrogressive evolution



Strictly Based on the **new Syllabus** of NMC for **NEET** **2024**


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Hints & Solutions

Mock Test-1

PART-I: PHYSICS

SECTION-A

1. (d) We have

$$V = 3x^2 \text{ Volt}$$

$$E_x = -\frac{\partial V}{\partial x} = -6x \Rightarrow E_{x/x=1} = -6$$

$$E_y = -\frac{\partial V}{\partial y} = 0$$

$$E_z = -\frac{\partial V}{\partial z} = 0$$

$$\text{So, } |\vec{E}| = \sqrt{-6^2 + 0^2 + 0^2} = 6$$

$$\text{In vector form, } \vec{E} = -6\hat{i}V/m$$

2. (d)
- $y \propto \frac{1}{\sin^4 \frac{\theta}{2}}$

$$\text{at } \theta = 0 \Rightarrow y \rightarrow \infty$$

$$\text{at } \theta = \pi \Rightarrow y \text{ is a small finite value.}$$

3. (c) Initial length = Final length

$$\Rightarrow 4 \times 2\pi R_i = 2\pi R_f \Rightarrow R_f = 4R_i$$

$$\text{As } B = \frac{\mu_0 i}{2R} \times n \Rightarrow B \propto \frac{n}{R}$$

$$\Rightarrow \frac{B_2}{B_1} = \frac{n_2}{n_1} \times \frac{R_1}{R_2} = \frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$$

$$\text{So, } B_2 = \frac{B_1}{16} = \frac{32}{16} = 2T$$

4. (d) Density of nucleus,
- $\rho = \frac{\text{Mass}}{\text{Volume}} = \frac{mA}{\frac{4}{3}\pi R^3}$

$$\Rightarrow \rho = \frac{mA}{\frac{4}{3}\pi(R_0 A^{1/3})^3} \quad (\because R = R_0 A^{1/3})$$

Here m = mass of a nucleon

$$\therefore \rho = \frac{3 \times 1.67 \times 10^{-27}}{4 \times 3.14 \times (1.3 \times 10^{-15})^3} \quad (\text{Given, } R_0 = 1.3 \times 10^{-15})$$

$$\Rightarrow \rho = 2.38 \times 10^{17} \text{ kg/m}^3$$

5. (c)

Type of gases	No. of degrees of freedom
Monoatomic gas	3T
Diatomic + rigid	3T + 2R
Diatomic + non-rigid	3T + 2R + 1V
Polyatomic	3T + 3R + More than 1V

T = Translational degree of freedom

R = Rotational degree of freedom

V = Vibrational degree of freedom

6. (c) de-Broglie wavelength is given by

$$\lambda = \frac{h}{\sqrt{2mK}}$$

Let mass of proton = m_p

Mass of alpha particle = $4m_p$

Mass of electron = m_e

$$\lambda_e = \frac{h}{\sqrt{2m_e K E_e}} = \frac{h}{\sqrt{2m_e 4K}} = \frac{h}{\sqrt{8m_e K}}$$

$$\lambda_p = \frac{h}{\sqrt{2m_p K}}$$

$$\lambda_\alpha = \frac{h}{\sqrt{2m_\alpha K_\alpha}} = \frac{h}{\sqrt{2 \times 2m_p \times 2K}} = \frac{h}{\sqrt{8m_p K}}$$

It is clear $\lambda_p > \lambda_e$

As $m_e \ll m_p$

$$\therefore \lambda_e > \lambda_p$$

\therefore Correct order will be $\lambda_\alpha < \lambda_p < \lambda_e$

7. (d) K.E. =
- $\frac{p^2}{2m}$

$$\therefore \frac{K_1}{K_2} = \frac{p_1^2}{2m_1} \times \frac{2m_2}{p_2^2} = \frac{m_2}{m_1} = \frac{16}{9}$$

$$\therefore \frac{m_1}{m_2} = \frac{9}{16}$$

8. (b) Let r be the radius of small drops of water.

R = radius of big drop formed

as volume remain same.

$$\therefore 8 \cdot \frac{4}{3}\pi r^3 = \frac{4}{3}\pi R^3 \Rightarrow R = 2r$$

Terminal velocity,

$$v_T = \frac{2}{9\eta}(\rho - \sigma)r^2g$$

$$\therefore v_T \propto r^2$$

$$\therefore \frac{v_1}{v_2} = \left(\frac{r}{R}\right)^2$$

$$\Rightarrow \frac{10}{v_2} = \left(\frac{1}{2}\right)^2$$

$$(\because v_1 = 10 \text{ cm/s given})$$

$$\Rightarrow v_2 = 40 \text{ cm/s}$$

9. (b) Here, b and
- $x^2 = L^2$
- have same dimensions

$$\text{Also, } a = \frac{x^2}{E \times t} = \frac{L^2}{(M L^2 T^{-2}) T} = M^{-1} T^1$$

$$a \times b = [M^{-1} L^2 T]$$

10. (d) Let u be the initial velocity that have to find and a be the uniform acceleration of the particle.

For $t = 3$ s, distance travelled $S = 12$ m and

for $t = 3 + 3 = 6$ s distance travelled

$$S' = 12 + 30 = 42 \text{ m}$$

$$\text{From, } S = ut + \frac{1}{2}at^2$$

$$12 = u \times 3 + \frac{1}{2} \times a \times 3^2$$

$$\text{or } 24 = 6u + 9a \quad \dots(i)$$

$$\text{Similarly, } 42 = u \times 6 + \frac{1}{2} \times a \times 6^2$$

$$\text{or } 42 = 6u + 18a \quad \dots(ii)$$

On solving, we get $u = 1 \text{ m s}^{-1}$

11. (c) Time to complete $1/4$ th oscillation is $\frac{T}{4}$ s. Time to

complete $\frac{1}{8}$ th vibration from extreme position is obtained from

$$y = \frac{a}{2} = a \cos \omega t = a \cos \frac{2\pi}{T}t \text{ or } t = \frac{T}{6} \text{ s}$$

So time to complete $3/8$ th oscillation

$$= \frac{T}{4} + \frac{T}{6} = \frac{5T}{12}$$

12. (d) According to Faraday's law of electro-magnetic induction,

$$\text{Induced emf, } e = \frac{L di}{dt}$$

$$50 = L \left(\frac{5-2}{0.1 \text{ sec}} \right)$$

$$\Rightarrow L = \frac{50 \times 0.1}{3} = \frac{5}{3} = 1.67 \text{ H}$$

13. (c) Work function of aluminium is 4.2 eV. The energy of two photons can not be added at the moment photons collide with electron all its energy will be dissipated or wasted as this energy is not sufficient to knock it out. Hence emission of electron is not possible.

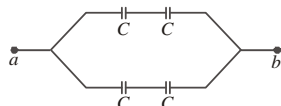
14. (a) Current flowing through the conductor,

$$I = nev_d A. \text{ Hence}$$

$$\frac{4}{1} = \frac{nev_{d1} \pi(1)^2}{nev_{d2} \pi(2)^2} \text{ or } \frac{v_{d1}}{v_{d2}} = \frac{4 \times 4}{1} = \frac{16}{1}$$

15. (a) The equivalent circuit is shown in figure

$$\text{Thus, } C_{ab} = C = \frac{\epsilon_0 A}{d}$$



16. (a) Given : $T/2 = 0.5$ s

$$\therefore T = 1 \text{ s}$$

$$\text{Frequency, } f = \frac{1}{T} = \frac{1}{1} = 1 \text{ Hz}$$

If A is the amplitude, then

$$2A = 50 \text{ cm} \Rightarrow A = 25 \text{ cm.}$$

17. (d) Unit positive charge at O will be repelled equally by three charges at the three corners of triangle.

By symmetry, resultant \vec{E} at O would be zero.

$$18. (b) \frac{\Delta \ell}{\ell} = \alpha \Delta T = 10^{-5} \times 100 = 10^{-3}$$

$$\frac{\Delta \ell}{\ell} \times 100\% = 10^{-3} \times 100$$

$$= 10^{-1} = 0.1\%$$

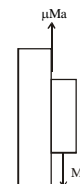
19. (d) Force on $M = Mg$

$$\text{Reaction force} = Ma$$

$$\text{force of friction} = \mu R = \mu Ma$$

Force of friction will balance the weight. So

$$\mu Ma \geq Mg ; \mu \geq \frac{g}{a}$$



20. (a) According to question, one half of its kinetic energy is converted into heat in the wood.

$$\frac{1}{2}mv^2 \times \frac{1}{2} = ms\Delta T$$

$$\Rightarrow \Delta T = \frac{v^2}{4 \times s} = \frac{210 \times 210}{4 \times 4.2 \times 0.3 \times 1000} = 87.5^\circ \text{C}$$

21. (a)

22. (a) According to Stefan's law

$$E = \sigma T^4$$

Heat radiated per unit area in 1 hour (3600s) is

$$= 5.7 \times 10^{-8} \times (3000)^4 \times 3600 = 1.7 \times 10^{10} \text{ J}$$

23. (d) Total charge $Q_1 + Q_2 = Q'_1 + Q'_2$

$$= 12\mu\text{C} - 3\mu\text{C} = 9\mu\text{C}$$

Two isolated conducting spheres S_1 and S_2 are now connected by a conducting wire.

$$\therefore V_1 = V_2 = \frac{KQ'_1}{\frac{2}{3}R} = \frac{KQ'_2}{\frac{R}{3}} = 12 - 3 = 9\mu\text{C}$$

$$Q'_1 = 2Q'_2 \Rightarrow 2Q'_2 + Q'_2 = 9\mu\text{C}$$

$$\therefore Q'_1 = 6\mu\text{C} \text{ and } Q'_2 = 3\mu\text{C}$$

24. (b) The bullets are fired at the same initial speed

$$\frac{H}{H'} = \frac{u^2 \sin^2 60^\circ}{2g} \times \frac{2g}{u^2 \sin^2 30^\circ} = \frac{\sin^2 60^\circ}{\sin^2 30^\circ}$$

$$= \frac{(\sqrt{3}/2)^2}{(1/2)^2} = \frac{3}{1}$$

25. (d) Total resistance of the circuit

$$= 4000 + 400 = 4400 \Omega$$

$$\text{Current flowing } i = \frac{V}{R} = \frac{440}{4400} = 0.1 \text{ amp.}$$

Voltage across load = Ri

$$= 4000 \times 0.1 = 400 \text{ volt.}$$

26. (c) Phase difference = ϕ

$$\text{Path diff} = \frac{\lambda}{2\pi} \times \text{phase diff} = \frac{\lambda}{2\pi} \phi$$

27. (d) Velocity after the collision

$$= \frac{10 \times 10 + 5 \times 0}{15} = \frac{100}{15} = \frac{20}{3} \text{ m/sec.}$$

28. (c) The centre of mass remains at rest because force of attraction is mutual. No external force is acting.

29. (c) $v_{\text{oxg.}} = \sqrt{\frac{3R \times 289}{32}} \quad \left(v_{\text{rms}} = \sqrt{\frac{3RT}{M}} \right)$

$$v_H = \sqrt{\frac{3R \times 400}{2}} \text{ so } v_H = 2230.59 \text{ m/sec}$$

30. (a) $\xrightarrow{P} \text{---} \xrightarrow{n}$

For forward bias, p-side must be at higher potential than n-side. $\Delta V = (+)Ve$.

31. (c) The direction of oscillations of E and B fields are perpendicular to each other as well as to the direction of propagation. So, electromagnetic waves are transverse in nature.

The electric and magnetic fields oscillate in same phase.

32. (a) The kinetic energy is directly proportional to temperature.

33. (a) Let pressure outside be P_0

$$\therefore P_1 \text{ (in smaller bubble)} = P_0 + \frac{2T}{r}$$

$$P_2 \text{ (in bigger bubble)} = P_0 + \frac{2T}{R} \quad (R > r)$$

$$\therefore P_1 > P_2$$

hence air moves from smaller bubble to bigger bubble.

34. (b) $\frac{3\lambda}{2} = 2$ or $\lambda = \frac{4}{3} \text{ m}$

$$\text{Velocity, } v = f\lambda = 240 \times \frac{4}{3} = 320 \text{ m/sec}$$

$$\text{Also } f_1 = \frac{240}{3} = 80 \text{ Hz}$$

35. (b) Distance in last two second

$$= \frac{1}{2} \times 10 \times 2 = 10 \text{ m.}$$

$$\text{Total distance} = \frac{1}{2} \times 10 \times (6 + 2) = 40 \text{ m.}$$

SECTION-B

36. (c)

37. (a) Positive charge particle moves in the direction of field and so the right trend is : Top, down, top, down.

38. (c)

39. (a) $K.E. = h\nu - h\nu_{\text{th}} = eV_0$ (V_0 = cut off voltage)

$$\Rightarrow V_0 = \frac{h}{e} (8.2 \times 10^{14} - 3.3 \times 10^{14})$$

$$= \frac{6.6 \times 10^{-34} \times 4.9 \times 10^{14}}{1.6 \times 10^{-19}} \approx 2 \text{ V.}$$

40. (b) Diamagnetic substances tend to move from stronger to weaker part of the field.

Magnetic susceptibility of diamagnetic substance is negative.

41. (a)

42. (c) **Given :** Work done, $W = 830 \text{ J}$

No. of moles of gas, $\mu = 2$

For diatomic gas $\gamma = 1.4$

Work done during an adiabatic change

$$W = \frac{\mu R(T_1 - T_2)}{\gamma - 1}$$

$$\Rightarrow 830 = \frac{2 \times 8.3(\Delta T)}{1.4 - 1} = \frac{2 \times 8.3(\Delta T)}{0.4}$$

$$\Rightarrow \Delta T = \frac{830 \times 0.4}{2 \times 8.3} = 20 \text{ K}$$

43. (d) **Given,**

Boiling point of water, = UFP 65°

Freezing point of water, = LFP -15°

$$\frac{X - \text{LFP}}{\text{UFP} - \text{LFP}} = \frac{T_F - 32}{212 - 32}$$

$$\Rightarrow \frac{-95 - (-15)}{65 - (-15)} = \frac{T_F - 32}{180}$$

$$\Rightarrow \frac{-80}{80} = \frac{T_F - 32}{180} \Rightarrow T_F = -180 + 32$$

$$\Rightarrow T_F = -148^\circ \text{ F}$$

44. (c) **Given,** $V_L : V_C : V_R = 1 : 2 : 3$

$$V = 100 \text{ V}$$

$$V_R = ?$$

As we know,

$$V = \sqrt{V_R^2 + (V_L - V_C)^2}$$

Solving we get, $V_R \approx 90 \text{ V}$

45. (d) Gravitational field, $I = (5\hat{i} + 12\hat{j}) \text{ N/kg}$

$$I = -\frac{dv}{dr}$$

$$v = -\left[\int_0^x I_x dx + \int_0^y I_y dy \right]$$

$$= -[I_x \cdot x + I_y \cdot y]$$

$$= -[5(7-0) + 12(-3-0)]$$

$$= -[35 + (-36)] = 1 \text{ J/kg}$$

i.e., change in gravitational potential

1 J/kg.

Hence change in gravitational potential energy 1 J

46. (a) $G = 15\Omega$, $i_g = 4 \text{ mA}$, $i = 6 \text{ A}$

Required shunt,

$$S = \left(\frac{i_g}{i - i_g} \right) G = \left(\frac{4 \times 10^{-3}}{6 - 4 \times 10^{-3}} \right) \times 15$$

$$= \frac{4 \times 10^{-3}}{5.996} \times 15$$

$$= 10 \text{ m}\Omega \text{ (in parallel)}$$

47. (a) $\frac{f_0}{f_e} = 9$, $\therefore f_0 = 9f_e$
 Also $f_0 + f_e = 20$ (\because final image is at infinity)
 $9f_e + f_e = 20$, $f_e = 2$ cm, $\therefore f_0 = 18$ cm

48. (d) Here, $N - mg = ma = \frac{mg}{2} \Rightarrow N = \frac{3mg}{2}$

N = normal reaction

Now, work done by normal reaction ' N ' on

block in time t , $W = \vec{N} \cdot \vec{S} = \left(\frac{3mg}{2} \right) \left(\frac{1}{2} g t^2 \right)$

$$\text{or, } W = \frac{3mg^2 t^2}{8}$$

49. (d) Net Power, P
 $= 15 \times 45 + 15 \times 100 + 15 \times 10 + 2 \times 1000$
 $= 15 \times 155 + 2000$ W

Power, $P = VI$

$$\Rightarrow I = \frac{P}{V}$$

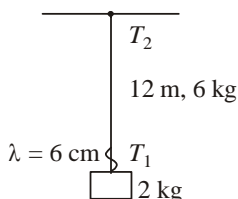
$$\therefore I_{\text{main}} = \frac{15 \times 155 + 2000}{220} = 19.66 \text{ A} \approx 20 \text{ A}$$

50. (c) Using, $V = f\lambda$

$$\frac{V_1}{\lambda_1} = \frac{V_2}{\lambda_2} \Rightarrow \lambda_2 = \frac{V_2}{V_1} \lambda_1$$

Again using,

$$n = \frac{V}{\lambda} = \sqrt{\frac{T}{M}} \lambda_2 = \sqrt{\frac{T_2}{T_1}} \lambda_1 \quad T_2 = 8g \text{ (Top)}$$



PART-II: CHEMISTRY

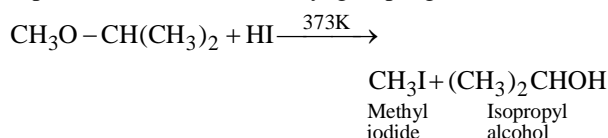
SECTION-A

51. (c) A – (r), B – (q), C – (p), D – (s)
52. (d) Magnetic quantum number determines the orientation of the orbital.
53. (d) In BF_3 , hybridisation is sp^2 and number of electrons are 6.
54. (b)
55. (c) A – (p), B – (r), C – (q), D – (s)
56. (a) Si, Ge, As are metalloids and show properties in between these of metals and non-metals.
57. (b) Atomic orbitals having same or nearly same energy will not combine if they do not have the same symmetry. $2p_z$ orbital of one atom cannot combine with $2p_x$ or $2p_y$ orbital of other atom because of their different symmetries.
58. (a) $\text{A}_2(\text{g}) + \text{B}_2(\text{g}) \rightleftharpoons \text{X}_2(\text{g}); \Delta H = -x \text{ kJ}$
 On increasing pressure, equilibrium shifts in a direction where number of moles decreases *i.e.*, forward direction.
 On decreasing temperature, equilibrium shifts in exothermic direction *i.e.*, forward direction.
- So, high pressure and low temperature favours maximum formation of product.
59. (b) $\text{K}_2\text{O} : 2x - 2 = 0 \Rightarrow x = +1$
 $\text{K}_2\text{O}_2 : 2x - 2 = 0 \Rightarrow x = +1$
 $\text{KO}_2 : x - 1 = 0 \Rightarrow x = +1$
 Thus, potassium shows +1 state in all its oxides, superoxides and peroxides.
60. (a) A – (s), B – (r), C – (p), D – (q)
61. (a) Zinc metal which has a more negative electrode potential than iron, hence it will provide electrons in preference of the iron, and therefore corrodes first. Only when all the zinc has been oxidised, the iron starts to rust.
62. (d) Kjeldahl method is not applicable to any of the given compounds. As nitrogen of these compounds does not change to ammonium sulphate on heating with conc. H_2SO_4 .
63. (b) For zero order reaction,
 $\text{rate, } r = k[\text{R}]^0 \Rightarrow \text{rate} = \frac{-d[\text{R}]}{dt} = k \times 1$
 $\Rightarrow d[\text{R}] = k dt \Rightarrow [\text{R}] = -kt + \text{R}_0$
 where R_0 is the concentration of reactant at time $t = 0$.
 Thus, $[\text{R}]$ decreases with time t .
64. (a) $\begin{array}{c} \text{:}\ddot{\text{O}}\text{--H} \\ | \\ \text{CH}_3\text{--C=CH}_2 \end{array}$
 has $9\sigma, 1\pi$ and 2 lone pairs.
65. (b) For combustion reaction, ΔH is negative,
 $\Delta n = (16 + 18) - (25 + 2) = +7$,
 so ΔS is +ve, reaction is spontaneous, hence ΔG is –ve.
66. (b) Reagents used in the various steps indicate that the compound Z has an alcoholic group. This set of reactions is possible only when Z is $\text{CH}_3\text{CHOHCH}_3$.
 In options a and c, Y cannot be converted back into d by the given series of reactions.
67. (c) Chlorination of methane proceeds via free radical mechanism. Conversion of methyl chloride to methyl alcohol proceeds via nucleophilic substitution. Formation of ethylene from ethyl alcohol proceeds via dehydration reaction. Nitration of benzene is electrophilic substitution reaction.
68. (a)
69. (a) Alkyl iodides are often prepared by the reaction of alkyl chlorides/bromides with NaI in dry acetone. This reaction is known as Finkelstein reaction.
 $\text{R--X} + \text{NaI} \longrightarrow \text{R--I} + \text{NaX}$
 $\text{X} = \text{Cl, Br}$
 NaCl or NaBr thus formed is precipitated in dry acetone. It facilitates the forward reaction according to Le Chatelier's principle. The synthesis of alkyl fluorides is best accomplished by heating an alkyl chloride/bromide in the presence of a metallic fluoride such as AgF, Hg_2F_2 , CoF_2 or SbF_3 . The reaction is termed as Swarts reaction.
 $\text{H}_3\text{C--Br} + \text{AgF} \longrightarrow \text{H}_3\text{C--F} + \text{AgBr}$
70. (a) According to the $(n+1)$ rule the higher the value of $(n+1)$, the higher is the energy. When $(n+1)$ value is the same see value of n .

	i	ii	iii	iv
(n + 1)	(4 + 1)	(4 + 0)	(3 + 2)	(3 + 1)
	5	4	5	4

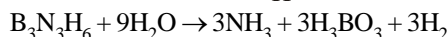
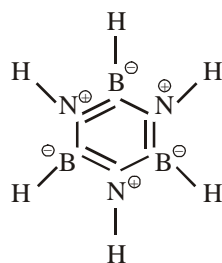
$\therefore \text{iv} < \text{ii} < \text{iii} < \text{i}$

71. (c) Justification : free expansion $w = 0$
adiabatic process $q = 0$
 $\Delta U = q + w = 0$, this means that internal energy remains constant. Therefore,
 $\Delta T = 0$.
72. (b) $\text{Mn}^{2+} (3d^5)$ is more stable than $\text{Mn}^{3+} (3d^4)$.
73. (c) In NH_4NO_3 , there are two different N-atoms (NH_4^+ , NO_3^-) with different oxidation numbers, thus reaction is not disproportionation.
74. (c) In case of unsymmetrical ethers, the site of cleavage depends on the nature of alkyl group e.g.,

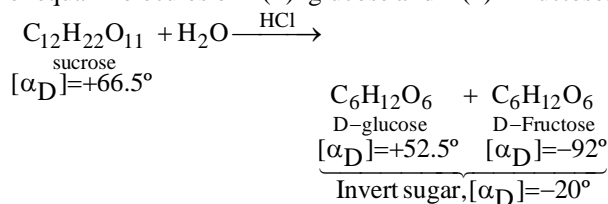


The alkyl halide is always formed from the smaller alkyl group.

75. (c)
76. (b) Borazine is $\text{B}_3\text{N}_3\text{H}_6$. It does not contain banana ($3\text{C} - 2e^-$) bonds.



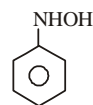
77. (c) $\text{CH}_2 = \overset{\text{sp}^2}{\text{C}} = \overset{\text{sp}^2}{\text{CH}_2}$
78. (b)
79. (c) The hydrolysis of sucrose by boiling with mineral acid or by enzyme invertase or sucrase produces a mixture of equal molecules of D(+)-glucose and D(-)-Fructose.



80. (d) The hydrophilic/ hydrophobic character of amino acid residues is important to tertiary structure of protein rather than to secondary structure. In secondary structure, it is the steric size of the residues that is important and residues are positioned to minimise interactions between each other and the peptide chain.
81. (b)
82. (d) Various products are formed when nitroarenes are reduced. These are given below for $\text{C}_6\text{H}_5\text{NO}_2$.

Medium

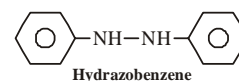
In acidic medium
In neutral medium



Main product

Aniline ($\text{C}_6\text{H}_5\text{NH}_2$) (metal/HCl)
Phenyl hydroxylamine, ($\text{Zn}/\text{NH}_4\text{Cl}$)

In alkaline medium



Thus, Aniline will be main product in case of (d).

83. (d) The equivalent conductivity of a solution,

$$\Lambda_{\text{eq}} = \frac{1000}{C} \times \kappa$$

Where,

κ = specific conductance = Unit $\text{ohm}^{-1} \text{cm}^{-1}$

C = normality of the solution unit g eq/cm³

Hence, the unit of Λ_{eq} is $\text{Ohm}^{-1} \cdot \text{cm}^2 (\text{gm equivalent})^{-1}$.

84. (b)

85. (d) $\mu = \sqrt{n(n+2)}$ B.M. = 3.83 B.M.

$n = 3$ (n = No. of unpaired e^-)

Therefore, oxidation number of Cr should be +3.

Hence complex is $\text{Cr}(\text{H}_2\text{O})_6\text{Cl}_3$.

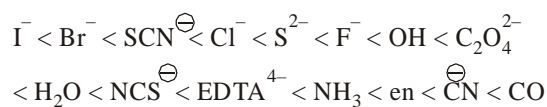
Complex shows geometrical isomerism therefore formula of complex is $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]\text{Cl} \cdot 2\text{H}_2\text{O}$.

IUPAC Name:

Tetraaquadichlorido chromium(III) Chloride dihydrate

SECTION-B

86. (c) $x > y$ because same bonds are formed in reaction (1) and (2) but no bonds are broken in reaction (1) whereas in reaction (2) bonds in the reactant molecules are broken. As energy is absorbed when bonds are broken, energy released in reaction (1) is greater than that in reaction (2).
87. (d) For reaction to proceed from right to left $Q > K_c$ i.e., the reaction will be fast in backward direction.
88. (a) When the lead storage battery is recharged, the reaction occurring on cell is reversed and PbSO_4 (s) on anode and cathode is converted into Pb and PbO_2 respectively. The electrode reactions are as follows :
- Anode reaction:**
 $\text{PbSO}_4 (\text{s}) + 2e^- \rightarrow \text{Pb} (\text{s}) + \text{SO}_4^{2-} (\text{aq})$ (Reduction)
- Cathode reaction:**
 $\text{PbSO}_4 (\text{s}) + 2\text{H}_2\text{O} \rightarrow \text{PbO}_2 (\text{s}) + \text{SO}_4^{2-} (\text{aq}) + 4\text{H}^+ + 2e^-$
(Oxidation)
- Net reaction:**
 $2\text{PbSO}_4 (\text{s}) + 2\text{H}_2\text{O} \rightarrow \text{Pb} (\text{s}) + \text{PbO}_2 (\text{s}) + 4\text{H}^+ (\text{aq}) + 2\text{SO}_4^{2-} (\text{aq})$
89. (d) According to spectrochemical series, the order of ligand field strength is



So, correct order is $\text{SCN}^- < \text{F}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$

90. (d) For a zero order reaction

$$\text{Rate constant} = k = \frac{a-x}{t}$$

$$2 \times 10^{-2} = \frac{a-0.5}{25}$$

$$a-0.5=0.5$$

$$a=1.0 \text{ M}$$

91. (d) Nessler's reagent is $\text{K}_2[\text{HgI}_4]$
Nitrogen is not present in Nessler's reagent

92. (c) $\text{AB} \rightleftharpoons \text{A}^+ \text{B}^-$

$$K_{\text{sp}} = \frac{[\text{A}^+][\text{B}^-]}{[\text{AB}]}$$

Salt will precipitate if ionic conc. $> K_{\text{sp}}$

$$[\text{A}^+][\text{B}^-] > 1 \times 10^{-8}$$

$$(1 \times 10^{-3})[\text{B}^-] > 1 \times 10^{-8}$$

$$[\text{B}^-] > \frac{1 \times 10^{-8}}{1 \times 10^{-3}} \text{ or } 1 \times 10^{-5}$$

93. (a) Given vapour pressure of pure solute

$$(P^0) = 121.8 \text{ mm; Weight of solute (w)} = 15 \text{ g}$$

Weight of solvent (W) = 250 g; Vapour pressure of pure solvent (P) = 120.2 mm and Molecular weight of solvent (M) = 78

From Raoult's law

$$= \frac{P^0 - P}{P^0} = \frac{w}{m} \times \frac{M}{W} = \frac{121.8 - 120.2}{121.8} = \frac{15}{m} \times \frac{78}{250}$$

$$\text{or } m = \frac{15 \times 78}{250} \times \frac{121.8}{1.6} = 356.2$$

94. (b) When the concentration of reactant is reduced to half its initial value, the rate is reduced by $\frac{2.4}{0.6} = 4$ times

It means, rate $\propto [\text{reactant}]^2$

So, order of reaction = 2

95. (d) $\text{H}_2\text{O}_2(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{aq}) + \frac{1}{2} \text{O}_2(\text{g})$

For a first order reaction

$$k = \frac{2.303}{t} \log \frac{a}{(a-x)}$$

Given $a = 0.5$, $(a-x) = 0.125$, $t = 50 \text{ min}$

$$\therefore k = \frac{2.303}{50} \log \frac{0.5}{0.125} = 2.78 \times 10^{-2} \text{ min}^{-1}$$

$$r = k[\text{H}_2\text{O}_2] = 2.78 \times 10^{-2} \times 0.05 \\ = 1.386 \times 10^{-3} \text{ mol min}^{-1}$$

Now

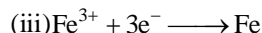
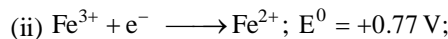
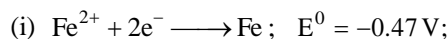
$$-\frac{d[\text{H}_2\text{O}_2]}{dt} = \frac{d[\text{H}_2\text{O}]}{dt} = \frac{2d[\text{O}_2]}{dt}$$

$$\therefore \frac{2d[\text{O}_2]}{dt} = -\frac{d[\text{H}_2\text{O}_2]}{dt}$$

$$\therefore \frac{d[\text{O}_2]}{dt} = \frac{1}{2} \times \frac{d[\text{H}_2\text{O}_2]}{dt}$$

$$= \frac{1.386 \times 10^{-3}}{2} = 6.93 \times 10^{-4} \text{ mol min}^{-1}$$

96. (a) $\Delta G^\circ = -nFE^\circ$



(i) $\Delta G^0 = -nFE^0 = -2(-0.47)F = 0.94F$

(ii) $\Delta G^0 = -nFE^0 = -1(+0.77)F = -0.77F$

(iii) On adding : $\Delta G^0 = +0.17F$

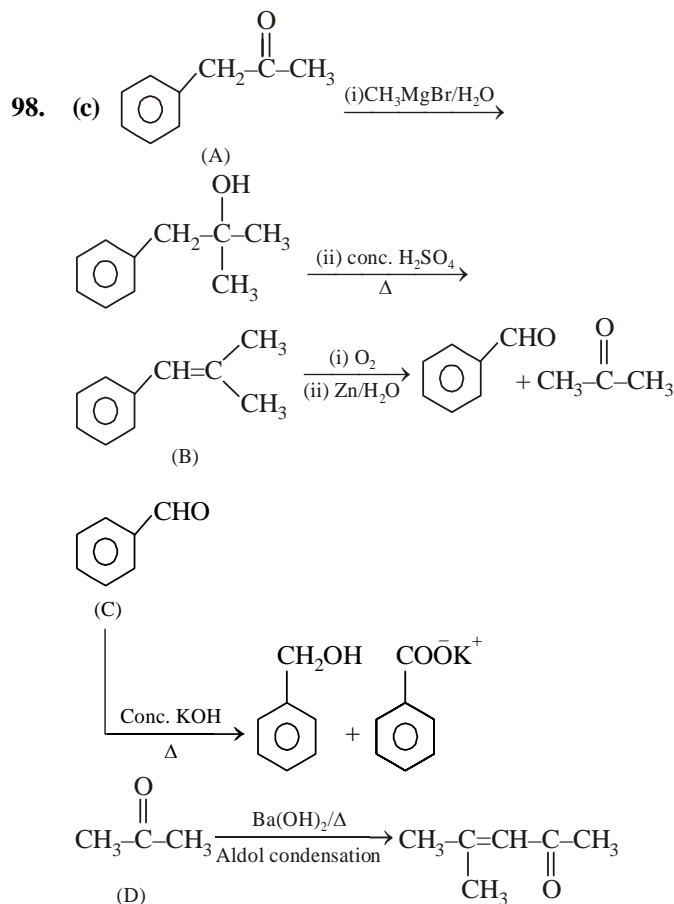
$$\Delta G^0 = -nFE^0$$

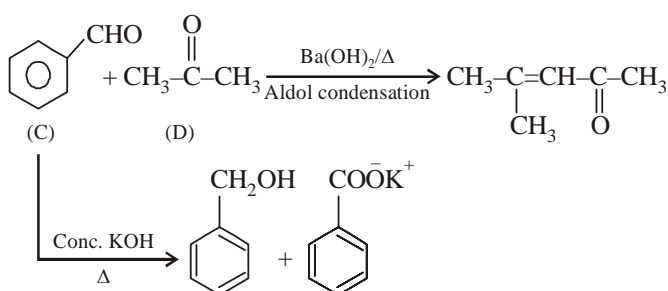
$$E^0 \text{ for } (\text{Fe}^{3+} \longrightarrow \text{Fe})$$

$$= \frac{\Delta G^0}{-nF} = \frac{0.17F}{-3F} = -0.057 \text{ V}$$

97. (b) i Remains unchanged when number of ions before and after complex ion remains constant.

Solute	y	Complex	y
(a) PtCl_4	5	$\text{K}_2[\text{PtCl}_6]$	3
(b) ZnCl_2	3	$\text{Zn}[(\text{NH}_3)_4]\text{Cl}_2$	3





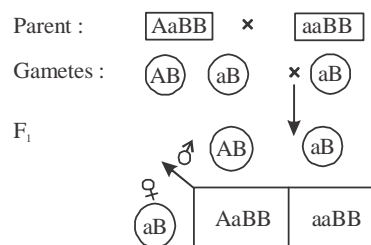
99. (b) First reaction is $\text{S}_{\text{N}}1$ in which rate does not depend on conc. of nucleophile but depends on reactant conc. Second reaction is $\text{E}2$ reaction in which rate depends on conc. of base as well as reactant concentration. Therefore, changing in the concentration of base will have no effect on rate of reaction (1).
100. (a) Bond dissociation energy of E–H bond in hydrides of group 16 follows the order:
 $\text{H}_2\text{O} > \text{H}_2\text{S} > \text{H}_2\text{Se} > \text{H}_2\text{Te}$

PART-III: BOTANY

SECTION-A

101. (d) A mutualistic relationship is when two organisms of different species “work together,” and each benefiting from the relationship. Fig and wasp shows mutualistic relationship in which the fig provides a home for the wasp and in return wasp provides the pollination services.
102. (d) Order being higher category is the assemblage of families which exhibit a few similar characteristics. Dog (*Canis familiaris*) and Cat (*Felis domesticus*) belong to two different families—canidae and Felidae respectively.
103. (a) Glycocalyx or mucilage is the outermost coating of bacterial cells/cell wall which is rich in polysaccharides. A thick and tougher mucilage is called capsule which gives gummy or sticky trait to cells. It protects the cells from dessication, toxins and preventing attachment to foreign invaders.
104. (a) G_0 or resting phase is a non-growing state distinct from interphase. It is a period in the cell cycle in which cells exist in a quiescent state. It is viewed as either an extended G_1 phase, where the cell is neither dividing nor preparing to divide, or a distinct quiescent stage that occurs outside of the cell cycle.
105. (a) Net primary productivity is the rate of organic matter build up or stored by producers in their bodies per unit time and area. Net productivity is equal to gross primary productivity minus loss due to respiration and other reasons. Rate of increase in energy containing organic matter or biomass by heterotrophs or consumers per unit time and area is known as secondary productivity.
106. (c) Viroids in nature are sub-viral agents as infectious RNA particles, without protein coat.
107. (d) A – IV; B – III; C – I; D – II
108. (a) A – II; B – I; C – IV; D – III

109. (a)
110. (d) Dodo - Mauritius
Quagga - Africa
Thylacine - Australia
 Stellar's sea cow - Russia
 Rest of options are incorrect
111. (d) The end product of glycolysis is pyruvate. It enters mitochondria and is oxidatively decarboxylated to acetyl CoA before entering into Krebs cycle.
112. (c) Differentiation of shoot is controlled by low auxin concentration. While in tissue culture auxin concentration is made high to promote rooting.
113. (b) During double fertilization in plants one sperm fuses with the egg cell and the other sperm fuses with two polar nuclei of the central cell to produce triploid primary endosperm cell ($3n$). Since the latter involves fusion of three haploid nucleus therefore it is called triple fusion.
114. (c) Embryo sac is 7-celled structure. There is a large central cell with two polar nuclei, egg apparatus with egg cell and 2 synergids present at micropylar end and its chalazal end, 3 antipodal cells are present.
115. (a) $\text{AaBB} \times \text{aaBB}$ on crossing gives 50% individuals having genotype AaBB and 50% individuals having genotype aaBB.



116. (d) The oceans cover about $\frac{2}{3}$ of the whole surface of our earth. Thus it is the most stable ecosystem, because of buffering action by water.
117. (a) Parthenocarpy is the development of fruits without prior fertilization which results in the formation of seedless fruits. In some plant species, parthenocarpic fruits are produced naturally or they may be induced by treatment of the unpollinated flowers with auxin. Removal of androecium before pollen release is called emasculation which is helpful in preventing unwanted pollination. Vernalized seeds are the chilled treated seeds for breaking dormancy. Phenyl Mercuric Acetate is an antitranspirant. Gibberellins and Auxins are known to induce parthenocarpy in plants. If a tomato plant is treated with a low concentration of auxin and gibberellic acid it'll produce fruits without fertilization i.e. parthenocarpic fruits.
118. (a)
119. (a) UAA is a nonsense codon. It signals for polypeptide chain termination. Hence, only 24 amino acids chain will be formed as the process of translation will be terminated at 25th codon.

120. (b) The rate at which organic molecules are formed in a green plant is called gross productivity.
121. (b) Ovules develop into seed. Endosperm may be completely consumed by developing embryo.
122. (b) Well developed vascular system present in the members of pteridophytes but absent in mosses as the plant body is sporophyte which is distinguished into true root, stem and leaves.
123. (b) A centriole is a barrel - shaped cell structure found in most animal eukaryotic cells, though absent in higher plants and most fungi.
124. (a) Association of algae and fungi is referred to as lichen. Symbiotic association of *Rhizobium* with roots of leguminous plants is referred to as symbiosis. Mycorrhiza is symbiotic association between fungi and roots of higher plants. The fungal partner of mycorrhiza obtains food from roots of the higher plant and in return supplies mineral elements to it.
125. (b) *Laminaria* (kelp) and *Fucus* (rock weed) are marine algae. They are the members of class- phaeophyceae (brown) algae.
126. (b) Vacuoles are present mainly in the plant cells. Each vacuole is surrounded by cytoplasmic membrane called as tonoplast which is similar to plasma membrane.
127. (a) *In situ* means keeping endangered species of animals or plants into natural environment and not in the environment that looks like natural but man made, like zoological & botanical gardens. *In situ* includes, national parks, sanctuaries and biosphere reserve.
128. (d) *Monascus purpureus* is a yeast used in the production of statins which are used in lowering blood cholesterol.
129. (d)
130. (a) According to the concept of species-area relationship, within a region, species richness gets increased when explored area is increased, but only up to a limit.
131. (b) A node is formed at the place from where a leaf arises, i.e., the place of origin of a leaf on the stem apex is differentiated as the node. The space between two successive nodes is called internode.
132. (a)
133. (d) Both the statements are correct.
134. (c) *Cyanobacteria* Chlorophyll a, PS I and II.
135. (d) Kingdom animalia includes all heterotrophic, multicellular complex eukaryotes. They depend either upon plants or on other animals for their food requirements. Kingdom monera includes prokaryotic organisms lacking membrane bound nucleus. Hence, nuclear membrane cannot be found in Monera. Protista is a eukaryotic kingdom.
- generally surrounded by gelatinous sheath. They often form blooms in polluted water bodies.
137. (b) In fabaceae family, flower is zygomorphic, imbricate aestivation and polypetalous.
138. (a)
139. (d) A-(iv), B-(iii), C-(i), D-(ii)
140. (a) In numerical taxonomy numbers and codes are assigned to each observable characteristics and the data is then processed. In this way each charalter is given equal importance and at the same time hundreds of characters can be considered.
141. (a) Food chain is the transfer of energy from green plants (Primary producers), through a sequence of organisms occupies in a food chain is known as its trophic level. Therefore, statements (ii) and (iii) are correct.
142. (b) 143. (a) 144. (d)
145. (d) In the given figure, the root tip shows their different regions which are marked as A, B and C. The correct labelling of A, B and C are region of maturation, region of elongation and region of meristematic activity respectively.
146. (c) Part A is the root hair zone which represents the zone of differentiation or maturation. This is the most suitable part for anatomical studies of root because different types of primary tissues differentiate or mature in this region. Xylem, phloem, pericycle, endodermis, cortex and epiblema are clearly visible in this region.
147. (b) In the food web, different food chains are interconnected. Each chain is interconnected and consists of different trophic levels i.e. producers, consumers and detritivores. So, kite can also be a part of food web.
148. (b) When S-phase completes, a somatic cell contains 2n number of chromosomes and 4C content of DNA. During DNA replication, the unwinding of strands leaves a single strand vulnerable. During S phase, any problems with DNA replication trigger a “checkpoint” — a cascade of signaling events that puts the phase on hold until the problem is resolved.
149. (c) Photophosphorylation refers to addition of phosphate in the presence of light.
150. (b) In chlorophyceae, sexual reproduction takes place by all the three processes
1. Isogamy – Fusion of morphologically and physiologically similar gametes.
 2. Anisogamy – Morphologically similar but physiologically dissimilar gametes.
 3. Oogamy – Fusing gametes are dissimilar in all respect.

PART-IV: ZOOLOGY

SECTION-B

136. (a) The cyanobacteria (blue-green algae) have chlorophyll 'a' similar to green plants and are photosynthetic autotrophs. The cyanobacteria are unicellular, colonial or filamentous, freshwater/marine or terrestrial algae. The colonies are

SECTION-A

151. (a) **Chitin** is a long-chain polymer of a N-acetylglucosamine, a derivative of glucose. It is a characteristic component of the cell walls of fungi, exoskeletons of arthropods such as crustaceans (e.g., crabs, lobsters and

shrimps) and insects, the radulae of molluscs, and the beaks and internal shells of cephalopods, including squid and octopuses.

152. (a) Amphibians such as frogs can respire through their moist skin. This type of respiration is known as cutaneous respiration.
153. (b) The superior vena cava pours venous blood into the right atria and left atria receives blood from lungs. This then flows into **ventricles**. The contraction of muscles of atria arise from SA nodes and passes on to AV node and then to the Purkinje's fibres.
154. (c) **Fast muscle fibres** contract spontaneously and reach anaerobic conditions in shorter time, so as to accumulate lactic acid in the muscles in shorter time.
Slow muscle fibres have a better ability to endure, as they are resistant to fatigue and contract slowly, due to accumulation of a large amount of myoglobin in them.
Actin filaments form the isometric band in the muscle fibre because it is the only actin protein which is present in that region.
Sarcomere is the contractile unit of the skeletal muscle.
155. (d)
156. (c) The given figure shows the morula stage of embryonic development. Morula is produced by a series of cleavage (mitotic) divisions of the early embryo, starting with the single-celled. Once the embryo has divided into 16 cells, it begins to resemble a mulberry, hence the name.
157. (c) The statements (i), (ii) and (iii) are correct while the statement (iv) is incorrect.
158. (b) Muscle contraction is initiated by signals sent by CNS via a motor neuron.
159. (b) Statement II is incorrect. The correct statement is- Relative abundance of carbon and hydrogen is **higher** in any living organism than in earth's crust.
160. (a) DNA ligase is the enzyme which helps in joining two fragments of DNA. The enzyme is used in DNA replication as it joints the Okazaki segments (also in proof reading). It also finds its use in genetic engineering as it can join two or more desired nucleotide sequences of DNA.
161. (a) The linking of antibiotic resistance gene with the plasmid vector became possible with DNA ligase. DNA ligase is an enzyme that is able to join together two portions of DNA and therefore plays an important role in DNA repair. DNA ligase is also used in recombinant DNA technology as it ensures that the foreign DNA is bound to the plasmid into which it is incorporated.
162. (b) Gel electrophoresis is a technique to separation of DNA fragments according to their size. DNA is negatively charged so in gel tank when electric passed, DNA move towards positive electrode.
163. (b) DNA or RNA segment tagged with a radioactive molecule is called Probe. They are used to detect the presence of complementary sequences in nucleic acid

samples. Probes are used for identification and isolation of DNA or RNA..

164. (c) Movement of Ca^{2+} out in sarcoplasmic reticulum controls the making and breaking of actin and myosin complex actomyosin due to which muscle contraction and relaxation takes place. Albert Szent Gyorgyi worked out biochemical events of muscle contraction.
165. (d) Brain is the most vital organ. It stops functioning in the absence of O_2 .
166. (c) Melanin is the pigment which gives colour to the skin. Retinol is the other name for vitamin A. Sclerotin is the component of the carapace in crustaceans.
167. (c)
168. (a) Egg is liberated from the ovary (ovulation) at secondary oocyte stage when the meiosis II is arrested in secondary oocyte. It will be induced by the sperm.
169. (a) **Stenohaline** : Steno meaning narrow and haline meaning salt. A fish cannot handle a wide fluctuation in salt content in water. Many fresh water fish tend to be stenohaline and die in environments of high salinity such as the ocean. Fish living in coastal estuaries and tide pools are often euryhaline (tolerant to changes in salinity) as are many species which have life cycle requiring tolerance to both fresh water and sea water environments such as *Salmon*.
170. (a)
171. (b) Foetal ejection reflex in human female is induced by fully developed foetus and placenta. When a woman is in a lithotomy or semi-sitting position, the foetal ejection reflex is impaired and the increased pain caused by the sacrum's inability to move as the baby descends can be intolerable.
172. (d)
173. (d) The most significant trend in evolution of modern man (*Homo sapiens*) from his ancestors is development of brain capacity.
174. (d) Both statements are correct.
175. (d)
176. (b) Malaria is caused by *Plasmodium*. Asexual cycle of *Plasmodium* takes place in man hence, it is secondary host. Sexual cycle of *Plasmodium* occur in mosquito hence, it is called the primary host.
177. (a) 178. (a) 179. (b)
180. (c) Endonuclease are restriction enzymes which cut the DNA internally.
181. (c) Liver is the primary site of detoxification and elimination of body wastes and poisons. Liver detoxifies endotoxins, e.g. toxic NH_3 combined with CO_2 to form less toxic urea. It also detoxifies alcohol and convert them to acetaldehyde and then harmless acetyl CoA.
182. (b) Water surrounding the body in Hydra and blood in prawn are the media of circulation and transport.
183. (c)
184. (c) The amount of yolk and its distribution determines the type and depth of cleavage. Cleavage is effected due to yolk resulting in different types of segmentation or cleavage.

185. (d) Gonorrhoea, Syphilis, Genital herpes are sexually transmitted diseases. Gonorrhoea is caused by a bacterium *Neisseria gonorrhoeae*. Syphilis is caused by a bacterium *Treponema pallidum*. Genital herpes is caused by a virus Type-II-Herpes simplex virus.

SECTION-B

186. (c) When the external intercostal muscles and diaphragm relax, the ribs move downward and inward and diaphragm becomes convex (dome shaped), thus decreasing the volume of thoracic cavity and increasing the pressure inside as compared to the atmospheric pressure outside. This will cause the air to move out (expiration).
187. (b)
188. (d)
189. (c) Fast muscle fibres contract spontaneously and reach anaerobic conditions in shorter time, so as to accumulate lactic acid in the muscles in shorter time.
Slow muscle fibres have a better ability to endure, as they are resistant to fatigue and contract slowly, due to accumulation of a large amount of myoglobin in them.
Actin filaments form the isometric band in the muscle fibre because it is the only actin protein which is present in that region.
Sarcomere is the contractile unit of the skeletal muscle.
190. (c) The head of the sperm is known as acrosome that has enzymes which help sperm to enter an egg.
191. (c) Reproductive health in society can be improved by creating awareness among people about various reproduction related aspects and providing facilities and support for building up a reproductively healthy society.
192. (d) The ascending limb of Henle's loop is non-permeable to water.
193. (a) Adaptive radiation refers to evolution of different species from a common ancestor. The mammals are adapted for different mode of life i.e. they show adaptive radiation.

They can be aerial (bat), aquatic (whale and dolphins), burrowing or fossorial (rat), cursorial (horse), scantorial (squirrel) or arboreal (monkey). The adaptive radiation, the term by Osborn, is also known as Divergent evolution.

194. (b) Column I

Column II

- | | |
|--------------------|---|
| A. Trophoblast | Outer layer of blastocyst attached to the endometrium |
| B. Cleavage | Mitotic division of zygote |
| C. Inner cell mass | Group of cells that would differentiate as embryo |
| D. Implantation | Embedding of blastocyst in the endometrium |
195. (b) Haemophilia is sex linked recessive disease in which a simple protein that is a part of protein cascade involved in clotting of blood is affected. Due to this, in an affected individual, a simple cut will result in non-stop bleeding.
196. (b)
197. (c) Lyases enzyme catalyses breakdown without addition of water.
Isomerase enzyme catalyses the conversion of an aldose sugar to a ketose sugar.
Oxidoreductase enzyme catalyses the transfer of electrons from one molecule to another molecule.
Ligases enzyme catalyses the bonding of two RNA molecules.
198. (c) Fishes have two-chambered hearts. Amphibians and reptiles have three chambered hearts. Birds and mammals have four chambered hearts.
199. (b) If the walls of the collecting duct are water-permeable, water leaves the ducts to pass into the hyperosmotic surrounding and concentrated urine is produced. Thus, when there is insufficient ADH, less water is reabsorbed and more dilute urine is produced in copious amounts.
200. (b) Thorn of *Bougainvillea* and tendril of *Cucurbita* are example of homologous organs.

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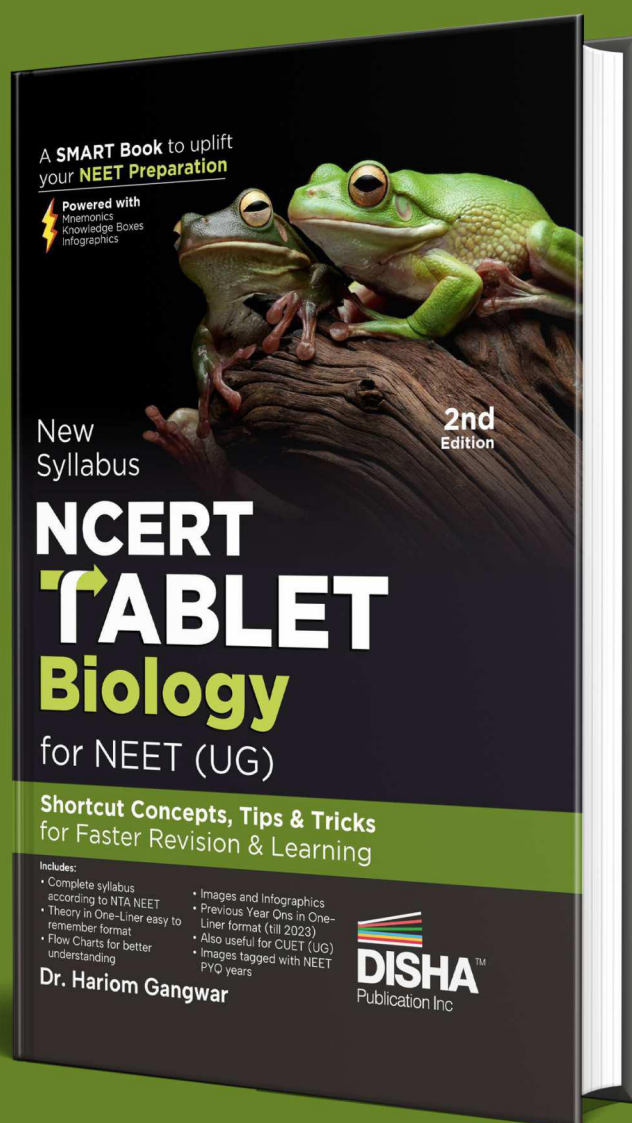
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