NEET (UG)

SOLVED PAPER 2016 (Phase II)

Time : 3 Hours **Max. Marks : 720**

Important Instructions :

1. *The test is of 3 hours duration and test contains 180 questions. Each question carries 4 marks. For each correct response, the candidate will get 4 marks.*
2. *For each incorrect response, one mark will be deducted from the total scores.*

PHYSICS

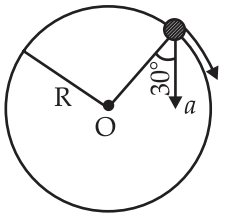
1. Planck's constant (h), speed of light in vacuum (c) and Newton's gravitational constant (G) are three fundamental constants. Which of the following combinations of these has the dimension of length ?

(a) $\sqrt{\frac{hG}{c^{\frac{3}{2}}}}$ **(b)** $\sqrt{\frac{hG}{c^{\frac{5}{2}}}}$ **(c)** $\sqrt{\frac{hc}{G}}$ **(d)** $\sqrt{\frac{Gc}{h^{\frac{3}{2}}}}$

2. Two cars P and Q start from a point at the same time in a straight line and their positions are represented by $x_P(t) = at + bt^2$ and $x_Q(t) = ft - t^2$. At what time do the cars have the same velocity ?

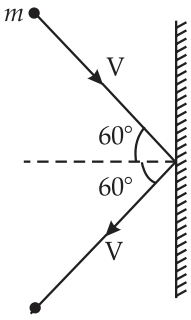
(a) $\frac{a-f}{1+b}$ **(b)** $\frac{a+f}{2(b-1)}$ **(c)** $\frac{a+f}{2(1+b)}$ **(d)** $\frac{f-a}{2(1+b)}$

3. In the given figure, a = 15 m/s^2 represents the total acceleration of a particle moving in the clockwise direction in the circle of radius R = 2.5 m at a given instant of time. The speed of the particle is



(a) 4.5 m/s **(b)** 5.0 m/s **(c)** 5.7 m/s **(d)** 6.2 m/s

4. A rigid ball of mass ***m*** strikes a rigid wall at 60° and gets reflected without loss of speed as shown in the figure. The value of impulse imparted by the wall on the ball will be



(a) $\frac{mV}{2}$ **(b)** $\frac{mV}{3}$ **(c)** mV **(d)** $2mV$

5. A bullet of mass 10 g moving horizontal with a velocity of 400 m/s strikes a wood block of mass 2 kg which is suspended by light inextensible string of length 5 m. As a result, the centre of gravity of the block found to rise a vertical distance of 10 cm. The speed of the bullet after it emerges of horizontally from the block will be

(a) 100 m/s **(b)** 80 m/s **c)** 120 m/s **(d)** 160 m/s

6. Two identical balls A and B having velocities of 0.5 m/s and – 0.3 m/s respectively collide elastically in one dimension. The velocities of B and A after the collision respectively will be

(a) – 0.5 m/s and 0.3 m/s **(b)** 0.5 m/s and – 0.3 m/s

(c) – 0.3 m/s and 0.5 m/s **(d)** 0.3 m/s and 0.5 m/s

7. A particle moves from a point $(-2\hat{i} + 5\hat{j})$ to $(4\hat{i} + 3\hat{k})$ when a force of $(4\hat{i} + 3\hat{j})$ N is applied. How much work has been done by the force ?

(a) 8 J **(b)** 11 J **(c)** 5 J **(d)** 2 J

8. Two rotating bodies A and B of masses m and $2m$ with moments of inertia I_A and I_B ($I_B > I_A$) have equal kinetic energy of rotation. If L_A and L_B be their angular momenta respectively, then

(a) $L_A = \frac{L_B}{2}$ **(b)** $L_A = 2L_B$

(c) $L_B > L_A$ **(d)** $L_A > L_B$

9. A solid sphere of mass m and radius R is rotating about its diameter. A solid cylinder of the same mass and same radius is also rotating about its geometrical axis with an angular speed twice that of the sphere. The ratio of their kinetic energies of rotation $\left(\frac{E_{sphere}}{E_{cylinder}}\right)$ will be

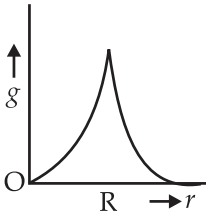
(a) 2 : 3 **(b)** 1 : 5 **(c)** 1 : 4 **(d)** 3 : 1

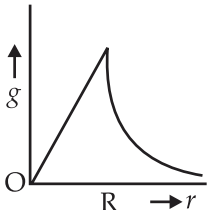
10. A light rod of length l has two masses m_1 and m_2 attached to its two ends. The moment of inertia of the system about an axis perpendicular to the rod and passing through the centre of mass is

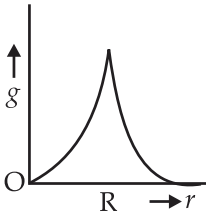
(a) $m_1m_2/(m_1+m_2)\times l^2$ **(b)** $(m_1+m_2)/m_1m_2 \times l^2$

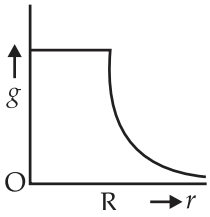
(c) $(m_1+m_2) \times l^2$ **(d)** $\sqrt{m_1m_2}l^2$

11. Starting from the centre of the earth having radius R, the variation of g (acceleration due to gravity) is shown by

(a) 

(b) 

(c) 

(d) 

12. A satellite of mass m is orbiting the earth (of radius R) at a height h from its surface. The total energy of the satellite in terms of g_0, the value, of acceleration due to gravity at the earth's surface is

(a) $\frac{mg_0R^2}{2(R+h)}$ **(b)** $-\frac{mg_0R^2}{2(R+h)}$

(c) $\frac{2mg_0R^2}{R+h}$ **(d)** $-\frac{2mg_0R^2}{R+h}$

13. A rectangular film of liquid is extended from (4 cm × 2 cm) to (5 cm × 4 cm). If the work done is 3×10^{-4} J, the value of the surface tension of the liquid is

(a) 0.250 Nm^{-1} **(b)** 0.125 Nm^{-1}

(c) 0.2 Nm^{-1} **(d)** 8.0 Nm^{-1}

14. Three liquids of densities ρ_1, ρ_2 and ρ_3 (with $\rho_1 > \rho_2 > \rho_3$), having the same value of surface tension T, rise to the same height in three identical capillaries. The angles of contact θ_1, θ_2 and θ_3 obey

(a) $\frac{\pi}{2} > \theta_1 > \theta_2 > \theta_3 \geq 0$

(b) $0 \leq \theta_1 < \theta_2 < \theta_3 < \frac{\pi}{2}$

(c) $\frac{\pi}{2} < \theta_1 < \theta_2 < \theta_3 < \pi$

(d) $\pi > \theta_1 > \theta_2 > \theta_3 > \frac{\pi}{2}$

15. Two identical bodies are made of a material for which the heat capacity increases with temperature. One of these is at 100°C, while the other one is at 0°C. If the two bodies are brought into contact, then assuming no heat loss, the final common temperature is

(a) 50°C

(b) more than 50°C

(c) less than 50°C but greater than 0°C

(d) 0°C

16. A body cools from a temperature 3T to 2T in 10 minutes. The room temperature is T. Assume that Newton's law of cooling is applicable. The temperature of the body at the end of next 10 minutes will be Out of Syllabus

(a) $\frac{7}{4}T$ **(b)** $\frac{3}{2}T$ **(c)** $\frac{4}{3}T$ **(d)** T

17. One mole of an ideal monatomic gas undergoes a process described by the equation pV^3 = constant. The heat capacity of the gas during this process is

(a) $\frac{3}{2}R$ **(b)** $\frac{5}{2}R$ **(c)** 2 R **(d)** R

18. The temperature inside a refrigerator is t_2°C and the room temperature is t_1°C. The amount of heat delivered to the room for each joule of electrical energy consumed ideally will be Out of Syllabus

(a) $\frac{t_1}{t_1 - t_2}$ **(b)** $\frac{t_1 + 273}{t_1 - t_2}$

(c) $\frac{t_2 + 273}{t_1 - t_2}$ **(d)** $\frac{t_1 + t_2}{t_1 + 273}$

19. A given sample of an ideal gas occupies a volume V at a pressure p and absolute temperature T. The mass of each molecule of the gas is m. Which of the following gives the density of the gas ?

(a) $\frac{p}{(kT)}$ **(b)** $\frac{pm}{(kT)}$ **(c)** $\frac{p}{(kTV)}$ **(d)** mkT

20. A body of mass m is attached to the lower end of a spring whose upper end is fixed. The spring has negligible mass. When the mass m is slightly pulled down and released, it oscillates with a time period of 3 s. When the mass m is increased by 1 kg, the time period of oscillations becomes 5 s. The value of m in kg is

(a) $\frac{3}{4}$ **(b)** $\frac{4}{3}$ **(c)** $\frac{16}{9}$ **(d)** $\frac{9}{16}$

21. The second overtone of an open organ pipe has the same frequency as the first overtone of a closed pipe L meter long. The length of the open pipe will be

(a) L **(b)** 2L **(c)** $\frac{L}{2}$ **(d)** 4L

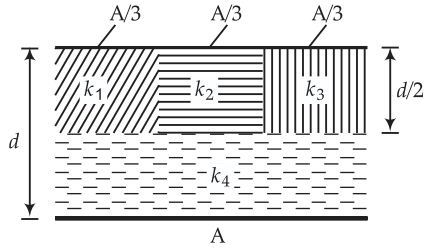
22. Three sound waves of equal amplitudes have frequencies $(n - 1)$, n, $(n + 1)$. They superimpose to give beats. The number of beats produced per second will be

(a) 1 **(b)** 4 **(c)** 3 **(d)** 2

23. An electric dipole is placed at an angle of 30° with an electric field intensity 2×10^5 N/C. It experiences a torque equal to 4 Nm. The charge on the dipole, if the dipole length is 2 cm, is

(a) 8 mC **(b)** 2 mC **(c)** 5 mC **(d)** 7 mC

24. A parallel-plate capacitor of area A, plate separation d and capacitance C is filled with four dielectric materials having dielectric constants k_1, k_2, k_3 and k_4 as shown in the figure below. If a single dielectric material is to be used to have the same capacitance C in this capacitor, then its dielectric constant k is given by



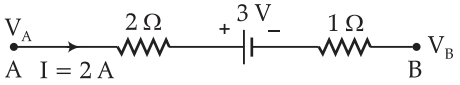
(a) $k = k_1 + k_2 + k_3 + 3k_4$

(b) $k = \frac{2}{3}(k_1 + k_2 + k_3) + 2k_4$

(c) $\frac{2}{k} = \frac{3}{k_1 + k_2 + k_3} + \frac{1}{k_4}$

(d) $\frac{1}{k} = \frac{1}{k_1} + \frac{1}{k_2} + \frac{1}{k_3} + \frac{3}{2k_4}$

25. The potential difference $(V_A - V_B)$ between the points A and B in the given figure is



(a) –3 V **(b)** +3 V **(c)** +6 V **(d)** +9 V

26. A filament bulb (500 W, 100 V) is to be used in a 230 V main supply. When a resistance R is connected in series, it works perfectly and the bulb consumes 500 W. The value of R is

(a) 230 Ω **(b)** 46 Ω **(c)** 26 Ω **(d)** 13 Ω

27. A long wire carrying a steady current is bent into a circular loop of one turn. The magnetic field at the centre of the loop is B. It is then bent into a circular coil of n turns. The magnetic field at the centre of this coil of n turns will be

(a) nB **(b)** n^2B **(c)** $2n$B **(d)** $2n^2$B

28. A bar magnet is hung by a thin cotton thread in a uniform horizontal magnetic field and is in equilibrium state. The energy required to rotate it by 60° is W. Now the torque required to keep the magnet in this new position is

(a) $\frac{W}{\sqrt{3}}$ **(b)** $\sqrt{3}$ W **(c)** $\frac{\sqrt{3}W}{2}$ **(d)** $\frac{2W}{\sqrt{3}}$

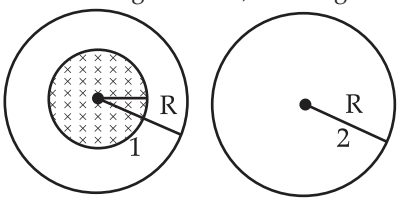
29. An electron is moving in a circular path under the influence of a transverse magnetic field of 3.57×10^{-2} T. If the value of e/m is 1.76×10^{11} C/kg, the frequency of revolution of the electron is

(a) 1 GHz **(b)** 100 MHz
(c) 62.8 MHz **(d)** 6.28 MHz

30. Which of the following combinations should be selected for better tuning of an L-C-R circuit used for communication ?

(a) R = 20 Ω, L = 1.5 H, C = 35 μF
(b) R = 25 Ω, L = 2.5 H, C = 45 μF
(c) R = 15 Ω, L = 3.5 H, C = 30 μF
(d) R = 25 Ω, L = 1.5 H, C = 45 μF

31. A uniform magnetic field is restricted within a region of radius r. The magnetic field changes with time at a rate $\frac{dB}{dt}$. Loop 1 of radius R > r encloses the region r and loop 2 of radius R is outside the region of magnetic field as shown in the figure. Then, the emf generated is



(a) zero in loop 1 and zero in loop 2

(b) $-\frac{dB}{dt}\pi r^2$ in loop 1 and $-\frac{dB}{dt}\pi r^2$ in loop 2

(c) $-\frac{dB}{dt}\pi R^2$ in loop 1 and zero in loop 2

(d) $-\frac{dB}{dt}\pi r^2$ in loop 1 and zero in loop 2

32. The potential differences across the resis-tance, capacitance and inductance are 80 V, 40 V and 100 V respectively in an L-C-R circuit. The power factor of this circuit is

(a) 0.4 **(b)** 0.5 **(c)** 0.8 **(d)** 1.0

33. A 100 Ω resistance and a capacitor of 100 Ω reactance are connected in series across a 220 V source. When the capacitor is 50% charged, the peak value of the displacement current is

(a) 2.2 A **(b)** 11 A **(c)** 4.4 A **(d)** $11\sqrt{2}$A

34. Two identical glass $\left(\mu_g = \frac{3}{2}\right)$ equi-convex lenses of focal length f each are kept in contact. The space between the two lenses is filled with water $\left(\mu_w = \frac{4}{3}\right)$. The focal length of the combination is

(a) $\frac{f}{3}$ **(b)** f **(c)** $\frac{4f}{3}$ **(d)** $\frac{3f}{4}$

35. An air bubble in a glass slab with refractive index 1.5 (near normal incidence) is 5 cm deep when viewed from one surface and 3 cm deep when viewed from the opposite face. The thickness (in cm) of the slab is

(a) 8 **(b)** 10 **(c)** 12 **(d)** 16

36. The interference pattern is obtained with two coherent light sources of intensity ratio n. In the interference pattern, the ratio $\frac{I_{max} - I_{min}}{I_{max} + I_{min}}$ will be

(a) $\frac{\sqrt{n}}{n+1}$ **(b)** $\frac{2\sqrt{n}}{n+1}$

(c) $\frac{\sqrt{n}}{(n+1)^2}$ **(d)** $\frac{2\sqrt{n}}{(n+1)^2}$

37. A person can see clearly objects only when they lie between 50 cm and 400 cm from his eyes. In order to increase the maximum distance of distinct vision to infinity, the type and power of the correcting lens, the person has to use, will be Out of Syllabus

(a) convex, + 2.25 diopter **(b)** concave, – 0.25 diopter
(c) concave, – 0.2 diopter **(d)** convex, + 0.15 diopter

38. A linear aperture whose width is 0.02 cm is placed immediately in front of a lens of focal length 60 cm. The aperture is illuminated normally by a parallel beam of wavelength 5×10^{-5} cm. The distance of the first dark band of the diffraction pattern from the centre of the screen is

(a) 0.10 cm **(b)** 0.25 cm **(c)** 0.20 cm **(d)** 0.15 cm

39. Electrons of mass m with de-Broglie wavelength λ fall on the target in an X-ray tube. The cut-off wavelength ($\lambda 0$) of the emitted X-ray is

(a) $\lambda_0 = \frac{2mc\lambda^2}{h}$ **(b)** $\lambda_0 = \frac{2h}{mc}$

(c) $\lambda_0 = \frac{2m^2c^2\lambda^3}{h^2}$ **(d)** $\lambda_0 = \lambda$

40. Photons with energy 5 eV are incident on a cathode C in a photoelectric cell. The maximum energy of emitted photoelectrons is 2 eV. When photons of energy 6 eV are incident on C, no photoelectrons will reach the anode A, if the stopping potential of A relative of C is

(a) + 3 V **(b)** + 4 V **(c)** – 1 V **(d)** – 3 V

41. If an electron in a hydrogen atom jumps from the third orbit to the second orbit, it emits a photon of wavelength λ. When it jumps from the fourth orbit to the third orbit, the corresponding wavelength of the photon will be

(a) $\frac{16}{25}\lambda$ **(b)** $\frac{9}{16}\lambda$ **(c)** $\frac{20}{7}\lambda$ **(d)** $\frac{20}{13}\lambda$

42. The half-life of a radioactive substance is 30 minutes. The time (in minutes) taken between 40% decay and 85% decay of the same radioactive substance is

Out of Syllabus

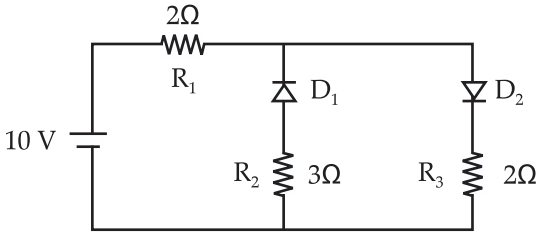
(a) 15 **(b)** 30 **(c)** 45 **(d)** 60

43. For CE transistor amplifier, the audio signal voltage across the collector resistance of 2 kΩ is 4 V. If the current amplification factor of the transistor is 100 and the base resistance is 1 kΩ, then the input signal voltage is

Out of Syllabus

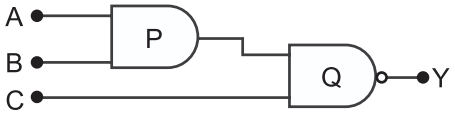
(a) 10 mV **(b)** 20 mV **(c)** 30 mV **(d)** 15 mV

44. The given circuit has two ideal diodes connected as shown in the figure below. The current flowing through the resistance R_1 will be



(a) 2.5 A **(b)** 10.0 A **(c)** 1.43 A **(d)** 3.13 A

45. What is the output Y in the following circuit, when all the three inputs A, B, C are first 0 and then 1 ?



(a) 0, 1 **(b)** 0, 0 **(c)** 1, 0 **(d)** 1, 1

CHEMISTRY

46. Which one of the following compounds shows the presence of intramolecular hydrogen bond ?

(a) H_2O_2

(b) HCN

(c) Cellulose

(d) Concentrated acetic acid

47. The molar conductivity of a 0.5 mol/dm^3 solution of $AgNO_3$ with electrolytic conduc-tivity of 5.76×10^{-3} S cm^{-1} at 398 K is

(a) 2.88 S cm^2/mol **(b)** 11.52 S cm^2/mol

(c) 0.086 S cm^2/mol **(d)** 28.8 S cm^2/mol

48. The decomposition of phosphine (PH_3) on tungsten at low pressure is a first-order reaction. It is because the

(a) rate is proportional to the surface coverage.

(b) rate is inversely proportional to the surface coverage.

(c) rate is independent of the surface coverage.

(d) rate of decomposition is very slow.

49. The coagulation values in millimoles per litre of the electrolytes used for the coagulation of As_2S_3 are given below

I. (NaCl) = 52,

II. ($BaCl_2$) = 0.69

III. ($MgSO_4$) = 0.22

The correct order of their coagulating power is

(a) I > II > III **(b)** II > I > III

(c) III > II > I **(d)** III > I > II

50. During the electrolysis of molten sodium chloride, the time required to produce 0.10 mol of chlorine gas using a current of 3A is

(a) 55 minutes. **(b)** 110 minutes.

(c) 220 minutes. **(d)** 330 minutes.

51. How many electrons can fit in the orbital for which $n = 3$ and $l = 1$?

(a) 2 **(b)** 6 **(c)** 10 **(d)** 14

52. For sample of perfect gas when its pressure is changed isothermally from P_i to P_f, the entropy change is given by

(a) $\Delta S = nR \ln\left(\frac{P_f}{P_i}\right)$ **(b)** $\Delta S = nR \ln\left(\frac{P_i}{P_f}\right)$

(c) $\Delta S = nRT \ln\left(\frac{P_f}{P_i}\right)$ **(d)** $\Delta S = RT \ln\left(\frac{P_i}{P_f}\right)$

53. The van't Hoff factor (i) for a dilute aqueous solution of the strong electrolyte barium hydroxide is

(a) 0 **(b)** 1 **(c)** 2 **(d)** 3

54. The percentage of pyridine (C_5H_5N) that forms pyridinium ion ($C_5H_5N^+H$) in a 0.10 M aqueous pyridine solution (K_b for $C_5H_5N = 1.7 \times 10^{-9}$) is

(a) 0.0060% **(b)** 0.013% **(c)** 0.77% **(d)** 1.6%

55. In calcium fluoride, having the fluorite structure, the coordination numbers for calcium ion (Ca^{2+}) and fluoride ion (F^-) are Out of Syllabus
(a) 4 and 2 **(b)** 6 and 6 **(c)** 8 and 4 **(d)** 4 and 8

56. If the E°_{cell} for a given reaction has a negative value, which of the following gives correct relationships for the values of ΔG° and K_{eq} ?
(a) $\Delta G^\circ > 0; K_{eq} < 1$ **(b)** $\Delta G^\circ > 0; K_{eq} > 1$
(c) $\Delta G^\circ < 0; K_{eq} > 1$ **(d)** $\Delta G^\circ < 0; K_{eq} < 1$

57. Which one of the following is incorrect for ideal solution ?
(a) $\Delta H_{mix} = 0$
(b) $\Delta U_{mix} = 0$
(c) $\Delta P = P_{obs.} - P_{calculated\ by\ Raoult's\ law} = 0$
(d) $\Delta G_{mix} = 0$

58. The solubility of AgCl(s) with solubility product 1.6×10^{-10} in 0.1 M NaCl solution would be
(a) 1.26×10^{-5} M **(b)** 1.6×10^{-9} M
(c) 1.6×10^{-11} M **(d)** zero

59. Suppose the elements X and Y combine to form two compounds XY_2 and X_3Y_2. When 0.1 mole of XY_2 weights 10 g and 0.05 mol of X_3Y_2 weighs 9 g, the atomic weights of X and Y are
(a) 40, 30 **(b)** 60, 40 **(c)** 20, 30 **(d)** 30, 20

60. The number of electrons delivered at the cathode during electrolysis by a current of 1 A in 60 s is (charge on electron = 1.60×10^{-19} C)
(a) 6×10^{23} **(b)** 6×10^{20}
(c) 3.75×10^{20} **(d)** 7.48×10^{23}

61. Boric acid is an acid because its molecule
(a) contains replaceable H^+ ion.
(b) gives up a proton.
(c) accepts OH^- from water releasing proton.
(d) combines with proton from water molecule.

62. AlF_3 is soluble in HF only is presence of KF. It is due to the formation of
(a) $K_3[AlF_3H_3]$ **(b)** $K_3[AlF_6]$
(c) AlH_3 **(d)** $K[AlF_3H]$

63. Zinc can be coated on iron to produce galvanised iron but the reverse is not possible. It is because Out of Syllabus
(a) zinc is lighter than iron.
(b) zinc has lower melting point than iron.
(c) zinc has lower negative electrode potential than iron.
(d) zinc has higher negative electrode potential than iron.

64. The suspension of slaked lime in water is known as Out of Syllabus
(a) lime water.
(b) quick lime.
(c) milk of lime.
(d) aqueous solution of slaked lime.

65. The hybridisations of the atomic orbitals of nitrogen in NO_2^+, NO_3^- and NH_4^+ respectively are
(a) *sp*, sp^3 and sp^2 **(b)** sp^2, sp^3 and *sp*
(c) *sp*, sp^2 and sp^3 **(d)** sp^2, *sp* and sp^3

66. Which of the following fluoro-compounds is most likely to behave as a Lewis base ?
(a) BF_3 **(b)** PF_3 **(c)** CF_4 **(d)** SiF_4

67. Which of the following pairs of ions is isoelectronic and isostructural ?
(a) CO_3^{2-}, NO_3^- **(b)** ClO_3^-, CO_3^{2-}
(c) SO_3^{2-}, NO_3^- **(d)** ClO_3^-, SO_3^{2-}

68. In context with beryllium, which one of the following statements is incorrect ? Out of Syllabus
(a) It is rendered passive by nitric acid.
(b) It form Be_2C.
(c) Its salts rarely hydrolyse.
(d) Its hydride is electron-deficient and polymeric.

69. Hot concentrated sulphuric acid is a moderately strong oxidising agent. Which of the following reaction does not show oxidising behaviour ?
(a) $Cu + 2H_2SO_4 \rightarrow CuSO_4 + SO_2 + 2H_2O$
(b) $3S + 2H_2SO_4 \rightarrow 3SO_2 + 2H_2O$
(c) $C + 2H_2SO_4 \rightarrow CO_2 + 2SO_2 + 2H_2O$
(d) $CaF_2 + H_2SO_4 \rightarrow CaSO_4 + 2HF$

70. Which of the following pairs of *d*-orbitals will have electron density along the axes ?
(a) d_{z^2}, d_{xz} **(b)** d_{xz}, d_{yz}
(c) $d_{z^2}, d_{x^2-y^2}$ **(d)** $d_{xy}, d_{x^2-y^2}$

71. The correct geometry and hybridisation for XeF_4 are
(a) octahedral, sp^3d^2
(b) trigonal bipyramidal, sp^3d
(c) planar triangle, sp^3d^3
(d) square planar, sp^3d^2

72. Among the following, which one is a wrong statement ?
(a) PH_5 and $BiCl_5$ do not exist.
(b) $p\pi$-$d\pi$ bonds are present in SO_2.
(c) SeF_4 and CH_4 have same shape.
(d) I_3^+ has bent geometry.

73. The correct increasing order of trans-effect of the following species is
(a) $NH_3 > CN^- > Br^- > C_6H_5^-$
(b) $CN^- > C_6H_5^- > Br^- > NH_3$
(c) $Br^- > CN^- > NH_3 > C_6H_5^-$
(d) $CN^- > Br^- > C_6H_5^- > NH_3$

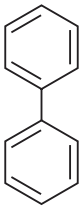
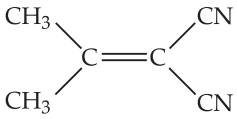
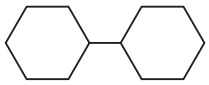
74. Which one of the following statements related to lanthanoids is incorrect ?
(a) Europium shows + 2 oxidation state.
(b) The basicity decreases as the ionic radius decreases from Pr to Lu.
(c) All the lanthanoids are much more reactive than aluminium.
(d) Ce (+4) solution are widely used as oxidising agent in volumetric analysis.

75. Jahn-Teller effect is not observed in high spin complexes of
(a) d^7 **(b)** d^8 **(c)** d^4 **(d)** d^9

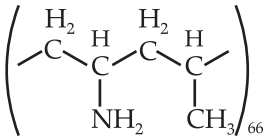
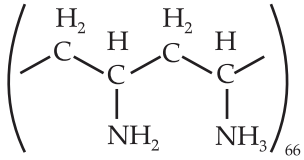
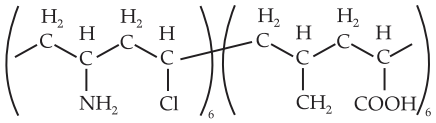
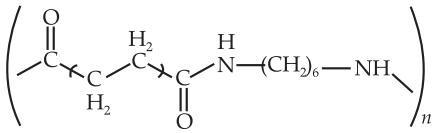
76. Which of the following can be used as the halide component for Friedel-Crafts reaction ?

(a) Chlorobenzene **(b)** Bromobenzene
(c) Chloroethene **(d)** Isopropyl chloride

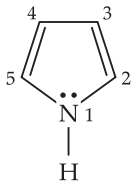
77. In which of the following molecules, all atoms are coplanar ?

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

78. Which one of the following structures represents nylon 6, 6 polymer ?

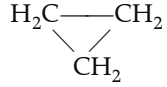
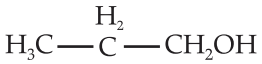
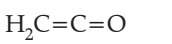
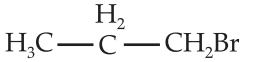
(a) 
(b) 
(c) 
(d) 

79. In pyrrole

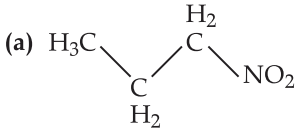
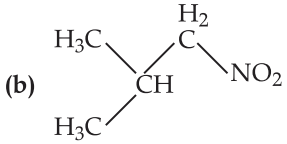
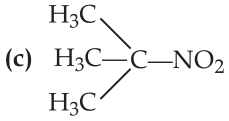
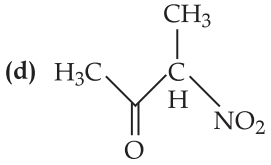


the electron density is maximum on
(a) 2 and 3 **(b)** 3 and 4 **(c)** 2 and 4 **(d)** 2 and 5

80. Which of the following compounds shall not produce propene by reaction with HBr followed by elimination or direct only elimination reaction ?

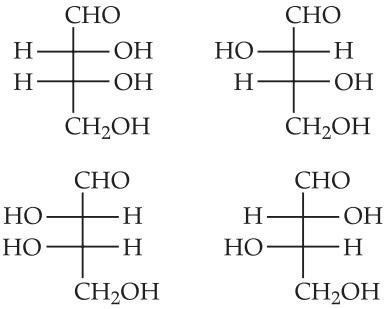
(a) 
(b) 
(c) 
(d) 

81. Which one of the following nitro-compounds does not react with nitrous acid ?

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

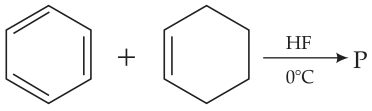
82. The central dogma of molecular genetics states that the genetic information flows from
(a) amino acids → proteins → DNA
(b) DNA → carbohydrates → proteins
(c) DNA → RNA → proteins
(d) DNA → RNA → carbohydrates

83. The correct corresponding order of names of four aldoses with configuration given below

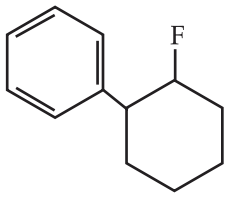
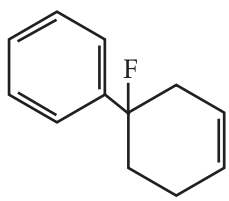


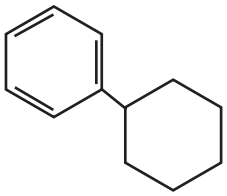
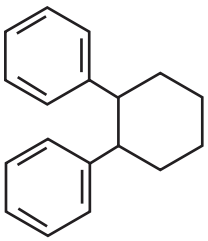
respectively, is
(a) L-erythrose, L-threose, L-erythrose, D-threose
(b) D-threose, D-erythrose, L-threose, L-erythrose
(c) L-erythrose, L-threose, D-erythrose, D-threose
(d) D-erythrose, D-threose, L-erythrose, L-threose

84. In the given reaction

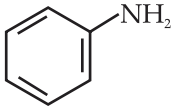
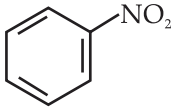


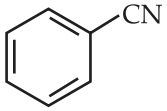
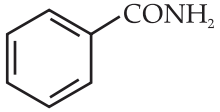
the product P is

(a) 
(b) 

(c)  **(d)** 

85. A given nitrogen-containing aromatic compound A reacts with Sn/HCl, followed by HNO_2 to give an unstable compound B. B, on treatment with phenol, forms a beautiful coloured compound C with the molecular formula $C_{12}H_{10}N_2O$. The structure of compound A is

(a)  **(b)** 

(c)  **(d)** 

86. Consider the reaction

$$CH_3CH_2CH_2Br + NaCN \rightarrow CH_3CH_2CH_2CN + NaBr$$

This reaction will be the faster in

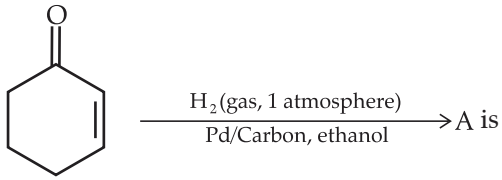
(a) ethanol

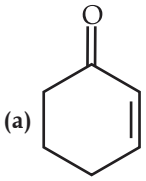
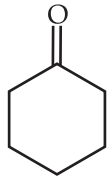
(b) methanol

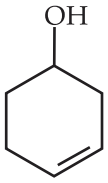
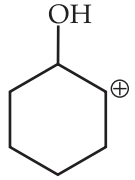
(c) N, N′-dimethylformamide (DMF)

(d) water

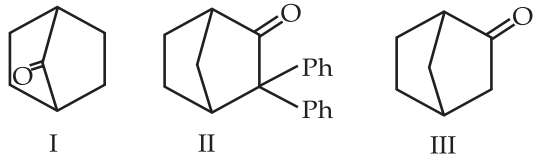
87. The correct structure of the product A formed in the reaction



(a)  **(b)** 

(c)  **(d)** 

88. Which among the given molecules can exhibit tautomerism ?

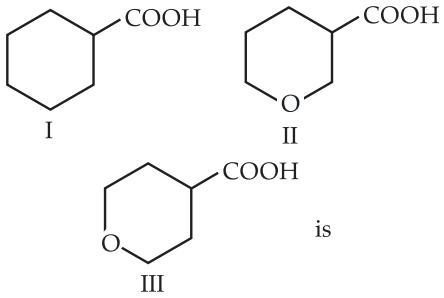


I II III

(a) III only **(b)** Both I and II

(c) Both I and II **(d)** Both II and III

89. The correct order of strength of the carboxylic acids



I II III

is

(a) I > II > III **(b)** II > III > I

(c) III > II > I **(d)** II > I > III

90. The compound that will react most readily with gaseous bromine has the formula

(a) C_3H_6 **(b)** C_2H_2 **(c)** C_4H_{10} **(d)** C_2H_4

BIOLOGY

91. Which one of the following is wrong for fungi ?

(a) They are eukaryotic.

(b) All fungi possess a purely cellulosic cell wall.

(c) They are heterotrophic.

(d) They are both unicellular and multicellular.

92. Methanogens belongs to

(a) eubacteria. **(b)** archaebacteria.

(c) dinoflagellates. **(d)** slime moulds.

93. Select the wrong statement.

(a) The walls of diatoms are easily destructible.

(b) 'Diatomaceous earth' is formed by the cell walls of diatoms.

(c) Diatoms are chief producers in the oceans.

(d) Diatoms are microscopic and float passively in water.

94. The label of a herbarium sheet does not carry information on

(a) date of collection. **(b)** name of collector.

(c) local names. **(d)** height of the plant.

95. Conifers are adapted to tolerate extreme environmental conditions because of

(a) broad hardy leaves. **(d)** superficial stomata.

(c) thick cuticle. **(d)** the presence of vessels.

96. Which one of the following statements is wrong ?

(a) Algae increase the level of dissolved oxygen in the immediate environment.

(b) Algin is obtained from red algae and carrageenan from brown algae.

(c) Agar-agar is ob tained from *Gelidium* and *Gracilaria.*

(d) *Laminaria* and *Sargassum* are used as food.

97. The term 'polyadelphous' is related to
(a) gynoecium. **(b)** androecium.
(c) corolla. **(d)** calyx.

98. How many plants among *Indigofera, Sesbania, Salvia, Allium, Aloe*, mustard, groundnut, radish, gram and turnip have stamens with different lengths in their flowers ?
(a) Three **(b)** Four **(c)** Five **(d)** Six

99. Radial symmetry is found in the flowers of
(a) *Brassica.* **(b)** *Trifolium.* **(c)** *Pisum.* **(d)** *Cassia.*

100. Free-central placentation is found in
(a) *Dianthus.* **(b)** *Argemone.* **(c)** *Brassica.* **(d)** *Citrus.*

101. Cortex is the region found between
(a) epidermis and stele.
(b) pericycle and endodermis.
(c) endodermis and pith.
(d) endodermis and vascular bundle.

102. The balloon-shaped structures called tyloses
Out of Syllabus
(a) originate in the lumen of vessels.
(b) characterise the sapwood.
(c) are extensions of xylem parenchyma cells into vessels.
(d) are linked to the ascent of sap through xylem vessels.

103. A non-proteinaceous enzyme is
(a) lysozyme. **(b)** ribozyme.
(c) ligase. **(d)** deoxyribonuclease.

104. Select the mismatch.
(a) Gas vacuoles — Green bacteria Cells
(b) Large central — Animals cells vacuoles
(c) Protists — Eukaryotes
(d) *Methanogens* — Prokaryotes

105. Select the wrong statement.
(a) Bacterial cell wall is made up of peptidoglycan.
(b) Pili and fimbriae are mainly involved in motility of bacterial cells.
(c) Cyanobacteria lack flagellated cells.
(d) *Mycoplasma* is a wall-less microorganism.

106. A cell organelle containing hydrolytic enzyme is
(a) lysosome. **(b)** microsome.
(c) ribosome. **(d)** mesosome.

107. During cell growth, DNA synthesis takes places in
(a) S-phase. **(b)** G_1-phase.
(c) G_2-phase. **(d)** M-phase.

108. Which of the following biomolecules is common to respiration-mediated break down of fats, carbohydrates and proteins ?
(a) Glucose-6-phosphate.
(b) Fructose 1, 6-bisphosphate.
(c) Pyruvic acid.
(d) Acetyl Co-A.

109. A few drops of sap were collected by cutting across a plant stem by a suitable method. The sap was tested chemically. Which one of the following test results indicates that it is phloem sap ?
(a) Acidic
(b) Alkaline
(c) Low refractive index
(d) The absence of sugar

110. You are given a tissue with its potential for differentiation in an artificial culture. Which of the following pairs of hormones would you add to the medium to secure shoots as well as roots ?
(a) IAA and gibberellin.
(b) Auxin and cytokinin.
(c) Auxin and abscisic acid.
(d) Gibberellin and abscisic acid.

111. Phytochrome is a
(a) flavoprotein. **(b)** glycoprotein.
(c) lipoprotein. **(d)** chromoprotein.

112. Which is essential for the growth of root tip ?
(a) Zn **(b)** Fe
(c) Ca **(d)** Mn

113. The process which makes major difference between C_3 and C_4 plants is
(a) glycolysis. **(b)** Calvin cycle.
(c) photorespiration. **(d)** respiration.

114. Which one of the following statements is not correct?
(a) Offspring produced by the asexual reproduction are called clone.
(b) Microscopic, motile asexual reproduc-tive structures are called zoospores.
(c) In potato, banana and ginger, the plantlets arise from the internodes present in the modified stem.
(d) Water hyacinth, growing in the standing water, drains oxygen from water that leads to the death of fishes.

115. Which one of the following generates new genetic combinations leading to variation ?
(a) Vegetative reproduction
(b) Parthenogenesis
(c) Sexual reproduction
(d) Nucellar polyembryony

116. Match column I with column II and select the correct option using the codes given below

Column I		Column II	
A.	Pistils fused together	1.	Gametogenesis
B.	Formation of gametes	2.	Pistillate
C.	Hyphae of higher ascomycetes	3.	Syncarpous
D.	Unisexual female flower	4.	Dikaryotic

Codes

	A	B	C	D
(a)	4	3	2	1
(b)	2	1	4	3
(c)	1	2	4	3
(d)	3	1	4	2

117. In majority of angiosperms
(a) egg has a filiform apparatus.
(b) there are numerous antipodal cells.

(c) reduction division occurs in the megaspore mother cells.
(d) a small central cell is present in the embryo sac.

118. Pollination in water hyacinth and water lily is brought about by the agency of
(a) water. **(b)** insects or wind.
(c) birds. **(d)** bats.

119. The ovule of an angiosperm is technically equivalent to
(a) megasporangium.
(b) megasporophyll.
(c) megaspore mother cell.
(d) megaspore.

120. Taylor conducted the experiments to prove semi-conservative mode of chromosome replication on
(a) *Vinca rosea.*
(b) *Vicia faba.*
(c) *Drosophila melanogaster.*
(d) *E. coil.*

121. The mechanism that causes a gene to move from one linkage group to another is called
(a) inversion. **(b)** duplication.
(c) translocation. **(d)** crossing-over.

122. The equivalent of a structural gene is
(a) muton. **(b)** cistron. **(c)** operon. **(d)** recon.

123. A true breeding plant is
(a) one that is able to breed on its own.
(b) produced due to cross-pollination among unrelated plants.
(c) near homozygous and produces offspring of its own kind.
(d) always homozygous recessive in its genetic constitution.

124. Which of the following *r*RNAs act as structural RNA as well as ribozyme in bacteria ?
(a) 5 *sr*RNA **(b)** 18 *sr*RNA
(c) 23 *sr*RNA **(d)** 5-8 *sr*RNA

125. Stirred-tank bioreactors have been designed for
(a) purification of product.
(b) addition of preservatives to the product.
(c) availability of oxygen throughout the process.
(d) ensuring anaerobic conditions in the culture vessel.

126. A foreign DNA and plasmid cut by the same restriction endonuclease can be joined to form a recombinant plasmid using
(a) *Eco* RI. **(b)** *taq* polymerase.
(c) polymerase III. **(d)** ligase.

127. Which of the following is not a component of downstream processing ?
(a) Separation **(b)** Purification
(c) Preservation **(d)** Expression

128. Which of the following restriction enzymes produces blunt ends ?
(a) *Sal* I **(b)** *Eco* RV **(c)** *Xho* **(d)** *Hind* III

129. Which kind of therapy was given in 1990 to a four-year-old girl with Adenosine Deaminase (ADA) deficiency ?
(a) Gene therapy **(b)** Chemotherapy
(c) Immunotherapy **(d)** Radiation therapy

130. How many hotspots of biodiversity in the world have been identified till date by Norman Myers ?
(a) 17 **(b)** 25 **(c)** 34 **(d)** 43

131. The primary producers of the deep-sea hydrothermal vent ecosystem are
(a) green algae.
(b) chemosynthetic bacteria.
(c) blue-green algae.
(d) coral reefs.

132. Which of the following is correct for *r*-selected species?
(a) Large number of progeny with small size.
(b) Large number of progeny with large size.
(c) Small number of progeny with small size.
(d) Small number of progeny with large size.

133. If '+' sign is assigned to beneficial interaction, '–' sign to detrimental and '0' sign to neutral interaction, then the population interaction represented by '+' '–' refers to
(a) mutualism. **(b)** amensalism.
(c) commensalism. **(d)** parasitism.

134. Which of the following is correctly matched ?
(a) Aerenchyma — *Opuntia*
(b) Age pyramid — Biome
(c) *Parthenium hysterophorus* — Threat to biodiversity
(d) Stratification — Population

135. Red List contains data or information on
(a) all economically important plants.
(b) plants whose products are in international trade.
(c) threatened species.
(d) marine vertebrates only.

136. Which of the following sets of diseases is caused by bacteria ?
(a) Cholera and tetanus **(b)** Typhoid and smallpox
(c) Tetanus and mumps **(d)** Herpes and influenza

137. Match column I with column II for housefly classification and select the correct option using the codes given below

Column I		Column II	
A.	Family	1.	Diptera
B.	Order	2.	Arthropoda
C.	Class	3.	Muscidae
D.	Phylum	4.	Insecta

Codes

	A	B	C	D
(a)	3	1	4	2
(b)	3	2	4	1
(c)	4	3	2	1
(d)	4	2	1	3

138. Choose the correct statement.
(a) All mammals are viviparous.
(b) All cyclostomes do not possess jaws and paired fins.
(c) All reptiles have a three-chambered heart.
(d) All Pisces have gills covered by an operculum.

139. Study the four statements (I-IV) given below and select the two correct ones out of them.
I. Definition of biological species was given by Ernst Mayr.

II. Photoperiod does not affect reproduction in plants.
III. Binomial nomenclature system was given by RH Whittaker.
IV. In unicellular organisms, reproduction is synonymous with growth.
The two correct statements are
(a) II and III **(b)** III and IV
(c) I and IV **(d)** I and II

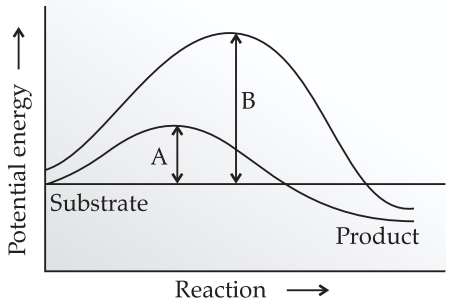
140. In male cockroaches, sperms are stored in which part of the reproductive system ? Out of Syllabus
(a) Seminal vesicles **(b)** Mushroom glands
(c) Testes **(d)** Vas deferens

141. Smooth muscles are
(a) involuntary, fusiform, non-striated
(b) voluntary, multinucleate, cylindrical
(c) involuntary, cylindrical, striated
(d) voluntary, spindle-shaped, uninucleate

142. Oxidative phosphorylation is
(a) formation of ATP by transfer of phosphate group from a substrate to ADP.
(b) oxidation of phosphate group in ATP.
(c) addition of phosphate group to ATP.
(d) formation of ATP by energy released from electron removed during substrate oxidation.

143. Which of the following is the least likely to be involved in stabilising the three-dimensional folding of most proteins ?
(a) Hydrogen bonds
(b) Electrostatic interaction
(c) Hydrophobic interaction
(d) Ester bonds

144. Which of the following describes the given graph correctly ?



(a) Endothermic reaction with energy A in the presence of enzyme and B in the absence of enzyme.
(b) Exothermic reaction with energy A in the presence of enzyme and B in the absence of enzyme.
(c) Endothermic reaction with energy A in the absence of enzyme and B in the presence enzyme.
(d) Exothermic reaction with energy A in the absence of enzyme and B in the presence of enzyme.

145. When cell has stalled DNA replication fork, which checkpoint should be predominantly activated ?
(a) $\frac{G_1}{S}$ **(b)** $\frac{G_2}{M}$
(c) M **(d)** Both $\frac{G_2}{M}$ and M

146. Match the stages of meiosis in column I to their characteristic features in column II and select the correct option using the codes given below

Column I		Column II	
A.	Pachytene	1.	Pairing of homologous chromosomes
B.	Metaphase-I	2.	Terminalisation of chiasmata
C.	Diakinesis	3.	Crossing-over takes place
D.	Zygotene	4.	Chromosomes align at equatorial plate

Codes

	A	B	C	D
(a)	3	4	2	1
(b)	1	4	2	3
(c)	2	4	3	1
(d)	4	3	2	1

147. Which hormones do stimulate the production of pancreatic juice and bicarbonate ?
(a) Angiotensin and epinephrine
(b) Gastrin and insulin
(c) Cholecystokinin and secretin
(d) Insulin and glucagon

148. The partial pressure of oxygen in the alveoli of the lungs is
(a) equal to that in the blood.
(b) more than that in the blood.
(c) less than that in the blood.
(d) less than that of carbon dioxide.

149. Choose the correct statement. Out of Syllabus
(a) Nociceptors respond to changes in pressure.
(b) Meissner's corpuscles are thermo-receptors.
(c) Photoreceptors in the human eye are depolarised during darkness and become hyperpolarised in response to the light stimulus.
(d) Receptors do not produce graded potentials.

150. Grave's disease is caused due to Out of Syllabus
(a) hyposecretion of thyroid gland.
(b) hypersecretion of thyroid gland.
(c) hyposecretion of adrenal gland.
(d) hypersecretion of adrenal gland.

151. Name the ion responsible for unmasking of active sites for myosin for cross-bridge activity during muscle contraction.
(a) Calcium **(b)** Magnesium
(c) Sodium **(d)** Potassium

152. Name the blood cells, whose reduction in number can cause clotting disorder, leading to excessive loss of blood from the body.
(a) Erythrocytes **(b)** Leucocytes
(c) Neutrophils **(d)** Thrombocytes

153. Name a peptide hormone which acts mainly on hepatocytes, adipocytes and enhances cellular glucose uptake and utilisation.
(a) Insulin **(b)** Glucagon
(c) Secretin **(d)** Gastrin

154. Osteoporosis, an age-related disease of skeletal system, may occur due to
(a) immune disorder affecting neuromuscular junction leading to fatigue.
(b) high concentration of Ca^{++} and Na^{+}.
(c) decreased level of oestrogen.
(d) accumulation of uric acid leading to inflammation of joints.

155. Serum differs from blood in
(a) lacking globulins.
(b) lacking albumins.
(c) lacking clotting factors.
(d) lacking antibodies.

156. Lungs do not collapse between breaths and some air always remains in the lungs which can never be expelled because
(a) there is a negative pressure in the lungs.
(b) there is a negative intrapleural pressure pulling at the lung walls.
(c) there is a positive intrapleural pressure.
(d) pressure in the lungs in higher than the atmospheric pressure.

157. The posterior pituitary gland is not a 'true' endocrine gland because
(a) it is provided with a duct.
(b) it only stores and releases hormones.
(c) it is under the regulation of hypothal-amus.
(d) it secretes enzymes.

158. The part of nephron involved in active reabsorption of sodium is
(a) distal convoluted tubule.
(b) proximal convoluted tubule.
(c) Bowman's capsule.
(d) descending limb of Henle's loop.

159. Which of the following is hormone-releasing IUD ?
(a) LNG-20 **(b)** Multiload-375
(c) Lippes loop **(d)** Cu-7

160. Which of the following is incorrect regarding vasectomy ?
(a) No sperm occurs in seminal fluid.
(b) No sperm occurs in epididymis.
(c) Vasa deferentia is cut and tied.
(d) Irreversible sterility.

161. Embryo with more than 16 blastomeres formed due to *in vitro* fertilisation is transferred into
(a) uterus. **(b)** fallopian tube.
(c) fimbriae. **(d)** cervix.

162. **Which of the following depicts the correct pathway of transport of sperms ?**
(a) Rete testis → Efferent ductules → Epididymis → Vas deferens
(b) Rete testis → Epididymis → Efferent ductules → Vas deferens
(c) Rete testis → Vas deferens → Efferent ductules → Epididymis
(d) Efferent ductules → Rete testis → Vas deferens → Epididymis

163. Match column I with column II and select the correct option using the codes given below

Column I		Column II	
A.	Mons pubis	1.	Embryo formation
B.	Antrum	2.	Sperm
C.	Trophectoderm	3.	Female external genitalia
D.	Nebenkern	4.	Graafian follicle

Codes

	A	B	C	D
(a)	3	4	2	1
(b)	3	4	1	2
(c)	3	1	4	2
(d)	1	4	3	2

164. Several hormones like hGG, hPL, oestrogen, progesterone are produced by
(a) ovary. **(b)** placenta.
(c) fallopian tube. **(d)** pituitary.

165. If a colourblind man marries a woman who is homozygous for normal colour vision, the probability of their son being colourblind is
(a) 0 **(b)** 0.5 **(c)** 0.75 **(d)** 1

166. Genetic drift operates in
(a) small isolated population.
(b) large isolated population.
(c) non-reproductive population.
(d) slow reproductive population.

167. In Hardy-Weinberg equation, the frequency of heterozygous individual is represented by
(a) p^2 **(b)** $2pq$ **(c)** pq **(d)** q^2

168. The chronological order of human evolution from early to the recent is
(a) *Australopithecus* → *Ramapithecus Homo habilis* → *Home erectus*
(b) *Ramapithecus* → *Australopithecus* → *Homo habilis* → *Homo erectus*
(c) *Ramapithecus* → *Homo habilis* → *Australopithecus* → *Homo erectus*
(d) *Australopithecus* → *Homo habilis* → *Ramapithecus* → *Homo erectus*

169. Which of the following is the correct sequence of events in the origin of life ?
I. Formation of protobionts.
II. Synthesis of organic monomers.
III. Synthesis of organic polymers.
IV. Formation of DNA-based genetic systems.
(a) I, II, III, IV **(b)** I, III, II, IV
(c) II, III, I, IV **(d)** II, III, IV, I

170. A molecule that can act as a genetic material must fulfil the traits given below, except
(a) it should be able to express itself in the form of 'Mendelian characters'.
(b) it should be able to generate its replica.
(c) it should be unstable structurally and chemically.
(d) it should provide the scope for slow changes that are required for evolution.

171. DNA-dependent RNA polymerase catalyses transcription on one strand of the DNA which is called the
(a) template strand. **(b)** coding strand.
(c) alpha strand. **(d)** anti strand.

172. Interspecific hybridisation is the mating of
(a) animals within same breed without having common ancestors.
(b) two different related species.
(c) superior males and females of different breeds.
(d) more closely related individuals within same breed for 4-6 generations.

173. Which of the following is correct regarding AIDS causative agent HIV ?
(a) HIV is enveloped virus containing one molecule of single-stranded RNA and one molecule of reverse transcriptase.
(b) HIV is enveloped virus that contains two identical molecules of single-stranded RNA and two molecules of reverse transcriptase.
(c) HIV is unenveloped retrovirus.
(d) HIV does not escape but attacks the acquired immune response.

174. Among the following edible fishes, which one is marine fish having rich source of omega-3 fatty acids?
Out of Syllabus
(a) Mystus **(b)** Mangur **(c)** Mrigala **(d)** Mackerel

175. Match column I with column II and select the correct option using the codes given below

Column I		Column II	
A.	Citric acid	1.	*Trichoderma*
B.	Cyclosporin	2.	*Clostridium*
C.	Statins	3.	*Aspergillus*
D.	Butyric acid	4.	*Monascus*

Codes

	A	B	C	D
(a)	3	1	2	4
(b)	3	1	4	2
(c)	1	4	2	3
(d)	3	4	1	2

176. Biochemical Oxygen Demand (BOD) may not be a good index for pollution in water bodies receiving effluents from
(a) domestic sewage. **(b)** dairy industry.
(c) petroleum industry. **(d)** sugar industry.

177. The principle of competitive exclusion was stated by
(a) C Darwin. **(b)** GF Gause.
(c) Mac Arthur. **(d)** Verhulst and Pearl.

178. Which of the following National Parks is home to the famous musk deer or hangul ?
(a) Keibul Lamjao National Park, Manipur.
(b) Bandhavgarh National Park, Madhya Pradesh.
(c) Eaglenest Wildlife Sancturay, Arunachal Pradesh.
(d) Dachigam National Park, Jammu and Kashmir.

179. A lake which is rich in organic waste may result in
(a) increased population of aquatic organisms due to minerals.
(b) drying of the lake due to algal bloom.
(c) increased population of fish due to lots of nutrients.
(d) mortality of fish due to lack of oxygen.

180. The highest DDT concentration in aquatic food chain shall occur in
(a) phytoplankton. **(b)** seagull.
(c) crab. **(d)** eel.

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