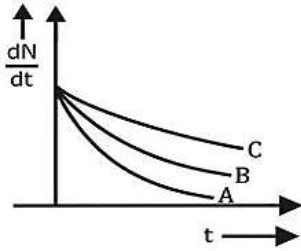


Physics

1. Which one of the following nuclei has shorter mean life?



- (a) B (b) Same for all
(c) A (d) C

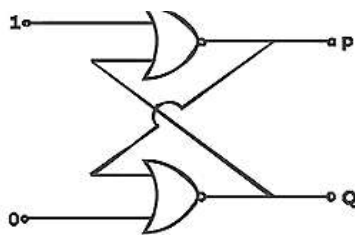
2. The conductivity of semiconductor increases with increase in temperature because

- (a) Relaxation time increases
(b) Number density of current carriers increases, relaxation time decreases but effect of decrease in relaxation time is much less than increase in number density
(c) Number density of charge carriers increases
(d) Both number density of charge carriers and relaxation time increase

3. For a transistor amplifier, the voltage gain

- (a) Is high at high and low frequencies and constant in the middle frequency range
(b) Constant at high frequencies and low at low frequencies
(c) Remains constant for all frequencies
(d) Is low at high and low frequencies and constant at mid frequencies

4. In the following circuit, what are P and Q?



- (a) P = 1, Q = 0 (b) P = 1, Q = 1
(c) P = 0, Q = 0 (d) P = 0, Q = 1

5. An antenna uses electromagnetic waves of frequency 5 MHz. For proper working, the size of the antenna should be

- (a) 300 m (b) 3 km
(c) 15 m (d) 15 km

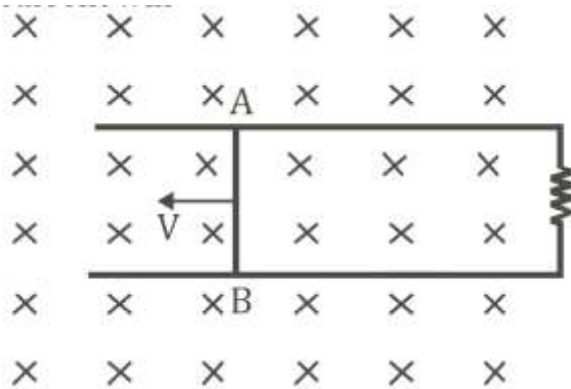
6. A magnetic needle has a magnetic moment of $5 \times 10^{-2} \text{ Am}^2$ and moment of inertia $8 \times 10^{-6} \text{ kgm}^2$. It has a period of oscillation of 2 s in a magnetic field $\vec{B}$. The magnitude of magnetic field is approximately.

- (a) $0.4 \times 10^{-4} \text{ T}$ (b) $0.8 \times 10^{-4} \text{ T}$
(c) $1.6 \times 10^{-4} \text{ T}$ (d) $3.2 \times 10^{-4} \text{ T}$

7. A toroid has 500 turns per metre length. If it carries a current of 2 A, the magnetic energy density inside the toroid is

- (a) 0.314 J/m^3 (b) 3.14 J/m^3
(c) 0.628 J/m^3 (d) 6.28 J/m^3

8. Consider the situation given in figure. The wire AB is slid on the fixed rails with a constant velocity. If the wire AB is replaced by a semicircular wire, the magnitude of the induced current will

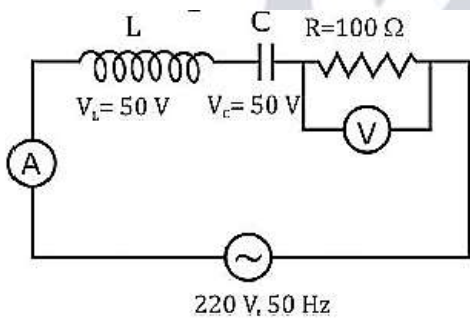


- (a) Remain same
(b) Increase or decrease depending on whether the semicircle bulges towards the resistance or away from it
(c) Increase
(d) Decrease

9. The frequency of an alternating current is 50 Hz. What is the minimum time taken by current to reach its peak value from rms value?

- (a) $2.5 \times 10^{-3} \text{ s}$ (b) $10 \times 10^{-3} \text{ s}$
(c) $5 \times 10^{-3} \text{ s}$ (d) 0.02 s

10. The readings of ammeter and voltmeter in the following circuit are respectively

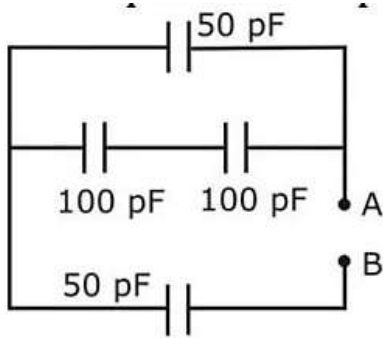


- (a) 1.5 A, 100 V (b) 2.2 A, 220 V
(c) 1.2 A, 120 V (d) 2.7 A, 220 V

11. Two metal plates are separated by 2 cm. The potentials of the plates are -10 V and +30 V. The electric field between the two plates is

- (a) 1000 V/m (b) 3000 V/m
(c) 500 V/m (d) 2000 V/m

12. The equivalent capacitance between A and B is,



- (a) $\frac{100}{3}$ pF (b) 300 pF
(c) 50 pF (d) 150 pF

13. A capacitor of capacitance C charged by an amount Q is connected in parallel with an uncharged capacitor of capacitance $2C$. The final charges on the capacitors are

- (a) $\frac{Q}{4}, \frac{3Q}{4}$ (b) $\frac{Q}{5}, \frac{4Q}{5}$
(c) $\frac{Q}{2}, \frac{Q}{2}$ (d) $\frac{Q}{3}, \frac{2Q}{3}$

14. Though the electron drift velocity is small and electron charge is very small, a conductor can carry an appreciably large current because

- (a) Drift velocity of electron is very large
(b) Relaxation time is small
(c) Electron number density is very large
(d) Electron number density depends on temperature

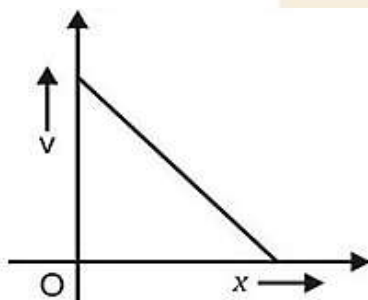
15. Masses of three wires of copper are in the ratio 1: 3: 5 and their lengths are in the ratio 5: 3: 1. The ratio of their electrical resistance are

- (a) 5:3:1 (b) 125: 15: 1
(c) 1: 3: 5 (d) 1: 15: 125

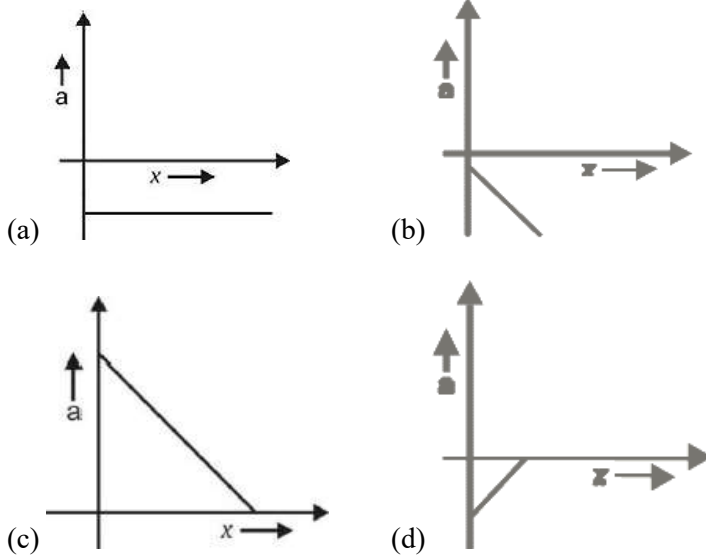
16. If P , Q and R are physical quantities having different dimensions, which of the following combinations can never be a meaningful quantity?

- (a) $PQ - R$ (b) $\frac{PR - Q^2}{R}$
(c) $\frac{P - Q}{R}$ (d) $\frac{PQ}{R}$

17. The given graph shows the variation of velocity (v) with position (x) for a particle moving along a straight line



Which of the following graph shows the variation of acceleration (a) with position (x)?



18. The trajectory of a projectile projected from origin is given by the equation $y = x - \frac{2x^2}{5}$. The initial velocity of the projectile is?

- (a) 5 ms^{-1} (b) $\frac{5}{2} \text{ ms}^{-1}$
(c) $\frac{2}{5} \text{ ms}^{-1}$ (d) 25 ms^{-1}

19. An object with mass 5 kg is acted upon by a force, $\vec{F} = (-3\hat{i} + 4\hat{j})\text{N}$. If its initial velocity at $t = 0$ is $\vec{v} = (6\hat{i} - 12\hat{j})\text{ms}^{-1}$, the time at which it will just have a velocity along y-axis is

- (a) 10 s (b) 15 s
(c) 5 s (d) 2 s

20. During inelastic collision between two objects, which of the following quantity always remains conserved?

- (a) Total mechanical energy
(b) Speed of each body
(c) Total kinetic energy
(d) Total linear momentum

21. In Rutherford experiment, for head-on collision of α -particles with a gold nucleus, the impact parameter is

- (a) of the order of 10^{-14} m
(b) of the order of 10^{-6} m
(c) zero
(d) of the order of 10^{-10} m

22. Frequency of revolution of an electron revolving in n^{th} orbit of H-atom is proportional to

- (a) n (b) $\frac{1}{n^3}$
(c) $\frac{1}{n^2}$ (d) n independent of n

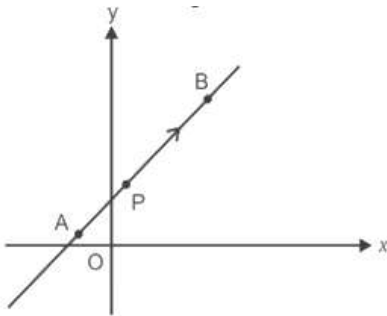
23. A hydrogen atom in ground state absorbs 10.2 eV of energy. The orbital angular momentum of the electron is increased by

- (a) $2.11 \times 10^{-34} \text{ Js}$ (b) $4.22 \times 10^{-34} \text{ Js}$
(c) $1.05 \times 10^{-34} \text{ Js}$ (d) $3.16 \times 10^{-34} \text{ Js}$

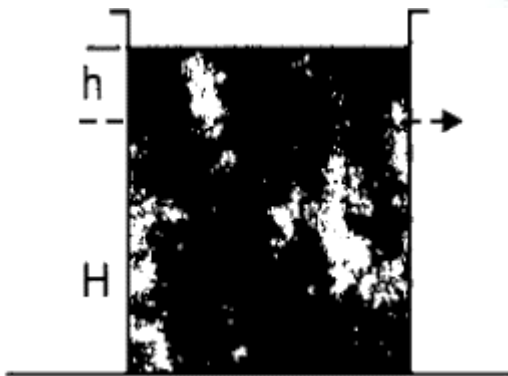
24. The end product of decay of ${}_{90}\text{Th}^{232}$ is ${}_{82}\text{Pb}^{208}$. The number of α and β particles emitted are respectively.

- (a) 6,4 (b) 4,6
(c) 3,3 (d) 6,0

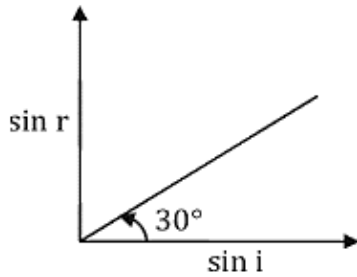
25. Two protons are kept at a separation of 10 nm. Let F_n and F_e be the nuclear force and the electromagnetic force between them
- $F_e \gg F_n$
 - F_e and F_n differ only slightly
 - $F_e = F_n$
 - $F_e \ll F_n$
26. Two particles which are initially at rest move towards each other under the action of their mutual attraction. If their speeds are v and $2v$ at any instant, then the speed of center of mass of the system is,
- Zero
 - v
 - $2v$
 - $1.5v$
27. A particle is moving uniformly along a straight line as shown in the figure. During the motion of the particle from A to B, the angular momentum of the particle about 'O'



- decreases
 - first increases then decreases
 - increases
 - Remains constant
28. A satellite is orbiting close to the earth and has a kinetic energy K . The minimum extra kinetic energy required by it to just overcome the gravitation pull of the earth is
- $2K$
 - $2\sqrt{2}K$
 - K
 - $\sqrt{3}K$
29. A wire is stretched such that its volume remains constant. The Poisson's ratio of the material of the wire is
- 0.50
 - 0.25
 - 0.50
 - 0.25
30. A cylindrical container containing water has a small hole at height of $H = 8$ cm from the bottom and at a depth of 2 cm from the top surface of the liquid. The maximum horizontal distance travelled by the water before it hits the ground (x) is

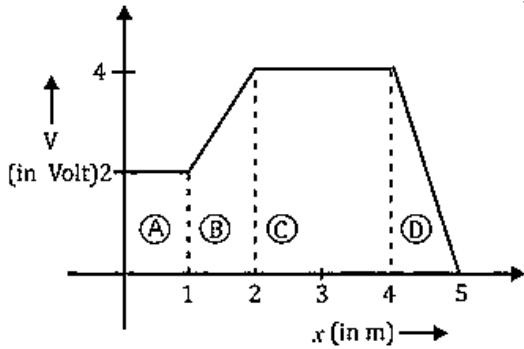


- $4\sqrt{2}$ cm
 - 6 cm
 - 8 cm
 - 4 cm
31. A transparent medium shows relation between i and r as shown. If the speed of light in vacuum is c , the Brewster angle for the medium is



- (a) 45° (b) 90°
(c) 30° (d) 60°

32. In Young's double slit experiment, using monochromatic light of wavelength λ , the intensity of light at a point on the screen where path difference is λ is K units. The intensity of light at a point where path difference is $\frac{\lambda}{3}$ is
- (a) $\frac{K}{4}$ (b) $2K$
(c) K (d) $4K$
33. Due to Doppler's effect, the shift in wavelength observed is $0.1\text{\AA}$ for a star producing wavelength $6000\text{\AA}$. Velocity of recession of the star will be
- (a) 10 km/s (b) 20 km/s
(c) 25 km/s (d) 5 km/s
34. An electron is moving with an initial velocity $\vec{V} = V_0\hat{i}$ and is in a uniform magnetic field $\vec{B} = B_0\hat{j}$. Then, it's de Broglie wavelength
- (a) Increases with time
(b) Increases and decreases periodically
(c) Remains constant
(d) Decreases with time
35. Light of certain frequency and intensity incident on a photosensitive material causes photoelectric effect. If both the frequency and intensity are doubled The photoelectric saturation current becomes.
- (a) doubled (b) unchanged
(c) quadrupled (d) halved
36. A certain charge $2Q$ is divided at first into two parts q_1 and q_2 . Later, the charges are placed at a certain distance. If the force of interaction between two charges is maximum then $\frac{Q}{q_1} = \underline{\hspace{2cm}}$.
- (a) 2 (b) 0.5
(c) 4 (d) 1
37. A particle of mass m and charge q is placed at rest in uniform electric field E and then released The kinetic energy attained by the particle after moving a distance y is
- (a) qE^2y (b) q^2Ey
(c) qEy^2 (d) qEy
38. An electric dipole is kept in non-uniform electric field (d) It generally experiences
- (a) A force but not a torque
(b) Neither a force nor a torque
(c) A force and torque
(d) A torque but not a force
39. The figure gives the electric potential V as a function of distance through four regions on x axis. Which of the following is true for the magnitude of the electric field E in these regions?



- (a) $E_A = E_C$ and $E_B < E_D$
 (b) $E_A < E_B < E_C < E_D$
 (c) $E_A > E_B > E_C > E_D$
 (d) $E_B = E_D$ and $E_A < E_C$

40. A system of two charges separated by a certain distance apart stores electrical potential energy. If the distance between them is increased, the potential energy of the system,

- (a) Decreases in any case
 (b) Remains the same
 (c) Increases in any case
 (d) May increase or decrease

41. In a cyclotron, a charged particle

- (a) Speeds up between the dees because of the magnetic field
 (b) Slows down with in a dee and speeds up between dees
 (c) Undergoes acceleration all the time
 (d) Speeds up in dee

42. The number of turns in a coil of Galvanometer is tripled, then

- (a) Voltage sensitivity remains constant and current sensitivity increases 3 times
 (b) Both voltage and current sensitivity decreases by 33%
 (c) Voltage sensitivity increases 3 times and current sensitivity remains constant
 (d) Both voltage and current sensitivity remains constant

43. A circular current loop of magnetic moment M is in an arbitrary orientation in an external uniform magnetic field $\vec{B}$. The work done to rotate the loop by 30° about an axis perpendicular to its plane is

- (a) $\sqrt{3} \frac{MB}{2}$ (b) Zero
 (c) MB (d) $\frac{MB}{2}$

44. In a permanent magnet at room temperature

- (a) The individual molecules have nonzero magnetic moment which are all perfectly aligned(d)
 (b) Domains are all perfectly aligned
 (c) Magnetic moment of each molecule is zero.
 (d) Domains are partially aligned

45. Coersivity of a magnet where the ferromagnet gets completely demagnetized is $3 \times 10^3 \text{ Am}^{-1}$. The minimum current required to be passed in a solenoid having 1000 turns per metre, so that the magnet gets

completely demagnetized when placed inside the solenoid is

- (a) 60 mA (b) 6 A
(c) 30 mA (d) 3 A

46. An inductor of inductance L and resistor R are joined together in series and connected by a source of frequency ω . The power dissipated in the circuit is

- (a) $\frac{V^2 R}{R^2 + \omega^2 L^2}$ (b) $\frac{V^2 R}{\sqrt{R^2 + \omega^2 L^2}}$
(c) $\frac{R^2 + \omega^2 L^2}{V}$ (d) $\frac{V}{R^2 + \omega^2 L^2}$

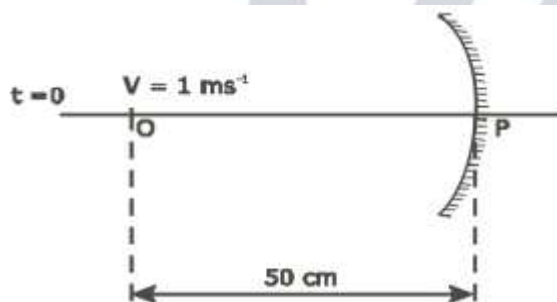
47. An electromagnetic wave is travelling in x -direction with electric field vector given by $\vec{E}_y = E_0 \sin(kx - \omega t)\hat{j}$. The correct expression for magnetic field vector is

- (a) $\vec{B}_z = E_0 C \sin(kx - \omega t)\hat{k}$
(b) $\vec{B}_z = \frac{E_0}{c} \sin(kx - \omega t)\hat{k}$
(c) $\vec{B}_y = E_0 C \sin(kx - \omega t)\hat{j}$
(d) $\vec{B}_y = \frac{E_0}{c} \sin(kx - \omega t)\hat{j}$

48. The phenomenon involved in the reflection of radio-waves by ionosphere is similar to

- (a) Total internal reflection of light in air during a mirage
(b) Scattering of light by air particles
(c) Reflection of light by plane mirror
(d) Dispersion of light by water molecules during the formation of a rainbow

49. A point object is moving uniformly towards the pole of a concave mirror of focal length 25 cm along its axis as shown below. The speed of the object is 1 ms^{-1} . At $t = 0$, the distance of the object from the mirror is 50 cm. The average velocity of the image formed by the mirror between time $t = 0$ and $t = 0.25 \text{ s}$ is:

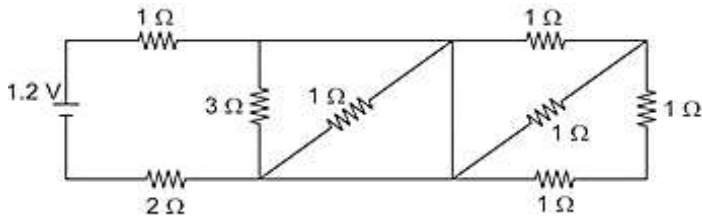


- (a) 20 cm s^{-1} (b) Infinity
(c) 40 cm s^{-1} (d) Zero

50. A certain prism is found to produce a minimum deviation of 38° . It produces a deviation of 44° when the angle of incidence is either 42° or 62° . What is the angle of incidence when it is undergoing minimum deviation?

- (a) 40° (b) 60°
(c) 30° (d) 49°

51. In the given circuit, the current through 2Ω resistor is

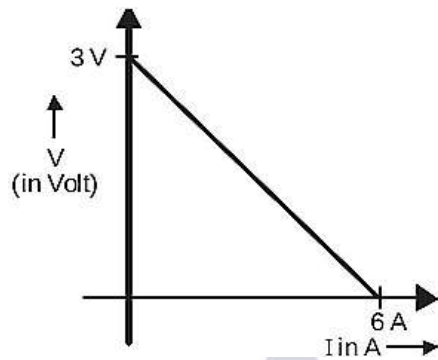


- (a) 0.3 A (b) 0.1 A
(c) 0.2 A (d) 0.4 A

52. Kirchhoff's junction rule is a reflection of

- (a) Conservation of energy
(b) Conservation of charges
(c) Conservation of current density vector
(d) Conservation of momentum

53. The variation of terminal potential difference (V) with current flowing through a cell is as shown



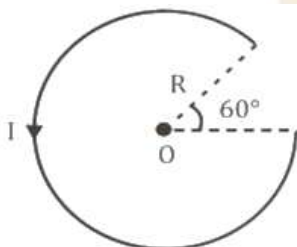
The emf and internal resistance of the cell are

- (a) 3 V, 0.5Ω (b) 6 V, 0.5Ω
(c) 3 V, 2Ω (d) 6 V, 2Ω

54. In a potentiometer experiment, the balancing point with a cell is at a length 240 cm . On shunting the cell with a resistance of 2Ω, the balancing length becomes 120 cm . The internal resistance of the cell is

- (a) 2Ω (b) 0.5Ω
(c) 4Ω (d) 1Ω

55. The magnetic field at the centre 'O' in the given figure is



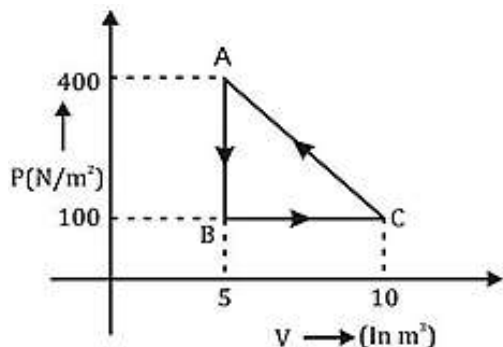
- (a) $\frac{5}{12} \frac{\mu_0 I}{R}$ (b) $\frac{\mu_0 I}{12R}$
(c) $\frac{7}{14} \frac{\mu_0 I}{R}$ (d) $\frac{3}{10} \frac{\mu_0 I}{R}$

56. An aluminium sphere is dipped into water. Which of the following is true?

- (a) Buoyancy will be more in water at 0°C than that in water at 4°C

- (b) Buoyancy may be more or less in water at 4°C depending on the radius of the sphere
- (c) Buoyancy will be less in water at 0°C than that in water at 4°C
- (d) Buoyancy in water at 0°C will be same as that in water at 4°C

57. A thermodynamic system undergoes a cyclic process ABC as shown in the diagram. The work done by the system per cycle is



- (a) -1250 J\$ (b) 1250 J
(c) 750 J (d) -750 J\$

58. One mole of O_2 gas is heated at constant pressure starting at 27°C . How much energy must be added to the gas as heat to double its volume?

- (a) 450 R (b) 1050 R
(c) Zero (d) 750 R

59. A piston is performing S.H.M. in the vertical direction with a frequency of 0.5 Hz. A block of 10 kg is placed on the piston. The maximum amplitude of the system such that the block remains in contact with the piston is

- (a) 0.5 m (b) 0.1 m
(c) 1 m (d) 1.5 m

60. The equation of a stationary wave is $y = 2\sin\left(\frac{\pi x}{15}\right)\cos(48\pi t)$. The distance between a node and its next antinode is

- (a) 1.5 units (b) 30 units
(c) 7.5 units (d) 22.5 units

Chemistry

61. Which of the following possess net dipole moment?

- (a) BF_3 (b) SO_2
(c) CO_2 (d) BeCl_2

62. The number of π -bonds and σ -bonds present in naphthalene are respectively

- (a) 5,19 (b) 6,19
(c) 5,20 (d) 5,11

63. The reaction in which $\Delta H > \Delta U$ is

- (a) $\text{CaCO}_{3(s)} \rightarrow \text{CaO}_{(s)} + \text{CO}_{2(g)}$
(b) $\text{N}_{2(g)} + \text{O}_{2(g)} \rightarrow 2\text{NO}_{(g)}$
(c) $\text{CH}_{4(g)} + 2\text{O}_{2(g)} \rightarrow \text{CO}_{2(g)} + 2\text{H}_2\text{O}_{(l)}$
(d) $\text{N}_{2(g)} + 3\text{H}_{2(g)} \rightarrow 2\text{NH}_{3(g)}$

64. The number of moles of electron required to reduce 0.2 mole of $\text{Cr}_2\text{O}_7^{2-}$ to Cr^{+3}

- (a) 6 (b) 1.2
(c) 0.6 (d) 12

65. In the reaction $\text{B}(\text{OH})_3 + 2\text{H}_2\text{O} \rightarrow [\text{B}(\text{OH})_4]^- + \text{H}_3\text{O}^+$

B(OH)₃ functions as

- (a) Lewis base (b) Protonic acid
(c) Lewis acid (d) Bronsted acid

66. Match the following acids with their pK_a values:

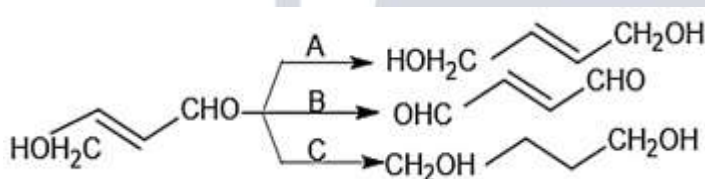
Acid	pK _a
(a) Phenol	(i) 16
(b) P-Nitrophenol	(ii) 0.78
(c) Ethanol	(iii) 10
(d) Picric acid	(iv) 7.1

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

67. Which of the following can be used to test the acidic nature of ethanol?

- (a) Na₂CO₃ (b) Blue litmus solution
(c) Na metal (d) NaHCO₃

68. The reagents A, B and C respectively are

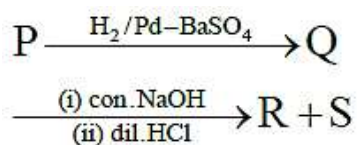


- (a) NaBH₄, alk. KMnO₄, H₂/Pd
(b) H₂/Pd, PCC, NaBH₄
(c) H₂/Pd, alk. KMnO₄, NaBH₄
(d) NaBH₄, PCC, H₂/Pd

69. Propanoic acid undergoes HVZ reaction to give chloropropanoic acid The product obtained is

- (a) As stronger as propanoic acid
(b) Stronger acid than propanoic acid
(c) Stronger than dichloropropanoic acid
(d) Weaker acid than propanoic acid

70.



R and S form benzyl benzoate when treated with each other. Hence P is

- (a) $C_6H_5CH_2OH$ (b) C_6H_5CHO
(c) C_6H_5COOH (d) C_6H_5COCl

71. Among the following, the main reactions occurring in blast furnace during extraction of iron from haematite are

- (i) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$
(ii) $FeO + SiO_2 \rightarrow FeSiO_3$
(iii) $Fe_2O_3 + 3C \rightarrow 2Fe + 3CO$
(iv) $CaO + SiO_2 \rightarrow CaSiO_3$

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

72. Which of the following pair contains 2 lone pair of electrons on the central atom?

- (a) H_2O, NF_3 (b) I_3^+, H_2O
(c) SO_4^{2-}, H_2S (d) XeF_4, NH_3

73. Which of the following statement is correct?

- (a) Cl_2 is a stronger oxidizing agent than F_2 .
(b) Cl_2 oxidises H_2O to O_2 but F_2 does not.
(c) Fluoride is a good oxidizing agent.
(d) F_2 oxidises H_2O to O_2 but Cl_2 does not.

74. 0.1 mole of XeF_6 is treated with 1.8 g of water. The product obtained is

- (a) $XeO_2 F_2$ (b) XeO_3
(c) $Xe + XeO_3$ (d) $XeOF_4$

75. In the reaction of gold with aquaregia, oxidation state of Nitrogen changes from

- (a) +6 to +4 (b) +4 to +2
(c) +3 to +1 (d) +5 to +2

76. The vitamin that helps in clotting of blood is

- (a) C (b) A
(c) K (d) B_2

77. The polymer containing five methylene groups as it's repeating unit is

- (a) Nylon 6 (b) Nylon 6, 6
(c) Bakelite (d) Dacron

78. Cis-1, 4-polyisoprene is called

- (a) Neoprene (b) Buna-N
(c) Natural rubber (d) Buna-S

79. Which cleansing agent gets precipitated in hard water?

- (a) Sodium stearate
(b) Sodium lauryl sulphate
(c) Sodium dodecyl benzene sulphonate
(d) Cetyl trimethyl ammonium bromide

80. Anti-histamine among the following is

- (a) Morphine
(b) Bromopheneramine

- (c) Chloroxylenol
- (d) Amoxycillin

81. The elements in which electrons are progressively filled in 4 f orbital are called

- (a) Transition elements
- (b) Actinoids
- (c) Halogens
- (d) Lanthanoids

82. Incorrect statement with reference to Ce (Z = 58)

- (a) Ce in +3 oxidation state is more stable than in +4.
- (b) Ce^{4+} is a reducing agent
- (c) Ce shows common oxidation states of +3 and +4.
- (d) Atomic size of Ce is more than that of Lu.

83. A mixture of NaCl and $K_2Cr_2O_7$ is heated with conc H_2SO_4 , deep red vapours are formed Which of the following statement is false?

- (a) The vapours contain CrO_2Cl_2 only.
- (b) The vapours give a yellow solution with NaOH.
- (c) The vapours when passed into lead acetate in acetic acid give a yellow precipitate.
- (d) The vapours contain CrO_2Cl_2 and Cl_2 .

84. Which of the following statement is wrong?

- (a) Mn^{3+} and Co^{3+} are oxidizing agents in aqueous solution.
- (b) In highest oxidation states, the transition metals show acidic character.
- (c) All element of 3d series exhibit variable oxidation states.
- (d) Metals in highest oxidation states are more stable in oxides than in fluorides.

85. Which among the following is the strongest ligand?

- (a) NH_3
- (b) CN^-
- (c) en
- (d) CO

86. Which of the following is a network crystalline solid?

- (a) AlN
- (b) I_2
- (c) Ice
- (d) NaCl

87. The number of atoms in 2.4 g of body centred cubic crystal with edge length 200 pm is (density = 10 g cm^{-3} , $N_A = 6 \times 10^{23} \text{ atoms /mol}$)

- (a) 6×10^{20}
- (b) 6×10^{22}
- (c) 6×10^{19}
- (d) 6×10^{23}

88. 1 mole of NaCl is doped with 10^{-5} mole of $SrCl_2$. The number of cationic vacancies in the crystal lattice will be

- (a) 6.022×10^{15}
- (b) 6.022×10^{18}
- (c) 12.044×10^{20}
- (d) 6.022×10^{23}

89. A non-volatile solute, 'A' tetramerises in water to the extent of 80%, 2.5 g of 'A' in 100 g of water, lower the freezing point by 0.3°C The molar mass of A in mol L^{-1} is (K_f for water = $1.86 \text{ K kg mol}^{-1}$)

- (a) 221
- (b) 62
- (c) 354
- (d) 155

90. Solution 'A' contains acetone dissolved in chloroform and solution 'B' contains acetone dissolved in carbon disulphide. The type of deviations from Raoult's law shown by solutions A and B, respectively are:

- (a) Positive and negative
- (b) Positive and positive

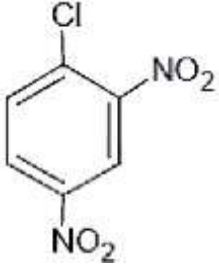
- (c) Negative and positive
(d) Negative and negative
91. The mass of AgCl precipitated when a solution containing 11.70 g of NaCl is added to a solution containing 3.4 g of AgNO₃ is [Atomic mass of Ag = 108, Atomic mass of Na = 23]
(a) 1.17 g (b) 5.74 g
(c) 6.8 (d) 2.87 g
92. Two particles A and B are in motion. If the wavelength associated with ' A ' is 33.33 nm , the wavelength associated with ' B ' whose momentum is $\frac{1}{3}$ rd of ' A ' is
(a) 2.5×10^{-8} m (b) 1.0×10^{-8} m
(c) 1.0×10^{-7} m (d) 1.25×10^{-7} m
93. The first ionization enthalpy of the following elements are in the order:
(a) P < Si < N < C (b) C < N < Si < P
(c) Si < P < C < N (d) P < Si < C < N
94. Solubility of AgCl is least in
(a) Pure water (b) 0.1MNaCl
(c) 0.1MAlCl₃ (d) 0.1MBaCl₂
95. Which of the following equations does NOT represent Charles's law for a given mass of gas at constant pressure?
(a) $\log V = \log K + \log T$
(b) $\frac{V}{T} = K$
(c) $\frac{d(\ln V)}{dT} = \frac{1}{T}$
(d) $\log K = \log V + \log T$
96. Which is the most suitable reagent for the following conversion?
- $$\text{CH}_3\text{-CH=CH-CH}_2\text{-}\overset{\text{O}}{\parallel}\text{C-CH}_3 \longrightarrow \text{CH}_3\text{-CH=CH-CH}_2\text{-}\overset{\text{O}}{\parallel}\text{C-OH}$$
- (a) I₂ and NaOH solution
(b) Tollen's reagent
(c) Sn and NaOH solution
(d) Benzoyl peroxide
97. Which of the following is least soluble in water at 298 K ?
(a) (CH₃)₃ N (b) CH₃NH₂
(c) C₆H₅NH₂ (d) (CH₃)₂NH
98. If aniline is treated with 1: 1 mixture of con. HNO₃ and con. H₂SO₄, p-nitroaniline and m-nitroaniline are formed nearly in equal amounts. This is due to
(a) Protonation of -NH₂ which causes deactivation of benzene ring
(b) m-directing property of -NH₂ group
(c) Isomerisation of some p-nitroaniline into m-nitroaniline
(d) m&p directing property of -NH₂ group
99. In nucleic acids, the nucleotides are joined together by
(a) Phosphodiester linkage
(b) Phosphoester linkage
(c) Sulphodiester linkage
(d) Phosphodisulphide linkage
100. Which of the following is generally water insoluble?
(a) Vitamin-C (b) Fibrous protein
(c) Glycine (d) Amylose

- 101. Relative lowering of vapour pressure of a dilute solution of glucose dissolved in 1 kg of water is 0.002. The molality of the solution is**
 (a) 0.222 (b) 0.004
 (c) 0.021 (d) 0.111
- 102. One litre solution of MgCl_2 is electrolyzed completely by passing a current of 1 A for 16 min 5 sec. The original concentration of MgCl_2 solution was (Atomic mass of Mg = 24)**
 (a) $5 \times 10^{-2} \text{M}$ (b) $5 \times 10^{-3} \text{M}$
 (c) $1.0 \times 10^{-2} \text{M}$ (d) $0.5 \times 10^{-3} \text{M}$
- 103. An aqueous solution of CuSO_4 is subjected to electrolysis using inert electrodes. The pH of the solution will**
 (a) Remain unchanged
 (b) increase
 (c) increase or decrease depending on the strength of the current
 (d) decrease
- 104. Give: $E_{\text{Mn}^{+7}/\text{Mn}^{+2}}^0 = 1.5 \text{ V}$ and $E_{\text{Mn}^{+4}/\text{Mn}^{+2}}^0 = 1.2 \text{ V}$, then $E_{\text{Mn}^{+7}/\text{Mn}^{+4}}^0$ is**
 (a) 0.1 V (b) 0.3 V
 (c) 2.1 V (d) 1.7 V
- 105. The plot of $t_{1/2} \text{ V/s[R]}_0$ for a reaction is a straight-line parallel to x-axis. The unit for the rate constant of this reaction is**
 (a) $\text{molL}^{-1} \text{s}^{-1}$ (b) $\text{molL}^{-1} \text{s}$
 (c) s^{-1} (d) $\text{Lmol}^{-1} \text{s}^{-1}$
- 106. The metal nitrate that liberates NO_2 on heating**
 (a) LiNO_3 (b) NaNO_3
 (c) RbNO_3 (d) KNO_3
- 107. Which of the following is NOT true regarding the use of hydrogen as a fuel?**
 (a) The combustible energy of hydrogen can be directly converted to electrical energy in a fuel cell.
 (b) High calorific value
 (c) Hydrogen gas can be easily liquefied and stored
 (d) Combustion product is ecofriendly.
- 108. Resonance effect is not observed in**
 (a) $\text{CH}_2 = \text{CH} - \text{C} \equiv \text{N}$
 (b) $\text{CH}_2 = \text{CH} - \text{CH} = \text{CH}_2$
 (c) $\text{CH}_2 = \text{CH} - \text{CH}_2 - \text{NH}_2$
 (d) $\text{CH}_2 = \text{CH} - \text{Cl}$
- 109. 2-butyne is reduced to trans-but-2-ene using**
 (a) Na in liq. NH_3 (b) H_2 | Ni
 (c) Zn in dil. HCl (d) H_2 | Pd - C
- 110. Eutrophication causes**
 (a) Reduction in water pollution
 (b) Increase of nutrients in water
 (c) Decreases BOD
 (d) Reduction in dissolved oxygen
- 111. Addition of excess of AgNO_3 to an aqueous solution of 1 mole of $\text{PdCl}_2 + 4\text{NH}_3$, gives 2 moles of AgCl. The conductivity of this solution corresponds to-**
 (a) 1:3 electrolyte (b) 1:1 electrolyte
 (c) 1:4 electrolyte (d) 1:2 electrolyte

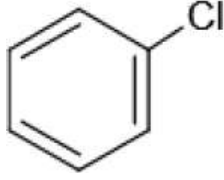
112. The formula of penta aquanitrato chromium (III) nitrate is:

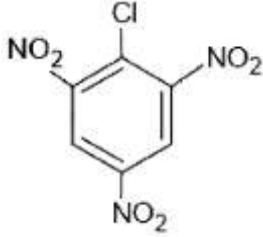
- (a) $[\text{Cr}(\text{H}_2\text{O})_6](\text{NO}_2)_2$
- (b) $[\text{Cr}(\text{H}_2\text{O})_6](\text{NO}_3)_3$
- (c) $[\text{Cr}(\text{H}_2\text{O})_5\text{NO}_2]\text{NO}_3$
- (d) $[\text{Cr}(\text{H}_2\text{O})_5\text{NO}_3](\text{NO}_3)_2$

113. Which of the following halide undergoes hydrolysis on warming with water/aqueous NaOH?

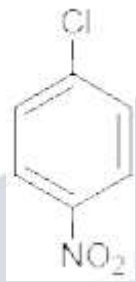
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(a)



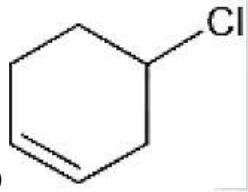
(b)
- 

(c)

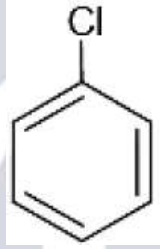


(d)

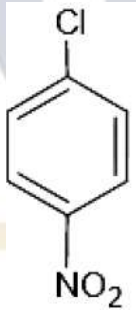
114. The compound having longest C – Cl bond is

- 

(a)



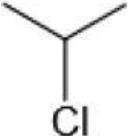
(b)
- (c) $\text{CH}_2 = \text{CH} - \text{Cl}$

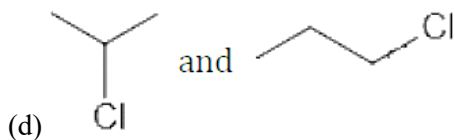
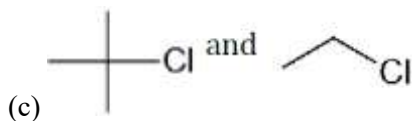
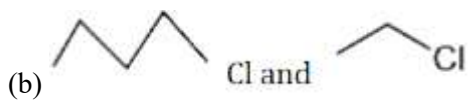


(d)

115. The alkyl halides required to prepare



- (a)  and 



116. Which is a wrong statement?

- (a) $e^{-E_a/RT}$ gives the fraction of reactant molecules that are activated at the given temp
 (b) Rate constant $k =$ Arrhenius constant A ; if $E_a = 0$
 (c) Presence of catalyst will not alter the value of E_a
 (d) $\ln k$ vs $\frac{1}{T}$ plot is a straight line.

117. 1 L of 2MCHCH₃COOH is mixed with 1 L of 3MCC₂H₅OH to form an ester. The rate of the reaction with respect to the initial rate when each solution is diluted with an equal volume of water will be

- (a) 2 times (b) 0.25 times
 (c) 4 times (d) 0.5 times

118. Which of the following is an example of homogeneous catalysis?

- (a) Oxidation of SO₂ in contact process
 (b) Oxidation of NH₃ in Oswald's process
 (c) Manufacture of NH₃ by Haber's process
 (d) Oxidation of SO₂ in lead chamber process

119. Critical Micelle concentration for a soap solution is $1.5 \times 10^{-4} \text{ mol L}^{-1}$. Micelle formation is possible only when the concentration of soap solution in mol L^{-1} is:

- (a) 4.6×10^{-5} (b) 2.0×10^{-3}
 (c) 1.1×10^{-4} (d) 7.5×10^{-5}

120. Oxidation state of copper is +1 in

- (a) Cuprite (b) Malachite
 (c) Chalcopyrite (d) Azurite

Mathematics

121. If $\sqrt[3]{y}\sqrt{x} = \sqrt[6]{(x+y)^5}$, then $\frac{dy}{dx} =$

- (a) $\frac{x}{y}$ (b) $x + y$
 (c) $x - y$ (d) $\frac{y}{x}$

122. Rolle's theorem is not applicable in which one of the following cases?

- (a) $f(x) = x^2 - 4x + 5$ in $[1,3]$
 (b) $f(x) = x^2 - x$ in $[0,1]$
 (c) $f(x) = |x|$ in $[-2,2]$
 (d) $f(x) = [x]$ in $[2.5,2.7]$

123. The interval in which the function $f(x) = x^3 - 6x^2 + 9x + 10$ is increasing in

- (a) $(-\infty, 1) \cup (3, \infty)$ (b) $(-\infty, -1] \cup (-3, \infty)$
(c) $[1, 3]$ (d) $(-\infty, -1) \cup [3, \infty)$

124. The side of an equilateral triangle are increasing at the rate of 4 cm/sec The rate at which its area is increasing, when the side is 14 cm

- (a) $10\sqrt{3}$ cm²/sec (b) $14\sqrt{3}$ cm²/sec
(c) 42 cm²/sec (d) None of these

125. The value of $\sqrt{24.99}$ is

- (a) 4.999 (b) 4.899
(c) 5.001 (d) 4.897

126. If $|3x - 5| \leq 2$ then

- (a) $-1 \leq x \leq \frac{7}{3}$ (b) $1 \leq x \leq \frac{7}{3}$
(c) $1 \leq x \leq \frac{9}{3}$ (d) $-1 \leq x \leq \frac{9}{3}$

127. A random variable 'X' has the following probability distribution:

X	1	2	3	4	5	6	7
P(X)	$k - 1$	$3k$	k	$3k$	$3k^2$	k^2	$k^2 + k$

- (a) $\frac{1}{5}$ (b) -2
(c) $\frac{2}{7}$ (d) $\frac{1}{10}$

128. If A and B are two events of a sample space S such that $P(A) = 0.2$, $P(B) = 0.6$ and $P(A | B) = 0.5$ then $P(A' | B) =$

- (a) $\frac{3}{10}$ (b) $\frac{2}{3}$
(c) $\frac{1}{2}$ (d) $\frac{1}{3}$

129. If 'X' has a binomial distribution with parameters $n = 6$, p and $P(X = 2) = 12$, $P(X = 3) = 5$ then $P =$

- (a) $\frac{5}{12}$ (b) $\frac{16}{21}$
(c) $\frac{1}{2}$ (d) None of these

130. A man speaks truth 2 out of 3 times. He picks one of the natural numbers in the set $S = \{1, 2, 3, 4, 5, 6, 7\}$ and reports that it is even. The probability that it is actually even is

- (a) $\frac{2}{5}$ (b) $\frac{1}{5}$
(c) $\frac{1}{10}$ (d) $\frac{3}{5}$

131. If U is the universal set with 100 elements; A and B are two sets such that $n(A) = 50$, $n(B) = 60$, $n(A \cap B) = 20$ then $n(A' \cap B') = ?$

- (a) 40 (b) 20
(c) 90 (d) 10

132. The domain of the function $f: R \rightarrow R$ defined by $f(x) = \sqrt{x^2 - 7x + 12}$

- (a) $(-\infty, 3] \cup [4, \infty)$ (b) $(-\infty, 3] \cup (4, \infty)$
(c) $(-\infty, 3] \cap [4, \infty)$ (d) (3, 4)

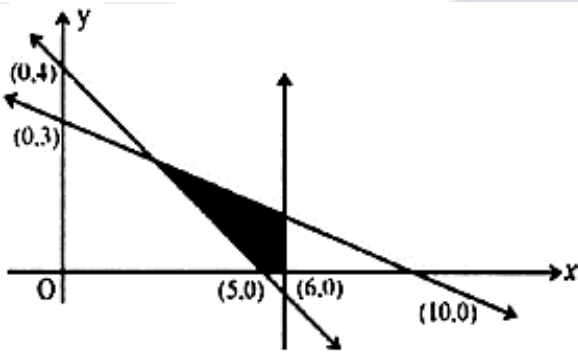
133. If $\cos x = |\sin x|$ then, the general solution is

- (a) $x = n\pi \pm \frac{\pi}{4}, n \in Z$
(b) $x = 2n\pi \pm \frac{\pi}{4}, n \in Z$
(c) $x = n\pi + (-1)^n \frac{\pi}{4}, n \in Z$
(d) $x = (2n + 1)\pi \pm \frac{\pi}{4}, n \in Z$

134. $\sqrt{3}\operatorname{cosec} 20^\circ - \sec 20^\circ =$

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

135. If $P(n): 2^n < n!$ then the smallest positive integer for which $P(n)$ is true, is
 (a) 2 (b) 3
 (c) 4 (d) 5
136. Foot of the perpendicular drawn from the point $(1, 3, 4)$ to the plane $2x - y + z + 3 = 0$ is
 (a) $(-1, 4, 3)$ (b) $(0, -4, -7)$
 (c) $(1, 2, -3)$ (d) $(-3, 5, 2)$
137. Acute angle between the line $\frac{x-5}{2} = \frac{y+1}{-1} = \frac{z+4}{1}$ And the plane $3x - 4y - z + 5 = 0$ is
 (a) $\cos^{-1}\left(\frac{9}{\sqrt{364}}\right)$ (b) $\sin^{-1}\left(\frac{9}{\sqrt{364}}\right)$
 (c) $\cos^{-1}\left(\frac{5}{2\sqrt{13}}\right)$ (d) $\sin^{-1}\left(\frac{5}{2\sqrt{13}}\right)$
138. The distance of the point $(1, 2, 1)$ from the line $\frac{x-1}{2} = \frac{y-2}{1} = \frac{z-3}{2}$ is
 (a) $\frac{2\sqrt{3}}{5}$ (b) $\frac{2\sqrt{5}}{3}$
 (c) $\frac{\sqrt{5}}{3}$ (d) $\frac{20}{3}$
139. XY-plane divides the line joining the points $A(2, 3, -5)$ and $B(-1, -2, -3)$ in the ratio
 (a) 2:1 internally (b) 3:2 externally
 (c) 5:3 internally (d) 5:3 externally
140. The shaded region in the figure is the solution set of the inequations



- (a) $4x + 5y \geq 20, 3x + 10y \leq 30, x \leq 6, x, y \geq 0$.
 (b) $4x + 5y \geq 20, 3x + 10y \leq 30, x \geq 6, x, y \geq 0$.
 (c) $4x + 5y \leq 20, 3x + 10y \leq 30, x \leq 6, x, y \geq 0$.
 (d) $4x + 5y \leq 20, 3x + 10y \leq 30, x \geq 6, x, y \geq 0$.
141. The order of the differential equation $y = C_1 e^{C_2 + x} + C_3 e^{C_4 + x}$ is
 (a) 1 (b) 2
 (c) 3 (d) 4
142. If $|\vec{a}| = 16, |\vec{b}| = 4$ then, $\sqrt{|\vec{a} \times \vec{b}|^2 + |\vec{a} \cdot \vec{b}|^2} =$
 (a) 4 (b) 8
 (c) 16 (d) 64
143. If the angle between $\vec{a}$ and $\vec{b}$ is $\frac{2\pi}{3}$ and the projection of $\vec{a}$ in the direction of $\vec{b}$ is -2, then $|\vec{a}| =$
 (a) 4 (b) 3
 (c) 2 (d) 1
144. A unit vector perpendicular to the plane containing the vectors $\hat{i} + 2\hat{j} + \hat{k}$ and $-2\hat{i} + \hat{j} + 3\hat{k}$ is
 (a) $\frac{\hat{i} + \hat{j} + \hat{k}}{\sqrt{3}}$ (b) $\frac{\hat{i} + \hat{j} - \hat{k}}{\sqrt{3}}$
 (c) $\frac{-\hat{i} + \hat{j} - \hat{k}}{\sqrt{3}}$ (d) $\frac{-\hat{i} - \hat{j} - \hat{k}}{\sqrt{3}}$
145. $[\vec{a} + 2\vec{b} - \vec{c}, \vec{a} - \vec{b}, \vec{a} - \vec{b} - \vec{c}] =$
 (a) 0 (b) $[\vec{a}, \vec{b}, \vec{c}]$
 (c) $2[\vec{a}, \vec{b}, \vec{c}]$ (d) $3[\vec{a}, \vec{b}, \vec{c}]$

146. $\int_{-3}^3 \cot^{-1} x dx =$

- (a) 3π (b) 0
(c) 6π (d) 3

147. $\int \frac{1}{\sqrt{x} + x\sqrt{x}} dx =$

- (a) $2\log(\sqrt{x} + 1) + C$ (b) $\frac{1}{2}\tan^{-1}\sqrt{x} + C$
(c) $\tan^{-1}\sqrt{x} + C$ (d) $2\tan^{-1}\sqrt{x} + C$

148. $\int \frac{2x-1}{(x-1)(x+2)(x-3)} dx = A\log|x-1| + B\log|x+2| + C\log|x-3| + K$, then A, B, C are respectively

- (a) $\frac{-1}{6}, \frac{1}{3}, \frac{-1}{2}$ (b) $\frac{1}{6}, \frac{1}{3}, \frac{-1}{5}$
(c) $\frac{1}{6}, \frac{-1}{3}, \frac{1}{3}$ (d) $\frac{-1}{6}, \frac{-1}{3}, \frac{1}{2}$

149. $\int_0^2 [x^2] dx =$

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

150. $\int_0^1 \sqrt{\frac{1+x}{1-x}} dx =$

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

151. If α and β are roots of the equation $x^2 + x + 1 = 0$ then $\alpha^2 + \beta^2$ is

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

152. The number of 4-digit numbers without repetition that can be formed using the digits 1, 2, 3, 4, 5, 6, 7 in which each number has two odd digits and two even digits is

- (a) 432 (b) 436
(c) 450 (d) 454

153. The number of terms in the expansion of $(x^2 + y^2)^{25} - (x^2 - y^2)^{25}$ after simplification is

- (a) 0 (b) 13
(c) 26 (d) 50

154. The third term of a G.P. is 9. The product of its first five terms is

- (a) 3^5 (b) 3^9
(c) 3^{10} (d) 3^{12}

155. A line cuts off equal intercepts on the co-ordinate axes. The angle made by this line with the positive direction of X-axis is

- (a) 45° (b) 90°
(c) 120° (d) 135°

156. $\int x^3 \sin 3x dx =$

- (a) $-\frac{x^3 \cos 3x}{3} - \frac{x^2 \sin 3x}{3} + \frac{2x \cos 3x}{9} - \frac{2 \sin 3x}{27} + C$
(b) $\frac{x^3 \cos 3x}{3} + \frac{x^2 \sin 3x}{3} - \frac{2x \cos 3x}{9} - \frac{2 \sin 3x}{27} + C$
(c) $-\frac{x^3 \cos 3x}{3} + \frac{x^2 \sin 3x}{3} + \frac{2x \cos 3x}{9} - \frac{2 \sin 3x}{27} + C$
(d) $-\frac{x^3 \cos 3x}{3} + \frac{x^2 \sin 3x}{3} - \frac{2x \cos 3x}{9} - \frac{2 \sin 3x}{27} + C$

157. The area of the region above X-axis included between the parabola $y^2 = x$ and the circle $x^2 + y^2 = 2x$ in square units is

- (a) $\frac{\pi}{4} - \frac{3}{2}$ (b) $\frac{3}{2} - \frac{\pi}{4}$
(c) $\frac{2}{3} - \frac{\pi}{4}$ (d) $\frac{\pi}{4} - \frac{2}{3}$

158. The area of the region bounded by Y-axis, $y = \cos x$ and $y = \sin x$; $0 \leq x \leq \frac{\pi}{2}$ is

- (a) $\sqrt{2} - 1$ Sq. units (b) $\sqrt{2}$ Sq. units
(c) $\sqrt{2} + 1$ Sq. units (d) $2 - \sqrt{2}$ Sq. units

159. The integrating factor of the differential equation $(2x + 3y^2)dy = ydx$ ($y > 0$) is

- (a) $e^{\frac{1}{y}}$ (b) $-\frac{1}{y^2}$
(c) $\frac{1}{x}$ (d) $\frac{1}{y^2}$

160. The equation of the curve passing through the point (1, 1) such that the slope of the tangent at any point (x, y) is equal to the product of its coordinates is

- (a) $2\log x = y^2 - 1$ (b) $2\log y = x^2 + 1$
(c) $2\log y = x^2 - 1$ (d) $2\log x = y^2 + 1$

161. The eccentricity of the ellipse $9x^2 + 25y^2 = 225$ is

- (a) $\frac{4}{5}$ (b) $\frac{3}{5}$
(c) $\frac{3}{4}$ (d) $\frac{9}{16}$

162. $\sum_{r=1}^n (2r - 1) = x$ then $\lim_{n \rightarrow \infty} \left[\frac{1^3}{x^2} + \frac{2^3}{x^2} + \frac{3^3}{x^2} + \dots + \frac{n^3}{x^2} \right] =$

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

163. The negation of the statement "All continuous functions are differentiable."

- (a) All continuous functions are not differentiable
(b) Some continuous functions are differentiable.
(c) Some continuous functions are not differentiable.
(d) All differentiable functions are continuous

164. Mean and standard deviation of 100 items are 50 and 4 respectively. The sum of all squares of the items is

- (a) 251600 (b) 256100
(c) 266000 (d) 261600

165. Two letters are chosen from the letters of the word 'EQUATIONS'. The probability that one is vowel and the other is consonant is

- (a) $\frac{8}{9}$ (b) $\frac{4}{9}$
(c) $\frac{3}{9}$ (d) $\frac{5}{9}$

166. The constant term in the expansion of $\begin{vmatrix} 3x+1 & 2x-1 & x+2 \\ 5x-1 & 3x+2 & x+1 \\ 7x-2 & 3x+1 & 4x-1 \end{vmatrix}$ is

- (a) 0 (b) 2
(c) -10 (d) 6

167. If $[x]$ represents the greatest integer function and $f(x) = x - [x] - \cos x$ then $f'\left(\frac{\pi}{2}\right) =$

- (a) 0 (b) 1
(c) 2 (d) does not exist

168. If $f(x) = \begin{cases} \frac{\sin 3x}{e^{2x}-1} & ; x \neq 0 \\ k-2 & ; x = 0 \end{cases}$ is

Continuous at $x = 0$, then $k =$

- (a) $\frac{3}{2}$ (b) $\frac{9}{5}$
(c) $\frac{1}{2}$ (d) None of these

169. If $f(x) = \sin^{-1} \left[\frac{2^{x+1}}{1+4^x} \right]$, then $f'(0) =$

- (a) $2\log 2$ (b) $\log 2$
(c) $\frac{2\log 2}{5}$ (d) $\frac{4\log 2}{5}$

170. If $x = \sec^2 \theta$, $y = a \tan^2 \theta$ then $\frac{d^2y}{dx^2} =$

- (a) 2a (b) 1
(c) 0 (d) 4

171. The inverse of the matrix $\begin{bmatrix} 2 & 5 & 0 \\ 0 & 1 & 1 \\ -1 & 0 & 3 \end{bmatrix}$ is

- (a) $\begin{bmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{bmatrix}$ (b) $\begin{bmatrix} 3 & -5 & 5 \\ -1 & -6 & -2 \\ 1 & -5 & 2 \end{bmatrix}$
(c) $\begin{bmatrix} 3 & -15 & 5 \\ -1 & 6 & -2 \\ 1 & -5 & 2 \end{bmatrix}$ (d) $\begin{bmatrix} 3 & -15 & 5 \\ -1 & 6 & -2 \\ 1 & -5 & -2 \end{bmatrix}$

172. If P and Q are symmetric matrices of the same order then $PQ - QP$ is

- (a) Identity matrix
(b) Symmetric matrix
(c) zero matrix
(d) Skew symmetric matrix

173. If $3A + 4B' = \begin{bmatrix} 7 & -10 & 17 \\ 0 & 6 & 31 \end{bmatrix}$ and $2B - 3A' = \begin{bmatrix} -1 & 18 \\ 4 & 0 \\ -5 & -7 \end{bmatrix}$ then B =

- (a) $\begin{bmatrix} 1 & 3 \\ -1 & 1 \\ 2 & 4 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & -3 \\ -1 & 1 \\ 2 & 4 \end{bmatrix}$
(c) $\begin{bmatrix} -1 & -18 \\ 4 & -16 \\ -5 & -7 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 3 \\ -1 & 1 \\ 2 & -4 \end{bmatrix}$

174. If $A = \begin{bmatrix} 1 & 3 \\ 4 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 2 & -1 \\ 1 & 2 \end{bmatrix}$, then $|ABB'| =$

- (a) 50 (b) -250
(c) 100 (d) 250

175. If the value of a third order determinant is 16, then the value of the determinant formed by replacing each of its elements by its cofactor is

- (a) 96 (b) 48
(c) 256 (d) 16

176. $f: \mathbb{R} \rightarrow \mathbb{R}$ and $g: [0, \infty) \rightarrow \mathbb{R}$ is defined by $f(x) = x^2$ and $g(x) = \sqrt{x}$. Which one of the following is not true?

- (a) $\text{gof}(4) = 4$ (b) $\text{Fog}(-4) = 4$
(c) $\text{Fog}(2) = 2$ (d) $\text{gof}(-2) = 2$

177. $A = \{x \mid x \in \mathbb{N}, x \leq 5\}$, $B = \{x \mid x \in \mathbb{Z}, x^2 - 5x + 6 = 0\}$, then the number of onto functions from A to B is

- (a) 2 (b) 23
(c) 30 (d) 32

178. On the set of positive rationals, a binary operation $*$ is defined by $a * b = \frac{2ab}{5}$. If $2 * x = 3^{-1}$ then $x =$

- (a) $\frac{1}{6}$ (b) $\frac{5}{12}$
(c) $\frac{2}{5}$ (d) $\frac{125}{48}$

179. $\cos \left[2\sin^{-1} \frac{3}{4} + \cos^{-1} \frac{3}{4} \right] =$

- (a) $\frac{-3}{4}$ (b) $\frac{3}{4}$
(c) $\frac{3}{5}$ (d) does not exist

180. If $a + \frac{\pi}{2} < 2\tan^{-1} x + 3\cot^{-1} x < b$ then 'a' and 'b' are respectively.

- (a) 0 and π (b) $\frac{\pi}{2}$ and 2π
(c) 0 and 2π (d) $\frac{-\pi}{2}$ and $\frac{\pi}{2}$

Biology

181. What is the function of protein GLUT-4?

- (a) Acts as an enzyme

- (b) Enables glucose transport into cells.
- (c) Fight infectious agents
- (d) Functions as intercellular ground substance.

182. Cell in the quiescent stage (G_0)

- (a) Always become cancerous
- (b) Show indefinite proliferation
- (c) Remain metabolically inactive
- (d) Remain metabolically active

183. Consider the following statements i, ii, and iii regarding criteria for essentiality of the nutrients in plants:

- (i) The presence of elements is must for plants to complete their life cycle.
- (ii) The role of the element can be replaced by another in their life cycle.
- (iii) The elements must be directly involved in the metabolism of the plant.

Choose the correct statement/s:

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

184. During chemiosmotic synthesis of ATP in photosynthesis:

- (a) The protons accumulate in the intermembrane space of chloroplast.
- (b) The proton gradient is not required
- (c) The protons accumulate in the intermembrane space of mitochondrion
- (d) The protons accumulate within the lumen of the thylakoids.

185. When tripalmitin is used as respiratory substrate. The process consumes 145 molecules of oxygen and releases 102 molecules of CO_2 , then RQ would be

- (a) 0.5 (b) 0.7
- (c) 1.4 (d) 1.0

186. Identify the incorrect statement with reference of Biocontrol agents:

- (a) They do not show any negative impact on crop plants
- (b) They help to increase the use of synthetic pesticides.
- (c) They are significant in treating ecologically sensitive area
- (d) They do not affect non -target pests.

187. A farmer has applied chemical fertilisers in the crop field for many successive seasons, the crop growth was poor as soil lost its fertility. Suggest the suitable microorganism that replenishes the fertility of soil in this field

- (a) Spirulina (b) Nostoc
- (c) Chlorella (d) Spirogyra

188. In cloning vectors, antibiotic resistance genes are helpful for.

- (a) Transfer of foreign gene to the host
- (b) Selection of recombinants
- (c) Making the host cells competent
- (d) Cleaving the vector by REN

189. A student while extracting DNA from *Aspergillus* fungus requires _____ enzyme to break open the cell wall.
- (a) Cellulase (b) Lysozyme
(c) Pectinase (d) Chitinase
190. Identify the DNA sequence which can be cut using Eco RI.
- (a) 5'TGCTTAGGTA3' 3'ACGAATTCAT5'
(b) 5'ACGAATTCAT3' 3'TGCTTAGGTA5'
(c) 5'TGCTTAGGTA3' 3'ATGAATTCGT5'
(d) 3'ACGAATTCAT5' 5'TGCTTAAGTA3'
191. Which of the following amino acids is coded by single codon?
- (a) Valine (b) Phenylalanine
(c) Tyrosine (d) Tryptophan
192. In Prokaryotes the transcription of DNA is initiated with the help of
- (a) Rho factor
(b) Elongation factor
(c) Sigma factor
(d) Termination factor
193. According to Human Genome Project (HGP), the total number of genes in human genome is estimated at 30,000, the number of genes present on Y-chromosome are
- (a) 2968 genes (b) 242 genes
(c) 231 genes (d) 2898 genes
194. In a crime investigation, the investigating officer collects different biological samples from the crime spot for DNA Finger-Printing Analysis. Which of the following samples is not helpful in the analysis?
- (a) Skin shreds (b) Erythrocytes
(c) Semen samples (d) Hair Follicle
195. A mature mRNA consists of bases without any stop codon in between. Calculate the number of amino acids coded by the mRNA during translation.
- (a) 9000 (b) 299
(c) 300 (d) 450
196. Which one of the following ecosystem has the highest annual net primary productivity?
- (a) Desert
(b) Tropical deciduous forest
(c) Tropical rain forest
(d) Temperature evergreen forest
197. Of the total incident solar radiation of percentage photosynthetically Active Radiation (PAR) captured by the plants
- (a) 10 – 20% of PAR only
(b) 2 – 10% of PAR only
(c) 0 – 10% of PAR only
(d) 30 – 40% of PAR only
198. The historic convention related to conservation of biological diversity is also known as
- (a) Earth Summit (b) Kyoto protocol
(c) World Summit (d) Montreal protocol
199. Which one of the following human activities has contributed as deforestation by northeastern sides of India?
- (a) Urbanisation (b) Industrialisation
(c) Mono cropping (d) Jhum cultivation
200. In an area where DDT has been used extensively, the population of birds declined significantly because -
- (a) Birds became vulnerable to predators.

- (b) Birds stopped laying eggs
- (c) Many of the eggs laid by birds showed pre-matured breaking
- (d) Earthworms in the area got eradicated

201. The brain capacity of *Homo habilis*

- (a) 1800 cc (b) Between 650 cc -800 cc
- (c) 900 cc (d) 1400 cc

202. In *Bougainvillea* and *Cucurbita*, the axillary bud is modified into thorn and tendril respectively. This is an example of

- (a) Co-evolution (b) Divergent Evolution
- (c) Micro Evolution (d) Convergent Evolution

203. Identify the incorrect statements.

- (a) HIV is transmitted by mosquito bite.
- (b) Pneumonia is a bacterial disease.
- (c) Cancer is a non-infectious disease
- (d) Ringworm is a fungal disease.

204. A person shows symptoms like Sneezing, water eyes, morning cases and difficulty in breathing on exposure to certain substances in air, which type of antibody is produced during such condition?

- (a) IgG (b) IgE
- (c) IgM (d) IgA

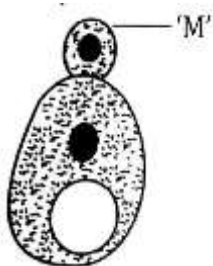
205. A man was suffering from mental illness like depression and insomnia Identify the drug which is normally used as medicine in such cases

- (a) Morphine
- (b) Lysergic Acid Diethylamides (LSD)
- (c) Nicotine
- (d) Heroine

206. Plants like *Marchantia* and *Funaria* produce gametes by mitosis, because

- (a) They are gametophytes
- (b) Plant body is haploid
- (c) They are dioecious.
- (d) Gametophyte is diploid

207. Identify the asexual reproductive structure 'M' in the following diagram:



- (a) Zoospore (b) Bud
- (c) Gemmule (d) Conidium

208. In some plants stigma and anther mature at different times because.

- (a) It attracts pollinators
- (b) It facilitates self- pollination
- (c) It prevents cross pollination
- (d) It facilitates cross pollination

209. Now-a-days agricultural practice is expensive to the farmers as they need to purchase hybrid seeds every year. Which of the following strategies can be employed to overcome this problem?

- (a) Synthetic seeds
- (b) Production of Apomictic seeds
- (c) Conventional plant breeding
- (d) Parthenocarpy

210. Identify the correct order of steps involved in Artificial hybridization in plants:

- (a) Artificial Pollination → Emasculation → Rebagging → Bagging
- (b) Rebagging → Artificial Pollination → Bagging → Emasculation
- (c) Emasculation → Bagging → Artificial Pollination → Rebagging
- (d) Bagging → Artificial pollination → Rebagging → Emasculation

211. Which of the following protozoan parasites causes sleeping sickness?

- (a) Plasmodium
- (b) Entamoeba
- (c) Leishmania
- (d) Trypanosoma

212. Which of the following phyla possess body cavity as shown in the diagram below?



- (a) Annelida
- (b) Porifera
- (c) Aschelminthes
- (d) Coelenterata

213. Testa and Tegmen of the seed coat represent

- (a) Dried integuments
- (b) Dried Sepals
- (c) Dried Tepals
- (d) Dried petals

214. The trees growing in temperature regions show clear demarcation between spring wood and autumn wood This is because

- (a) The climatic conditions are uniform
- (b) The water stress is more throughout the year
- (c) The temperature is high
- (d) The climatic conditions are not uniform throughout the year

215. Identify the part labelled as ' M ' in the diagram given below

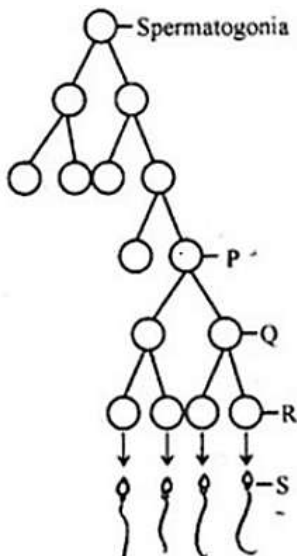


- (a) Chromatid
- (b) Kinetochore
- (c) Centromere
- (d) Satellite

216. Which of these is not an advantage in genetically modified crops?
- Increases efficiency of mineral usage in plant
 - Reduces the reliance on chemical pesticides
 - Enhances the nutritional value of food
 - Increases the post-harvest losses
217. Some multinational companies have exploited the traditional knowledge of the indigenous people to produce commercially important bio products, without their consent. This is an example for
- Biopatent
 - Bioprospecting
 - Biopiracy
 - Bioremediation
218. In Amphibian and reptiles, the body temperature changes corresponding to external temperature. The organisms which show this kind of response is termed as -
- Partial Regulators
 - Regulators
 - Thermophiles
 - Conformers
219. Assertion (A): The Monarch butterfly feeds on poisonous weeds during its caterpillar stage. Reason (R): It helps butterfly to become distasteful to its predator.
- (A) is true (R) is false
 - (A) is true and (R) is its correct explanation
 - Both (A) and (R) are false
 - Both (A) and (R) are true, but (R) is not the correct explanation of (A)
220. From the given options, identify the correct combination of population interactions that correspond to the symbols given here.

++ -- +0

- Parasitism Competition Mutualism
 - Predation Competition Commensalism
 - Mutualism Competition Commensalism
 - Mutualism Parasitism Amensalism
221. The nourishing cells in the Seminiferous tubules are
- Follicular cells
 - Leydig cells
 - Sertoli cells
 - Spermatogonial cells
222. If in a normal Menstruating woman, menses occur 5th April, what will be the expected date of Ovulation?
- 10th April
 - 18th April
 - 29th April
 - 14th April
223. Identify the cells represented as P, Q, R and S in the given schematic representation of spermatogenesis.



(a) P - Spermatozoa

Q - Spermatids

R - Secondary Spermatocyte

S - Primary Spermatocyte

(b) P - Primary Spermatocyte

Q - Secondary Spermatocyte

R - Spermatids

S - Spermatozoa

(c) P - Secondary Spermatocyte

Q - Spermatids

R - Spermatozoa

S - Primary Spermatocyte

(d) P - Secondary Spermatocyte

Q - Primary Spermatocyte

R - Spermatozoa

S - Spermatids

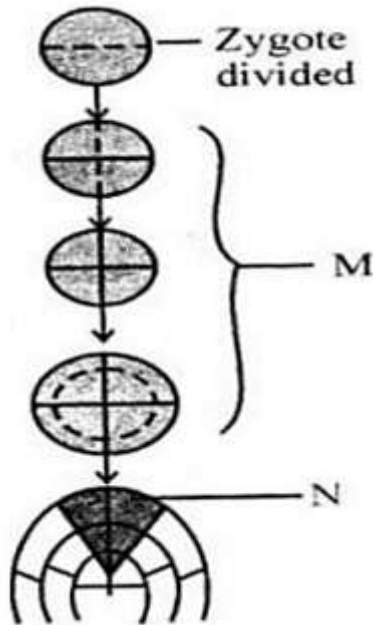
224. The method of natural contraception which requires correct knowledge of Menstrual cycle is

- (a) Periodic Abstinence
- (b) Lactational Amenorrhoea
- (c) IUDs - Intrauterine Devices
- (d) Coitus interrupts

225. A childless couple visit Assisted Reproductive Technologies (ARTs) centre to get assistance to have child. On diagnosis, it was noticed that there was low sperm count in the male partner. Which of the following strategy of ART is most suitable in this case?

- (a) Gamete Intra-Fallopian Transfer (GIFT)
- (b) Artificial Insemination (AI)
- (c) Zygote Intra-Fallopian Transfer
- (d) In vitro Fertilisation (IVF)

226. In the following diagrammatic representation showing stages of embryonic development, identify the type of growth phase labelled as M and N:



- (a) M is geometric phase and N is arithmetic phase
- (b) Both M and N are arithmetic phases.
- (c) M is arithmetic phase and N is geometric phase
- (d) Both M and N are geometric phases

227. Indigestion of fats in humans may be an indication of

- (a) Intestinal ulcers
- (b) Under secretion of saliva
- (c) Inflammation of liver
- (d) Under secretion of amylase

228. Choose the correct statement from the following:

- (a) Erythroblastosis foetalis may result when foetus is Rh^{-ve} and mother is Rh^{+ve}
- (b) Histamine, Serotonin and Heparin are secreted by basophils
- (c) Atherosclerosis is often referred as angina pectoris
- (d) Person with blood group AB can donate blood to person with blood group A

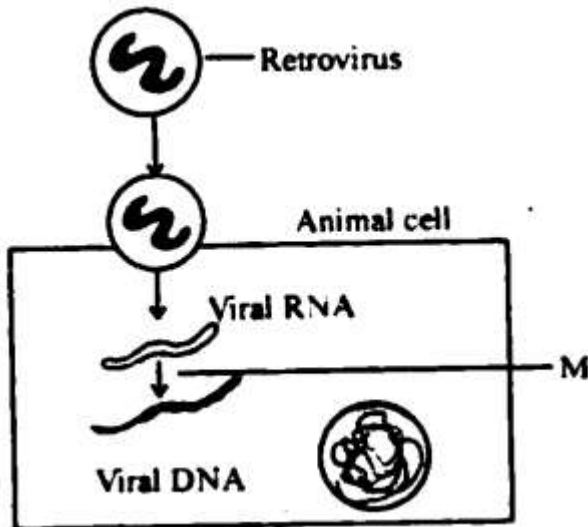
229. In blind spot of the human eye

- (a) Both cones and rods are absent.
- (b) Only cones are absent
- (c) Both cones and rods are present.
- (d) Only rods are absent

230. A boy after attaining sexual maturity shows muscular growth, growth of facial and axillary hair, aggressiveness and low pitch of voice. These changes are attributed to _____ hormone.

- (a) Estrogen
- (b) Testosterone
- (c) Secretin
- (d) Glucagon

231. Identify the enzyme that catalyses the step labelled as ' M ' in the given schematic representation of Replication of retrovirus



- (a) Reverse transcriptase (b) RNA Polymerase
(c) Recombinase (d) DNA ligase

232. In animal breeding, the maximum genetic variations can be achieved through.

- (a) Inbreeding (b) Outcrossing
(c) Interspecific hybridization (d) Crossbreeding

233. The oil content and quality of groundnut variety was improved by plant breeding technique. This is an example of

- (a) Bioremediation (b) Biomagnification
(c) Biodegradation (d) Biofortification

234. Microbes like spirulina can be good alternate to the conventional sources of proteins for human nutrition because

- (a) Their proteins are different from plant proteins.
(b) they give more biomass in less time
(c) they have high fibre content
(d) they are produced using synthetic fertilisers

235. Consider the following morphological biochemical or physiological characteristics of plants.

(i) Presence of hairy leaves

(ii) Production of more nectar in flower

(iii) High sugar content in plant parts

(iv) Presence of higher aspartic acid concentration.

Choose the correct combination of statements which give natural resistance to plants against insect pests:

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

236. Identify the odd one among the following disorders:

- (a) Haemophilia
(b) Sickle-cell -Anaemia
(c) Phenyl Ketonuria
(d) Thalassemia

237. From the chromosomal complements given below, identify the one which shows female heterogamety.

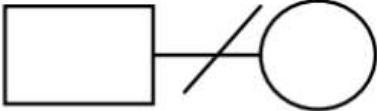
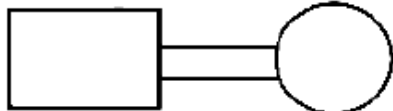
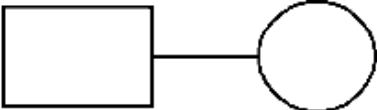
- (a) XX – XO (b) XX – XY
(c) XX – XXY (d) ZZ – ZW

238. In Morgan's experiment with Drosophila, when yellow bodied white eyed female was crossed with brown bodied red eyed male and their F₁ Progeny were intercrossed What was the percentage of

recombinants in F_2 generation?

- (a) 62.8% (b) 98.7%
(c) 1.3% (d) 37.2%

239. In the following symbols, used in human pedigree Analysis, identify the symbol that denotes consanguineous mating.

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

240. Which of the following Nitrogen bases is found only in DNA?

- (a) Cytosine (b) Adenine
(c) Thymine (d) Guanine

