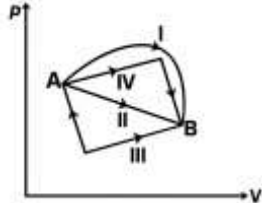
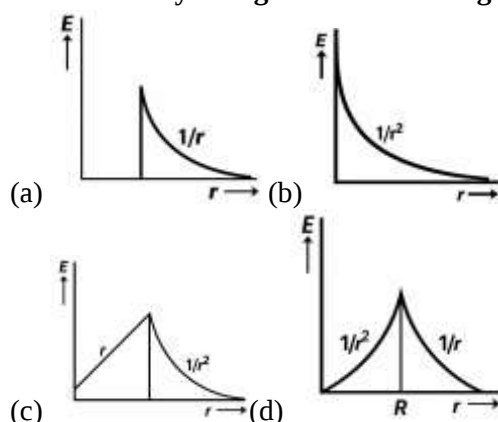


PHYSICS

- During the phenomenon of resonance**
 - the amplitude of oscillation becomes large
 - the frequency of oscillation becomes large
 - the time period of oscillation becomes large
 - all of the above
- If the earth were to spin faster, acceleration due to gravity at the poles**
 - increases
 - decreases
 - remains the same
 - depends on how fast it spins
- Maximum amplitude of message signal in amplitude modulation is 20 cm . If the amplitude of carrier wave is 40 cm , then modulation index of modulated wave is**
 - 1
 - 0.5
 - 0.25
 - 2
- If heat engine is filled at temperature 27°C and heat of 100 kcal is taken from source at temperature 677°C . Work done (in J) is**
 - 0.28×10^6
 - 2.8×10^6
 - 28×10^6
 - 0.028×10^6
- During α -decay, atomic mass of parent nuclei is**
 - decreased by 2 units
 - increased by 2 units
 - decreased by 4 units
 - increased by 4 units
- A point object is placed on the optic axis of a convex lens of focal length f at a distance of $2f$ to the left of it. The diameter of the lens is d . An eye is placed at a distance of $3f$ to the right of the lens and a distance h below the optic axis. The maximum value of h to see the image is**
 - d
 - $\frac{d}{2}$
 - $\frac{d}{3}$
 - $\frac{d}{4}$
- For CE transistor amplifier, the audio signal voltage across the collector resistance of $4\text{k}\Omega$ is 5V. If the current amplification factor of the transistor is 100 and base resistance is $2\text{k}\Omega$, then input signal voltage is**
 - 75 mv
 - 25 mv
 - 20 mv
 - 50 mv
- From the following $p - V$ diagram, an ideal gas undergoing a change of state from A to B. Four different processes I, II, III and IV as shown in the figure may lead to same change of stat**

 - Work done is maximum in case (I)
 - Change in internal energy is same in all the four cases
 - Change in internal energy is same in (IV) and (III) cases, but not in (I) and (II)
 - Work done is minimum in case (II)
- A copper and a steel wire of same diameter are connected end to end. A deforming force F_1 is applied to the wire which causes an elongation of 1 cm . The two wires will have**
 - the same stress
 - different stress
 - the same strain
 - different strain
- If kinetic energy of a body is increased by 300%, then percentage change in momentum will be**

- (a) 100% (b) 150%
(c) 265% (d) 73.2%

11. Which of the following diagram represents the variation of the electric field with distance r from the centre of a uniformly charged nonconducting sphere of radius R ?



12. A DC ammeter and a hot wire ammeter are connected to a circuit in series. When a direct current is passed through circuit, the DC ammeter shows 6 A. When AC current flows through circuit, what is the average readings in DC ammeter and the AC ammeter, if DC and AC currents flow simultaneously through the circuit?

- (a) DC = 6 A, AC = 10 A
(b) DC = 3 A, AC = 5 A
(c) DC = 5 A, AC = 8 A
(d) DC = 2 A, AC = 3 A

13. A bullet of mass m hits a mass M and gets embedded in it. If the block rises to a height h as a result of this collision, the velocity of the bullet before collision is

- (a) $a \cdot v = \sqrt{2gh}$
(b) $v = \sqrt{2gh} \left[1 + \left(\frac{m}{M} \right) \right]$
(c) $v = \sqrt{2gh} \left(1 + \sqrt{\frac{M}{m}} \right)$
(d) $v = \sqrt{2gh} \left[1 - \left(\frac{m}{M} \right) \right]$

14. A particle of mass m is moving in a horizontal circle of radius r under a centripetal force given by $\left(\frac{-K}{r^2} \right)$, where K is a constant. Then

- (a) the total energy of the particle is $\left(\frac{-K}{2r} \right)$
(b) the kinetic energy of the particle is $\left(\frac{K}{r} \right)$
(c) the potential energy of the particle is $\left(\frac{K}{2r} \right)$
(d) the kinetic energy of the particle is $\left(\frac{-K}{r} \right)$

15. The height at which the acceleration due to gravity becomes $\frac{9}{16}$ (where, g = acceleration due to gravity on the surface of the earth) in terms of R is, if R is the radius of earth.

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

16. Which of the following series spectrum of hydrogen atom lies in ultraviolet region?

- (a) paschen series (b) brackett series
(c) pfund series (d) lyman series

17. Speed of electromagnetic wave in a medium having relative permittivity ϵ_r and relative permeability μ_r is (speed of light in air, $c = 3 \times 10^8$ m/s)

- (a) $\frac{1}{\sqrt{\mu_r \epsilon_r}}$ (b) $\frac{c}{\sqrt{\mu_r \epsilon_r}}$
 (c) $c \sqrt{\frac{\mu_r}{\epsilon_r}}$ (d) $\frac{c}{\mu_r \epsilon_r}$

18. The wavelength of the second line of Balmer series is 486.4 nm . What is the wavelength of the first line of Lyman series?

- (a) 78.8 nm (b) 121.6 nm
 (c) 418.2 nm (d) 610.5 nm

19. A bat emitting an ultrasonic wave of frequency 4.5×10^4 Hz at speed of 6 m/s between two parallel walls. The two frequencies heard by the bat will be

- (a) 4.67×10^4 Hz, 4.34×10^4 Hz
 (b) 4.34×10^4 Hz, 4.67×10^4 Hz
 (c) 4.5×10^4 Hz, 5.4×10^4 Hz
 (d) 4.67×10^3 Hz, 4.34×10^4 Hz

20. A disc of moment of inertia $4 \text{ kg} - \text{m}^2$ revolving with 16rad/s is placed on another disc of moment of inertia $8 \text{ kg} - \text{m}^2$ revolving 4rad/s. The angular frequency of composite disc

- (a) 4rad/s (b) $\frac{3}{16}$ rad/s
 (c) 8rad/s (d) $\frac{16}{3}$ rad/s

21. An electric current I enters and leaves a uniform circular wire of radius r through diametrically opposite points. A charged particle q moves along the axis of circular wire passes through its centre with speed v . The magnetic force on the particle when it passes through the centre has a magnitude

- (a) $\frac{qv\mu_0 I}{2\pi r}$ (b) $qv \frac{\mu_0 I}{\pi r}$
 (c) $\frac{qv\mu_0 I}{r}$ (d) 0

22. Television frequencies are of the order of 100 MHz, while radio frequencies are of the order of 1 MHz.

Using these as typical frequencies, the ratio of the emf generated in a loop antenna by a television wave to that generated by a radio wave, if both have equal electric field intensities.

- (a) 1 (b) 10
 (c) 100 (d) 66.6

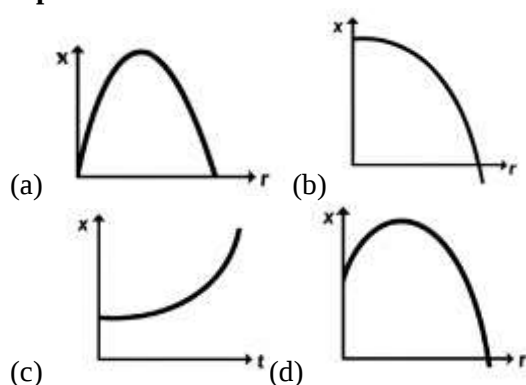
23. A particle is performing simple harmonic motion. Equation of its motion is $x = 5 \sin \left(4t - \frac{\pi}{6} \right)$, x being the displacement from mean position. Velocity (in ms^{-1}) of the particle at the instant when its displacement is 3 , will be

- (a) $\frac{2\pi}{3}$ (b) $\frac{5\pi}{6}$
 (c) 20 (d) 16

24. A raft of density 600 g/m^3 and mass 120 kg floats in water. How much weight can be put on the raft to make it just sink?

- (a) 120 kg (b) 200 kg
 (c) 40 kg (d) 80 kg

25. The displacement x of a particle in a straight line motion is given by $x = 1 - t - t^2$. The correct representation of the motion is



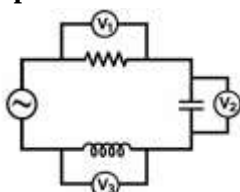
26. A galvanometer having a resistance of 4Ω is shunted by a wire of resistance 2Ω . If the total current is 1.5 A , the current passing through shunt is

- (a) 1.25 A (b) 1 A
(c) 0.75 A (d) 0.5 A

27. In Young's double slit experiment, the two slits are separated by 0.2 mm and they are 1 m from the screen. The wavelength of the light used is 500 nm . The distance between 6th maxima and 10th minima on the screen is closest to

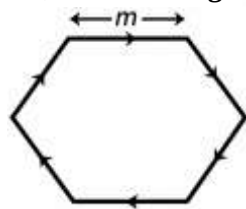
- (a) 12 mm (b) 10 mm
(c) 14 mm (d) 8 mm

28. A series $L - C - R$ circuit is connected to an AC source of 220 V and 50 Hz shown in figure. If the readings of the three voltmeters V_1 , V_2 and V_3 are 65 V , 415 V and 204 V respectively, the value of inductance and capacitance will be



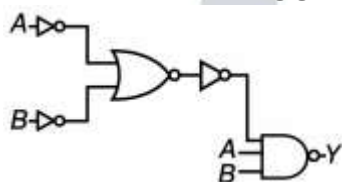
- (a) 2.0 H , $5\mu\text{F}$ (b) 1.0 H , $5\mu\text{F}$
(c) 4.0 H , $6\mu\text{F}$ (d) 1.0 H , $2\mu\text{F}$

29. A regular hexagon of side m which is a wire of length 24 m is coiled on that hexagon. If current in hexagon is I , then the magnetic moment,



- (a) $6\sqrt{3}Im^2$ (b) $3\sqrt{3}Im^2$
(c) $\frac{3\sqrt{3}}{2}Im^2$ (d) $6Im^2$

30. Which of the following gate give the similar output as the output of circuit diagram shown in the figure?



- (a) AND gate (b) OR gate
(c) NOR gate (d) NAND gate

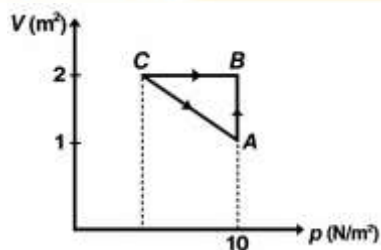
31. Water is poured in a tank through a cylindrical tube of area of crosssection A and ejecting water at a constant speed 4 m/s . The tank contains a hole of area $\frac{A}{2}$ at bottom. Level of water in the tank will not go up beyond

- (a) 5.6 m (b) 4.8 m
(c) 3.2 m (d) 1.8 m

32. If R and C denote resistance and capacitance of a material, then the dimension of CR will be :

- (a) $[ML^0T]$ (b) $[M^0L^0T]$
(c) $[M^0L^0T^2]$ (d) $[M^2L^0T]$

33. An ideal gas is taken through the cycle $A \rightarrow B \rightarrow C \rightarrow A$, as shown in the figure. If the net heat supplied to the gas in the cycle is 5 J , the work done by the gas in the process $C \rightarrow A$ is,



- (a) -5J (b) -10J
(c) -15J (d) -20J

34. From a circular disc of radius R , a square is cut out with a radius as its diagonal. The centre of mass of remaining portion is at a distance (from the centre)

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

35. A bar magnet of length 6 cm, is placed in the magnetic meridian with N pole, pointing towards the geographical north. Two neutral points, separated by a distance of 8 cm are obtained on the equatorial axis of the magnet. If $B_H = 1.2 \times 10^{-5}$ T. Then the pole strength of the magnet is

- (a) $0.75 \text{ A} \cdot \text{m}^2$ (b) $0.25 \text{ A} \cdot \text{m}^2$
(c) $0.50 \text{ A} \cdot \text{m}^2$ (d) $1.50 \text{ A} \cdot \text{m}^2$

36. A force F applied on the wire of radius r and length L and change in the length of the wire is 1. If the same force F is applied on the wire of the same material and radius $4r$ and length $4L$, then change in length of the other wire is,

- (a) $\frac{1}{4}$ (b) 21
(c) $\frac{1}{2}$ (d) 41

37. A 30 mW laser beam has a cross-sectional area of 15 mm^2 . The magnitude of the maximum electric field in this electromagnetic wave is given by $\left[\begin{array}{l} \text{Permittivity of space, } \epsilon_0 = 9 \times 10^{-12} \\ \text{Speed of light, } c = 3 \times 10^8 \text{ m/s} \end{array} \right]$

- (a) 1.22 kV/m (b) 12 kV/m
(c) 10 kV/m (d) 201 kV/m

38. The average kinetic energy of a molecule in air at room temperature of 20°C

- (a) $6 \times 10^{-22} \text{ J}$ (b) $7.06 \times 10^{-21} \text{ J}$
(c) $6.07 \times 10^{-21} \text{ J}$ (d) $6.70 \times 10^{-21} \text{ J}$

39. Two guns P and Q can fire bullets at speeds 2 km/s and 4 km/s, respectively. From a point on a horizontal ground, they are fired in all possible directions. The ratio of maximum or areas covered by the bullets fired by the two guns, on the ground is

- (a) 1: 2 (b) 1: 4
(c) 1: 8 (d) 1: 16

40. A cell of emf 2 V is connected with a load of resistance 1.5Ω . The power delivered by the cell to the load is maximum, then power transferred to the load is

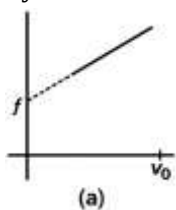
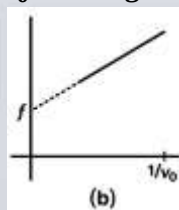
- (a) 0.33 w (b) 2.67 w
(c) 1.33 w (d) 3.25 w

41. A plane glass mirror of thickness 3 cm of material of $\mu = \frac{3}{2}$ is silvered on the black surface. When a point object is placed 9 cm from the front surface of the mirror, then the position of the brightest image from the front surface is

- (a) 9 cm (b) 11 cm
(c) 12 cm (d) 13 cm

42. Ultraviolet light of wavelength 99 nm falls on a metal plate of work function 1.0 eV. If the mass of the electron is $9.1 \times 10^{-31} \text{ kg}$, the wavelength of the fastest photoelectron emitted is

- (a) 0.63 nm (b) 0.66 nm
(c) 0.33 nm (d) 0.36 nm

43. In Young's double slit experiment, the fringe width is found to be 0.4 mm. If the whole apparatus is immersed in a liquid of refractive index $\frac{4}{3}$ without changing geometrical arrangement, the new fringe width will be
 (a) 0.45 mm (b) 0.4 mm
 (c) 0.53 mm (d) 0.30 mm
44. There are two identical containers C_1 and C_2 containing identical gases. Gas in C_1 is reduced to half of its original volume adiabatically, while the gas in container C_2 is also reduced to half of its initial volume isothermally. Find the ratio of final pressure in these containers. (γ be the adiabatic constant).
 (a) 2: 1 (b) 1: 2
 (c) 2^γ : 1 (d) $2^{\gamma-1}$: 1
45. If K_1 and K_2 are maximum kinetic energies of photoelectrons emitted when lights of wavelengths λ_1 and λ_2 , respectively incident on a metallic surface and $\lambda_1 = 3\lambda_2$, then
 (a) $K_1 > \left(\frac{K_2}{3}\right)$ (b) $K_1 < \left(\frac{K_2}{3}\right)$
 (c) $K_1 = 2K_2$ (d) $K_2 = 2K_1$
46. A car is moving with a speed of 54 km/h. If after 3 s, the driver applies brakes and it stops, then how much distance is covered by the car before coming to rest?
 (a) 22.5 m (b) 20 m
 (c) 25 m (d) 45.2 m
47. A source of sound emits sound waves at frequency f_0 . It is moving towards an observer with fixed speed v_s ($v_s < v$, where v is the speed of sound in air.) If the observers were to move towards the source with speed v_0 , one of the following two graphs (a and b) will give the correct variation of the frequency f heard by the observer as v_0 is change
- 

- The variation of f with v_0 is given correctly by
 (a) graph A with slope = $\frac{f_0}{(v+v_s)}$
 (b) graph B with slope = $\frac{f_0}{(v-v_s)}$
 (c) graph C with slope = $\frac{f_0}{(v-v_s)}$
 (d) graph B with slope = $\frac{f_0}{(v+v_s)}$
48. In which mode of transmission, the heat waves travel along straight line with the speed of light?
 (a) thermal radiation
 (b) forced convection
 (c) natural convection
 (d) thermal conduction
49. The escape velocity of a projectile on the earth's surface is 11.2 km/s. A body is projected out with thrice this speed. The speed of the body far away from the earth will be
 (a) 22.4 km/s (b) 31.7 km/s
 (c) 33.6 km/s (d) none of these
50. Consider a compound slab consisting of two different materials having equal lengths, thickness and thermal conductivities K and $2K$ respectively. The equivalent thermal conductivity of the slab is
 (a) $\sqrt{2}K$ (b) $3K$
 (c) $\frac{4}{3}K$ (d) $\frac{2}{3}K$
51. A circular coil of 20 turns and radius 10 cm is placed in a uniform magnetic field of 0.10 T normal to the plane of the coil. If the current in the coil is 5 A, then the average force on each electron in the coil due to the magnetic field is

- (a) 2.5×10^{-25} N (b) 4.5×10^{-25} N
(c) 5×10^{-25} N (d) 5.5×10^{-25} N

52. With what minimum acceleration can a fireman slide down a rope while breaking strength of the rope is $\frac{2}{3}$ of the weight?

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

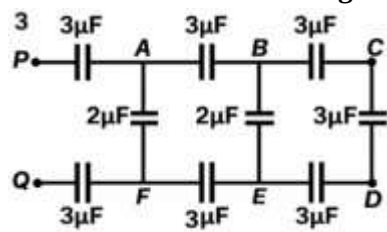
53. The string of length 2m is fixed at both ends. If the string vibrates in its fourth normal mode with a frequency of 500 Hz, then the waves would travel on it with a velocity of

- (a) 125 m/s (b) 250 m/s
(c) 500 m/s (d) 1000 m/s

54. An alternating voltage = $200\sin 100t$ is applied to a series combination of $R = 30\Omega$ and an inductor of 400 mH. The power factor of the circuit is,

- (a) 0.01 (b) 0.6
(c) 0.05 (d) 0.042

55. In the network shown in figure, the equivalent capacitance between points P and Q is



- (a) $1\mu F$ (b) $2\mu F$
(c) $3\mu F$ (d) $4\mu F$

56. The resultant of two forces acting at an angle of 120° is $10\text{ kg} - W$ and is perpendicular to one of the forces. That force is

- (a) $\frac{10}{\sqrt{3}}\text{ kg} - W$ (b) $10\text{ kg} - W$
(c) $20\sqrt{3}\text{ kg} - W$ (d) $10\sqrt{3}\text{ kg} - W$

57. Choose the incorrect statements.

- (a) silicon is used in the fabrication of led.
(b) led works on the principle of electroluminescence
(c) led is a power efficient device.
(d) led is fabricated with direct band gap semiconductor.

58. Charge on electron is

- (a) $3.2 \times 10^{-19}c$ (b) $1.6 \times 10^{-19}c$
(c) $-1.6 \times 10^{-19}c$ (d) $-3.2 \times 10^{-19}c$

59. Two charged spheres of $-20\mu C$ and $60\mu C$ are kept at a certain distance. They are touched and kept again at the same distance. What is the ratio of force experienced before and after?

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

60. The AC voltage across a resistance can be measured using a

- (a) hot wire voltmeter
(b) moving coil galvanometer
(c) potential coil galvanometer
(d) moving magnet galvanometer

CHEMISTRY

61.is unstable at cooking temperature, whereas the control of sweetness of food is difficult while using.....

- (a) Alitame and aspartame
(b) Aspartame and sucralose

- (c) Aspartame and alitame
(d) Alitame and sucralose

62. The chemical formula of Lucas reagent is

- (a) Anhy. ZnCl_2/HCl (d) $\text{C}_6\text{H}_5\text{SO}_2\text{Cl}$
(c) $\text{NaOH} + \text{CaO}$ (d) HNO_2

63. Give the correct order of acidity of

- (a) $\text{HClO}_4 < \text{HClO}_3 < \text{HClO}_2 < \text{HClO}$
(b) $\text{HClO} < \text{HClO}_2 < \text{HClO}_3 < \text{HClO}_4$
(c) $\text{HClO}_4 < \text{HClO}_2 < \text{HClO} < \text{HClO}_3$
(d) $\text{HClO} < \text{HClO}_3 < \text{HClO}_2 < \text{HClO}_4$

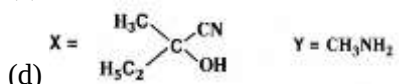
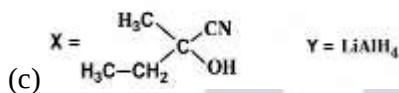
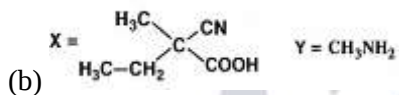
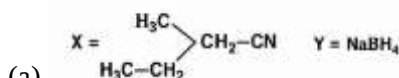
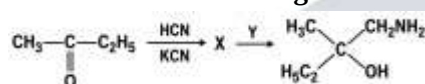
64. The process of aggregation of colloidal particles into an insoluble precipitate by the addition of suitable electrolyte is called

- (a) coagulation (b) diffusion
(c) peptization (d) electrolysis

65. Alkyl halides undergoing $\text{S}_\text{N}2$ reaction do inverse

- (a) racemic mixture
(b) retention of configuration
(c) formation of carbocation
(d) inversion of configuration

66. X and Y in the following reactions are



67. Doping of silicon (Si) with indium (In) leads to the formation of

- (a) n-type semiconductor (b) metal
(c) p-type semiconductor (d) insulator

68. For the reaction, $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2\text{HI}(\text{g})$ the position of equilibrium can be shifted to the right by

- (a) addition of HI
(b) addition of both I_2 and HI
(c) increasing temperature
(d) addition of I_2

69. Which of the following are not path functions?

- (I) H-TS (II) W
(III) q (IV) q + w
(a) I and III (b) I, II, IV
(c) II, III and IV (d) I and IV

70. The system that forms maximum boiling azeotropes is

- (a) acetone-chloroform
(b) ethyl alcohol-water
(c) benzene-toluene
(d) CS_2 + acetone

71. KMnO_4 acts as an oxidising agent in acidic medium. The number of moles of KMnO_4 that will be required to react with one mole of oxalate ions (to form CO_2) in acidic solution is
- (a) $\frac{2}{5}$ (b) $\frac{5}{2}$
 (c) 5 (d) $\frac{5}{4}$
72. What can be A and B in the following reaction?
- (a) HBr al
 (b) KOH
 (c) HBr, Peroxidealc.
 (d) HBr, Peroxide aq. KOH, Δ
73. Which of the following is a false statement?
- (a) Methoxymethane has higher boiling point than ethanol.
 (b) Alcohols are more soluble in water than hydrocarbons of comparable molecular mass.
 (c) ortho- and para-nitrophenols are more acidic than phenols.
 (d) Phenol is more acidic than alcohol.
74. Which of the following molecules does not exhibit dipole moment?
- (i) CCl_4 (ii) CO_2
 (iii) NH_3 (iv) CHCl_3
 (v) H_2O (vi) $\text{CH}_3 - \text{O} - \text{CH}_3$
 (a) (ii), (v), (iv) (b) (i), (iii), (vi)
 (c) (i), (ii) (d) (iii), (iv), (vi)
75. Which of the following is highly basic?
- (a) Diphenylamine (b) Benzylamine
 (c) Aniline (d) Triphenylamine
76. The relation between work done in reversible and irreversible process is
- (a) $W_{\text{irr}} > W_{\text{rev}}$ (b) $W_{\text{irr}} < W_{\text{rev}}$
 (c) $W_{\text{irr}} = W_{\text{rev}}$ (d) $W_{\text{irr}} \neq W_{\text{rev}}$
77. What is the function platelets?
- (a) It binds to oxygen
 (b) It binds to carbon dioxide
 (c) It forms cyanide in body
 (d) It leads to coagulation of blood
78. The monosaccharides of maltose is
- (a) α -D-glucose and α -D-glucose
 (b) β -D-glucose and α -D-glucose
 (c) α -D-glucose and α -D-fructose
 (d) α -D-glucose and β -D-fructose
79. Which of the following does not affect solubility of a gas in liquid?
- (a) Nature of gas and liquid (b) Pressure
 (c) Concentration (d) Temperature
80. Which of the following statement is incorrect for H_2O_2 structure?
- (a) It has an open book structure
 (b) Its dihedral angle is 180° .
 (c) It O — O bond length is 145.8 and O — H is 98.8.
 (d) Angle between both planes is 90.2° .
81. A newly prepared radioactive nuclide has a decay constant of 6.93 s^{-1} . What is the half-life of the nuclide?
- (a) 0.1 s (b) 0.2 s
 (c) 0.3 s (d) 0.4 s

82. Which of the following show both Frenkel and Schottky defect?

- (a) ZnS (b) AgBr
(c) NaCl (d) AgCl

83. The essential amino acid are

- (i) Leucine (ii) Glutamic acid
(iii) Asparagine (iv) Valine
(a) (i), (ii) (b) (ii), (iii)
(c) (iii), (iv) (d) (i), (iv)

84. Increasing order of bond order of oxygen and its ions is

- (a) $O_2 < O_2^+ < O_2^{2-} < O_2^-$
(b) $O_2^- < O_2^{2-} < O_2^+ < O_2$
(c) $O_2^+ < O_2 < O_2^- < O_2^{2-}$
(d) $O_2^{2-} < O_2^- < O_2 < O_2^+$

85. Minimum number of nodes are present in

- (a) 2 s (b) 3 s
(c) 4 s (d) 5 s

86. pH of $10^{-3}M$ solution of KOH is

- (a) 7.01 (b) 2
(c) 11 (d) 9

87. Barbiturates are used to treat

- (a) fatigue (b) hallucinations
(c) allergies (d) depression

88. Which of the product is not possible in Wurtz reaction?

- (a) Methane (b) Ethane
(c) Propane (d) Butane

89. The colour of CrO_4^{2-} changes to $Cr_2O_7^{2-}$ is

- (a) yellow to orange (b) orange to yellow
(c) yellow to blue (d) orange to blue

90. On treatment of glucose with bromine water the product formed is Options:

- (a) saccharic acid (b) gluconic acid
(c) glutamic acid (d) acetic acid

91. Which among the following forms minimum boiling azeotropes?

- (i) Heptane + Octane
(ii) Water + Nitric acid
(iii) Ethanol + Water
(iv) Acetone + Carbon dioxide
(a) (i), (ii), (iv) (b) (i), (ii) only
(c) (i), (iii), (iv) (d) (iv) only

92. Which of the following statement is incorrect about activation energy? **a. Higher the activation energy slower is the rate of reaction.**

- (a) Higher the activation energy slower is the rate of reaction.
(b) Catalyst decreases the activation energy.
(c) SI unit of activation energy is $J/mol/K^{-1}$.
(d) Activation energy depends upon the rate of reaction.

93. The P – O bond order in PO_4^{3-} is

- (a) 1 (b) 1.5
(c) 1.45 (d) 1.25

94. O_2^- , F^- , Mg^{2+} , Al^{3+} , O_2 , F_2 . How many of the species given above isoelectronic?

- (a) 4 (b) 2
(c) 3 (d) 5

95. How many atoms are present in hcp per unit cell?

- (a)4 (b)2
(c)1 (d)6

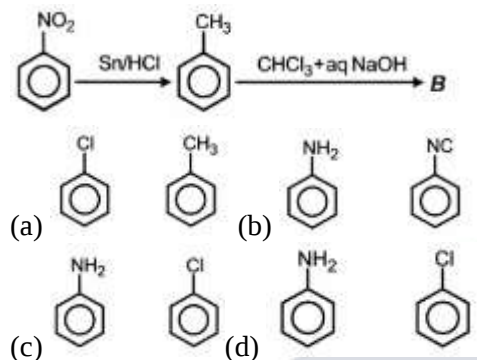
96. The equilibrium constant, K_c for $3C_2H_2(g) \rightleftharpoons C_6H_6(g)$ is $4L^2 \text{ mol}^{-2}$. If the equilibrium concentration of benzene is 0.5 mol^{-1} then what is the value of concentration of ethylene?

- (a)0.05 mol/L (b)0.5 mol/L
(c)0.25 mol/L (d)0.025 mol/L

97. Which of the following artificial sweeteners can be used in soft drinks only?

- (a)Alitame (b)Aspartame
(c)Sucralose (d)Saccharine

98. Identify the product formed in the given reaction.



99. Which of the following gas readily de-colourises the acidified $KMnO_4$ solution?

- (a) CO_2 (b) SO_2
(c) P_2O_5 (d) NO_2

100. Which of the following gas readily de-colourises the acidified $KMnO_4$ solution?

- (a) CO_2 (b) SO_2
(c) P_2O_5 (d) NO_2

101. Which of the following is used to prepare the inner lining of a blast furnace?

- (a)Graphite bricks (b)Silica bricks
(c)Fire clay bricks (d)basic bricks

102. What will be the emf of the following cell at $25^\circ C$?



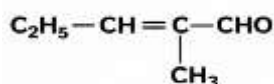
$E_{\left(\frac{Fe^{2+}}{Fe}\right)}^\circ = -0.44 \text{ V}; E_{\left(\frac{H^+}{H_2}\right)}^\circ = 0.00 \text{ V}$

- (a)0.44 V (b)-0.44 V
(c)0.41 V (d)-0.41 V

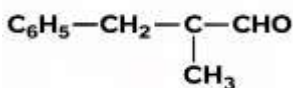
103. Which of the following vitamin is responsible for beri-beri disease?

- (a)A (b) B_1
(c)K (d)D

104. Find the product formed for the given reaction.

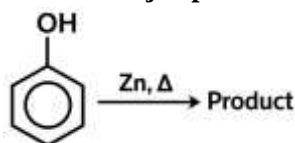


- (a)
(b) $C_6H_5-CH_2CH_2CH_2CHO$



- (c)
(d) $C_6H_5CH=C(CH_3)-CHO$

105. In which of the following changes, entropy decreases?
 (a) Rusting of iron
 (b) Melting of ice
 (c) Vaporisation of camphor
 (d) Crystallisation of sucrose from solution
106. Which of the following is added to soaps to impart antiseptic properties?
 (a) Iodine (b) Furacine
 (c) Bithional (d) Terpeneol
107. Which among the following will not liberate nitrogen on reaction with nitrous acid?
 (a) dimethylamine (b) 2-aminopropane
 (c) ethylamine (d) methylamine
108. The complex which does not show optical isomerism is
 (a) $\text{cis} - [\text{Co}(\text{en})_2\text{Cl}_2]\text{Cl}$
 (b) $\text{cis} - [\text{CrCl}_2(\text{ox})_2]^{3-}$
 (c) $\text{cis} - [\text{CoCl}(\text{en})_2(\text{NH}_3)]^{2+}$
 (d) $\text{cis} - [\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$
109. What will be the density of N_2 gas at 230°C and 3 atm pressure? ($R = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1}$)
 (a) 3.41 g/mL (b) 2.03 g/mL
 (c) 4.30 g/mL (d) 0.27 g/mL
110. The solution which have lowest freezing point is
 (a) 0.2M K_2SO_4 (b) 0.2 M KCl
 (c) 0.2M NaNO_3 (d) 0.2M MgSO_4
111. Calculate the molar conductance of 0.025 M aqueous solution of calcium chloride at 25°C . The specific conductance of calcium chloride is $12.04 \times 10^{-2} \text{ Sm}^{-1}$
 (a) $4.816 \times 10^{-5} \text{ Sm}^2 \text{ mol}^{-1}$
 (b) $3.816 \times 10^{-5} \text{ Sm}^2 \text{ mol}^{-1}$
 (c) $381.6 \times 10^{-5} \text{ Sm}^2 \text{ mol}^{-1}$
 (d) $481.6 \times 10^{-5} \text{ Sm}^2 \text{ mol}^{-1}$
112. For the reaction $2 \text{N}_2\text{O}_5 \rightarrow 4\text{NO}_2 + \text{O}_2$. If initial pressure is 100 atm and rate constant k is $3.38 \times 10^{-5} \text{ s}^{-1}$. After 20 min the final pressure of N_2O_5 will be
 (a) 96 atm (b) 50 atm
 (c) 70 atm (d) 60 atm
113. The difference between heat capacity at constant pressure and heat capacity at constant volume is
 (a) R (b) $\frac{R}{T}$
 (c) $\frac{R}{V}$ (d) 1
114. Which of the following gas is responsible for acid rain?
 (a) Sulphur dioxide and nitrous oxide
 (b) Sulphur dioxide and carbon monoxide
 (c) Sulphur dioxide and carbon dioxide
 (d) Sulphur dioxide and nitrogen oxide
115. Which of the following compound does not exists?
 (a) NCl_3 (b) NCl_5
 (c) SbCl_3 (d) NI_3
116. The major product in the given reaction is



- (a) toluene (b) p-methyl toluene
 (c) benzene (d) o-methyl benzene

117. The spectrum of He^+ is similar to

- (a) H (b) Li^+
(c) Na (d) He^+

118. The Paschen series of hydrogen spectrum lies in which region?

- (a) UV region (b) IR region
(c) Visible region (d) Microwave region

119. The oxidation state of nickel in $[\text{Ni}(\text{CO}_4)]$ is

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

120. The correct condition for physical adsorption is

- (a) High T and high p
(b) High T and low p
(c) Low T and high p
(d) T and p do not affect

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121. The value of $3^{\log_4 5} - 5^{\log_4 3}$ is

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

122. If the tangent to the curve $xy + ax + by = 0$ at $(1, 1)$ is inclined at angle $\tan^{-1} 2$ with X-axis, then

- (a) $a = 1, b = 2$ (b) $a = 1, b = -2$
(c) $a = -1, b = 2$ (d) $a = -1, b = -2$

123. If $\lim_{x \rightarrow 0} \frac{(1+a^3)^{8e^{1/x}}}{1+(1-b^3)e^{1/x}} = 2$, then

- (a) $a = 1, b = 2$ (b) $a = 1, b = -3^{1/3}$
(c) $a = 2, b = 3^{1/3}$ (d) None of these

124. If two circles $(x-1)^2 + (y-3)^2 = r^2$ and $x^2 + y^2 - 8x + 2y + 8 = 0$

- (a) $2 < r < 8$ (b) $r < 2$
(c) $r = 2$ (d) $r > 2$

125. The approximate value of $(0.007)^{1/3}$ is

- (a) $\frac{21}{120}$ (b) $\frac{23}{120}$
(c) $\frac{29}{120}$ (d) $\frac{31}{120}$

126. The circle $x^2 + y^2 + 4x - 7y + 12 = 0$ cuts an intercept on Y-axis of length

- (a) 3 (b) 4
(c) 7 (d) 1

127. Let $f(x) = a - (x-3)^{8/9}$, then maxima of $f(x)$ is

- (a) 3 (b) $a - 3$
(c) a (d) None

128. If the derivative of the function $f(x) = \begin{cases} bx^2 + ax + 4; & x \geq -1 \\ ax^2 + b; & x < -1 \end{cases}$ is everywhere continuous, then

- (a) $a = 2, b = 3$ (b) $a = 3, b = 2$
(c) $a = -2, b = -3$ (d) $a = -3, b = -2$

129. If $\lim_{x \rightarrow \infty} \left(1 + \frac{a}{x} + \frac{b}{x^2}\right)^{2x} = e^2$, then

- (a) $a = 1, b = 2$ (b) $a = 2, b = 1$
(c) $a = 1, b \in \mathbb{R}$ (d) None of these

130. $S \equiv x^2 + y^2 + 2x + 3y + 1 = 0$ and $S' \equiv x^2 + y^2 + 4x + 3y + 2 = 0$ are two circles.

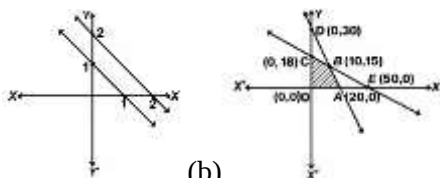
The point $(-3, -2)$ lies

- (a) inside S only (b) inside S only
(c) inside S and S' (d) outside S and S'

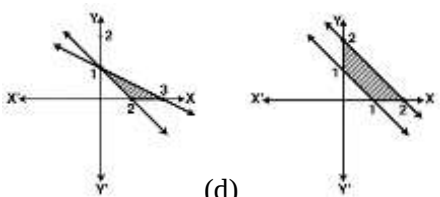
131. The probability of choosing randomly a number c from the set $\{1, 2, 3, \dots, 9\}$ such that the quadratic equation $x^2 + 4x + c = 0$ has real roots, is

- (a) $\frac{1}{9}$ (b) $\frac{2}{9}$
(c) $\frac{3}{9}$ (d) $\frac{4}{9}$

132. Shade the feasible region for the inequations $6x + 4y \leq 120$, $3x + 10y \leq 180$, $x, y \geq 0$ in a rough figure.



(a) (b)



(c) (d)

133. The maximum of Z is where, $Z = 4x + 2y$ subject to constraints $4x + 2y \geq 46$, $x + 3y \leq 24$ and $x, y \geq 0$ is

- (a) 46 (b) 96
(c) 52 (d) None of these

134. If for any 2×2 square matrix A , $A(\text{adj}A) = \begin{bmatrix} 8 & 0 \\ 0 & 8 \end{bmatrix}$, then find the value of $\det(A)$.

- (a) 6 (b) 7
(c) 8 (d) 5

135. If $A = \begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$, then $|A| \text{adj}A$ is equal to

- (a) a^{3n} (b) a^{-3n}
(c) $-a^{3n}$ (d) $2a^{3n}$

136. If $A = \begin{bmatrix} 2-k & 2 \\ 1 & 3-k \end{bmatrix}$ is a singular matrix, then the value of $5k - k^2$ is

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

137. If θ be the angle between the vectors $a = 2\hat{i} + 2\hat{j} - \hat{k}$ and $b = 6\hat{i} - 3\hat{j} + 2\hat{k}$, then

- (a) $\cos\theta = \frac{4}{21}$ (b) $\cos\theta = \frac{3}{19}$
(c) $\cos\theta = \frac{2}{19}$ (d) $\cos\theta = \frac{5}{21}$

138. If x, y and z are non-zero real numbers and $a = x\hat{i} + 2\hat{j}$, $b = y\hat{j} + 3\hat{k}$ and $c = x\hat{i} + y\hat{j} + z\hat{k}$ are such that $a \times b = z\hat{i} - 3\hat{j} + \hat{k}$, then $[abc]$ is equal to

- (a) 3 (b) 10
(c) 9 (d) 6

139. Maximum value of $z = 12x + 3y$, subject to constraints $x \geq 0, y \geq 0, x + y \leq 5$ and $3x + y \leq 9$ is

- (a) 15 (b) 36
(c) 60 (d) 40

140. If $p = \hat{i} + \hat{j}$, $q = 4\hat{k} - \hat{j}$ and $r = \hat{i} + \hat{k}$, then the unit vector in the direction of $3p + q - 2r$ is

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

141. The line $\frac{x-3}{4} = \frac{y-4}{5} = \frac{z-5}{6}$ is parallel to the plane

- (a) $3x + 4y + 5z = 7$ (b) $x + y + z = 2$
(c) $x - 2y + z = 0$ (d) $2x + 3y + 4z = 0$

142. $\int \frac{1}{x\sqrt{ax-x^2}} dx$ is

- (a) $\frac{-3}{a} \sqrt{\frac{a-x}{x}} + C$ (b) $-\frac{2}{a} \sqrt{\frac{x}{a-x}} + C$
 (c) $\frac{-2}{a} \sqrt{\frac{a-x}{x}} + C$ (d) None of these

143. $\int \frac{3^x}{\sqrt{1-9^x}} dx$ is equal to

- (a) $(\log 3) \sin^{-1} 3^x + C$
 (b) $\frac{1}{3} \sin^{-1} (3^x) + C$
 (c) $\frac{1}{\log 3} \sin^{-1} 3^x + C$
 (d) $3 \log 3 \sin^{-1} 3^x + C$

144. $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \cos x dx$

- (a) 2 (b) 0
 (c) -1 (d) 5

145. The angle between the lines $\frac{x+4}{3} = \frac{y-1}{5} = \frac{z+3}{4}$ and $\frac{x+1}{1} = \frac{y-4}{1} = \frac{z-5}{2}$ is

- (a) 30° (b) $\cos^{-1} \left(\frac{3}{2\sqrt{2}} \right)$
 (c) $\cos^{-1} \left(\frac{8}{5\sqrt{3}} \right)$ (d) None of these

146. The point of intersection of the lines $\frac{x-1}{1} = \frac{y-1}{2} = \frac{z-2}{3}$ and $\frac{x-5}{2} = \frac{y-2}{1} = z$ is

- (a) $(1, -2, 0)$ (b) $(3, 1, 0)$
 (c) $(-2, -5, -7)$ (d) None of these

147. Five persons A, B, C, D and E are in queue of a shop. The Probability that A and B are always together is

- (a) $\frac{2}{5}$ (b) $\frac{1}{4}$
 (c) $\frac{3}{5}$ (d) $\frac{2}{3}$

148. If the probability for A to fail in an examination is 0.2 and that for B is 0.3, then the probability that either A or B fail is

- (a) 0.38 (b) 0.44
 (c) 0.50 (d) 0.94

149. Three vertices are chosen randomly from the seven vertices of a regular 7-sided polygon. The probability that they form the vertices of an isosceles triangle is

- (a) $\frac{1}{7}$ (b) $\frac{1}{3}$
 (c) $\frac{3}{7}$ (d) $\frac{3}{5}$

150. If A, B and C are three mutually exclusive and exhaustive events such that $P(A) = 2P(B) = 3P(C)$. What is $P(B)$?

- (a) $\frac{6}{11}$ (b) $\frac{6}{22}$
 (c) $\frac{1}{6}$ (d) $\frac{1}{3}$

151. If $U_{n+1} = 3U_n - 2U_{n-1}$ and $U_0 = 2, U_1 = 3$, then U_n is equal to

- (a) $1 - 2^n$ (b) $2^n + 1$
 (c) $2^n - 1$ (d) $2^n + 2$

152. If $4^n + 15n + P$ is divisible by 9 for all $n \in \mathbb{N}$, then the least negative integral value of P is

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

153. $(2^{3n} - 1)$ is divisible by

- (a) 6 (b) 7
 (c) 8 (d) 9

154. If $S = \frac{2^2-1}{2} + \frac{3^2-2}{6} + \frac{4^2-3}{12} + \dots$ upto 10 terms, then S is equal to
- (a) $\frac{120}{11}$ (b) $\frac{13}{11}$
 (c) $\frac{110}{11}$ (d) $\frac{19}{11}$
155. $\sum_{n=1}^m n \cdot n!$ is equal to
- (a) $m! - 1$ (b) $(m-1)! - 1$
 (c) $(m+1)! - 1$ (d) $m!(m-1)!$
156. The first and fifth terms of an A.P. are -14 and 2 respectively and the sum of its n terms is 40. The value of n is
- (a) 8 (b) 12
 (c) 10 (d) 13
157. The solution of the differential equation $\frac{d^2y}{dx^2} = 0$ represents
- (a) all circles in a plane
 (b) all straight lines in a plane
 (c) all parabolas in a plane
 (d) all ellipses in a plane
158. The solution of the differential equation $\frac{dy}{dx} + \sqrt{\frac{1-y^2}{1-x^2}} = 0$ is
- (a) $\cos^{-1}x + \cos^{-1}y = c$
 (b) $\sin^{-1}x + \sin^{-1}y = c$
 (c) $\cosh^{-1}x + \cosh^{-1}y = c$
 (d) $\sinh^{-1}x + \sinh^{-1}y = c$
159. The solution of the differential equation $x \frac{dy}{dx} = \cot y$ is
- (a) $y \cos x = c$ (b) $x \cos y = c$
 (c) $\log(x \cos y) = c$ (d) $\log(y \cos x) = c$
160. If ${}^nC_3 = 220$, then n = ?
- (a) 11 (b) 12
 (c) 10 (d) 9
161. A multiple choice examination has 5 questions. Each question has three alternative answers of which exactly one is correct. The probability that a student will get 4 or more correct answer just by guessing, is
- (a) $\frac{13}{3^5}$ (b) $\frac{11}{3^5}$
 (c) $\frac{10}{3^5}$ (d) $\frac{17}{3^5}$
162. If $\sin A + \sin B = a$ and $\cos A + \cos B = b$, then $\cos(A+B)$ equals?
- (a) $\frac{a^2+b^2}{b^2-a^2}$ (b) $\frac{2ab}{a^2+b^2}$
 (c) $\frac{b^2-a^2}{a^2+b^2}$ (d) $\frac{a^2-b^2}{a^2+b^2}$
163. What is $\frac{\cos \theta}{1-\tan \theta} + \frac{\sin \theta}{1-\cot \theta}$ equal to?
- (a) $\sin \theta - \cos \theta$ (b) $2 \sin \theta$
 (c) $\sin \theta + \cos \theta$ (d) $2 \cos \theta$
164. Find the general solution of $\sin 2x + \cos x = 0$.
- (a) $(n \pm 1) \frac{\pi}{2}$
 (b) $n\pi \pm \frac{\pi}{2}$
 (c) $n\pi + (-1)^n \frac{7\pi}{6}$ or $(2n \pm 1) \frac{\pi}{2}$
 (d) None of the above

165. If $f(x) + 2f(1-x) = x^2 + 5$ $\forall$ real values of x then $f(x)$ is given by
 (a) $x^2 - 5$ (b) 2
 (c) $\frac{(x-2)^2+3}{3}$ (d) None of these
166. If $A = \{3, 5, 7\}$ and $B = \{1, 2, 3, 5\}$, then $A \times B \cap B \times A$ is equal to
 (a) $\{(3,3), (5,3), (2,7), (7,2)\}$
 (b) $\{(3,3), (3,5), (5,3), (5,5)\}$
 (c) $\{(3,3), (5,5)\}$
 (d) $\{(3,5), (5,5), (5,3)\}$
167. Total number of elements in the power set of A containing 17 elements is
 (a) 2^{17+1} (b) 2^{17-1}
 (c) $17^2 - 1$ (d) 2^{17}
168. The argument of $\frac{1-i\sqrt{3}}{1+i\sqrt{3}}$ is
 (a) $\frac{\pi}{3}$ (b) $\frac{2\pi}{3}$
 (c) $\frac{4\pi}{3}$ (d) $-\frac{2\pi}{3}$
169. Evaluate $\left[i^{22} + \left(\frac{1}{i}\right)^{25}\right]^3$
 (a) $4(i-1)$ (b) $2-7i$
 (c) $i-1$ (d) $2(1-i)$
170. $(i + \sqrt{3})^{100} + (i - \sqrt{3})^{100} + 2^{100}$ is equal to
 (a) 0 (b) 1
 (c) -1 (d) 2^{101}
171. There are 12 points in a plane out of which 3 points are collinear. How many straight lines can be drawn by joining any two of them?
 (a) 60 (b) 64
 (c) 72 (d) 84
172. How many numbers greater than 50000 can be formed by using digits 2, 5, 5, 6, 7 ?
 (a) 60 (b) 48
 (c) 52 (d) 42
173. A regular polygon of n sides has 170 diagonals, then n is equal to
 (a) 20 (b) 17
 (c) 24 (d) 20
174. Let the equation of the pair of lines $y = px$ and $y = qx$ can be written as $(y - px)(y - qx) = 0$. Then the equation of the pair of the angle bisectors of the line $x^2 - 4xy - 5y^2 = 0$ is
 (a) $x^2 - 3xy + y^2 = 0$ (b) $x^2 + 4xy - y^2 = 0$
 (c) $x^2 + 3xy - y^2 = 0$ (d) $x^2 - 3xy - y^2 = 0$
175. The distance of the point $(1, 2)$ from the line $x + y + 2 = 0$ measured along the line parallel to $2x - y = 5$ is equal to
 (a) $\frac{125}{3}$ (b) $\frac{125}{\sqrt{3}}$
 (c) $\frac{5\sqrt{5}}{3}$ (d) $\frac{5\sqrt{3}}{3}$
176. The slope of lines which makes an angle 45° with the line $2x - y = -7$
 (a) $\frac{1}{3}, -3$ (b) $-1, 1$
 (c) $3, -\frac{1}{3}$ (d) $1, \frac{1}{3}$
177. If 2 and 3 are intercepts of a line $L = 0$, then the distance of $L \equiv 0$ from the origin is
 (a) $\frac{5}{\sqrt{13}}$ (b) $\frac{\sqrt{13}}{6}$
 (c) $\frac{6}{\sqrt{13}}$ (d) 1

178. The total number of terms in the expansion of $(x + y)^{100} + (x - y)^{100}$ is

- (a) 49 (b) 50
(c) 51 (d) 99

179. The coefficient of x^{20} in the expansion of $(1 + 3x + 3x^2 + x^3)^{20}$ is

- (a) ${}^{60}C_{40}$ (b) ${}^{30}C_{20}$
(c) ${}^{15}C_2$ (d) None of these

180. In the expansion of $(1 - 3x + 3x^2 - x^3)^{2n}$, the middle term is

- (a) $(n + 1)$ th term
(b) $(2n + 1)$ th term
(c) $(3n + 1)$ th term
(d) None of these

