

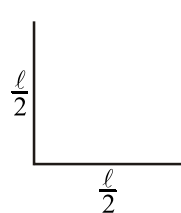
Mock Test-5

General Instructions

- This question booklet contains 150 Multiple Choice Questions (MCQs).
Section-A: Physics & Chemistry - 50 Questions each and
Section-B: Mathematics - 50 Questions.
- Choice and sequence for attempting questions will be as per the convenience of the candidate.
- Read each question carefully.
- Determine the one correct answer out of the four available options given for each question.
- Each question with correct response shall be awarded one (1) mark. There shall be no negative marking.
- No mark shall be granted for marking two or more answers of same question, scratching or overwriting.
- Duration of paper is 3 Hours.

SECTION-A

PHYSICS

- The magnetic field at a point due to a current carrying conductor is directly proportional to
 - resistance of the conductor
 - thickness of the conductor
 - current flowing through the conductor
 - distance from the conductor
- The work done in placing a charge of 8×10^{-18} coulomb on a condenser of capacity 100 micro-farad is
 - 16×10^{-32} joule
 - 3.1×10^{-26} joule
 - 4×10^{-10} joule
 - 32×10^{-32} joule
- Light of wavelength 6000 \AA falls on a single slit of width 0.1 mm. The second minimum will be formed for the angle of diffraction of
 - 0.08 radian
 - 0.06 radian
 - 0.12 radian
 - 0.012 radian
- A body executing linear simple harmonic motion has a velocity of 3 m/s when its displacement is 4 cm and a velocity of 4 m/s when its displacement is 3 cm. What is the amplitude of oscillation?
 - 5 cm
 - 7.5 cm
 - 10 cm
 - 12.5 cm
- If the mass of earth is eighty times the mass of a planet and diameter of the planet is one fourth that of earth, then acceleration due to gravity on the planet would be
 - 7.8 m/s^2
 - 9.8 m/s^2
 - 6.8 m/s^2
 - 2.0 m/s^2
- A steel wire of length ℓ has a magnetic moment M. It is bent in L-shape (Figure). The new magnetic moment is
 - M
 - $\frac{M}{\sqrt{2}}$
 - $\frac{M}{2}$
 - 2M
- At a certain place, the angle of dip is 30° and the horizontal component of earth's magnetic field is 0.50 oersted. The earth's total magnetic field (in oersted) is
 - $\sqrt{3}$
 - 1
 - $\frac{1}{\sqrt{3}}$
 - $\frac{1}{2}$
- In an LR-circuit, the inductive reactance is equal to the resistance R of the circuit. An e.m.f. $E = E_0 \cos(\omega t)$ applied to the circuit. The power consumed in the circuit is
 - $\frac{E_0^2}{R}$
 - $\frac{E_0^2}{2R}$
 - $\frac{E_0^2}{4R}$
 - $\frac{E_0^2}{8R}$
- Why is the Wheatstone bridge better than the other methods of measuring resistances?
 - It does not involve Ohm's law
 - It is based on Kirchoff's law
 - It has four resistor arms
 - It is a null method

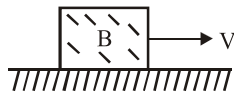
10. The gap between the frequency of the side bands in an amplitude modulated wave is
 (a) twice that of the carrier signal
 (b) twice that of the message signal
 (c) the same as that of the message signal
 (d) the same as that of the carrier signal

11. The density of a material in CGS system is 8 g/cm^3 . In a system of a unit in which unit of length is 5 cm and unit of mass is 20 g, the density of material is
 (a) 8 (b) 20 (c) 50 (d) 80

12. Excitation energy of a hydrogen like ion in its excitation state is 40.8 eV. Energy needed to remove the electron from the ion in ground state is
 (a) 54.4 eV (b) 13.6 eV
 (c) 40.8 eV (d) 27.2 eV

13. A block B is pushed momentarily along a horizontal surface with an initial velocity V. If μ is the coefficient of sliding friction between B and the surface, block B will come to rest after a time

- (a) $\frac{g\mu}{V}$ (b) $\frac{g}{V}$
 (c) $\frac{V}{g}$ (d) $\frac{V}{g(\mu)}$



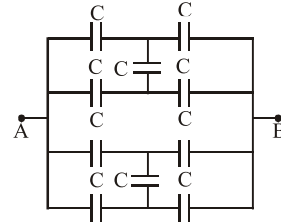
14. Two identical spheres of gold are in contact with each other. The gravitational attraction between them is
 (a) directly proportional to the square of the radius
 (b) directly proportional to the cube of the radius
 (c) directly proportional to the fourth power of the radius
 (d) inversely proportional to the square of the radius

15. The coefficient of performance of a refrigerator is 5. If the inside temperature of freezer is -20°C , then the temperature of the surroundings to which it rejects heat is
 (a) 41°C (b) 11°C (c) 21°C (d) 31°C

16. In Young's double slit experiment, the slits are 3 mm apart. The wavelength of light used is 5000 \AA and the distance between the slits and the screen is 90 cm. The fringe width in mm is
 (a) 1.5 (b) 0.015 (c) 2.0 (d) 0.15

17. The effective capacitance of combination of combination of equal capacitors between points A and B shown in figure is

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



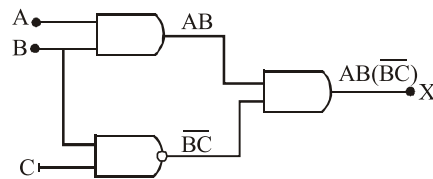
18. In a photoelectric experiment the stopping potential for the incident light of wavelength 4000 \AA is 2 volt. If the wavelength be changed to 3000 \AA , the stopping potential will be

- (a) 2V (b) zero
 (c) less than 2 V (d) more than 2 V

19. When the current in a coil changes from 2 amp. to 4 amp. in 0.05 sec., an e.m.f. of 8 volt is induced in the coil. The coefficient of self inductance of the coil is

- (a) 0.1 henry (b) 0.2 henry
 (c) 0.4 henry (d) 0.8 henry

20. The correct option for getting $X = 1$ from the given circuit is:



- (a) $A = B = C = 1$ (b) $A = B = 1 \text{ \& } C = 0$
 (c) $A = C = 1 \text{ \& } B = 0$ (d) $A = 0 \text{ \& } B = C = 1$

21. The linear velocity of a rotating body is given by:

$$\vec{v} = \vec{\omega} \times \vec{r}$$

If $\vec{\omega} = \hat{i} - 2\hat{j} + 2\hat{k}$ and $\vec{r} = 4\hat{j} - 3\hat{k}$, then the magnitude of \vec{v} is

- (a) $\sqrt{29}$ units (b) $\sqrt{31}$ units
 (c) $\sqrt{37}$ units (d) $\sqrt{41}$ units

22. A ship of mass $3 \times 10^7 \text{ kg}$ initially at rest, is pulled by a force of $5 \times 10^4 \text{ N}$ through a distance of 3m. Assuming that the resistance due to water is negligible, the speed of the ship is

- (a) 1.5 m/sec. (b) 60 m/sec.
 (c) 0.1 m/sec. (d) 5 m/sec.

23. A particle of mass 2 kg is moving such that at time t , its position, (in meter) is given by $\vec{r}(t) = 5\hat{i} - 2t^2\hat{j}$. The angular momentum of the particle at $t = 2s$ about the origin (in $\text{kg m}^{-2} \text{s}^{-1}$) is:

- (a) $-80\hat{k}$ (b) $(10\hat{i} - 16\hat{j})$
 (c) $-40\hat{k}$ (d) $40\hat{k}$

24. A metallic wire of length 2.0 m is elongated by 2.0 mm. Area of cross-section of the wire is 4.0 mm^2 . The elastic potential energy stored in the wire in elongated condition is [young's modulus of the metallic wire is $= 2 \times 10^{11} \text{ N/m}^2$]

- (a) 8.23 (b) 0.83 (c) 6.23 (d) 0.63

25. An ideal gas A and a real gas B have their volumes increased from V to $2V$ under isothermal conditions. The increase in internal energy

- (a) will be same in both A and B
 (b) will be zero in both the gases
 (c) of B will be more than that of A
 (d) of A will be more than that of B

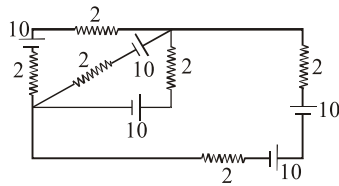
26. An electron moving with kinetic energy 6×10^{-16} joules enters a field of magnetic induction 6×10^{-3} weber/m² at right angle to its motion. The radius of its path is

- (a) 3.42 cm (b) 4.23 cm
 (c) 5.17 cm (d) 7.7 cm

27. An iron rod of length 2m and cross-sectional area of 50 mm^2 stretched by 0.5 mm, when a mass of 250 kg is hung from its lower end. Young's modulus of iron rod is

- (a) $19.6 \times 10^{20} \text{ N/m}^2$ (b) $19.6 \times 10^{18} \text{ N/m}^2$
 (c) $19.6 \times 10^{10} \text{ N/m}^2$ (d) $19.6 \times 10^{15} \text{ N/m}^2$

28. All batteries are having emf 10 volt and internal resistance negligible. All resistors are in ohms. Calculate the current in the right most 2Ω resistor.



- (a) $\frac{25}{12} \text{ A}$ (b) $\frac{25}{6} \text{ A}$
 (c) $\frac{12}{25} \text{ A}$ (d) $\frac{6}{25} \text{ A}$

29. A mass of 20 kg moving with a speed of 10m/s collides with another stationary mass of 5 kg. As

a result of the collision, the two masses stick together. The kinetic energy of the composite mass will be

- (a) 600 (b) 800 (c) 1000 (d) 1200

30. A radioactive source of half-life 2 hours emits radiation of intensity which is 64 times the permissible safe level. The minimum time in hours after which it would be possible to work safely with the source is

- (a) 12 (b) 8 (c) 6 (d) 24

31. A hospital uses an ultrasonic scanner to locate tumours in a tissue. The operating frequency of the scanner is 4.2 MHz. The speed of sound in a tissue is 1.7 km/s. The wavelength of sound in tissue is close to

- (a) $4 \times 10^{-4} \text{ m}$ (b) $8 \times 10^{-4} \text{ m}$
 (c) $4 \times 10^{-3} \text{ m}$ (d) $8 \times 10^{-3} \text{ m}$

32. A particle executes simple harmonic motion between $x = -A$ and $x = +A$. The time taken for it to go from O to $A/2$ is T_1 and to go from $A/2$ to A is T_2 . Then

- (a) $T_1 < T_2$ (b) $T_1 > T_2$
 (c) $T_1 = T_2$ (d) $T_1 = 2T_2$

33. The moment of inertia of a thin uniform rod of mass M and length L about an axis passing through its midpoint and perpendicular to its length is I_0 . Its moment of inertia about an axis passing through one of its ends and perpendicular to its length is

- (a) $I_0 + ML^2/2$ (b) $I_0 + ML^2/4$
 (c) $I_0 + 2ML^2$ (d) $I_0 + ML^2$

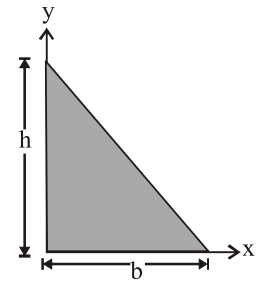
34. The centre of mass of triangle shown in figure has coordinates

(a) $x = \frac{h}{2}, y = \frac{b}{2}$

(b) $x = \frac{b}{2}, y = \frac{h}{2}$

(c) $x = \frac{b}{3}, y = \frac{h}{3}$

(d) $x = \frac{h}{3}, y = \frac{b}{3}$



35. A particle P is moving in a circle of radius ' a ' with a uniform speed v . C is the centre of the circle and AB is a diameter. When passing through B the angular velocity of P about A and C are in the ratio:

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

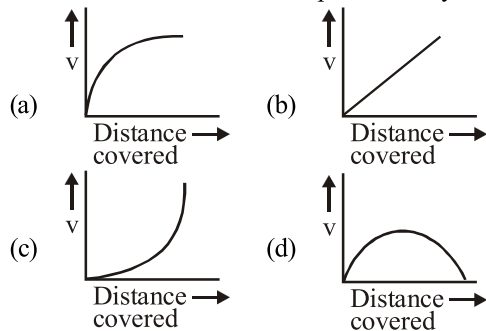
36. When light passing through rotating nicol is observed, no change in intensity is seen. What inference can be drawn ?
- The incident light is unpolarized.
 - The incident light is circularly polarized.
 - The incident light is unpolarized or circularly polarized.
 - The incident light is unpolarized or circularly polarized or combination of both.

37. An infinitely long thin straight wire has uniform linear charge density of $\frac{1}{3} \text{ cm}^{-1}$. Then, the magnitude of electric intensity at a point 18 cm away is: (Given $\epsilon_0 = 8.8 \times 10^{12} \text{ C}^2 \text{ Nm}^{-2}$)
- $0.33 \times 10^{11} \text{ NC}^{-1}$
 - $3 \times 10^{11} \text{ NC}^{-1}$
 - $0.66 \times 10^{11} \text{ NC}^{-1}$
 - $1.32 \times 10^{11} \text{ NC}^{-1}$

38. In an oscillation of L-C circuit, the maximum charge on the capacitor is Q. The charge on the capacitor, when the energy is stored equally between the electric and magnetic field is

- $\frac{Q}{2}$
- $\frac{Q}{\sqrt{2}}$
- $\frac{Q}{\sqrt{3}}$
- $\frac{Q}{3}$

39. A lead shot of 1 mm diameter falls through a long column of glycerine. The variation of its velocity v with distance covered is represented by



40. A coil having 500 square loops each of side 10 cm is placed normal to a magnetic field which increases at the rate of 1 Wb/m^2 . The induced e.m.f. is

- 0.1 V
- 5.0 V
- 0.5 V
- 1.0 V

41. An ideal gas is found to obey an additional law $VP^2 = \text{constant}$. The gas is initially at temperature T and volume V. When it expands to a volume 2V, the temperature becomes

- $T/\sqrt{2}$
- 2 T
- $2T\sqrt{2}$
- 4 T

42. A tuning fork of known frequency 256 Hz makes 5 beats per second with the vibrating string of a piano. The beat frequency decreases to 2 beats per second when the tension in the piano string

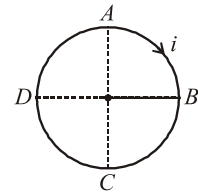
is slightly increased. The frequency of the piano string before increasing the tension was

- $(256+2) \text{ Hz}$
- $(256-2) \text{ Hz}$
- $(256-5) \text{ Hz}$
- $(256+5) \text{ Hz}$

43. Water flows in a stream line manner through a capillary tube of radius a, the pressure difference being P and the rate flow Q. If the radius is reduced to $\frac{a}{2}$ and the pressure is increased to 2P, the rate of flow becomes

- 4Q
- Q
- $\frac{Q}{2}$
- $\frac{Q}{8}$

44. A circular coil ABCD carrying a current i is placed in a uniform magnetic field. If the magnetic force on the segment AB is \vec{F} , the force on the remaining segment BCDA is



- \vec{F}
- $-\vec{F}$
- $3\vec{F}$
- $-3\vec{F}$

45. The refractive indices of glass and water with respect to air are $\frac{1}{2}$ and $\frac{1}{\sqrt{3}}$ respectively. Then the refractive index of glass with respect to water is

- $\frac{1}{\sqrt{3}}$
- $\frac{\sqrt{3}}{2}$
- $\frac{2}{\sqrt{3}}$
- 2

46. A certain number of spherical drops of a liquid of radius 'r' coalesce to form a single drop of radius 'R' and volume 'V'. If 'T' is the surface tension of the liquid, then :

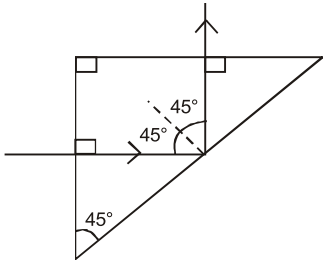
(a) energy = $4VT\left(\frac{1}{r} - \frac{1}{R}\right)$ is released

(b) energy = $3VT\left(\frac{1}{r} + \frac{1}{R}\right)$ is absorbed

(c) energy = $3VT\left(\frac{1}{r} - \frac{1}{R}\right)$ is released

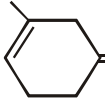
(d) energy is neither released nor absorbed

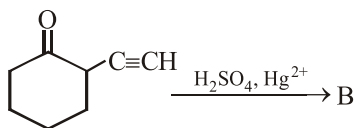
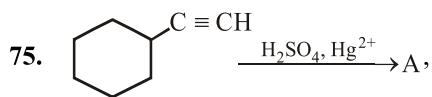
47. Two bodies A and B are placed in an evacuated vessel maintained at a temperature of 27°C . The temperature of A is 327°C and that of B is 227°C . The ratio of heat loss from A and B is about
- 2:1
 - 1:2
 - 4:1
 - 1:4

48. When the road is dry and the coefficient of the friction is μ , the maximum speed of a car in a circular path is 10 ms^{-1} . If the road becomes wet and $\mu' = \frac{\mu}{2}$, what is the maximum speed permitted?
- (a) 5 ms^{-1} (b) 10 ms^{-1}
(c) $10\sqrt{2} \text{ ms}^{-1}$ (d) $5\sqrt{2} \text{ ms}^{-1}$
49. A light ray is incident perpendicularly to one face of a 90° prism and is totally internally reflected at the glass-air interface. If the angle of reflection is 45° , we conclude that the refractive index n
- (a) $n > \frac{1}{\sqrt{2}}$
(b) $n > \sqrt{2}$
(c) $n < \frac{1}{\sqrt{2}}$
(d) $n < \sqrt{2}$
- 
50. A whistle of frequency 385 Hz rotates in a horizontal circle of radius 50 cm at an angular speed of $20 \text{ radians s}^{-1}$. The lowest frequency heard by a listener a long distance away at rest with respect to the centre of the circle, given velocity of sound equal to 340 ms^{-1} , is
- (a) 396 Hz (b) 363 Hz (c) 374 Hz (d) 385 Hz

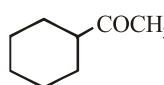
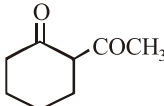
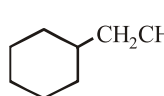
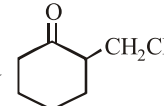
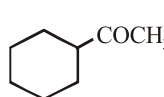
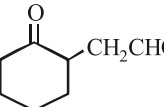
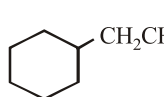
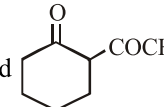
CHEMISTRY

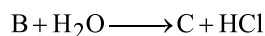
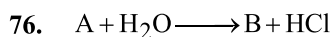
51. The radii of Na^+ and Cl^- ions are 95 pm and 181 pm respectively. The edge length of NaCl unit cell is
- (a) 276 pm (b) 138 pm
(c) 552 pm (d) 415 pm
52. Aluminium oxide may be electrolysed at 1000°C to furnish aluminium metal (At. Mass = 27 amu ; $1 \text{ Faraday} = 96,500 \text{ Coulombs}$). The cathode reaction is $\text{Al}^{3+} + 3\text{e}^- \rightarrow \text{Al}$. To prepare 5.12 kg of aluminium metal by this method would require
- (a) $5.49 \times 10^7 \text{ C}$ of electricity.
(b) $1.83 \times 10^7 \text{ C}$ of electricity.
(c) $5.49 \times 10^4 \text{ C}$ of electricity.
(d) $5.49 \times 10^1 \text{ C}$ of electricity.
53. Among the following, the wrong statement is
- (a) PMMA is plexiglass
(b) SBR is natural rubber
(c) PTFE is teflon
(d) LDPE is low density polythene
54. Hydride ion transfer takes place in:
- (a) Frankland method
(b) Wurtz reaction
(c) Cannizzaro reaction
(d) Wolff-Kishner reduction
55. The value of the 'spin only' magnetic moment for one of the following configurations is 2.84 B.M. . The correct one is
- (a) d^5 (in strong ligand field)
(b) d^3 (in weak as well as in strong fields)
(c) d^4 (in weak ligand fields)
(d) d^4 (in strong ligand fields)
56. Which of these does not influence the rate of reaction?
- (a) Nature of the reactants
(b) Concentration of the reactants
(c) Temperature of the reaction
(d) Molecularity of the reaction
57. 3-Hexyne reacts with Na/liq. NH_3 to produce
- (a) cis-3-Hexene (b) trans-3-Hexene
(c) 3-Hexylamine (d) 2-Hexylamine
58. Total volume of atoms present in a face-centred cubic unit cell of a metal is (r is atomic radius)
- (a) $\frac{12}{3} \pi r^3$ (b) $\frac{16}{3} \pi r^3$
(c) $\frac{20}{3} \pi r^3$ (d) $\frac{24}{3} \pi r^3$
59. Which one of the following pairs is isostructural (i.e., having the same shape and hybridization)?
- (a) $[\text{BCl}_3 \text{ and } \text{BrCl}_3^-]$
(b) $[\text{NH}_3 \text{ and } \text{NO}_3^-]$
(c) $[\text{NF}_3 \text{ and } \text{BF}_3]$
(d) $[\text{BF}_4^- \text{ and } \text{NH}_4^+]$

60. Consider the following sequence of reactions :
 Compound [A] $\xrightarrow{\text{Reduction}}$ [B] $\xrightarrow{\text{HNO}_2}$ CH₃CH₂OH
 The compound [A] is
 (a) CH₃CH₂CN (b) CH₃NO₂
 (c) CH₃NC (d) CH₃CN
61. [Fe(H₂O)₆]²⁺ and [Fe(CN)₆]⁴⁻ differ in :
 (a) geometry, magnetic moment
 (b) geometry, hybridization
 (c) magnetic moment, colour
 (d) hybridization, number of *d*-electrons
62. Which of the following is chalcocopyrite?
 (a) CuFeS₂ (b) FeS₂
 (c) KMgCl₃·6H₂O (d) Al₂O₃·2H₂O
63. If *x* is the specific resistance of the solution and *N* is the normality of the solution, the equivalent conductivity of the solution is given by
 (a) $\frac{1000x}{N}$ (b) $\frac{1000}{Nx}$
 (c) $\frac{1000N}{x}$ (d) $\frac{Nx}{1000}$
64.  is oxidised by heating with alkaline KMnO₄ to give
 (a) CH₂O + CH₃CO(CH₂)₄COOH
 (b) CO₂ + CH₃COCH₂COCH₂CH₂COOH
 (c) CH₂O + CH₃COCH₂COCH₂CH₂COOH
 (d) the corresponding tetrol
65. The reagent commonly used to determine hardness of water titrimetrically is
 (a) oxalic acid
 (b) sodium thiosulphate
 (c) sodium citrate
 (d) disodium salt of EDTA
66. The charge on colloidal particles is due to
 (a) presence of electrolyte.
 (b) very small size of particles.
 (c) adsorption of ions from the solution.
 (d) none of these.
67. The E° at 25° C for the following reaction is 0.22 V. Calculate the equilibrium constant at 25° C :
 H₂(g) + 2AgCl(s) \longrightarrow 2Ag(s) + 2HCl(aq)
 (a) 2.8 × 10⁷ (b) 5.2 × 10⁸
 (c) 5.2 × 10⁶ (d) 5.2 × 10³
68. The reason for not storing XeF₆ in a glass or a quartz vessel is that
 (a) it forms an explosive having the formula XeO₂F₂
 (b) it forms an explosive having the formula XeOF₄
 (c) it forms XeO₂ which is explosive substance
 (d) it forms XeO₆⁴⁺ which is explosive in nature
69. The rate of a first order reaction is 1.5 × 10⁻² mol L⁻¹ min⁻¹ at 0.5 M concentration of the reactant. The half life of the reaction is
 (a) 0.383 min (b) 23.1 min
 (c) 8.73 min (d) 7.53 min
70. Bauxite ore is made up of Al₂O₃ + SiO₂ + TiO₂ + Fe₂O₃. This ore is treated with conc. NaOH solution at 500 K and 35 bar pressure for few hours and filtered hot. In the filtrate the species present is/are
 (a) NaAl(OH)₄ only
 (b) Na₂Ti(OH)₆ only
 (c) NaAl(OH)₄ and Na₂SiO₃
 (d) Na₂SiO₃ only
71. Which one of the following is employed as a tranquilizer?
 (a) Naproxen
 (b) Tetracycline
 (c) Chlorpheniramine
 (d) Equanil
72. Primary amines can be distinguished from secondary and tertiary amines by reacting with
 (a) Chloroform and alcoholic KOH
 (b) Methyl iodide
 (c) Chloroform alone
 (d) Zinc dust
73. In HS⁻, I⁻, RNH₂ and NH₃, order of proton accepting tendency will be
 (a) I⁻ > NH₃ > RNH₂ > HS⁻
 (b) HS⁻ > RNH₂ > NH₃ > I⁻
 (c) RNH₂ > NH₃ > HS⁻ > I⁻
 (d) NH₃ > RNH₂ > HS⁻ > I⁻
74. One litre hard water contains 12.00 mg Mg²⁺. Milli-equivalents of washing soda required to remove its hardness is :
 (a) 1 (b) 12.16
 (c) 1 × 10⁻³ (d) 12.16 × 10⁻³



The respective compounds A and B are

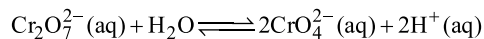
- (a)  and 
- (b)  and 
- (c)  and 
- (d)  and 



Compound (A), (B) and (C) will be respectively

- (a) $\text{PCl}_5, \text{POCl}_3, \text{H}_3\text{PO}_3$
 (b) $\text{PCl}_5, \text{POCl}_3, \text{H}_3\text{PO}_4$
 (c) $\text{SOCl}_2, \text{POCl}_3, \text{H}_3\text{PO}_3$
 (d) $\text{PCl}_3, \text{POCl}_3, \text{H}_3\text{PO}_4$
77. Camphor is often used in molecular mass determination because
 (a) it is readily available
 (b) it has a very high cryoscopic constant
 (c) it is volatile
 (d) it is solvent for organic substances

78. The dichromate ion is in equilibrium with chromate ion in aqueous solution as :



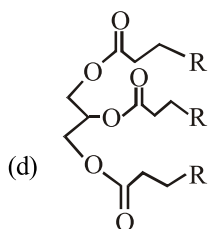
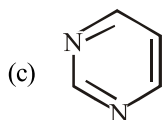
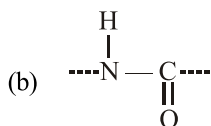
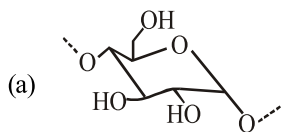
The oxoanion has

- (a) same oxidizing property in acidic and alkaline solutions.
 (b) better oxidizing property in acidic solution.
 (c) better oxidizing property in alkaline solution.
 (d) no oxidizing property in acidic or alkaline solution.
79. The correct sequence which shows decreasing order of the ionic radii of the elements is
 (a) $\text{Al}^{3+} > \text{Mg}^{2+} > \text{Na}^+ > \text{F}^- > \text{O}^{2-}$
 (b) $\text{Na}^+ > \text{Mg}^{2+} > \text{Al}^{3+} > \text{O}^{2-} > \text{F}^-$
 (c) $\text{Na}^+ > \text{F}^- > \text{Mg}^{2+} > \text{O}^{2-} > \text{Al}^{3+}$
 (d) $\text{O}^{2-} > \text{F}^- > \text{Na}^+ > \text{Mg}^{2+} > \text{Al}^{3+}$
80. Which of the following will give a pair of enantiomorphs?
 (a) $[\text{Cr}(\text{NH}_3)_6][\text{Co}(\text{CN})_6]$
 (b) $[\text{Co}(\text{en})_2\text{Cl}_2]\text{Cl}$
 (c) $[\text{Pt}(\text{NH}_3)_4][\text{PtCl}_6]$
 (d) $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{NO}_2$
81. In the following reaction

$$\text{C}_2\text{H}_5\text{OC}_2\text{H}_5 + 4[\text{H}] \xrightarrow{\text{Red P} + \text{HI}}$$

$$2\text{X} + \text{H}_2\text{O}, \text{X is}$$
 (a) ethane (b) ethylene
 (c) butane (d) propane
82. The solubility of a specific non-volatile salt is 4 g in 100 g of water at 25°C . If 2.0 g, 4.0 g and 6.0 g of the salt added to 100 g of water at 25°C , in system X, Y and Z. The vapour pressure would be in the order
 (a) $\text{X} < \text{Y} < \text{Z}$ (b) $\text{X} > \text{Y} > \text{Z}$
 (c) $\text{Z} > \text{X} = \text{Y}$ (d) $\text{X} > \text{Y} = \text{Z}$
83. The gas which is least adsorbed on charcoal (under identical conditions) is
 (a) HCl (b) O_2 (c) CO_2 (d) NH_3

84. Which one of the following chemical units is certainly to be found in an enzyme?



85. The reaction of Lucas reagent is fastest with:
- (a) $(\text{CH}_3)_2\text{CHOH}$ (b) $\text{CH}_3(\text{CH}_2)_2\text{OH}$
 (c) $\text{CH}_3\text{CH}_2\text{OH}$ (d) $(\text{CH}_3)_3\text{COH}$

86. Amalgams are
- (a) always in liquid state.
 (b) highly coloured alloys.
 (c) alloys which have a great resistance to abrasion.
 (d) alloys which contain Hg as one of the constituents.

87. Which of the following is most stable?
- (a) Ph_3C^+ (b) Ph_2CH^+
 (c) PhCH_2^+ (d) Tropylium cation

88. For which of the following changes, $\Delta H \neq \Delta U$
- (a) $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{NO}(\text{g})$
 (b) $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{HCl}(\text{g})$
 (c) $\text{C}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g})$
 (d) $\text{CaCO}_3(\text{s}) \rightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$

89. The drug is used as :

- (a) Antacid (b) Analgesic
 (c) Antimicrobial (d) Antiseptic

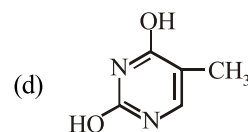
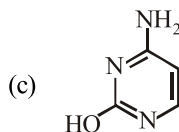
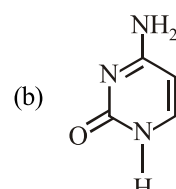
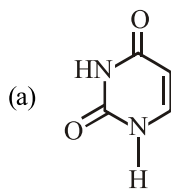
90. Mark the correct statement

- (a) Methylamine is slightly acidic.
 (b) Methylamine is less basic than ammonia.
 (c) Methylamine is a stronger base than ammonia.
 (d) Methylamine forms salts with alkalis.

91. Aryl halides can not be prepared by the reaction of aryl alcohols with PCl_3 , PCl_5 or SOCl_2 because

- (a) phenols are highly stable compounds.
 (b) carbon-oxygen bond in phenols has a partial double bond character.
 (c) carbon-oxygen bond is highly polar.
 (d) all of these.

92. Which of the following structures represents thymine ?



93. Which of the following expressions correctly represents the equivalent conductance at infinite dilution of $\text{Al}_2(\text{SO}_4)_3$. Given that $\Lambda_{\text{Al}^{3+}}^\circ$ and $\Lambda_{\text{SO}_4^{2-}}^\circ$ are the equivalent conductances at infinite dilution of the respective ions?

(a) $\frac{1}{3} \Lambda_{\text{Al}^{3+}}^\circ + \frac{1}{2} \Lambda_{\text{SO}_4^{2-}}^\circ$

(b) $2\Lambda_{\text{Al}^{3+}}^\circ + 3\Lambda_{\text{SO}_4^{2-}}^\circ$

(c) $\Lambda_{\text{Al}^{3+}}^\circ + \Lambda_{\text{SO}_4^{2-}}^\circ$

(d) $(\Lambda_{\text{Al}^{3+}}^\circ + \Lambda_{\text{SO}_4^{2-}}^\circ) \times 6$

94. 2-Bromopentane is heated with potassium ethoxide in ethanol. The major product obtained is

- (a) 2-ethoxypentane (b) pentene-1
 (c) *trans*-2-pentene (d) *cis*-pentene-2

95. In any period, the valency of an element with respect to oxygen
- increases one by one from IA to VIIA
 - decreases one by one from IA to VIIA
 - increases one by one from IA to IVA and then decreases from VA to VIIA one by one
 - decreases one by one from IA to IVA and then increases from VA to VIIA one by one
96. In face centred cubic lattice, a unit cell is shared equally by how many unit cells
- 2
 - 4
 - 6
 - 8
97. Which one of the following reactions of xenon compounds is not feasible?
- $3\text{XeF}_4 + 6\text{H}_2\text{O} \longrightarrow 2\text{Xe} + \text{XeO}_3 + 12\text{HF} + 1.5\text{O}_2$
 - $2\text{XeF}_2 + 2\text{H}_2\text{O} \longrightarrow 2\text{Xe} + 4\text{HF} + \text{O}_2$
 - $\text{XeF}_6 + \text{RbF} \longrightarrow \text{Rb}[\text{XeF}_7]$
 - $\text{XeO}_3 + 6\text{HF} \longrightarrow \text{XeF}_6 + 3\text{H}_2\text{O}$
98. Which of the following is an example of $\text{S}_{\text{N}}2$ reaction?
- $\text{CH}_3\text{Br} + \text{OH}^- \longrightarrow \text{CH}_3\text{OH} + \text{Br}^-$
 - $\text{CH}_3-\underset{\text{Br}}{\text{CH}}-\text{CH}_3 + \text{OH}^- \longrightarrow \text{CH}_3-\underset{\text{OH}}{\text{CH}}-\text{CH}_3$
 - $\text{CH}_3\text{CH}_2\text{OH} \xrightarrow{-\text{H}_2\text{O}} \text{CH}_2 = \text{CH}_2$
 - $(\text{CH}_3)_3\text{C}-\text{Br} + \text{OH}^- \longrightarrow (\text{CH}_3)_3\text{COH} + \text{Br}^-$
99. Isopropyl alcohol is obtained by reacting which of the following alkenes with concentrated H_2SO_4 followed by boiling with H_2O ?
- Ethylene
 - Propylene
 - 2-Methylpropene
 - Isoprene
100. Which of the following monomers form biodegradable polymers?
- 3-hydroxybutanoic acid + 3-hydroxypentanoic acid
 - Glycine + amino caproic acid
 - Ethylene glycol + phthalic acid
 - Both (a) and (b)

SECTION-B

MATHEMATICS

1. If $n(A) = 1000$, $n(B) = 500$ and if $n(A \cap B) \geq 1$ and $n(A \cup B) = p$, then
- $500 \leq p \leq 1000$
 - $1001 \leq p \leq 1498$
 - $1000 \leq p \leq 1498$
 - $1000 \leq p \leq 1499$
2. Let $f(x) = x$, $g(x) = \frac{1}{x}$ and $h(x) = f(x)g(x)$. Then, $h(x) = 1$ if and only if
- x is a real number
 - x is a rational number
 - x is an irrational number
 - x is a non-zero real number
3. The set of values of x for which $\frac{\tan 3x - \tan 2x}{1 + \tan 3x \tan 2x} = 1$ is :
- ϕ
 - 4
 - $\left\{ n\pi + \frac{\pi}{4} : n = 1, 2, 3, \dots \right\}$
 - $\left\{ 2n\pi + \frac{\pi}{4} : n = 1, 2, 3, \dots \right\}$
4. If a, b, c, d are distinct integers in A. P., such that $d^2 = a^2 + b^2 + c^2$, then $a + b + c + d$ is :
- 0
 - 1
 - 2
 - None of these
5. The lines $x + 2y - 5 = 0$, $2x - 3y + 4 = 0$, $6x + 4y - 13 = 0$
- are concurrent
 - form a right angled triangle
 - form an isosceles triangle
 - form an equilateral triangle
6. The area of an equilateral triangle inscribed in the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ is
- $\frac{3\sqrt{3}}{2}(g^2 + f^2 - c)$
 - $\frac{3\sqrt{3}}{4}(g^2 + f^2 - c)$
 - $\frac{3\sqrt{3}}{4}(g^2 + f^2 + c)$
 - None of these

7. If $z_1 = \sqrt{2} \left[\cos \frac{\pi}{4} + i \sin \frac{\pi}{4} \right]$ and $z_2 = \sqrt{3} \left[\cos \frac{\pi}{3} + i \sin \frac{\pi}{3} \right]$, then $|z_1 z_2|$ is equal to

\sqrt{m} . Value of m is
 (a) 6 (b) 3 (c) 2 (d) 5

8. Find the 7th term from the end in the expansion

$$\text{of } \left(x - \frac{2}{x^2} \right)^{10}.$$

(a) ${}^{10}C_4$ (b) ${}^{10}C_4 \cdot 2^4 x$
 (c) $2^4 \cdot x^2$ (d) ${}^{10}C_4 \cdot 2^4 \left(\frac{1}{x^2} \right)$

9. The roots of the equation $abc^2x^2 + 3a^2cx + b^2cx - 6a^2 - ab + 2b^2 = 0$ are
 (a) non-real
 (b) rational if a, b, c , are rational
 (c) irrational if a, b, c are rational
 (d) None of these

10. The limit of the series $\sum_{r=1}^n \frac{r}{1+r^2+r^4}$ as n approaches infinity, is

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

11. The mean and median of 100 items are 50 and 52 respectively. The value of largest item is 100. It was later found that it is 110 and not 100. The true mean and median are
 (a) 50.10, 51.5 (b) 50.10, 52
 (c) 50, 51.5 (d) None of these

12. The probability that in the random arrangement of the letters of the word 'UNIVERSITY', the two I's does not come together is

(a) $\frac{4}{5}$ (b) $1/5$ (c) $1/10$ (d) $9/10$

13. The determinant $\begin{vmatrix} a^2 + 2a & 2a + 1 & 1 \\ 2a + 1 & a + 2 & 1 \\ 3 & 3 & 1 \end{vmatrix}$ is

(a) > 0 if $a > 1$ (b) $= 0$ if $a = 1$
 (c) < 0 if $a < 1$ (d) all of these

14. If $f(x) = \sin x$, when x is rational }
 $= \cos x$, when x is irrational }

Then the function is

- (a) discontinuous at $x = n\pi + \pi/4$
 (b) continuous at $x = n\pi + \pi/4$
 (c) discontinuous at all x
 (d) None of these

15. If $A = \frac{1}{3} \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b \end{bmatrix}$ is an orthogonal matrix,

then

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

16. Find the angle between the tangent to the curve $y^2 = 2ax$ at the points where $x = a/2$.

- (a) 180° (b) 90°
 (c) 0° (d) None of these

17. If the area enclosed by $y^2 = 4ax$ is $\frac{1}{3}$ sq. unit,

then the roots of the equation $x^2 + 2x = a$, are

- (a) -4 and 2 (b) 2 and 4
 (c) -2 and -4 (d) 8 and -8

18. If $[\sin^{-1} \cos^{-1} \sin^{-1} \tan^{-1} x] = 1$, where $[\cdot]$ denotes the greatest integer function, then x belongs to the interval

- (a) $[\tan \sin \cos 1, \tan \sin \cos \sin 1]$
 (b) $(\tan \sin \cos 1, \tan \sin \cos \sin 1)$
 (c) $[-1, 1]$
 (d) $[\sin \cos \tan 1, \sin \cos \sin \tan 1]$

19. The solution to of the differential equation

$$(x+1) \frac{dy}{dx} - y = e^{3x} (x+1)^2 \text{ is}$$

- (a) $y = (x+1)e^{3x} + c$
 (b) $3y = (x+1) + e^{3x} + c$
 (c) $\frac{3y}{x+1} = e^{3x} + c$
 (d) $ye^{-3x} = 3(x+1) + c$

20. A father has 3 children with at least one boy. The probability that he has 2 boys and 1 girl is

- (a) $1/4$ (b) $1/3$
 (c) $2/3$ (d) None of these

21. If $\int \frac{dx}{x+x^7} = p(x)$ then, $\int \frac{x^6}{x+x^7} dx$ is equal to

- (a) $\ln |x| - p(x) + c$ (b) $\ln |x| + p(x) + c$
 (c) $x - p(x) + c$ (d) $x + p(x) + c$

22. The distance between the planes
 $x + 2y - 2z + 1 = 0$ and $2x + 4y - 4z + 5 = 0$ is
- (a) 2 units (b) $\frac{1}{4}$ units
(c) $\frac{1}{2}$ units (d) 4 units
23. If $\vec{a} = 2\hat{i} - 2\hat{j} + \hat{k}$ and $\vec{c} = -\hat{i} + 2\hat{k}$
then $|\vec{c} \cdot \vec{a}|$ is equal to:
- (a) $2\sqrt{5}\hat{i} + 2\sqrt{5}\hat{j} + \sqrt{5}\hat{k}$
(b) $2\sqrt{5}\hat{i} - 2\sqrt{5}\hat{j} + \sqrt{5}\hat{k}$
(c) $\sqrt{5}\hat{i} + \sqrt{5}\hat{j} + \sqrt{5}\hat{k}$
(d) $\sqrt{5}\hat{i} + 2\sqrt{5}\hat{j} + \sqrt{5}\hat{k}$
24. If $f(x) = 2\sin^{-1}\sqrt{1-x} + \sin^{-1}(2\sqrt{x(1-x)})$,
where $x \in \left(0, \frac{1}{2}\right)$, then $f'(x)$ is
- (a) $\frac{2}{\sqrt{x(1-x)}}$ (b) zero
(c) $-\frac{2}{\sqrt{x(1-x)}}$ (d) π
25. If R be a relation $<$ from $A = \{1, 2, 3, 4\}$ to
 $B = \{1, 3, 5\}$ i.e.,
- (a, b) $\in R \Leftrightarrow a < b$, then $R \circ R^{-1}$ is
- (a) $\{(1, 3), (1, 5), (2, 3), (2, 5), (3, 5), (4, 5)\}$
(b) $\{(3, 1), (5, 1), (3, 2), (5, 2), (5, 3), (5, 4)\}$
(c) $\{(3, 3), (3, 5), (5, 3), (5, 5)\}$
(d) $\{(3, 3), (3, 4), (4, 5)\}$
26. If $S(p, q, r) = (\sim p) \vee [\sim(q \wedge r)]$ is a compound
statement, then $S(\sim p, \sim q, \sim r)$ is
- (a) $\sim S(p, q, r)$ (b) $S(p, q, r)$
(c) $p \vee (q \wedge r)$ (d) $p \vee (q \vee r)$
27. The co-ordinates of the points A and B are
 $(2, 3, 4)$ and $(-2, 5, -4)$ respectively. If a point
 P moves so that $PA^2 - PB^2 = k$ where k is a
constant, then the locus of P is
- (a) $-8x + 4y - 16z + 16 = k$
(b) $-8x - 4y - 16z - 16 = k$
(c) $-8x + 4y - 16z - 16 = k$
(d) None of these
28. Let A be a set of n (≥ 3) distinct elements. The
number of triplets (x, y, z) of the elements of A in
which at least two coordinates are equal is
- (a) ${}^n P_3$ (b) $n^3 - {}^n P_3$
(c) $3n^2$ (d) $3n^2(n-1)$
29. The horizontal distance between two towers is
60 metres and the angular depression of the top
of the first tower as seen from the top of the
second, is 30° . If the height of the second tower
be 150 metres, then the height of the first tower is
- (a) $150 - 60\sqrt{3}$ m (b) 90 m
(c) $150 - 20\sqrt{3}$ m (d) None of these
30. Let the perpendiculars from any point on the
line $7x + 56y = 0$ upon $3x + 4y = 0$ and $5x - 12y = 0$
be p and p' , then
- (a) $2p = p'$ (b) $p = 2p'$
(c) $p = p'$ (d) None of these
31. The length of the latus rectum of the parabola
which has focus at $(-1, 1)$ and the directrix is
 $4x + 3y - 24 = 0$ is
- (a) 4 (b) 6 (c) 8 (d) 10
32. If $z = \frac{7-i}{3-4i}$ then $z^{14} =$
- (a) 2^7 (b) $2^7 i$ (c) $2^{14} i$ (d) $-2^7 i$
33. Number of integral values of x satisfying the
inequality $\left(\frac{3}{4}\right)^{6x+10-x^2} < \frac{27}{64}$ is
- (a) 5 (b) 6 (c) 7 (d) 8
34. In a ΔABC , $\frac{\sin A}{\sin C} = \frac{\sin(A-B)}{\sin(B-C)}$, then a^2, b^2, c^2
are such that
- (a) they are in G.P. (b) they are in H.P.
(c) they are in A.P. (d) $b^2 = a^2 + c^2$
35. Three numbers are in G.P. such that their sum is
38 and their product is 1728. The greatest number
among them is:
- (a) 18 (b) 16
(c) 14 (d) None of these
36. Find the number of integral solution of the
equation $x + y + z = 20$ and $x > -1, y > -2$ and $z > -3$.
- (a) ${}^{25}C_{23}$ (b) ${}^{17}C_2$
(c) ${}^{23}C_2$ (d) None of these
37. The coefficient of x^{100} in the expansion of
 $\sum_{j=0}^{200} (1+x)^j$ is:
- (a) $\binom{200}{100}$ (b) $\binom{201}{102}$
(c) $\binom{200}{101}$ (d) $\binom{201}{100}$

38. Derivative of $\left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)^2$ is
- (a) $\frac{1}{x^2}$ (b) $1 - \frac{1}{x^2}$
(c) 1 (d) $1 + \frac{1}{x^2}$
39. If $f: \mathbb{R} \rightarrow \mathbb{R}$, $g: \mathbb{R} \rightarrow \mathbb{R}$ and $h: \mathbb{R} \rightarrow \mathbb{R}$ are such that $f(x) = x^2$, $g(x) = \tan x$ and $h(x) = \log x$, then the value of $[h \circ (g \circ f)]$, if $x = \frac{\sqrt{\pi}}{2}$ will be :
- (a) 0 (b) 1 (c) -1 (d) 10
40. If matrix $A = \begin{bmatrix} 3 & -2 & 4 \\ 1 & 2 & -1 \\ 0 & 1 & 1 \end{bmatrix}$ and $A^{-1} = \frac{1}{k} \text{adj}(A)$, then k is
- (a) 7 (b) -7 (c) 15 (d) -11
41. Let $f(x)$ be a function defined as follows :
 $f(x) = \sin(x^2 - 3x)$, $x \leq 0$; and $6x + 5x^2$, $x > 0$
Then at $x = 0$, $f(x)$
- (a) has a local maximum
(b) has a local minimum
(c) is discontinuous
(d) None of these
42. $\int_{-\frac{3\pi}{2}}^{\frac{\pi}{2}} [(x+\pi)^3 + \cos^2(x+3\pi)] dx$ is equal to
- (a) $\frac{\pi^4}{32}$ (b) $\frac{\pi^4}{32} + \frac{\pi}{2}$
(c) $\frac{\pi}{2}$ (d) $\frac{\pi}{4} - 1$
43. For non zero, non collinear vectors \vec{p} and \vec{q} , the value of $[\hat{i} \vec{p} \vec{q}] + [\hat{j} \vec{p} \vec{q}] + [\hat{k} \vec{p} \vec{q}]$ is
- (a) $\vec{0}$ (b) $2(\vec{p} \times \vec{q})$
(c) $(\vec{q} \times \vec{p})$ (d) $(\vec{p} \times \vec{q})$
44. The area bounded by the x-axis, the curve $y = f(x)$ and the lines $x = 1$, $x = b$, is equal to $\sqrt{b^2 + 1} - \sqrt{2}$ for all $b > 1$, then $f(x)$ is
- (a) $\sqrt{x-1}$ (b) $\sqrt{x+1}$
(c) $\sqrt{x^2+1}$ (d) $\frac{x}{\sqrt{1+x^2}}$
45. The maximum value of $P = x + 3y$ such that $2x + y \leq 20$, $x + 2y \leq 20$, $x \geq 0$, $y \geq 0$ is
- (a) 10 (b) 60
(c) 30 (d) None of these
46. If $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ then A^{100} :
- (a) $2^{100}A$ (b) $2^{99}A$
(c) $2^{101}A$ (d) None of the above
47. Let f be the function defined by
- $$f(x) = \begin{cases} \frac{x^2 - 1}{x^2 - 2|x - 1| - 1}, & x \neq 1 \\ 1/2, & x = 1 \end{cases}$$
- (a) The function is continuous for all values of x
(b) The function is continuous only for $x > 1$
(c) The function is continuous at $x = 1$
(d) The function is not continuous at $x = 1$
48. The value of $\int e^{\tan^{-1}x} \frac{(1+x+x^2)}{1+x^2} dx$ is
- (a) $x e^{\tan^{-1}x} + C$ (b) $\tan^{-1}x + C$
(c) $e^{\tan^{-1}x} + 2x + C$ (d) None of these
49. The angle between two lines $\frac{x+1}{2} = \frac{y+3}{2} = \frac{z-4}{-1}$ and $\frac{x-4}{1} = \frac{y+4}{2} = \frac{z+1}{2}$ is:
- (a) $\cos^{-1}\left(\frac{1}{9}\right)$ (b) $\cos^{-1}\left(\frac{4}{9}\right)$
(c) $\cos^{-1}\left(\frac{2}{9}\right)$ (d) $\cos^{-1}\left(\frac{3}{9}\right)$
50. A fair die is thrown twenty times. The probability that on the tenth throw the fourth six appears is
- (a) $\frac{{}^{20}C_{10} \times 5^6}{6^{20}}$ (b) $\frac{120 \times 5^7}{6^{10}}$
(c) $\frac{84 \times 5^6}{6^{10}}$ (d) None of these