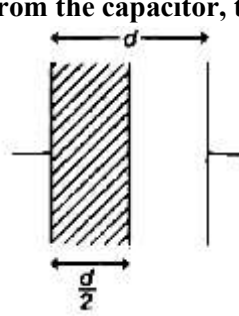
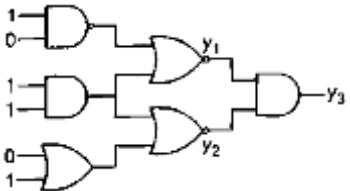


Physics

- For any fixed distance, the electromagnetic force between two protons is 10^n times of the gravitational force between them. Then, $n =$
 (a) 26 (b) 13
 (c) 39 (d) 36
- If A, B and C are three different physical quantities with different dimensional formulae, then the combination which can never give a proper physical quantity is
 (a) $\frac{A}{BC}$ (b) $\frac{AB-C^2}{BC}$
 (c) $\frac{A-C}{B}$ (d) $AC - B$
- The driver of a bus moving with a velocity of 72 km/h observes a boy walking across the road at a distance of 50 m in front of the bus and decelerates the bus at 5 ms^{-2} by applying brakes and is just able to avoid an accident. The reaction time of the driver is
 (a) 4 s (b) 3.5 s
 (c) 0.5 s (d) 4.5 s
- A helicopter flying horizontally with a velocity of 288 km/h drops a bomb. If the line joining the point of dropping the bomb and the point where bomb hits the ground makes an angle 45° with the horizontal, then the height at which the bomb was dropped is (Acceleration due to gravity = 10 ms^{-2})
 (a) 1320 m (b) 1280 m
 (c) 320 m (d) 640 m
- A man of mass 60 kg is standing in a lift moving up with a retardation of 2.8 ms^{-2} . The apparent weight of the man is
 (a) 756 N (b) 168 N
 (c) 588 N (d) 420 N
- The initial and final velocities of a body projected vertically from the ground are 20 ms^{-1} and 18 ms^{-1} respectively. The maximum height reached by the body is (Acceleration due to gravity = 10 ms^{-2})
 (a) 20 m (b) 16.2 m
 (c) 19 m (d) 18.1 m
- A particle is acted upon by a force of constant magnitude such that its velocity and acceleration are always perpendicular to each other, then its
 (a) linear momentum is constant
 (b) kinetic energy is constant
 (c) velocity is constant
 (d) acceleration is constant
- If the moment of inertia of a uniform solid cylinder about the axis of the cylinder is $\frac{1}{n}$ times its moment of inertia about an axis passing through its midpoint and perpendicular to its length, then the ratio of the length and radius of the cylinder is
 (a) $\sqrt{2(3n+1)}$ (b) $\sqrt{2(3n-1)}$
 (c) $\sqrt{3(2n+1)}$ (d) $\sqrt{3(2n-1)}$
- Two blocks of masses in the ratio $m:n$ are connected by a light inextensible string passing over a frictionless fixed pulley. If the system of the blocks is released from rest, then the acceleration of the centre of mass of the system of the blocks is
 (g = acceleration due to gravity)
 (a) $\left(\frac{m+n}{m-n}\right)^2 g$ (b) $\left(\frac{m-n}{m+n}\right)^2 g$
 (c) $\left(\frac{m+n}{m-n}\right) g$ (d) $\left(\frac{m-n}{m+n}\right) g$
- The amplitude of a particle executing simple harmonic motion is 6 cm. The distance of the point from the mean position at which the ratio of the potential and kinetic energies of the particle becomes 4: 5 is
 (a) 6 cm (b) 4 cm
 (c) 3 cm (d) 2 cm

11. If a body is projected vertically from the surface of the Earth with a speed of 8000 ms^{-1} , then the maximum height reached by the body is (Radius of the Earth = 6400 km and acceleration due to gravity = 10 ms^{-2})
 - (a) 1600 km
 - (b) 9600 km
 - (c) 6400 km
 - (d) 3200 km
12. If a brass sphere of radius 36 cm is submerged in a lake at a depth where the pressure is 10^7 Pa , then the change in the radius of the sphere is (Bulk modulus of brass = 60 GPa)
 - (a) $4 \times 10^{-2} \text{ cm}$
 - (b) $2 \times 10^{-3} \text{ cm}$
 - (c) $4 \times 10^{-3} \text{ cm}$
 - (d) $2 \times 10^{-2} \text{ cm}$
13. The work done in blowing a soap bubble of diameter 3 cm is (surface tension of soap solution = 0.035 Nm^{-1})
 - (a) $792 \mu \text{ J}$
 - (b) $99 \mu \text{ J}$
 - (c) $396 \mu \text{ J}$
 - (d) $198 \mu \text{ J}$
14. If the terminal velocity of a metal sphere of mass 8 g falling through a liquid is 3 cms^{-1} , then the terminal velocity of another sphere of mass 64 g made of the same metal falling through same liquid is
 - (a) 6 cms^{-1}
 - (b) 3 cms^{-1}
 - (c) 12 cms^{-1}
 - (d) 18 cms^{-1}
15. The length of a metal rod is 20 cm and its area of cross-section is 4 cm^2 . If one end of the rod is kept at a temperature of 100°C and the other end is kept in ice at 0°C , then the mass of the ice melted in 7 minutes is (Thermal conductivity of the metal = $90 \text{ Wm}^{-1} \text{ K}^{-1}$ and latent heat of fusion of ice = $336 \times 10^3 \text{ Jkg}^{-1}$)
 - (a) 90 g
 - (b) 67.5 g
 - (c) 22.5 g
 - (d) 45 g
16. The heat required to convert 8 g of ice at a temperature of -20°C to steam at 100°C is [specific heat capacity of ice = $2100 \text{ Jkg}^{-1} \text{ K}^{-1}$, specific heat capacity of water = $4200 \text{ J kg}^{-1} \text{ K}^{-1}$, latent heat of fusion of ice = $336 \times 10^3 \text{ J kg}^{-1}$ and latent heat of steam = $2.268 \times 10^6 \text{ Jkg}^{-1}$]
 - (a) 5400 cal
 - (b) 5840 cal
 - (c) 5760 cal
 - (d) 5120 cal
17. Two moles of a gas at a temperature of 327°C expands adiabatically such that its volume increases by 700%. If the ratio of the specific heat capacities of the gas is $\frac{4}{3}$, then the work done by the gas is (Universal gas constant = $8.3 \text{ J mol}^{-1} \text{ K}^{-1}$)
 - (a) 14.94 kJ
 - (b) 29.88 kJ
 - (c) 44.82 kJ
 - (d) 59.76 kJ
18. The molar specific heat of a monoatomic gas at constant pressure is (Universal gas constant = $8.3 \text{ J mol}^{-1} \text{ K}^{-1}$)
 - (a) $24.9 \text{ J mol}^{-1} \text{ K}^{-1}$
 - (b) $20.75 \text{ J mol}^{-1} \text{ K}^{-1}$
 - (c) $41.5 \text{ J mol}^{-1} \text{ K}^{-1}$
 - (d) $16.6 \text{ J mol}^{-1} \text{ K}^{-1}$
19. The fundamental frequency of transverse wave of a stretched string subjected to a tension T_1 is 300 Hz. If the length of the string is doubled and subjected to a tension of T_2 , the fundamental frequency of the transverse wave in the string becomes 100 Hz, then $T_2 : T_1 =$ (Linear density of the string is constant)
 - (a) 1:2
 - (b) 3:4
 - (c) 2:3
 - (d) 4:9
20. Two sound waves each of intensity I are superimposed. If the phase difference between the waves is $\frac{\pi}{2}$, then the intensity of the resultant wave is
 - (a) $2I$
 - (b) $3I$
 - (c) $4I$
 - (d) I
21. The angle of a prism made of a material of refractive index $\sqrt{2}$ is 90° . The angle of incidence for a light ray on the first face of the prism such that the light ray suffers total internal reflection at the second face is

- (a) 0° (b) 90°
 (c) 60° (d) 45°
22. The total magnification produced by a compound microscope is 24 when the final image is formed at the least distance of distinct vision. If the focal length of the eyepiece is 5 cm, the magnification produced by the objective is
 (a) 4 (b) 4.8
 (c) 120 (d) 6
23. In Young's double slit experiment with light of wavelength λ , the intensity of light at a point on the screen where the path difference becomes $\frac{\lambda}{3}$ is (I is intensity of the central bright fringe)
 (a) I (b) $\frac{1}{2}I$
 (c) $\frac{1}{3}I$ (d) $\frac{1}{4}I$
24. A thin spherical shell of radius R and surface charge density σ is placed in a cube of side $5R$ with their centers coinciding. The electric flux through one face of the cube is (ϵ_0 = Permittivity of free space)
 (a) $\frac{2\pi R^2 \sigma}{3\epsilon_0}$ (b) $\frac{\pi R^2 \sigma}{3\epsilon_0}$
 (c) $\frac{\sigma}{6\epsilon_0}$ (d) $\frac{\sigma}{4\pi\epsilon_0 R^2}$
25. As shown in the figure, a dielectric of constant K is placed between the plates of a parallel plate capacitor and is charged to a potential V using a battery. If the dielectric is pulled out after disconnecting the battery from the capacitor, the final potential difference across the plates of the capacitor is
- 
- (a) $\left(1 + \frac{1}{K}\right) 2V$ (b) $2KV$
 (c) $\frac{2V}{\left(1 + \frac{1}{K}\right)}$ (d) $\frac{V}{2} \left(1 + \frac{1}{K}\right)$
26. The drift speed of electrons in a material is found to be 0.3 ms^{-1} when an electric field of 2 Vm^{-1} is applied across it. The electron mobility (in $\text{m}^2 \text{ V}^{-1} \text{ s}^{-1}$) in the material is
 (a) 60×10^{-2} (b) 15×10^{-2}
 (c) 1350×10^6 (d) 5400×10^6
27. The power of an electric motor is 242 W when connected to a 220 V supply. When the motor is operated at 200 V, the current drawn by it is
 (a) 1.21 A (b) 1.1 A
 (c) 1.5 A (d) 1 A
28. A proton and an alpha particle moving with equal speeds enter normally into a uniform magnetic field. The ratio of times taken by the proton and the alpha particle to make one complete revolution in the magnetic field is
 (a) $1:\sqrt{2}$ (b) 1: 2
 (c) $\sqrt{2}: 1$ (d) 2:1
29. A solenoid of length 50 cm and radius 10 cm has two closely wound layers of windings 100 turns each. If a current of 2.5 A is passing through the windings, the magnetic field (in 10^{-4} T) at a point 5 cm from the axis is
 (a) 2π (b) 31.4
 (c) 4π (d) zero
30. If the magnetic susceptibility of a substance is 0.6, then the ratio of permeability of the substance and permeability of free space is

- (a)6:5 (b)7:4
(c)8:5 (d)3:5
31. The plane of a circular coil of resistance 7.5Ω is placed perpendicular to a uniform magnetic field. The flux ϕ (in weber) through the coil varies with time t (in second) as $\phi = 2t^2 + 3t - 2$. The induced power in the coil at time $t = 3$ s is
(a)7.5 W (b)15 W
(c)30 W (d)20 W
32. The frequency of an alternating voltage is 50 Hz. The time taken for instantaneous voltage to increase from zero to half of its peak voltage is
(a) $\frac{1}{800}$ s (b) $\frac{1}{600}$ s
(c) $\frac{1}{300}$ s (d) $\frac{1}{200}$ s
33. The dielectric constant of a medium is 8 and its relative permeability is 200. If an electromagnetic wave of frequency 100 MHz travels in this medium, then its wavelength is
(a)15 m (b)15 cm
(c)7.5 m (d)7.5 cm
34. Photons of energy 4.5 eV are incident on a photosensitive material of work function 3 eV. The de-Broglie wavelength associated with the photoelectrons emitted with maximum kinetic energy is nearly
(a)10Å (b)5Å
(c)20Å (d)15Å
35. If the difference in the frequencies of the first and second lines of Lyman series of hydrogen atom is f , then the difference in frequencies of the first and second lines of Balmer series of hydrogen atom is
(a) $\frac{3f}{4}$ (b) f
(c) $\frac{7f}{20}$ (d) $\frac{9f}{16}$
36. The average energy of a neutron produced in the fission of ${}^{235}_{92}\text{U}$ is
(a) 160×10^{-13} J (b) 320×10^{-15} J
(c) 320×10^{-13} J (d) 160×10^{-15} J
37. If 96.875% of a radioactive substance decays in 10 days, then the half life of the substance is (in days)
(a)10 (b)5
(c)4 (d)2
38. The power gain and voltage gain of a transistor connected in common emitter configuration are 1800 and 60 respectively. If the change in the emitter current is 0.62 mA, then the change in the collector current is
(a)0.60 mA (b)0.58 mA
(c)0.52 mA (d)0.48 mA
39. Six logic gates are connected as shown in the figure. The values of y_1, y_2 and y_3 respectively are

(a)(0,1,0) (b)(1,0,0)
(c)(0,0,1) (d)(0,0,0)
40. For commercial telephonic communication, the frequency range adequate for speech signals is
(a)20 Hz – 20kHz
(b)300 Hz – 3100 Hz
(c)200MHz – 600MHz
(d)300kHz – 8000kHz

Chemistry

41. The radius of stationary state ($n = 2$) of hydrogen atom is x pm. The radius of stationary state ($n = 3$) of He^+ ion (in pm) is

- (a) $9/8x$ (b) $9x/8$
 (c) $16x/9$ (d) $9/16x$
42. When electromagnetic radiation of wavelength 310 nm falls on the surface of a metal having work function 3.55 eV, the velocity of photoelectrons emitted is $x \times 10^5 \text{ ms}^{-1}$. The value of x is (Nearest integer)
 ($m_e = 9 \times 10^{-31} \text{ kg}$)
 (a) 2 (b) 4
 (c) 5 (d) 6
43. In which of the following options, elements are correctly arranged in the increasing order of their atomic radius?
 (a) $\text{Si} < \text{P} < \text{Na} < \text{N} < \text{F}$
 (b) $\text{Na} < \text{Si} < \text{P} < \text{N} < \text{F}$
 (c) $\text{F} < \text{N} < \text{P} < \text{Si} < \text{Na}$
 (d) $\text{N} < \text{F} < \text{Si} < \text{P} < \text{Na}$
44. A, B, C, D and E are elements with atomic numbers 13, 11, 9, 7 and 16 respectively. Among these elements, ion of an element X has largest size and ion of an element Y has smallest size. X and Y are respectively. (Assume that all ions have nearest inert gas configuration)
 (a) D, A (b) A, D
 (c) E, A (d) D, A
45. Identify the pair of molecules in which the hybridisation of the central atom is sp^2 with bent geometry.
 (a) H_2O , SO_2 (b) SO_2 , O_3
 (c) H_2O , O_3 (d) N_2O , H_2O
46. Consider the following statements
 (I) In the conversion of O_2 to O_2^{2+} bond order decreases.
 (II) In the conversion of O_2 to O_2^{2+} magnetic property is not changed.
 (III) In the conversion of O_2 to O_2^{2+} bond length decreases.
 (IV) O_2^{2-} and B_2 have same bond order.
 Identify the correct statements
 (a) (I) and (III) only (b) (III) and (IV) only
 (c) (II) and (III) only (d) (I) and (IV) only
47. The RMS velocity of dihydrogen is $\sqrt{7}$ times more than that of dinitrogen. If T_{H_2} and T_{N_2} are the temperatures of dihydrogen and dinitrogen, then the correct relationship between them is
 (a) $T_{\text{H}_2} = T_{\text{N}_2}$ (b) $T_{\text{H}_2} > T_{\text{N}_2}$
 (c) $T_{\text{H}_2} = \sqrt{7}T_{\text{N}_2}$ (d) $T_{\text{H}_2} = \frac{T_{\text{N}_2}}{2}$
48. Which of the following solution has highest amount of solute?
 (a) 1.0 L of 0.25M Na_2CO_3 (106u)
 (b) 0.25 L of 0.2M Na_2SO_4 (142u)
 (c) 0.5 L of 1.0M KMnO_4 (158u)
 (d) 0.75 L of 0.5M $(\text{NH}_2)_2\text{CO}$ (60u)
49. At 298 K, the enthalpy change (in kJ) for the reaction given below is
 $\text{CH}_4(g) + \text{O}_2(g) \rightarrow \text{C}(s) + 2\text{H}_2\text{O}(l)$
 Given: $\text{H}_2(g) + \frac{1}{2}\text{O}_2(g) \rightarrow \text{H}_2\text{O}(l); \Delta H^\ominus = -286 \text{ kJ}$
 $\text{C}(s) + \text{O}_2(g) \rightarrow \text{CO}_2(g); \Delta H^\ominus = -394 \text{ kJ}$
 $\text{CH}_4(g) + 2\text{O}_2(g) \rightarrow \text{CO}_2(g) + 2\text{H}_2\text{O}(l); \Delta H^\ominus = -890 \text{ kJ}$
 (a) +496 (b) -496
 (c) -1284 (d) +680
50. For the reaction $\text{N}_2\text{O}_4(g) \rightleftharpoons 2\text{NO}_2(g)$, the correct relation between degree of dissociation (α) of $\text{N}_2\text{O}_4(g)$ and equilibrium constant, K_p is (p = total pressure of mixture)
 (a) $\alpha = \frac{K_p/p}{4 + \frac{K_p}{p}}$ (b) $\alpha = \frac{K_p}{4 + K_p}$

$$(c) \alpha = \left(\frac{K_p/p}{4 + \frac{K_p}{p}} \right)^{\frac{1}{2}} \quad (d) 0\alpha = \left(\frac{K_p}{4 + K_p} \right)^{\frac{1}{2}}$$

51. Oxidation state of hydrogen in compound X is -1 and in compound Y is +1. X and Y are respectively

- (a) LiAlH_4 , H_2O (b) NH_3 , NaH
(c) CH_4 , H_2O (d) H_2S , NaBH_4

52. Match the following

List-I (Chemical)		List-II (Use)	
(A)	KOH	(I)	Coolant
(B)	Na(l)	(II)	Antacid
(C)	Li	(III)	Electrochemical cells
(D)	Mg(OH)_2	(IV)	Absorbent for CO_2

The correct answer is

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

53. When burnt in excess of oxygen, sodium forms a compound X and potassium forms a compound Y. The magnetic natures of X and Y respectively are

- (a) Both X and Y are paramagnetic in nature
(b) X is diamagnetic and Y is paramagnetic in nature
(c) X is paramagnetic and Y is diamagnetic in nature
(d) Both X and Y are diamagnetic in nature

54. The correct order of atomic radii of group 13 elements is

- (a) $\text{Al} > \text{Ti} > \text{Ga} > \text{In}$ (b) $\text{Al} > \text{Ga} > \text{In} > \text{Ti}$
(c) $\text{Ti} > \text{In} > \text{Ga} > \text{Al}$ (d) $\text{Ti} > \text{In} > \text{Al} > \text{Ga}$

55. Observe the following oxides. The number of amphoteric oxides from the given list is

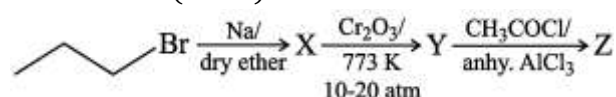
CO , B_2O_3 , SnO_2 , PbO_2 , Ga_2O_3 , SnO , PbO , CO_2

- (a) 3 (b) 4
(c) 5 (d) 6

56. Among the following compounds, which one is not primarily responsible for depletion of ozone layer in stratosphere?

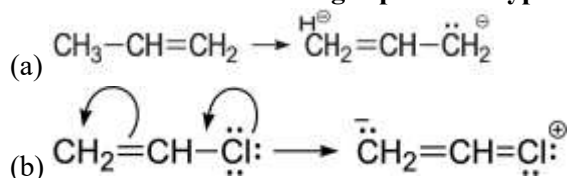
- (a) NO (b) CF_2Cl_2
(c) CH_4 (d) Cl_2

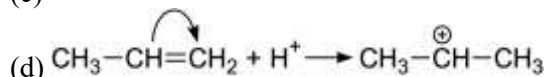
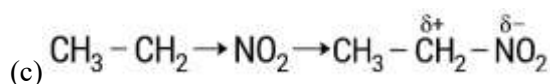
57. Consider the following sequence of reaction. In 'Z' the number of sp^3 carbons is 'a' and sp^2 carbons is 'b'. Value of (a + b) is



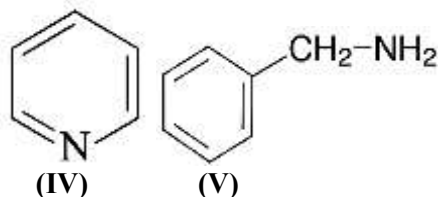
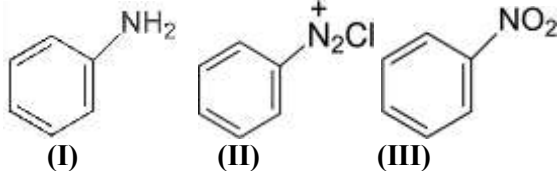
- (a) 8 (b) 7
(c) 6 (d) 9

58. Which one of the following represents hyperconjugation effect?





59. Which of the following compounds will be suitable for estimation of nitrogen by Kjeldahl's method?



- (a) and (V) only (b) (I), (II), (III) only
(c) (II) and (V) only (d) (III) and (IV) only

60. For the alkyne with formula C_6H_{10} , the number of alkynes with acidic hydrogens is x and number of alkynes with no acidic hydrogens is y . x and y are respectively

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

61. A substance has a density of 2 g cm^{-3} . It crystallises in the fcc crystal with an edge length of 600 pm. The molar mass of the substance (in g mol^{-1}) is ($N_A = 6 \times 10^{23} \text{ mol}^{-1}$)

- (a) 54.8 (b) 64.8
(c) 74.8 (d) 84.7

62. Observe the following statements

Statement (I) : The boiling point of 0.1 M urea solution is less than that of 0.1 M KCl solution.

Statement (II) : Elevation of boiling point is inversely proportional to molar mass of solute.

The correct answer is

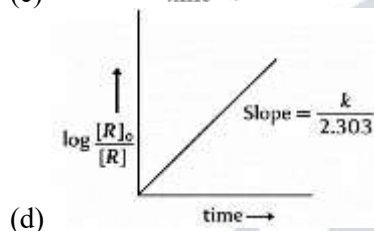
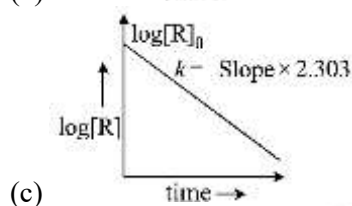
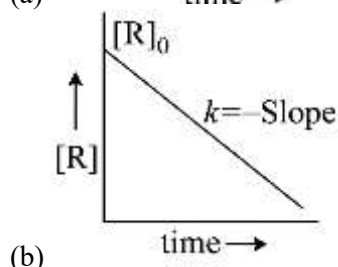
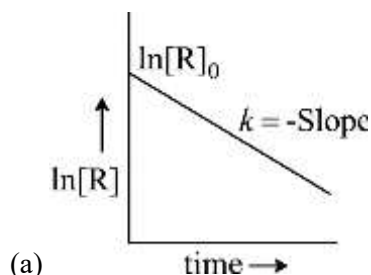
- (a) Both Statements (I) and (II) are correct.
(b) Statement (I) is correct, but Statement (II) is not correct.
(c) Statement (I) is not correct, but Statement (II) is correct.
(d) Both Statement (I) and (II) are not correct.

63. At 298 K, if emf of the cell corresponding to the reaction $\text{Zn}(s) + 2\text{H}^+(aq) \rightarrow \text{Zn}^{2+}(0.01\text{M}) + \text{H}_2(g)(1 \text{ atm})$ is 0.28 V, then the pH of the solution at the hydrogen electrode is $\left(\frac{2.303RT}{F} = \right.$

0.06 V), ($E^\circ_{\text{Zn}^{2+}/\text{Zn}} = -0.76 \text{ V}$)

- (a) 8 (b) 7
(c) 9 (d) 10

64. For the reaction $R \rightarrow P$, half life is independent of initial concentration of the reactant, R . Which one of the following graphs is not correct for the reaction?



65. Which of the following is not correct about Freundlich adsorption isotherm?

- (a) $\frac{x}{m} = k_p^{1/n}$ ($n > 1$)
- (b) Extent of adsorption of gas is more at high temperature than at low temperature
- (c) $\frac{1}{n}$ represents the slope of the isotherm
- (d) $\log \frac{x}{m} = \log k + \frac{1}{n} \log p$ holds good over a limited range of pressures

66. Identify the reaction, which is not related to extraction of copper

- (a) $2\text{Cu}_2\text{S} + 3\text{O}_2 \rightarrow 2\text{Cu}_2\text{O} + 2\text{SO}_2$
- (b) $2\text{FeS} + 3\text{O}_2 \rightarrow 2\text{FeO} + 2\text{SO}_2$
- (c) $\text{FeO} + \text{SiO}_2 \rightarrow \text{FeSiO}_3$
- (d) $\text{SiO}_2 + \text{CaO} \rightarrow \text{CaSiO}_3$

67. Phosphorus on reaction with sulphuryl chloride gives a compound X, which on complete hydrolysis gives Y. X and Y are respectively.

- (a) $\text{PCl}_3, \text{H}_3\text{PO}_3$
- (b) $\text{PCl}_5, \text{POCl}_3$
- (c) $\text{PCl}_5, \text{H}_3\text{PO}_4$
- (d) $\text{PCl}_3, \text{H}_3\text{PO}_2$

68. Xenon hexafluoride on partial hydrolysis gives 'X' and HF. The shape of 'X' is

- (a) pyramidal
- (b) tetrahedral
- (c) square pyramidal
- (d) linear

69. Which of the following pairs of oxoacids have basicity as 2?

- (a) $\text{H}_3\text{PO}_3, \text{H}_2\text{SO}_4$
- (b) $\text{H}_3\text{PO}_2, \text{H}_2\text{SO}_3$
- (c) $\text{H}_3\text{PO}_4, \text{H}_3\text{PO}_2$
- (d) $\text{H}_2\text{S}_2\text{O}_8, \text{H}_3\text{PO}_2$

70. In acidic medium one mole each of MnO_4^- and $\text{Cr}_2\text{O}_7^{2-}$ is reduce by x and y moles of ferrous ions. The sum of x and y is

- (a)14 (b)12
(c)10 (d)11

71. Which one of the following is not an ambidentate ligand?

- (a)CN (b)SCN⁻
(c)SO₄²⁻ (d)NO₂⁻

72. 'X' is a polymer, which is mainly used for making unbreakable cups and laminated sheets. The monomers of 'X' are

- (a)urea and formaldehyde
(b)ethylene glycol and phthalic acid
(c)phenol and formaldehyde
(d)1,3-butadiene and styrene

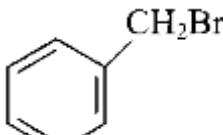
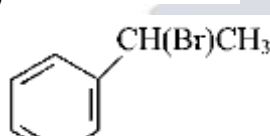
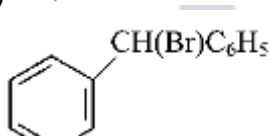
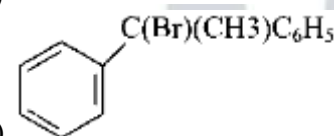
73. Which of the following hormones is an example of polypeptide?

- (a)Epinephrine (b)Insulin
(c)Estrogen (d)Androgen

74. The structure of which artificial sweetener contains aspartic acid and phenylalanine parts?

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

75. Which of the following is the most reactive towards S_N1 mechanism?

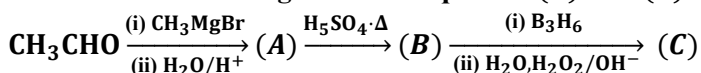
- (a) 
(b) 
(c) 
(d) 

76. $(\text{CH}_3)_3\text{CH} \xrightarrow{\text{KMnO}_4} \text{X} \xrightarrow[573\text{ K}]{\text{Cu}} \text{Y}$

The number of sp³ and sp² carbons in Y are respectively

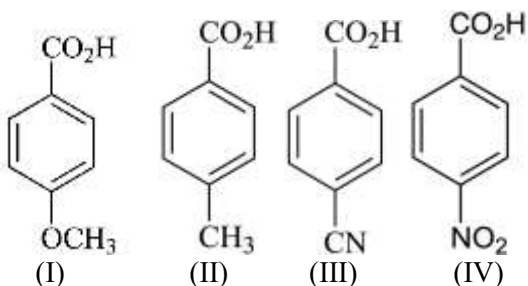
- (a)3,1 (b)2,2
(c)1,3 (d)4,0

77. Consider the following reaction sequence. (A) and (C) are



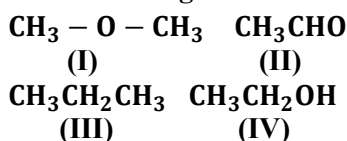
- (a)functional isomers
(b)metamers
(c)optical isomers
(d)position isomers

78. The increasing order of acidic strength of the following in aqueous solution is



- (a) (IV) < (II) < (III) < (I)
 (b) (I) < (III) < (II) < (IV)
 (c) (I) < (II) < (III) < (IV)
 (d) (III) < (I) < (II) < (IV)

79. The increasing order of boiling points of the following is



- (a) (I) < (III) < (II) < (IV)
 (b) (III) < (I) < (II) < (IV)
 (c) (I) < (IV) < (III) < (II)
 (d) (III) < (I) < (IV) < (II)

80. The major products *P* and *Q* from the following reactions are



- (a) $P = \text{C}_6\text{H}_5\text{NH}_2$; $Q = \text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$
 (b) $P = \text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$; $Q = \text{C}_6\text{H}_5\text{NH}_2$

- (c) $P = \text{C}_6\text{H}_5 - \underset{\text{OH}}{\underset{|}{\text{CH}}} - \text{NH}_2$; $Q = \text{C}_6\text{H}_5\text{COONa}$
 (d) $P = \text{C}_6\text{H}_5\text{CN}$; $Q = \text{C}_6\text{H}_5\text{Br}$

Mathematics

81. If $f(x) = \tan\left(\frac{\pi}{\sqrt{x+1}+4}\right)$ is a real valued function, then the range of *f* is

- (a) $[-1, 1]$ (b) $(0, 1]$
 (c) $[-1, \infty)$ (d) $\mathbb{R}$

82. The range of the real value function $f(x) = \sin^{-1}(\sqrt{x^2 + x + 1})$ is

- (a) $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ (b) $\left[0, \frac{\pi}{2}\right]$
 (c) $\left[\frac{\pi}{6}, \frac{\pi}{2}\right]$ (d) $\left[\frac{\pi}{3}, \frac{\pi}{2}\right]$

83. $1 + (1 + 3) + (1 + 3 + 5) + (1 + 3 + 5 + 7) + \dots$ to 10 terms =

- (a) 385 (b) 285
 (c) 506 (d) 406

84. If the augmented matrix corresponding to the system of equations $x + y - z = 1$, $2x + 4y - z = 0$ and

$$3x + 4y + 5z = 18 \text{ transformed to } \begin{bmatrix} 1 & a & 0 & -1 \\ 0 & 2 & 1 & b \\ 0 & 0 & c & 32 \end{bmatrix} \text{ then } \sqrt{a+b+c} =$$

- (a) 1 (b) 4
 (c) 9 (d) 16

85. If $\begin{vmatrix} 9 & 25 & 16 \\ 16 & 36 & 25 \\ 25 & 49 & 36 \end{vmatrix} = K$, then $K, K + 1$ are the roots of the equation

- (a) $x^2 - 13x + 42 = 0$
 (b) $x^2 - 15x + 56 = 0$
 (c) $x^2 - 19x + 90 = 0$

- (d) $x^2 - 17x + 72 = 0$
86. $A = \begin{bmatrix} 1 & -3 & -5 \\ -2 & 4 & -6 \\ 7 & -11 & 13 \end{bmatrix}$, then $\sqrt{|\text{adj}A|} =$
- (a) 64 (b) 16
(c) 36 (d) 216
87. If $\Delta_r = \begin{vmatrix} 1 & 2 \\ 3r-2 & 3r-5 \\ 0 & 3 \\ & 3r+1 \end{vmatrix}$ then $\sum_{r=1}^{33} \Delta_r =$ Options:
- (a) 0.99 (b) 0.33
(c) 0.66 (d) 0.55
88. If $\frac{2+3i}{i-2} - \frac{4i-3}{3+4i} = x + iy$, then $3x + y =$
- (a) 4 (b) -4
(c) -2 (d) 2
89. Let $z = x + iy$ and $P(x, y)$ be a point on the argand plane. If z satisfies the condition $\arg\left(\frac{z-3i}{z+2i}\right) = \frac{\pi}{4}$, then the locus of P is
- (a) $x^2 + y^2 - y - 6 = 0, (x, y) \neq (0, -2)$
(b) $x^2 + y^2 - x - y - 6 = 0, (x, y) \neq (0, -2)$
(c) $x^2 + y^2 + 5x - y - 6 = 0, (x, y) \neq (0, -2)$
(d) $x^2 + y^2 + x - y - 6 = 0, (x, y) \neq (0, -2)$
90. If ω is a complex cube root of unity and $x = \omega^2 - \omega + 2$, then
- (a) $x^2 - 4x + 7 = 0$ (b) $x^2 + 4x + 7 = 0$
(c) $x^2 - 2x + 4 = 0$ (d) $x^2 + 2x + 4 = 0$
91. The product of all the values of $(\sqrt{3} - i)^{\frac{3}{7}}$ is
- (a) 8 (b) -8
(c) 8i (d) -8i
92. α, β are the roots of the equation $\sin^2 x + b \sin x + c = 0$. If $\alpha + \beta = \frac{\pi}{2}$, then $b^2 - 1 =$
- (a) C (b) $2c$
(c) C^2 (d) $4c^2$
93. The number of integral values of 'a' for which the quadratic equation $ax^2 + ax + 5 = 0$ cannot have real roots is
- (a) infinite (b) 20
(c) 19 (d) 5
94. If the roots of the equation $32x^3 - 48x^2 + 22x - 3 = 0$ are in arithmetic progression, then the square of the common difference of the roots is
- (a) $\frac{1}{4}$ (b) $\frac{1}{16}$
(c) $\frac{1}{9}$ (d) $\frac{1}{25}$
95. If the sum of two roots of the equation $x^4 - 2x^3 + x^2 + 4x - 6 = 0$ is zero, then the sum of the squares of the other two roots is
- (a) -6 (b) 1
(c) -2 (d) 0
96. A student has to answer a multiple-choice question having 5 alternatives in which two or more than two alternatives are correct. Then, the number of ways in which the student can answer that question is
- (a) 31 (b) 30
(c) 27 (d) 26
97. Number of triangles whose vertices are the points (x, y) in the XY plane with integer coordinates satisfying $0 \leq x \leq 4$ and $0 \leq y \leq 4$ is
- (a) 2300 (b) 2260
(c) 2160 (d) 2230

98. If all the letters of the word 'HANDLE' are permuted in all possible ways and the words (with or without meaning) thus formed are arranged in dictionary order, then the rank of the word 'HELAND' is
 (a)420 (b)422
 (c)456 (d)475
99. If the coefficient of 3rd term from the beginning in the expansion of $\left(ax^2 - \frac{8}{bx}\right)^9$ is equal to the coefficient of 3rd term from the end in the expansion of $\left(ax - \frac{2}{bx^2}\right)^9$, then the relation between a and b is
 (a) $ab = -1$ (b) $ab = 1$
 (c) $a^5b^5 = -2$ (d) $a^5b^5 = 2$
100. If the expression $5^{2n} - 48n + k$ is divisible by 24 for all $n \in N$, then the least positive integral value of k is
 (a)47 (b)48
 (c)24 (d)23
101. If $\frac{x^3+3}{(x-3)^3} = a + \frac{b}{x-3} + \frac{c}{(x-3)^2} + \frac{d}{(x-3)^3}$, then $(a+d) - (b+c) =$
 (a)49 (b)15
 (c)-30 (d)-5
102. If $\sin A = -\frac{60}{61}$, $\cot B = -\frac{40}{9}$ and neither A and B is in 4th quadrant, then $6\cot A + 4\sec B =$
 (a) $\frac{26}{5}$ (b) $-\frac{26}{5}$
 (c)-3 (d)3
103. The period of the function $f(x) = \frac{2\sin\left(\frac{\pi x}{3}\right)\cos\left(\frac{2\pi x}{5}\right)}{3\tan\left(\frac{7\pi x}{2}\right) - 5\sec\left(\frac{5\pi x}{3}\right)}$ is
 (a)30 (b)60
 (c)300 (d)150
104. If $A + B + C = 4S$, then $\sin(2S - A) + \sin(2S - B) + \sin(2S - C) - \sin 2S =$
 (a) $4\cos\frac{A}{2}\cos\frac{B}{2}\cos\frac{C}{2}$
 (b) $4\sin\frac{A}{2}\cos\frac{B}{2}\cos\frac{C}{2}$
 (c) $4\cos\frac{A}{2}\sin\frac{B}{2}\cos\frac{C}{2}$
 (d) $4\sin\frac{A}{2}\sin\frac{B}{2}\sin\frac{C}{2}$
105. The general solution of the equation $\sqrt{6 - 5\cos x + 7\sin^2 x} - \cos x = 0$ also satisfies the equation
 (a) $\tan x + \cot x = 2$
 (b) $\cot x + \operatorname{cosec} x = 1$
 (c) $\tan x + \sec x = 1$
 (d) $\sec x + \operatorname{cosec} x = 2$
106. $\tan^{-1}\frac{3}{5} + \tan^{-1}\frac{6}{41} + \tan^{-1}\frac{9}{191} =$
 (a) $\tan^{-1}\frac{9}{10}$ (b) $\tan^{-1}\frac{18}{19}$
 (c) $\tan^{-1}\frac{3}{191}$ (d) $\tan^{-1}\frac{6}{205}$
107. If $2\tanh^{-1}x = \sinh^{-1}\left(\frac{4}{3}\right)$, then $\cosh^{-1}\left(\frac{1}{x}\right) =$
 (a) $\log(\sqrt{2} + 1)$ (b) $\log(\sqrt{2} - 1)$
 (c) $\log(2 + \sqrt{3})$ (d) $\log(2 - \sqrt{3})$
108. If p_1, p_2, p_3 are the altitudes and $a = 4, b = 5, c = 6$ are the sides of a $\triangle ABC$, then $\frac{1}{p_1^2} + \frac{1}{p_2^2} + \frac{1}{p_3^2} =$
 (a) $\frac{77}{225}$ (b) $\frac{44}{225}$
 (c) $\frac{308}{225}$ (d) $\frac{22}{75}$
109. Let the angles A, B, C of a $\triangle ABC$ be in arithmetic progression. If the exradii r_1, r_2, r_3 of $\triangle ABC$ satisfy the condition $r_3^2 = r_1r_2 + r_2r_3 + r_3r_1$, then $b =$

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

110. The position vectors of two points A and B are $\hat{i} + 2\hat{j} + 3\hat{k}$ and $7\hat{i} - \hat{k}$ respectively. The point P with position vector $-2\hat{i} + 3\hat{j} + 5\hat{k}$ is on the line AB . If the point Q is the harmonic conjugate of P , then the sum of the scalar components of the position vector of Q is

- (a) 6 (b) 4
(c) 2 (d) 0

111. The point of intersection of the line joining the points $\hat{i} + 2\hat{j} + \hat{k}$, $2\hat{i} - \hat{j} - \hat{k}$ and the plane passing through the points $\hat{i}$, $2\hat{j}$, $3\hat{k}$ is

- (a) $\hat{i} + 2\hat{j} + 3\hat{k}$ (b) $\frac{1}{7}(3\hat{i} - \hat{j} + \hat{k})$
(c) $\hat{i} - 3\hat{j} - 2\hat{k}$ (d) $\frac{1}{7}(15\hat{i} - 10\hat{j} - 9\hat{k})$

112. If a and b are two vectors such that $|a| = 5$, $|b| = 12$ and $|a - b| = 13$, then $|2a + b| =$

- (a) $2\sqrt{61}$ (b) 15
(c) $61\sqrt{2}$ (d) 17

113. If $a = \hat{i} - 2\hat{j} - 2\hat{k}$ and $b = 2\hat{i} + \hat{j} + 2\hat{k}$ are two vectors, then $(a + 2b) \times (3a - b)$

- (a) $2\hat{i} + 6\hat{j} - 5\hat{k}$ (b) $6\hat{i} - 2\hat{j} + 3\hat{k}$
(c) $14\hat{i} + 7\hat{j} - 5\hat{k}$ (d) $14\hat{i} + 42\hat{j} - 35\hat{k}$

114. The shortest distance between the lines $r = (3\hat{i} - 5\hat{j} + 2\hat{k}) + t(4\hat{i} + 3\hat{j} - \hat{k})$ and $r = (\hat{i} + 2\hat{j} - 4\hat{k}) + s(6\hat{i} + 3\hat{j} - 2\hat{k})$ is

- (a) 7 (b) 8
(c) 9 (d) 12

115. The mean deviation from the median for the following data is

x_i	2	9	8	3	5	7
f_i	5	3	1	6	6	1

- (a) 2 (b) $\frac{8}{3}$
(c) $\frac{9}{2}$ (d) 9

116. If three smallest squares are chosen at-random on a chess board, then the probability of getting them in such a way that they are all together in a row or in a column is

- (a) $\frac{73}{5208}$ (b) $\frac{1}{434}$
(c) $\frac{95}{217}$ (d) $\frac{479}{504}$

117. If three cards are drawn randomly from a pack of 52 playing cards then the probability of getting exactly, one spade card, exactly one king and exactly one card having a prime number is

- (a) $\frac{72}{221}$ (b) $\frac{72}{5525}$
(c) $\frac{16}{425}$ (d) $\frac{144}{5525}$

118. Urn A contains 6 white and 2 black balls; urn B contains 5 white and 3 black balls and urn C contains 4 white and 4 black balls. If an urn is chosen at random and a ball is drawn at random from it, then the probability that the ball drawn is white is

- (a) $\frac{3}{8}$ (b) $\frac{5}{8}$
(c) $\frac{1}{2}$ (d) $\frac{3}{4}$

119. If three dice are thrown, then the mean of the sum of the numbers appearing on them is

- (a) 58.5 (b) 76.66
(c) 71.75 (d) 10.5

120. If $X \sim B(7, P)$ is a binomial variate and $P(X = 3) = P(X = 5)$, then $P =$

- (a) $\frac{5 - \sqrt{10}}{3}$ (b) $\frac{\sqrt{10} - 2}{3}$

(c) $\frac{5-\sqrt{15}}{2}$

(d) $\frac{\sqrt{15}-3}{2}$

121. If the points $A(2, 3)$, $B(3, 2)$ form a triangle with a variable point $p(t, t^2)$, where t is a parameter, then the equation of the locus of the centroid of $\triangle ABC$ is
- (a) $9x^2 - 30x - 3y + 20 = 0$
 (b) $3x^2 - 10x - y + 10 = 0$
 (c) $9y^2 - 30y - 3x + 20 = 0$
 (d) $3y^2 - 10y - x + 10 = 0$
122. If (h, k) is the new origin to be chosen to eliminate first degree terms from the equation $S \equiv 2x^2 - xy - y^2 - 3x + 3y = 0$ by translation and if θ is the angle with which the axes are to be rotated about the origin in anti-clockwise direction to eliminate xy -term from $S = 0$, then $\tan 2\theta =$
- (a) $h + k$ (b) $h - k$
 (c) hk (d) $-\frac{h}{3k}$
123. A line L perpendicular to the line $5x - 12y + 6 = 0$ makes positive intercept on the Y -axis. If the distance from the origin to the line L is 2 units and the angle made by the perpendicular drawn from the origin to the line L with positive X -axis is θ , then $\tan \theta + \cot \theta =$
- (a) $\frac{25}{12}$ (b) $\frac{625}{168}$
 (c) $\frac{169}{60}$ (d) $\frac{1681}{360}$
124. If a line L passing through a point $A(2, 3)$ intersects another line $4x - 3y - 19 = 0$ at the point B such that $AB = 4$, then the angle made by the line L with positive X -axis in anti-clockwise direction is
- (a) $\tan^{-1}\left(-\frac{3}{4}\right)$ (b) $\tan^{-1}\left(\frac{3}{4}\right)$
 (c) $\frac{\pi}{4}$ (d) $-\frac{\pi}{4}$
125. A variable straight-line L with negative slope passes through the point $(4, 9)$ and cuts the positive coordinate axes in A and B . If O is the origin, then the minimum value of $OA + OB$ is
- (a) 25 (b) 12
 (c) 13 (d) 5
126. If $4x^2 + 12xy + 9y^2 + 2gx + 2fy - 1 = 0$ represent a pair of parallel lines, then
- (a) $\frac{f}{g} + \frac{g}{f} + \frac{13}{6} = 0$ (b) $f^2 + g^2 = fg$
 (c) $f^2 + g^2 = 6fg$ (d) $\frac{f}{g} + \frac{g}{f} = \frac{13}{6}$
127. If the equation of the circle passing through the points $(-1, 0)$, $(-1, 1)$, $(1, 1)$ is $ax^2 + ay^2 + 2gx + 2fy - 2 = 0$, then $a =$
- (a) 1 (b) -1
 (c) 2 (d) -2
128. For the circle $x - 2 = 5\cos \theta$, $y + 1 = 5\sin \theta$, where θ is the perimeter, the line $x = 1 + \frac{r}{2}$, $y = -2 + \frac{\sqrt{3}}{2}r$ where r is the perimeter, is a
- (a) Chord of the circle other than diameter
 (b) Tangent of the circle
 (c) Diameter of the circle
 (d) Line that does not meet the circle
129. If $x - 2y = 0$ is a tangent drawn at a point P on the circle $x^2 + y^2 - 6x + 2y + c = 0$, then the distance of the point $(6, 3)$ from P is
- (a) $\sqrt{5}$ (b) $2\sqrt{5}$
 (c) $4\sqrt{5}$ (d) $5\sqrt{2}$
130. If A, B are the points of contact of the tangents drawn from the point $(-3, 1)$ to the circle $x^2 + y^2 - 4x + 2y - 4 = 0$, then the equation of the circumcircle of the $\triangle PAB$ is
- (a) $x^2 + y^2 - 6x + 2y - 6 = 0$
 (b) $x^2 + y^2 - x + 7 = 0$
 (c) $x^2 + y^2 + x - 7 = 0$

$$(d) x^2 + y^2 + 6x - 2y - 6 = 0$$

131. If the angle between the circles $x^2 + y^2 - 2x + ky + 1 = 0$ and $x^2 + y^2 - kx - 2y + 1 = 0$ is $\cos^{-1}\left(\frac{1}{4}\right)$ and $k < 0$, then the point which lies on the radical axis of the given circle is

- (a) (1, -3) (b) (-1, 3)
(c) (-1, -3) (d) (1, 3)

132. A circle C passing through the point (1, 1) bisects the circumference of the circle $x^2 + y^2 - 2x = 0$. If C is orthogonal to the circle $x^2 + y^2 + 2y - 3 = 0$, then the centre of the circle C is

- (a) $\left(-\frac{1}{2}, 0\right)$ (b) $\left(\frac{5}{2}, 0\right)$
(c) $\left(0, \frac{5}{2}\right)$ (d) $\left(0, -\frac{1}{2}\right)$

133. If the normal drawn at $P(8, 16)$ to the parabola $y^2 = 32x$ meets the parabola again at Q , then the equation of the tangent drawn at Q to the parabola is

- (a) $x + 3y + 72 = 0$ (b) $x - y - 120 = 0$
(c) $3x - y - 264 = 0$ (d) $x + y - 24 = 0$

134. The focal distance of a point (5, 5) on the parabola $x^2 - 2x - 4y + 5 = 0$ is

- (a) 5 (b) 8
(c) 10 (d) 12

135. If S and S' are the foci of an ellipse $\frac{x^2}{169} + \frac{y^2}{144} = 1$ and the point B lying on positive Y -axis is one end of its minor axis, then the incentre of the $\triangle SBS'$ is

- (a) $\left(0, \frac{10}{3}\right)$ (b) $\left(\frac{13}{3}, \frac{10}{3}\right)$
(c) $\left(\frac{10}{3}, \frac{13}{3}\right)$ (d) $\left(0, \frac{13}{3}\right)$

136. One of the foci of an ellipse is (2, -3) and its corresponding directrix is $2x + y = 5$. If the eccentricity of the ellipse is $\frac{\sqrt{5}}{3}$, then the coordinates of the other focus are

- (a) (18, 5) (b) (4, -2)
(c) (-2, -5) (d) (-4, -6)

137. If the product of the perpendicular distances from any point on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ to its asymptotes is $\frac{36}{13}$ and its eccentricity is $\frac{\sqrt{13}}{3}$, then $a - b =$

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

138. If $A(0, 3, 4)$, $B(1, 5, 6)$, $C(-2, 0, -2)$ are the vertices of a $\triangle ABC$ and the bisector of angle A meets the side BC at D , then $AD =$

- (a) $\frac{\sqrt{21}}{5}$ (b) $\frac{\sqrt{42}}{10}$
(c) 10 (d) 4

139. If the direction cosines of two lines satisfy the equation $2l + m - n = 0$, $l^2 - 2m^2 + n^2 = 0$ and θ is the angle between the lines, then $\cos \theta =$

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

140. If the equation of the plane passing through the points (2, 1, 2), (1, 2, 1) and perpendicular to the plane $2x - y + 2z = 1$ is $ax + by + cz + d = 0$, then $\frac{a+b}{c+d} =$

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

141. If $[x]$ is the greatest integer function, then $\lim_{x \rightarrow 3} \frac{(3 - [x] + \sin[3 - x]) \cos[9 - 3x]}{[3 - x][3x - 9]}$

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

142. Let 'a' be a positive real number. If a real valued function $f(x) = \begin{cases} \frac{6^x - 3^x - 2^x + 1}{1 - \cos(\frac{x}{a})} & \text{if } x \neq 0 \\ \log 3 \log 4 & \text{if } x = 0 \end{cases}$ is continuous

at $x = 0$, then $a =$ Options:

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

143. If $f(x) = \sqrt{\cos^{-1} \sqrt{1 - x^2}}$, then $f'(\frac{1}{2}) =$

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

144. If $y = f(\cosh x)$ and $f'(x) = \log(x + \sqrt{x^2 - 1})$, then $\frac{d^2 y}{dx^2} =$

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

145. If $(x^2 - 3x + 2)^{\frac{y}{x^2 - 1}} = x + 2$, then $(\frac{dy}{dx})_{x=0} =$

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

146. If $x = \frac{t^2}{1+t^5}$, $y = \frac{2t^3}{1+t^5}$ and $t \neq -1$ is a parameter, then $\frac{dy}{dx} =$

- (a) $\frac{2(3+2t^5)}{(2-3t^5)}$ (b) $\frac{2t(3-2t^5)}{(2-3t^5)}$
(c) $\frac{2t(3-2t^5)}{(2+3t^5)}$ (d) $\frac{2(3+2t^5)}{(2+3t^5)}$

147. The acute angle between the curves $y = 3x^2 - 2x - 1$ and $y = x^3 - 1$ at their point of intersection which lies in the first quadrant is

- (a) $\tan^{-1}(\frac{2}{121})$ (b) $\tan^{-1}(2)$
(c) $\tan^{-1}(\frac{1}{13})$ (d) $\frac{\pi}{2}$

148. If the rate of change of the slope of the tangent drawn to the curve $y = x^3 - 2x^2 + 3x - 2$ at the point (2, 4) is k times the rate of change of its abscissa, then $k =$

- (a) 2 (b) 4
(c) 6 (d) 8

149. If $1^\circ = 0.0175$ radians, then the approximate value of $\sec 58^\circ$ is Options:

- (a) 1.9899 (b) 1.8788
(c) 1.8511 (d) 1.9677

150. If $f(x) = x + \log(\frac{x-1}{x+1})$ is a well-defined real valued function, then f is

- (a) monotonically decreasing function
(b) monotonically increasing function
(c) increasing in $(1, \infty)$ and decreasing in $(-\infty, -1)$
(d) decreasing in $(1, \infty)$ and increasing in $(-\infty, -1)$

151. A real valued function $f(x) = |x^2 - 3x + 2| + 2x - 3$ is defined on $[-2, 1]$. If m and M are absolute minimum and absolute maximum values of f respectively, then $M - 4m =$

- (a) 0 (b) 1
(c) 15 (d) 10

152. $\int \frac{2\sin x - 3\cos x}{4\cos x - 3\sin x} dx =$

- (a) $\frac{1}{25} [17\log |4\cos x - 3\sin x| - 6x] + C$

(b) $\frac{1}{25} [x - 18 \log |4 \cos x - 3 \sin x|] + C$

(c) $\frac{1}{25} [\log |4 \cos x - 3 \sin x| - 18x] + C$

(d) $\frac{1}{25} [17x - 6 \log |4 \cos x - 3 \sin x|] + C$

153. $\int e^{4x} (\sin 3x - \cos 3x) dx =$

(a) $\frac{e^{4x}}{25} (7 \sin 3x - \cos 3x) + C$

(a) $\frac{e^{4x}}{25} (\sin 3x - 7 \cos 3x) + C$

(c) $\frac{e^{4x}}{5} (7 \sin 3x + \cos 3x) + C$

(d) $\frac{e^{4x}}{5} (\sin 3x + 7 \cos 3x) + C$

154. $\int \left(\frac{1 - \log x}{1 + (\log x)^2} \right)^2 dx =$

(a) $\frac{1}{1 + (\log x)^2} + C$

(b) $\frac{\log x}{1 + (\log x)^2} + C$

(c) $\frac{x}{1 + (\log x)^2} + C$

(d) $\frac{x^2}{1 + (\log x)^2} + C$

155. If $\int (x+2)\sqrt{x^2-x+2} dx = \frac{1}{3}f(x) + \frac{5}{8}g(x) + \frac{35}{16}h(x) + C$ then $f(-1) + g(-1) + h\left(\frac{1}{2}\right) =$

(a) -4

(b) $2 + \ln\left(\frac{\sqrt{7}}{2}\right)$

(c) 4

(d) -2

156. $\int_0^2 \sqrt{(x+3)(2-x)} dx =$

(a) $\frac{25}{8} \cos^{-1}\left(\frac{1}{5}\right) - \frac{\sqrt{6}}{4}$

(b) $\frac{25}{8} \sin^{-1}\left(\frac{1}{5}\right) - \frac{\sqrt{6}}{4}$

(c) $\frac{\pi}{2}$

(d) π

157. $\int_0^{\pi/4} x^2 \sin 2x dx =$

(a) $\frac{\pi^2-2}{8}$

(b) $\frac{\pi(\pi-2)}{8}$

(c) $\frac{\pi-2}{8}$

(d) $\frac{\pi+2}{8}$

158. $\int_{-2\pi}^{2\pi} \sin^4 x \cos^6 x dx =$

(a) $\frac{3\pi}{128}$

(b) $\frac{9\pi}{32}$

(c) $\frac{9\pi}{64}$

(d) $\frac{3\pi}{64}$

159. If $\cos x \frac{dy}{dx} = y \sin x - 1$, $x \neq (2n+1)\frac{\pi}{2}$, $n \in \mathbb{Z}$ is the differential equation corresponding to the curve

$y = f(x)$ and $f(0) = 1$, then $f(x)$

(a) $(1-x)\sec x$

(b) $(1-x)\cos x$

(c) $x + \cos x$

(d) $x + \sec x$

160. The general solution of the differential equation $2dx + dy = (6xy + 4x - 3y)dx$ is

(a) $2 \log |2x-1| = 3y^2 + 4y + C$

(b) $\log |3y+2| = 3x^2 - 3x + C$

(c) $\log |3y+2| = x^2 - x + C$

(d) $\log |2x-1| = 3y^2 - 4y + C$