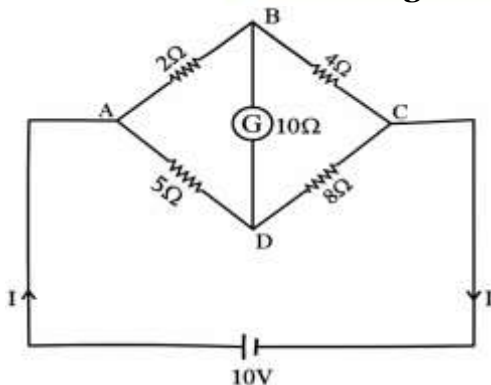


Physics

- A short bar magnet placed with its axis at 30° with a uniform external magnetic field of 0.5 T experiences a torque of magnitude equal to 4.5×10^{-2} J. Then the magnitude of magnetic moment of the magnet will be
 (a) $18 \times 10^{-2} \text{ J T}^{-1}$ (b) $36 \times 10^{-2} \text{ J T}^{-1}$
 (c) $1.8 \times 10^2 \text{ J T}^{-1}$ (d) $3.6 \times 10^2 \text{ J T}^{-1}$
- A square loop of side 10 cm and resistance 0.5Ω is placed vertically in the east-west plane. A uniform magnetic field of 0.10 T is setup across the plane in the north-east direction. The magnetic field is decreased to zero in 0.70 s at a steady rate. Then the magnitude of induced current during this time interval will be ____
 (a) $8.0 \times 10^{-3} \text{ A}$ (b) $4.0 \times 10^{-3} \text{ A}$
 (c) $6.0 \times 10^{-3} \text{ A}$ (d) $2.0 \times 10^{-3} \text{ A}$
- A coil has N turns and current passes through it is I ampere then we obtain L Henry of self inductance. Now if current change to $5 I$ then new self inductance will be ____ H.
 (a) L (b) $1/5 L$
 (c) $25 L$ (d) $5 L$
- A pure inductor of 50.0 mH is connected to a source of 220 V. Then rms current in the circuit will be ____ . The frequency of the source is 50 Hz.
 (a) 21 A (b) 7 A
 (c) 14 A (d) 28 A
- In LCR series a.c. circuit at resonance the value of power factor will be ____
 (a) ∞ (b) 1
 (c) -1 (d) 0
- If the primary coil of a transformer has 100 turns and the secondary has 200 turns. Then for a input of 220 V at 10 A find output current, in step up transformer.
 (a) 5.0 A (b) 50.0 A
 (c) 0.5 A (d) 0.05 A
- For obtaining wattless current ____ is connected with a.c. supply.
 (a) Only R (b) R – L in series
 (c) Only L (d) R – C in series
- As indicated below which one is the equation of Ampere-Maxwell law?
 (a) $\oint \vec{E} \cdot d\vec{l} = \mu_0 i_c + \mu_0 \epsilon_0 \frac{d\phi_E}{dt}$
 (b) $\oint \vec{B} \cdot d\vec{l} = \mu_0 i_c + \mu_0 \epsilon_0 \frac{d\phi_E}{dt}$
 (c) $\oint \vec{B} \cdot d\vec{A} = \mu_0 i_c + \mu_0 \epsilon_0 \frac{d\phi_E}{dt}$
 (d) $\oint \vec{B} \cdot d\vec{l} = \mu_0 i_c + \mu_0 \epsilon_0 \frac{d\phi_B}{dt}$
- Cellular phones use radio waves to transmit voice communication in the ____ band.
 (a) LF (b) HF
 (c) VHF (d) UHF
- For plane mirror focal length is ____ m. Options:
 (a) -1 (b) ∞
 (c) 1 (d) 0
- A rays coming from an object which is situated at ∞ spherical glass surface ($n = 1.5$). Then the distance of image will be ____ R is the radius of curvature of a spherical glass.
 (a) 1.5 R (b) R
 (c) 3R (d) 2R
- For a thin prism, the angle of prism is 4° having refractive index 1.6 , then the angle of minimum deviation will be ____
 (a) 0.4° (b) 2.0°
 (c) 2.4° (d) 1.6°

13. Consider a refracting telescope whose objective has a focal length of 1 m and the eyepiece a focal length of 1 cm, then magnifying power of this telescope will be ____ .
 (a) 100 (b) 50
 (c) 200 (d) 1
14. The phase difference between any two particle of a given wave front is ____ rad.
 (a) $\pi/4$ (b) 0
 (c) $\pi/2$ (d) π
15. In a Young's double-slit experiment, the slits are separated by 0.28 mm and the screen is placed 1.4 m away. The distance between the central bright fringe and the fourth bright fringe is measured to be 1.2 cm. Then the wavelength of light used in the experiment is ____ .
 (a) 500 nm (b) 660 nm
 (c) 600 nm (d) 550 nm
16. The refractive index of glass is 1.6 then the speed of light in glass will be ____ speed of light in vacuum is $3.0 \times 10^8 \text{ ms}^{-1}$.
 (a) $1.48 \times 10^8 \text{ ms}^{-1}$ (b) $1.66 \times 10^8 \text{ ms}^{-1}$
 (c) $1.22 \times 10^8 \text{ ms}^{-1}$ (d) $1.88 \times 10^8 \text{ ms}^{-1}$
17. Js is the unit of ____ physical quantity.
 (a) Angular momentum
 (b) Work function
 (c) Moment of Inertia
 (d) Rydberg constant
18. To emit an electron from the metal, minimum electric field required is ____ .
 (a) 10^4 V m^{-1} (b) 10^6 V m^{-1}
 (c) 10^5 V m^{-1} (d) 10^8 V m^{-1}
19. A ball of mass 0.12 kg moving with a speed of 20 ms^{-1} has de-Broglie wavelength-
 $[(h = 6.63 \times 10^{-34} \text{ J s})]$
 (a) $4.76 \times 10^{-34} \text{ m}$
 (b) $2.76 \times 10^{-34} \text{ m}$
 (c) $3.76 \times 10^{-34} \text{ m}$
 (d) $1.76 \times 10^{-34} \text{ m}$
20. The ratio of radius for second and third orbit of hydrogen atom is ____ .
 (a) 4:9 (b) 3:2
 (c) 9:4 (d) 2:3
21. In Geiger-Marsden scattering experiment the thickness of a thin foil of gold is ____ m.
 (a) 6.2×10^{-7} (b) 5.5×10^{-7}
 (c) 2.1×10^{-7} (d) 4.2×10^{-7}
22. The ground state energy of hydrogen atom is -13.6 eV, then the potential energy of the electron in this state will be ____ .
 (a) -6.8 eV (b) -27.2 eV
 (c) 13.6 eV (d) 27.2 eV
23. Some atomic species of the same element differing in mass are called ____
 (a) Isotope (b) Isotone
 (c) Isomar (d) Isobar
24. Find the value of x and y from below given nuclear reaction
 ${}_{92}^{235}\text{U} + {}_0^1\text{n} \rightarrow {}_x^{133}\text{Sb} + {}_{41}^y\text{Nb} + 4{}_0^1\text{n}$
 (a) (133,41) (b) (51,95)
 (c) (92,1) (d) (51,99)
25. The ratio of the nuclear radii of the ${}_1^1\text{H}$ and ${}_{13}^{27}\text{Al}$ is ____
 (a) 3:5 (b) 1:2
 (c) 2:1 (d) 1:3
26. Which impurity is used to convert pure semiconductor into p-type semiconductor?

- (a) Phosphorous (b) Antimony
(c) Indium (d) Arsenic
27. The energy required for electron to jump the forbidden band for germanium at room temperature in the intrinsic semiconductor is ____ eV.
(a) 0.05 (b) 0.72
(c) 5.4 (d) 1.1
28. The Dimensional formula for Electric Flux is ____ .
(a) $M^1 L^3 T^{-3} A^1$ (b) $M^1 L^1 T^{-3} A^{-1}$
(c) $M^{-1} L^{-3} T^3 A^1$ (d) $M^1 L^3 T^{-3} A^{-1}$
29. For an electric dipole an angle between $\vec{E}$ and $\vec{P}$ at a point on the equatorial plane is ____ .
(a) 45° (b) 180°
(c) 0° (d) 90°
30. An infinite line charge produces an electric field of 9×10^4 N/C at a distance of 2 cm . Then the linear charge density will be ($K = 9 \times 10^9$ N m²/C²)
(a) $0.1 \mu\text{C}/\text{m}$ (b) $10 \mu\text{C}/\text{m}$
(c) $0.01 \mu\text{C}/\text{m}$ (d) $1 \mu\text{C}/\text{m}$
31. If an electron is accelerated by a potential difference of 2.5 V it would gain energy of ____ .
(Take charge of electron 1×10^{-19} C)
(a) 2.5 erg (b) 2.5 MeV
(c) 2.5 eV (d) 2.5 J
32. A radius of spherical charged shell is 10 cm and electric potential on its surface is 100 V , then the potential at 2 cm from the centre of the shell will be ____
(a) 0 V (b) 1 V
(c) 200 V (d) 100 V
33. A parallel plate capacitor with air between the plates has a capacitance of 4 pF. If the distance between the plates is reduced by half and the space between them is filled with a substance of dielectric constant 6 then the value of capacitance will be _____.
(a) 48 pF (b) 24 pF
(c) 12 pF (d) 98 pF
34. The SI units of the current density is ____
(a) Am^{-2} (b) Am^{-1}
(c) Am^{-3} (d) Am^2
35. The magnitude of the drift velocity per unit electric field is known as ____ .
(a) Charge density (b) Conductivity
(c) Mobility (d) Resistivity
36. As shown in the circuit diagram find the value of I ____



- (a) 2.8 A (b) 0.4 A
(c) 1.8 A (d) 2.5 A
37. A silver wire has a resistance of 2.1Ω at 27.5°C and a resistance of 2.7Ω at 100°C . Then the temperature coefficient of resistivity of silver will be ____ .

- (a) $3.9 \times 10^{30} \text{C}$ (b) $3.9 \times 10^{30} \text{C}^{-1}$
(c) $3.9 \times 10^{-30} \text{C}$ (d) $3.9 \times 10^{-30} \text{C}^{-1}$

38. $\frac{V_s}{A m}$ is the unit of which physical quantity?

- (a) χ_m (b) μ_0
 (c) χ_c (d) ε_0

39. An ideal ammeter and an ideal voltmeter has resistance ____ Ω and ____ Ω respectively.

- (a) $(0, \infty)$ (b) $(\infty, 0)$
(c) (∞, ∞) (d) $(0, 0)$

40. A solenoid has a core of a material with relative permeability 400. The windings of the solenoid are insulated from the core and carry a current of 2 A. If the number turns is 1000 per meter then the value of magnetic intensity will be _____

- (a) $8 \times 10^{-5} \text{Am}^{-1}$ (b) $2 \times 10^3 \text{Am}^{-1}$
(c) $2 \times 10^{-3} \text{Am}^{-1}$ (d) $8 \times 10^5 \text{Am}^{-1}$

Chemistry

41. Reaction $2A \rightarrow B + 3C$ is zero order reaction. If $K = 3.5 \times 10^{-4} \text{ mol L}^{-1} \text{ S}^{-1}$; What will be the rate of production of 'C'?

- (a) $3.5 \times 10^{-4} \text{ mol L}^{-1} \text{ S}^{-1}$
 (b) $10.5 \times 10^{-4} \text{ mol L}^{-1} \text{ S}^{-1}$
 (c) $7.0 \times 10^{-4} \text{ mol L}^{-1} \text{ S}^{-1}$
 (d) $1.167 \times 10^{-4} \text{ mol L}^{-1} \text{ S}^{-1}$

42. KMnO_4 acts as an oxidising agent in acidic medium. The number of moles of KMnO_4 that will be needed to react with one mole of sulphide ion in acidic solution is ____.

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

43. Which one of the following is amphoteric oxide?

- (a) Cr_2O_3 (b) CrO
(c) CrO_3 (d) V_2O_3

44. Which of the following ion show highest spin only magnetic moment value?

- (a) Ti^{2+} (b) Mn^{2+}
(c) Fe^{2+} (d) Co^{2+}

45. Name the member of lanthanide series which is well known to exhibit +4 oxidation state?

- (a) Gadolinium (b) Thulium
(c) Samarium (d) Cerium

46. Which one is the correct formula for coordination compound tris [ethane-1,2-diamine] cobalt (III) sulphate

- (a) $[\text{Co}(\text{en})_3](\text{SO}_4)_2$
 (b) $[\text{Co}(\text{en})_3]_2(\text{SO}_4)_3$
 (c) $[\text{Co}(\text{en})_3]\text{SO}_4$
 (d) $[\text{Co}(\text{en})_3]_3(\text{SO}_4)_2$

47. Hybridizations in $[\text{Ni}(\text{CO})_4]$ and $[\text{Ni}(\text{CN})_4]^{-2}$ are respectively

- (a) dsp^2 and sp^3 (b) s^3 and s^3
(c) dsp^2 and dsp^2 (d) sp^3 and dsp^2

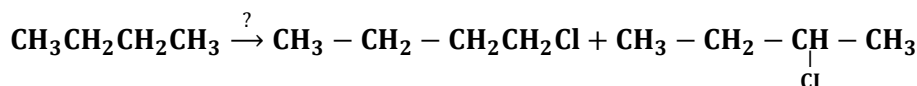
48. Identify the optically active compound from the following.

- (a) $[\text{Co}(\text{en})_3]\text{Cl}_3$ (b) $[\text{Co}(\text{NH}_3)_6]\text{Cl}_2$
(c) $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}$ (d) $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$

49. In the complex $\text{K}[\text{Cr}(\text{H}_2\text{O})_2(\text{C}_2\text{O}_4)_2] \cdot 3\text{H}_2\text{O}$, oxidation state and coordination number of the central metal ion is ____ and ____

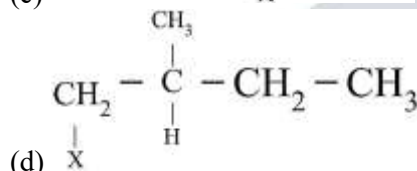
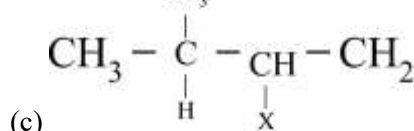
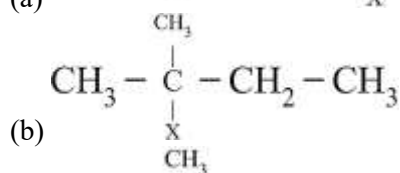
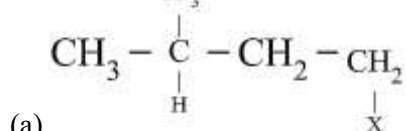
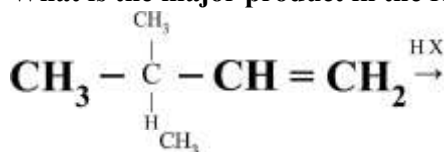
- (a) +4,6. (b) +3,4.
(c) +3,6 (d) +4,4

50. Which reagent will be used for the following reaction?



- (a) $\text{Cl}_2/\text{UV light}$ (b) $\text{NaCl} + \text{H}_2\text{SO}_4$
 (c) $\text{Cl}_2, \text{air/dark}$ (d) $\text{Cl}_2, \text{air, Fe/ dark}$

51. What is the major product in the following reaction?



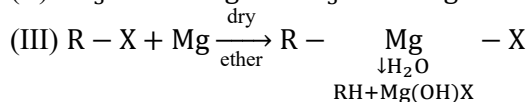
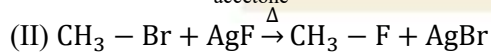
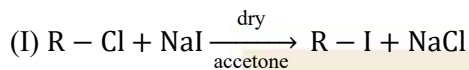
52. Predict the order of reactivity of the following compounds in $\text{S}_\text{N}1$ reaction

- (i) $\text{C}_6\text{H}_5 \cdot \text{CH}_2\text{Br}$
 (ii) $\text{C}_6\text{H}_5 \cdot \text{CH} \cdot (\text{C}_6\text{H}_5)\text{Br}$
 (iii) $\text{C}_6\text{H}_5 \cdot \text{CH}(\text{CH}_3)\text{Br}$
 (iv) $\text{C}_6\text{H}_5 \cdot \text{C} \cdot (\text{CH}_3)(\text{C}_6\text{H}_5)\text{Br}$

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

53. Match the reactions given in column - I with the names given in column - II.

Column I

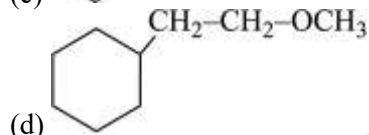
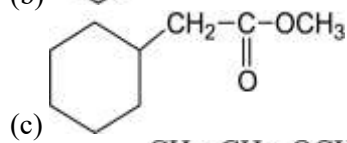
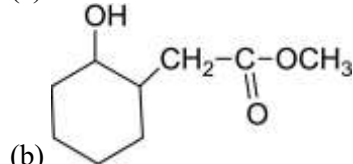
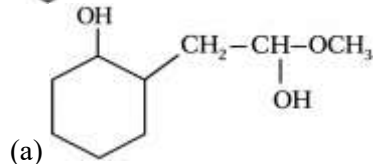
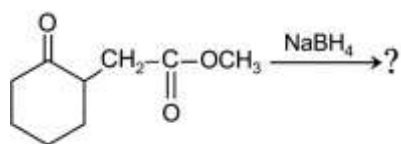


Column II

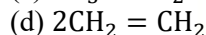
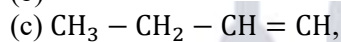
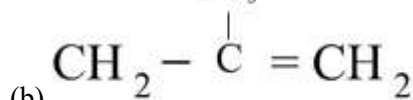
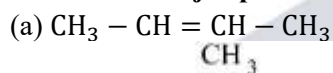
- (A) Swarts reaction
 (B) Wurtz reaction
 (C) Finkelstein reaction
 (D) Grignard reaction

- (a) (I) $\rightarrow$ (A); (II) $\rightarrow$ (C); (III) $\rightarrow$ (D)
 (b) (I) $\rightarrow$ (D); (II) $\rightarrow$ (C); (III) $\rightarrow$ (B)
 (c) (I) $\rightarrow$ (B); (II) $\rightarrow$ (A); (III) $\rightarrow$ (D)
 (d) (I) $\rightarrow$ (C); (II) $\rightarrow$ (A); (III) $\rightarrow$ (D)

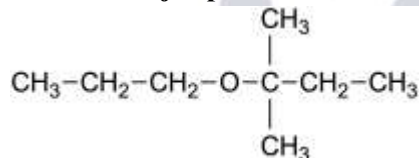
54. Which product will be obtained in the following reaction



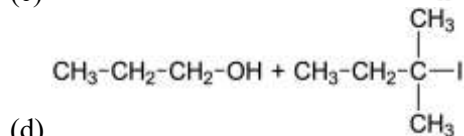
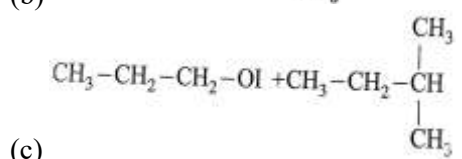
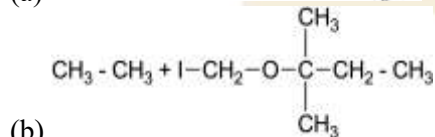
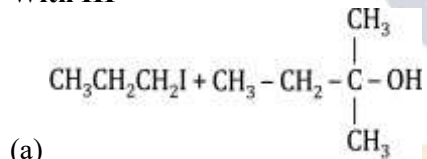
55. Predict the major product of acid catalysed dehydration of butan-1-ol.



56. Give the major product formed by heating



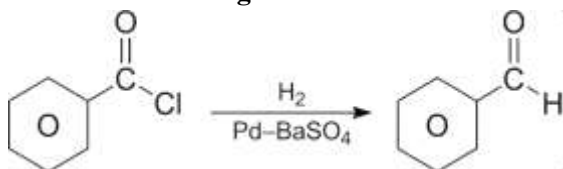
With HI



57. Arrange the following compounds in decreasing order of their acidic strength

- (i) (ii) (iii)
- (a) (i) > (ii) > (iii) (b) (iii) > (i) > (ii)
(c) (ii) > (i) > (iii) (d) (ii) > (iii) > (i)

58. Name the following reaction.

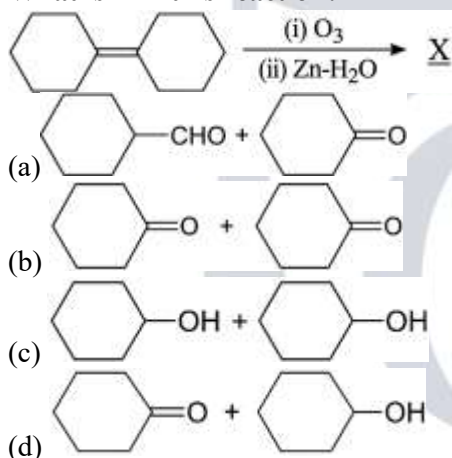


- (a) Etard reaction
(b) Stephen reaction
(c) Rosenmund reduction
(d) Clemmensen reduction

59. 'R' + $\text{CH}_3 - \text{CO} - \text{CH}_3 \xrightarrow{\text{H}^+}$ Schiff's base what is 'R' in this reaction?

- (a) $\text{CH}_3 - \text{NH}_2$
(b) $\text{NH}_2 - \text{NH}_2$
(c) NH_2OH
(d) $\text{C}_6\text{H}_5 - \text{NH} - \text{NH}_2$

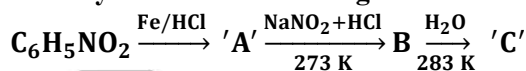
60. What is X in this reaction?



61. Which of the following carboxylic acid has least pKa value among all?

- (a) HCOOH (b) $\text{CH}_3 \cdot \text{COOH}$
(c) $\text{C}_6\text{H}_5 \cdot \text{COOH}$ (d) $\text{NO}_2 \cdot \text{CH}_2 \cdot \text{COOH}$

62. Identify 'C' in the following reaction.

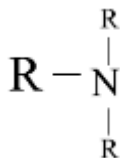


- (a)
- (b)
- (c)



(d)

63. Which amine is prepared by Gabriel phthalimide synthesis?



(a)

(b) $\text{R} - \text{NH} - \text{R}$

(c) $\text{R} - \text{NH}_2$

(d) $\text{Ar} - \text{NH}_2$

64. Which is the correct order of the basic strength of given amines?

(a) $\text{NH}_3 > \text{C}_6\text{H}_5\text{NH}_2 > (\text{C}_2\text{H}_5)_2\text{NH} > \text{C}_2\text{H}_5\text{NH}_2$

(b) $(\text{C}_2\text{H}_5)_2\text{NH} > \text{C}_2\text{H}_5\text{NH}_2 > \text{NH}_3 > \text{C}_6\text{H}_5\text{NH}_2$

(c) $\text{C}_6\text{H}_5\text{NH}_2 > (\text{C}_2\text{H}_5)_2\text{NH} > \text{C}_2\text{H}_5\text{NH}_2 > \text{NH}_3$

(d) $(\text{C}_2\text{H}_5)_2\text{NH} > \text{C}_2\text{H}_5\text{NH}_2 > \text{C}_6\text{H}_5\text{NH}_2 > \text{NH}_3$

65. Which diazonium salt is water insoluble and stable at room temperature?

(a) $\text{C}_6\text{H}_5 \text{N}_2^+ \text{HSO}_4^-$

(b) $\text{C}_6\text{H}_5 \text{N}_2^+ \text{Br}^-$

(c) $\text{C}_6\text{H}_5 \text{N}_2^+ \text{Cl}^-$

(d) $\text{C}_6\text{H}_5 \cdot \text{N}_2^+ \text{BF}_4^-$

66. Lactose is composed of which units?

(a) β -D-Galactose and β -D-Glucose

(b) α -D-Glucose and β -D-Fructose

(c) α -D-Glucose and β -D-Galactose

(d) α -D-Glucose and α -D-Glucose

67. Which of the following gives Zwitter ion in its aqueous solution?

(a) $\text{NH}_2 - \text{CH}_2 - \text{CH}_2 - \text{NH}_2$

(b) $\text{NH}_2 - \text{CH}_2 - \text{COOH}$

(c) $\text{CH}_3\text{CH}_2\text{NH}_2$

(d) $\text{COOH} - \text{CH}_2 - \text{COOH}$

68. Deficiency of which vitamin is responsible for RBC deficient in haemoglobin?

(a) Vitamin B_2

(b) Vitamin B_6

(c) Vitamin B_1

(d) Vitamin B_{12}

69. Which of the following statement is incorrect for the structure of Nucleic acids?

(a) A unit formed by the attachment of a base 1' position of sugar is known as nucleoside

(b) In DNA molecule, the sugar moiety is β -D-2-deoxyribose

(c) RNA contains four bases adenine, guanine, cytosine and thymine

(d) Nucleotides are joined together by phosphodiester linkage

70. Calculate the mass of Glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) required in making 2.5 kg of 0.25 molal aqueous solution.

[Atomic wt : $\text{H} = 1, \text{O} = 16, \text{C} = 12\text{amu}$]

(a) 90.0 g

(b) 107.65 g

(c) 112.5 g

(d) 135.0 g

71. The vapour pressure of pure liquids 'P' and 'Q' are 450 and 750 mm of Hg respectively at 350 K. If total vapour pressure is 600 mm of Hg, the mole fractions of 'P' and 'Q' respectively will be ____ and ____

(a) 0.6 and 0.4.

(b) 0.4 and 0.6

(c) 0.5 and 0.5

(d) 0.7 and 0.3

72. The freezing point depression of 645 g of aqueous solution of ethylene glycol ($\text{C}_2\text{H}_6\text{O}_2$) is 2.25 K. Find weight of ethylene glycol in the solution. [$K_f = 1.86 \text{ Kkgmol}^{-1}$; $\text{H} = 1, \text{C} = 12, \text{O} = 16\text{amu}$]

- (a) 48.375 g (b) 50 g
(c) 42.50 g (d) 45.0 g

73. Van't Hoff factor (i) for dilute aqueous solution of $K_4[Fe(CN)_6]$, $Fe[Fe(CN)_6]_3$ and $[CoCl_2(en)_2]Cl_2$ are respectively __, __, __ ?

- (a) 5,7,3 (b) 2,5,7
(c) 7,5,2 (d) 2,7,5

74. Calculate the potential of hydrogen electrode in contact with a solution whose pH is 10.

- (a) +0.59 V (b) -0.059 V
(c) -0.59 V (d) +0.059 V

75. Which of the statements for solution of electrolyte is not correct?

- (a) Conductivity of solution does not depend upon temperature
(b) Conductivity of solution depends on the nature of electrolyte
(c) Conductivity of solution depends on the nature of solvent and its viscosity
(d) Conductivity of solution depends on the concentration of electrolyte

76. During the electrolysis of higher concentration of H_2SO_4 , the product obtained at anode is ____.

- (a) $SO_2(g)$ (b) $S_2O_8^{2-}(aq)$
(c) $SO_3(aq)^{2-}$ (d) $O_2(g)$

77. How much Faraday of electricity is required to reduce 1.5 mole $KMnO_4$ into Mn in basic medium?

- (a) 6.0 F (b) 7.5 F
(c) 3.0 F (d) 4.5 F

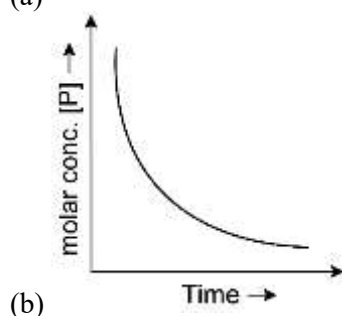
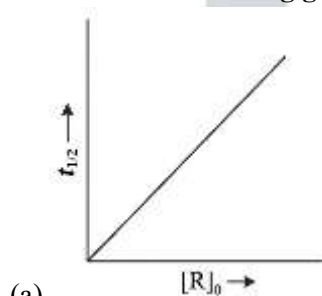
78. For any reaction the rate constant $K = 2.3 \times 10^{-5} \text{ mol}^{-3/2} \text{ L}^{3/2} \text{ S}^{-1}$; then the order of reaction will be ____.

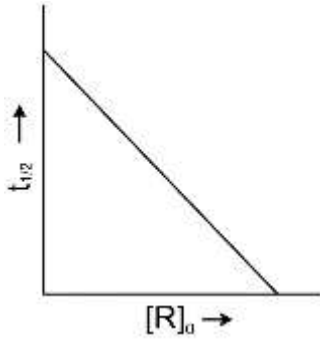
- (a) 0.5 (b) 1.5
(c) 2.5 (d) 0.0

79. Which of the following statements is incorrect for a reaction carried out in presence of catalyst?

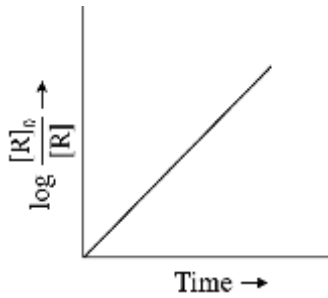
- (a) There is no change in Gibbs energy of the reaction
(b) Equilibrium constant of the reaction does not change
(c) The activation energy of the reaction decreases
(d) Potential energy of reactants and products change

80. Which of the following graphs is correct for a first order reaction $R \rightarrow P$?





(c)



(d)

Maths

81. The Integrating Factor of the differential equation $(\tan^{-1} y - x)dy = (1 + y^2)dx$ is ____.

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

82. The angle ' θ ' between the vectors $\vec{a} = \hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = \hat{i} + \hat{j} - \hat{k}$ is

- (a) $\cos^{-1}\left(-\frac{1}{3}\right)$ (b) $\cos^{-1}\frac{1}{3}$
(c) $\sin^{-1}\frac{1}{3}$ (d) $\sin^{-1}\left(-\frac{1}{3}\right)$

83. The area of a parallelogram, whose adjacent sides are given by the $\vec{a} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ and $\vec{b} = -\hat{j} - 2\hat{k}$, is ____.

- (a) $\sqrt{6}$ (b) $2\sqrt{6}$
(c) 24 (d) $2\sqrt{3}$

84. The value of $\hat{j} \cdot (\hat{i} \times \hat{k}) + \hat{i} \cdot (\hat{j} \times \hat{k}) + \hat{k} \cdot (\hat{j} \times \hat{i}) + \hat{i} \cdot (\hat{k} \times \hat{j})$ is ____

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

85. The angle, between the pair of lines, given by $\frac{x-3}{1} = \frac{y-2}{2} = \frac{z+4}{2}$, and $\frac{x-5}{3} = \frac{y+2}{2} = \frac{z}{6}$ is ____.

- (a) $\cos^{-1}\left(\frac{19}{21}\right)$ (b) $\cos^{-1}\left(\frac{\sqrt{19}}{21}\right)$
(c) $\sin^{-1}\left(\frac{19}{21}\right)$ (d) $\cos^{-1}\left(-\frac{19}{21}\right)$

86. If the lines $\frac{x-1}{-3} = \frac{y-2}{2k} = \frac{z-3}{2}$ and $\frac{x-1}{3k} = \frac{y-1}{1} = \frac{6-z}{5}$ are perpendicular, then the value of k is ____.

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

87. The Cartesian equation of the line which passes through the point $(1, -3, 5)$ and parallel to the line given by $\frac{x+3}{3} = \frac{y-4}{5} = \frac{z+8}{6}$ is :

- (a) $\frac{x-1}{3} = \frac{y+3}{5} = \frac{z-5}{6}$ (b) $\frac{x+3}{1} = \frac{y-4}{-3} = \frac{z+8}{5}$
(c) $\frac{x+3}{-3} = \frac{y-4}{4} = \frac{z+8}{-8}$ (d) $\frac{x-1}{-3} = \frac{y+3}{4} = \frac{z-5}{-8}$

88. The coordinates of the corner points of the bounded feasible region are $(0, 6), (3, 3), (9, 9), (0, 12)$. The maximum of the objective function $z = 6x + 12y$ is :

- (a) 152 (b) 162
(c) 144 (d) 166

89. Minimise objective function $z = 7x + 3y$ subject to the constraints : $x + y \leq 5, x + y \geq 10, x \geq 0, y \geq 0$ is :

- (a) 15
(b) 35
(c) 70
(d) No feasible region and hence no feasible solution

90. If, for independent events A and B, $P(A) = p, P(B) = \frac{1}{2}$ and $P(A \cup B) = \frac{3}{5}$ are given then, the value of p is

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

91. The probability of obtaining an even prime number on each die, when a pair of dice is rolled is :

- (a) $\frac{1}{3}$ (b) 0
(c) $\frac{1}{12}$ (d) $\frac{1}{36}$

92. If A and B are two events such that $P(B) \neq 0$ and $P(A | B) = 1$, then ____

- (a) $B \subset A$ (b) $A \subset B$
(c) $A \neq \varnothing$ (d) $B \neq \varnothing$

93. The relation $R = \{(a, a), (b, b), (c, c), (a, c)\}$, is defined on the set $\{a, b, c\}$, is ____ .

- (a) Reflexive and transitive but not symmetric
(b) Reflexive and symmetric but not transitive
(c) Transitive and symmetric but not reflexive
(d) An equivalence relation

94. $f: Z \rightarrow Z, f(x) = x^3 + 2$ is defined then function f is ____

- (a) One - one but not onto
(b) One - one and onto
(c) Not one - one but onto
(d) Neither one - one nor onto

95. If $y = \tan^{-1} x$ then ____ .

- (a) $0 \leq y \leq \pi$
(b) $0 < y < \pi$
(c) $-\pi/2 < y < \pi/2$
(d) $-\pi/2 \leq y \leq \pi/2$

96. The value of $\tan^{-1}(-1) + \sec^{-1}(-2) + \sin^{-1}\left(\frac{1}{\sqrt{2}}\right)$ is ____ .

- (a) $-\pi/6$ (b) $-\pi/3$
(c) π (d) $2\pi/3$

97. $\sin^{-1}\left(\sin \frac{23\pi}{6}\right) =$ ____

- (a) $-\pi/6$ (b) $\pi/6$
(c) $23\pi/6$ (d) $-5\pi/6$

98. If A is square matrix such that $A^2 = A$, then $(I - A)^3 - (I + A)^2 =$

- (a) $2(I - A)$ (b) $I - A$
(c) I (d) None of above

99. If $A = \begin{bmatrix} \sin \alpha & -\cos \alpha \\ \cos \alpha & \sin \alpha \end{bmatrix}$ and $A + A' = I$, then the value of $\cos \alpha$ is ____

- (a) $\frac{1}{2}$ (b) $\frac{\sqrt{3}}{2}$
(c) -1 (d) 0

100. If $A = \begin{bmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$ then $I + A^2 =$ ____ .

- (a) 0 (b) $I + A$
(c) A (d) $2I$
101. If area of $\triangle PQR$ is 3 sq. units with vertices $P(k, 1)$, $Q(2, 4)$ and $R(1, 1)$. Then value of k is ____ .
(a) $-3, 1$ (b) $0, 2$
(c) $-1, 3$ (d) $1, 3$
102. If $\begin{vmatrix} 2017 & 2018 \\ 2019 & 2020 \end{vmatrix} + \begin{vmatrix} 2021 & 2022 \\ 2023 & 2024 \end{vmatrix} = 2k$, then $k^3 =$ ____ .
(a) -8 (b) 8
(c) 0 (d) -64
103. If $A = \begin{bmatrix} 2 & -4 \\ -3 & 6 \end{bmatrix}$ then $A^{-1} =$ ____ .
(a) $\frac{1}{24} \begin{bmatrix} -2 & 4 \\ 3 & -6 \end{bmatrix}$ (b) $\frac{1}{24} \begin{bmatrix} 6 & 4 \\ 3 & 2 \end{bmatrix}$
(c) $\frac{1}{24} \begin{bmatrix} -6 & 4 \\ 3 & -2 \end{bmatrix}$ (d) Does not exist
104. If function f is continuous at point $x = \pi/2$ and $f(x) = \begin{cases} \frac{2k \cos x}{\pi - 2x}, & x \neq \pi/2 \\ 2024, & x = \pi/2 \end{cases}$; then the value of k is ____ .
(a) 1012 (b) 506
(c) 2024 (d) 4048
105. $\frac{d}{dx}(e^{x \log x} + e^3) =$ ____
(a) $(1 + \log x)$
(b) $x^x(1 + \log x)$
(c) $x^x \log x$
(d) $x^x(1 + \log x) + e^3$
106. If $x = a(1 - \cos \theta)$, $y = a(\theta + \sin \theta)$ then $\frac{dy}{dx} =$ ____ .
(a) $\cot \theta/2$ (b) $\tan \theta/2$
(c) $-\cot \theta/2$ (d) $-\tan \theta/2$
107. If $\frac{d^2y}{dx^2} - my = 0$ satisfies for $y = 7\sin x + 5\cos x$ then the value of m is ____
(a) 1 (b) 0
(c) -1 (d) -2
108. The rate of change of the surface area of a sphere with respect to its radius r , when $r = 6$ cm, is ____ cm^2/s .
(a) 24π (b) 12π
(c) 48π (d) 144π
109. For function $f(x) = \sin 3x$; $x \in [0, \frac{\pi}{2}]$, f is ____ .
(a) Increasing in $[0, \frac{\pi}{2}]$
(b) Decreasing in $[0, \frac{\pi}{2}]$
(c) Decreasing in $[0, \pi/6)$ and increasing in $(\pi/6, \pi/2)$
(d) Increasing in $[0, \pi/6)$ and decreasing in $(\pi/6, \pi/2)$
110. The absolute maximum value of the function $f(x) = \sin x + \cos x$, $x \in [0, \pi]$ is ____ .
(a) 0 (b) $\frac{1}{\sqrt{2}}$
(c) 1 (d) $\sqrt{2}$
111. $\int \frac{e^{2x}-1}{e^{2x}+1} dx = +C$
(a) $\log(e^{2x} - 1) + x$
(b) $\log(e^{2x} + 1) - x$
(c) $\log(e^{2x} + 1) + x$
(d) $\log(e^{2x} - 1) - x$
112. $\int \frac{1}{\sqrt{4x-x^2}} dx = C$

- (a) $\sin^{-1}\left(\frac{x-2}{2}\right)$
 (b) $\frac{1}{2}\tan^{-1}\left(\frac{x-2}{2}\right)$
 (c) $\log|(x-2) + \sqrt{4x-x^2}|$
 (d) $\frac{1}{4}\log\left|\frac{x}{x-4}\right|$

113. $\int e^x \left(\frac{1+\sin x}{1+\cos x}\right) dx = \dots + C$

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

114. $\int_{-\pi/2}^{\pi/2} (x^5 - x^3 \cos x + \sin^3 x - 3) dx =$

- (a) 3π (b) $-\pi$
 (c) -3π (d) 0

115. $\int_0^1 x e^x dx = \underline{\hspace{2cm}}$

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

116. Area lying in the first quadrant and bounded by ellipse $9x^2 + 16y^2 = 1$ is ____

- (a) $\frac{\pi}{12}$ (b) $\frac{\pi}{48}$
 (c) 12π (d) 3π

117. Area of the region bounded by the curve $x^2 = 4y$, X-axis and the line $x = 3$ is ____ .

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

118. The area bounded by the curve $y = \cos x$ between $x = -\pi/2$ and $x = \pi/2$ is

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

119. The order and the degree of the differential equation $\sqrt{\frac{d^2y}{dx^2}} = \sqrt[3]{\left(\frac{dy}{dx}\right)^4 + 2}$ is respectively ____ and ____ .

- (a) $3, 2$ (b) $2, 3$
 (c) $2, 8$ (d) $1, 8$

120. The general solution of the differential equation $\frac{xdy-ydx}{y} = 0$ is ____ .

- (a) $x = cy^2$ (b) $xy = c$
 (c) $y = cx$ (d) $y = cx^2$