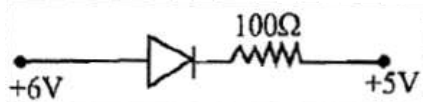


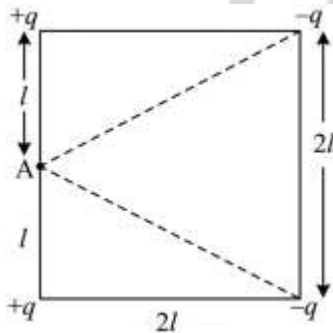
PHYSICS

1. What is the approximate percentage value of maximum voltage to its rms value in LCR AC circuit?
 (a) 22.8% (b) 70.7%
 (c) 50% (d) 141.4%
2. In which of the following AC circuit, we get the value of power factor 1 at resonance condition?
 (a) LCR series circuit
 (b) CR series circuit
 (c) Only inductor (L) circuit
 (d) LR series circuit
3. The output voltage of a step-down transformer is measured to be 24 V, when connected to a 12 watt light bulb. The value of the peak current is ____ .
 (a) $2\sqrt{2}$ A (b) $\sqrt{2}$ A
 (c) 2 A (d) $\frac{1}{\sqrt{2}}$ A
4. ____ are used in medicine to destroy cancer cells.
 (a) Microwaves (b) Gammarays
 (c) Ultraviolet rays (d) Visible rays
5. The speed of light in a medium is 200×10^8 cm/s. Refractive index of a medium is ____ ($c = 3 \times 10^8$ m/s).
 (a) 2.42 (b) 1.0
 (c) 1.5 (d) 1.33
6. What is the power of combination of convex lens and concave lens of equal focal length 25 cm ?
 (a) Zero (b) 25 D
 (c) Infinite (d) 8 D
7. At what angle of incidence should a ray of light incident on a face of an equilateral prism of minimum angle of deviation is 46° ?
 (a) 35° (b) 38°
 (c) 40° (d) 53°
8. If the tube-length (L) of a compound microscope increases, then its magnification ____ .
 (a) First increases and then decreases
 (b) Increases
 (c) Remains constant
 (d) Decreases
9. Two waves of same intensity I_0 emitted from two sources having same phase difference (ϕ). Due to superposition of two waves, the intensity of resultant wave is directly proportional to ____
 (a) $\sin^2\left(\frac{\phi}{2}\right)$ (b) $\sin^2 \phi$
 (c) $\cos^2\left(\frac{\phi}{2}\right)$ (d) $\cos^2 \phi$
10. For light diverging from a point source,
 (a) the intensity at the wavefront does not depend on the distance
 (b) the intensity increases in proportion to the distance squared
 (c) the wavefront is parabolic
 (d) the wavefront is spherical
11. In Young's double slit experiment, the slits are separated by 0.54 mm and the screen is placed 1.8 m away. The distance between central bright fringe and sixth bright fringe is measured to be 1.2 cm. Determine the wavelength of light used in the experiment.
 (a) 5000 Å (b) 600 nm
 (c) 8000 nm (d) 800 nm

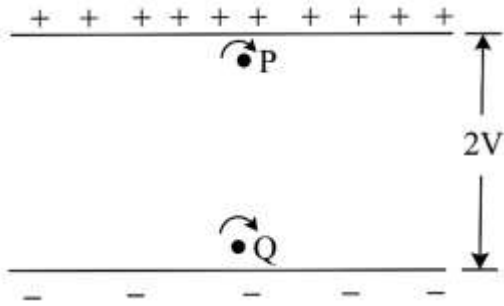
12. The minimum value of electric field required to pulled out electrons from a metal is approximately ____ V/cm.
 (a) 10^9 (b) 10^6
 (c) 10^{10} (d) 10^8
13. Monochromatic light of frequency 6×10^{14} Hz is produced by a laser. The power emitted is 4×10^{-3} W. How many photons per second on an average are emitted by the source? [$h = 6.63 \times 10^{-34}$ Js]
 (a) 1×10^{16} Photons per second
 (b) 5×10^{16} Photons per second
 (c) 3×10^{15} Photons per second
 (d) 5×10^{15} Photons per second
14. What is the de-Broglie wavelength of a bullet of mass 0.033 kg travelling at the speed of 1 km/s? ($h = 6.6 \times 10^{-34}$ Js)
 (a) 3×10^{-25} m (b) 2×10^{-35} m
 (c) 1.1×10^{-32} m (d) 1.7×10^{-35} m
15. According to Bohr's model, the orbital angular momentum of electrons in third excited state is ____ [$h = 6.63 \times 10^{-34}$ Js]
 (a) 4.2×10^{-34} kg m² s⁻¹
 (b) 12.350×10^{-34} kg m² s⁻¹
 (c) 1.625×10^{-26} erg-s
 (d) 6.63×10^{-34} Js
16. 13.6 eV energy is required to separate a hydrogen atom into proton and an electron. If the orbital radius of an electron in hydrogen atom is 5.3×10^{-11} m, then velocity of electron is ____
 (a) 6.25×10^7 ms⁻¹ (b) 1.36×10^5 ms⁻¹
 (c) 2.4×10^8 ms⁻¹ (d) 2.2×10^6 ms⁻¹
17. The ground state energy of hydrogen atom is -13.6 eV. The potential and kinetic energies of the electron in this state ____ .
 (a) -13.6eV, -27.2eV (b) -27.2eV, -13.6eV
 (c) -27.2eV, +13.6eV (d) -13.6eV, +27.2eV
18. Calculate the height of the potential barrier for a head on collision of two deuterons. (Radius of deuteron is 2 fm).
 (a) 7.2×10^{-19} J (b) 7.2×10^{-14} J
 (c) 3.6×10^{-19} J (d) 5.76×10^{-14} J
19. Choose correct option to complete the net effect of fusion reaction occurs in the Sun.
 $4 {}^1_1\text{H} + 2e^- \rightarrow \dots + 2\nu + 6\gamma + \dots$
 (a) ${}^3_2\text{He}$, 5.49MeV (b) ${}^4_2\text{He}$, 26.7MeV
 (c) ${}^4_2\text{He}$, 22.86MeV (d) ${}^3_2\text{He}$, 0.42MeV
20. ____ pair is called isotones.
 (a) ${}^{198}_{80}\text{Hg}$, ${}^{197}_{79}\text{Au}$ (b) ${}^3_1\text{H}$, ${}^3_2\text{He}$
 (c) ${}^{214}_{32}\text{Pb}$, ${}^{214}_{83}\text{Bi}$ (d) ${}^{12}_6\text{C}$, ${}^{14}_6\text{C}$
21. What is the current flowing through the given circuit? A given diode is an ideal diode.
- 
- (a) 0.1 A (b) 100 mA
 (c) 50 mA (d) 10mA
22. When a reverse bias is applied to a p-n junction, it ____ .
 (a) increases the majority carrier current and lowers the potential barrier
 (b) increases the majority carrier current

- (c) lowers the potential barrier
(d) raises the potential barrier

23. A filter circuit used in a rectifier, the value of load resistance and capacitance are 200Ω and $15\mu\text{F}$. Then the value of time constant is ____ .
(a) 1.33 ms (b) 3 ms
(c) 7.5 ms (d) $0.3\mu\text{s}$
24. The electric field due to point charge $2q$ at a distance r is E . Now, charge q is uniformly distributed over a thin spherical shell of radius R , the electric field at a distance $\frac{r}{2}$ ($r \gg R$) from the centre of the thin spherical shell is $E' =$ ____ .
(a) $4E$ (b) $2E$
(c) E (d) $\frac{E}{2}$
25. 15 charges, each of value q are placed on X - axis at an equal distance $0.5R$. The maximum electric flux associated with the spherical closed surface of radius $1.5R$, in which one of the charges at the centre is ____
(a) $\frac{5q}{\epsilon_0}$ (b) $\frac{7q}{\epsilon_0}$
(c) Zero (d) $\frac{15q}{\epsilon_0}$
26. In the absence of gravity, a charge q and mass $2m$ is placed stationary in a uniform electric field of intensity E . When the charge is released, its speed after n seconds is ____ .
(a) $2mqE$ (b) $\frac{qEn}{m}$
(c) $\frac{qEn}{2m}$ (d) $\frac{2qEn}{m}$
27. As shown in figure charges $+q, +q, -q$ and $-q$ are placed on the vertices of square, each side length is $2l$. The electric potential at mid-point 'A' of charges $+q$ and $+q$ is ____ .



- (a) Zero (b) $\frac{2kq}{l} \left[1 + \frac{1}{\sqrt{5}} \right]$
(c) $\frac{kq}{l} \left[1 - \frac{1}{\sqrt{5}} \right]$ (d) $\frac{2kq}{l} \left[1 - \frac{1}{\sqrt{5}} \right]$
28. Charge $1.6 \times 10^{-7}\text{C}$ are distributed uniformly over the surface of spherical conductor of radius R . The ratio of electric potential inside the spherical conductor to the electric field on the surface is ____ .
(a) $1.6 \times 10^{-7}R^2$ (b) R
(c) $1.6 \times 10^{-7}R$ (d) $\frac{1}{R}$
29. The potential difference between two plates of parallel plate capacitor is 2 V. As shown in figure electrons are placed at point P and Q. So

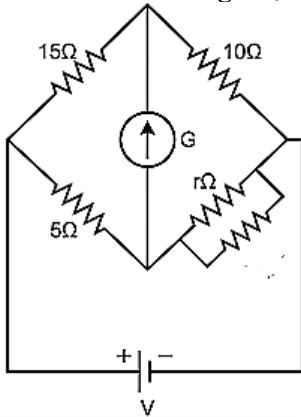


- (a) Electric forces acting on both the electrons are same.
 (b) Electric force acting on the electron at point P is greater than the electron at point Q.
 (c) Electric force acting on the electron at point P is less than the electron at point Q.
 (d) Electric forces acting on both the electrons are zero.

30. The drift velocity of an electron is v_d in a conductor of area of cross-section A and carries a current I . Now, the area of cross-section and current flowing through the conductor are double, then new drift velocity of the electron is ____.

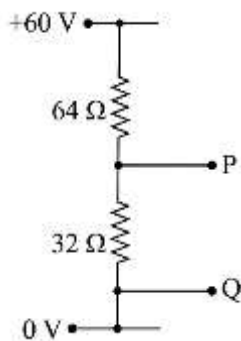
- (a) $\frac{v_d}{2}$ (b) $\frac{v_d}{4}$
 (c) $4v_d$ (d) v_d

31. As shown in the figure, balanced condition of Wheatstone Bridge is $n =$ ____



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

32. In the given circuit, potential difference between points P and Q is ____.



- (a) 128 V (b) 20 V
 (c) 96 V (d) 60 V

33. The ratio of magnetic field at the centre of the ring of radius R to the point on the axis at a distance $2\sqrt{2}R$ from its centre is ____.

- (a) 27:1 (b) 81:1
 (c) 1:9 (d) $1:2\sqrt{2}$

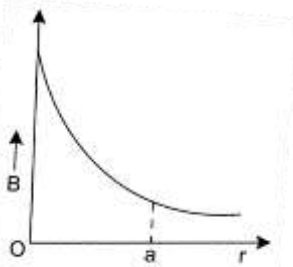
34. The dimensional formula of current sensitivity of moving coil galvanometer is

- (a) $[L^2]$ (b) $[M^1 L^2 T^{-2} A^{-1}]$
 (c) $[A^{-1}]$ (d) $[M^1 L^2 T^{-2}]$

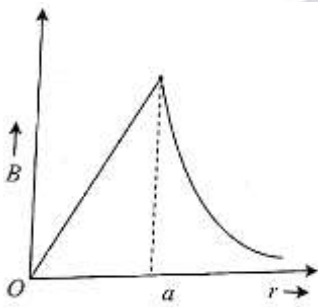
35. The horizontal component of the Earth's magnetic field at a certain place is $3 \times 10^{-5} \text{ T}$ and the direction of the field is from the geographic South to the geographic North. A very long straight conductor is carrying a steady current of 1 A. What is the force per unit length on it when it is placed on a horizontal table and the direction of current is South to North?

- (a) Zero (b) $1 \times 10^{-5} \text{ Nm}^{-1}$
 (c) $6 \times 10^{-5} \text{ Nm}^{-1}$ (d) $9 \times 10^{-5} \text{ Nm}^{-1}$

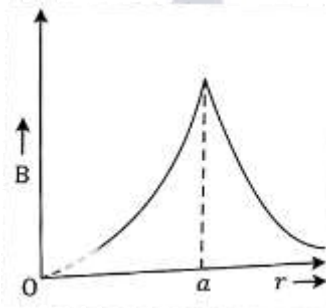
36. The magnetic field produced by a very long straight conducting wire of radius ' a ' and carrying current I is B , then the graph of magnetic field $B \rightarrow$ distance (r , (perpendicular to the axis of the wire) is ____.



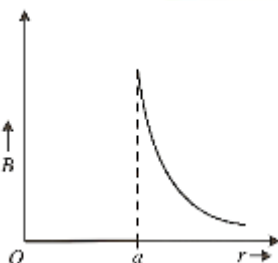
(a)



(b)



(c)

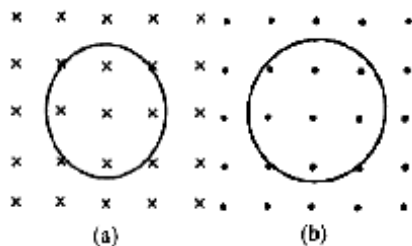


(d)

37. A paramagnetic substance is placed in a non-uniform magnetic field, then

- (a) perform continuous rotation
 (b) to move from a region of weak magnetic field to strong magnetic field
 (c) remain stationary
 (d) to move from a region of strong magnetic field to weak magnetic field

38. As shown in figure two identical conducting rings of radius r are placed in magnetic field. In figure (a) magnetic field increasing at the rate of 0.3 T/s and in figure(b) magnetic field decreasing at the rate of 0.2 T/s . The direction of current in ring (a) and ring(b), when observe from top are ____ .



- (a) Clockwise, Anticlockwise
 (b) Anticlockwise, Anticlockwise
 (c) Clockwise, Clockwise
 (d) Anticlockwise, Clockwise
39. A pair of adjacent coils has a mutual inductance of 2 H . If the current in one coil changes from 0 to 30 A in 0.15 s , what is the change of flux linkage with the other coil?
 (a) 300 Wb (b) 6 Wb
 (c) 60 Wb (d) 15 Wb
40. In an AC generator, induced emf $\varepsilon = 0$ at $t = 0$, then its value ____ .
 (a) minimum at time $\frac{2\pi}{3\omega}$
 (b) minimum at time $\frac{\pi}{2\omega}$
 (c) maximum at time $\frac{2\pi}{\omega}$
 (d) maximum at time $\frac{\pi}{2\omega}$

CHEMISTRY

41. Half life period for certain zero order reaction is 10 min . then how much time is required for this reaction to complete 100% ?
 (a) 20 min . (b) 30 min .
 (c) 60 min . (d) 40 min .
42. The half-life for radioactive decay of ^{14}C is 5730 years. An archaeological artifact containing wood had only 80% of the ^{14}C found in a living tree. Which is the correct formula for age (t) of the sample?
 (a) $t = \frac{0.3}{5730} \log \frac{20}{100}$ (b) $t = \frac{5730}{0.3} \log \frac{100}{80}$
 (c) $t = \frac{0.3}{5730} \log \frac{100}{20}$ (d) $t = \frac{5730}{0.3} \log \frac{80}{100}$
43. According to Arrhenius equation which of the following statement is correct?
 (a) Decrease in temperature or increase in Activation Energy will increase rate of reaction.
 (b) Increase in temperature and increase in Activation Energy will increase rate of reaction.
 (c) Increase in temperature or decrease in Activation Energy will increase rate of reaction.
 (d) Decrease in temperature and decrease in Activation Energy will increase rate of reaction.
44. Select correct reaction for the given rate.

$$\text{rate} = -6 \frac{d[\text{A}]}{dt} = -4 \frac{d[\text{B}]}{dt} = 3 \frac{d[\text{C}]}{dt} = 4 \frac{d[\text{D}]}{dt}$$
 (a) $2 \text{ A} + 3 \text{ B} \rightarrow 4 \text{ C} + 3 \text{ D}$
 (b) $6 \text{ A} + 4 \text{ B} \rightarrow 3 \text{ C} + 4 \text{ D}$
 (c) $3 \text{ A} + 2 \text{ B} \rightarrow 3 \text{ C} + 4 \text{ D}$
 (d) $3 \text{ A} + 2 \text{ B} \rightarrow 4 \text{ C} + 3 \text{ D}$
45. The highest Mn fluoride is MnF_4 whereas the highest oxide is Mn_2O_7 because ____
 (a) Fluorine does not have d-orbital.
 (b) Electronegativity of oxygen is more than fluorine.

- (c) Atomic volume of oxygen is less than fluorine.
(d) Oxygen forms multiple bonds and fluorine form single bond.
46. Identify the metal whose divalent ion has 'spin only' magnetic moment $\sqrt{35} B$ '

(a) Cr (b) Mn

(c) Fe (d) Co
47. In acidic solution MnO_4^{2-} convert into ____ .

(a) MnO_4^- and MnO_2

(b) MnO_4^- and MnO

(c) MnO and Mn_2O_3

(d) MnO_2 and Mn_2O_3
48. What is the oxidation state of Ti in Zeigler catalyst?

(a) +3 (b) +5

(c) +4 (d) +2
49. If $[Co(NH_3)_x(NO_2)_y]$ shows facial and meridional isomers, identify values of x and y .

(a) $x = 4, y = 2$ (b) $x = 2, y = 2$

(c) $x = 2, y = 4$ (d) $x = 3, y = 3$
50. Which statement is correct?

(a) $[NiCl_4]^{2-}$ is an inner orbital complex where as $[Ni(CN)_4]^{2-}$ is an outer orbital complex.

(b) $[NiCl_4]^{2-}$ is an outer orbital complex where as $[Ni(CN)_4]^{2-}$ is an inner orbital complex.

(c) $[NiCl_4]^{2-}$ and $[Ni(CN)_4]^{2-}$ are inner orbital complexes.

(d) $[NiCl_4]^{2-}$ and $[Ni(CN)_4]^{2-}$ are outer orbital complexes.
51. What will be the value of Van't Hoff factor (i) for following coordination compound? (compound completely dissociate in aqueous solution) Potassium trioxalatoaluminate (III)

(a) 4 (b) 5

(c) 2 (d) 3
52. According to crystal field theory for which of the following coordination entities Δ_0 is maximum?

(a) $[CoCl(NH_3)_5]^{2+}$ (b) $[Co(NH_3)_6]^{3+}$

(c) $[Co(CN)_6]^{3-}$ (d) $[Co(NH_3)_5(H_2O)]^{3+}$
53. Which of the following compound is not allylic halide?

(a) 1-Bromo-2-methylbut-2-ene

(b) 1-Bromobut-2-ene

(c) 3-Bromo-2-methylbut-1-ene

(d) 2-Bromo-2-methylbut-2-ene
54. How many minimum numbers of C -atom containing mono haloalkane shows Optical Isomerism?

(a) 6 (b) 4

(c) 3 (d) 5
55. Which of the following compound has highest reactivity towards S_N2 reaction?

(a) 1-Bromo-3-methylbutane

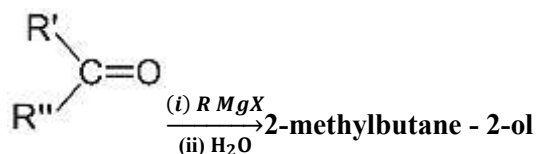
(b) 1-Bromo-2,2-dimethylpropane

(c) 1-Bromo-2-methylbutane

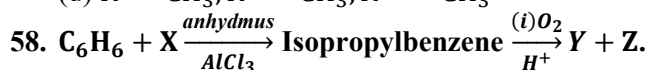
(d) 1-Bromobutane
56. ____ compound is slowly oxidised by air in presence of light to an extremely poisonous gas, carbonyl chloride.

(a) Trichloro methane (b) Methylene chloride

(c) Chlorobenzene (d) Chloromethane
57. Identify R' , R'' and R''' for the following reaction

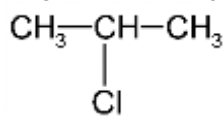


- (a) $\text{R}' = \text{C}_2\text{H}_5, \text{R}'' = \text{C}_2\text{H}_5, \text{R}''' = \text{CH}_3$
 (b) $\text{R}' = \text{CH}_3, \text{R}'' = \text{C}_2\text{H}_5, \text{R}''' = \text{CH}_3$
 (c) $\text{R}' = \text{C}_2\text{H}_5, \text{R}'' = \text{CH}_3, \text{R}''' = \text{C}_2\text{H}_5$
 (d) $\text{R}' = \text{CH}_3, \text{R}'' = \text{CH}_3, \text{R}''' = \text{CH}_3$



In this reaction X, Y and Z are ____ respectively.

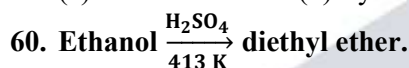
- (a) $\text{CH}_3\text{CH}_2\text{Cl}, \text{C}_6\text{H}_5\text{OH}, \text{CH}_3\text{COCH}_3$
 (b) $\text{CH}_3\text{CH}_2\text{Cl}, \text{C}_6\text{H}_4(\text{OH})_2, \text{CH}_3\text{CHO}$
 (c) $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}, \text{C}_6\text{H}_5\text{OH}, \text{CH}_3\text{COCH}_3$



- (d) _____, $\text{C}_6\text{H}_5\text{CHO}, \text{CH}_3\text{COCH}_3$

59. Which enzyme is used for fermentation of glucose?

- (a) Sucrase (b) Maltase
 (c) Invertase (d) Zymase



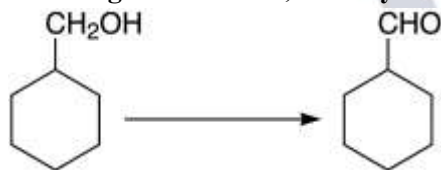
The above reaction is which type?

- (a) Substitution nucleophilic bimolecular
 (b) Substitution electrophilic bimolecular
 (c) Substitution nucleophilic unimolecular
 (d) Substitution electrophilic unimolecular

61. Identify the functional group present in Vanillin.

- (a) $-\text{COOH}, -\text{OH}, -\text{OC}_2\text{H}_5$
 (b) $-\text{CHO}, -\text{OH}, -\text{OCH}_3$
 (c) $-\text{COOH}, -\text{CH}_3, -\text{OCH}_3$
 (d) $-\text{CHO}, -\text{OH}, -\text{OC}_2\text{H}_5$

62. For the given reaction, identify the proper reagent.



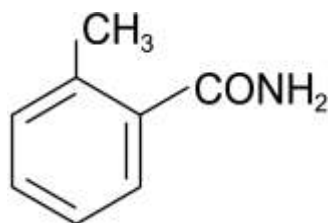
- (a) $\text{KMnO}_4/\text{H}_2\text{SO}_4$
 (b) $\text{O}_3/\text{H}_2\text{O} - \text{Zn dust}$
 (c) $\text{C}_5\text{H}_5\text{NH}^+\text{CrO}_3\text{Cl}^-$
 (d) $\text{CrO}_3 + (\text{CH}_3\text{CO})_2\text{O}$

63. Which reagent is used to distinguish Acetophenone and Benzophenone?

- (a) $\text{Cu}^{2+}/\text{OH}^-$ (b) $\text{Br}_2/\text{H}_2\text{O}$
 (c) $[\text{Ag}(\text{NH}_3)_2]^+/\text{OH}^-$ (d) NaOI

64. For which compound pKa is highest?

- (a) HCOOH
 (b) $\text{CH}_3\text{CH}_2\text{COOH}$
 (c) $\text{C}_6\text{H}_5\text{CH}_2\text{COOH}$
 (d) $\text{ClCH}_2\text{CH}_2\text{COOH}$



65. $\xrightarrow{\text{NaOBr}}$ Product "X".

Which statement is correct for Product "X"?

- (a) It is soluble in $\text{NaOH}_{(\text{aq})}$.
- (b) It does not react with Hinsberg's reagent.
- (c) It has one Isomer of 2° amine.
- (d) It does not give Azo dye test.

66. The most reactive amine towards dil. HCl is ____ .

- (a) $(\text{CH}_3)_2\text{NH}$
- (b) $(\text{CH}_3)_3\text{N}$
- (c) CH_3NH_2
- (d) $\text{C}_6\text{H}_5\text{NH}_2$

67. **Assertion:** Only small amount of HCl is required in reduction of Nitro compound with iron scrap.

Reason: FeCl_2 , formed gets hydrolysed to release HCl during the reaction.

- (a) Assertion is wrong but Reason is correct.
- (b) Both Assertion and Reason are correct, Reason give correct explanation for Assertion.
- (c) Assertion is correct but Reason is wrong.
- (d) Both Assertion and Reason are correct, Reason does not give correct explanation for Assertion.

68. Which type of solution of phenol is required to prepare Orange dye by coupling reaction?

- (a) Alkaline solution of phenol
- (b) Neutral solution of phenol
- (c) Acidic solution of phenol
- (d) CCl_4 solution of phenol

69. ____ nucleotide is not present in RNA.

- (a) Uracil containing
- (b) Adenine containing
- (c) Cytosine containing
- (d) Thymine containing

70. Each polypeptide in a protein has amino acids linked with each other in a specific sequence. This sequence of amino acids is called ____ structure of that protein.

- (a) Quaternary structure
- (b) Tertiary structure
- (c) Primary structure
- (d) Secondary structure

71. Deficiency of ____ vitamin causes scurvy disease.

- (a) Pyridoxine
- (b) Ascorbic acid
- (c) Riboflavin
- (d) Thiamine

72. Reaction with which reagent glucose form oxime?

- (a) CH_3OH
- (b) NH_2OH
- (c) NH_4OH
- (d) NH_2NH_2

73. What will be mass percentage of aqueous solution of NaOH in which mole fraction of NaOH is 0.2 ?

- (a) 64.86% W/W
- (b) 35.71% W/W
- (c) 23.38% W/W
- (d) 27.78% W/W

74. For which of the following mixture $\Delta_{\text{mix}}H > 0$?

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

75. Which is the correct order for solubility of following compound in n-octane (at Identical Condition)

- (I) Cyclohexane (II) KCl
(III) CH₃OH (IV) CH₃CN

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

76. ___ solution is hypertonic with reference to fluid inside the blood cell.

- (a) 0.8% W/VNaCl (b) 0.6% W/VNaCl
(c) 0.9% W/VNaCl (d) 1.2% W/VNaCl

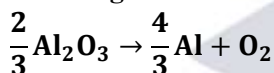
77. Which relation is correct for $\Lambda_m^0(\text{H}_2\text{O})$?

- (a) $\Lambda_m^0(\text{HCl}) + \Lambda_m^0(\text{NH}_4\text{Cl}) - \Lambda_m^0(\text{NH}_4\text{OH})$
(b) $\Lambda_m^0(\text{HCl}) + \Lambda_m^0(\text{NaOH}) - \Lambda_m^0(\text{NaCl})$
(c) $\Lambda_m^0(\text{HNO}_3) + \Lambda_m^0(\text{NaNO}_3) - \Lambda_m^0(\text{NaOH})$
(d) $\Lambda_m^0(\text{HNO}_3) + \Lambda_m^0(\text{Ba(OH)}_2) - \Lambda_m^0(\text{Ba(NO}_3)_2)$

78. For Daniell cell $E_{\text{cell}}^{\circ} = 1.1 \text{ V}$. How Kc is represented for reaction occurring in Daniell cell?

- (a) $K_c = 10^{2.2/0.059}$ (b) $K_c = 10^{-0.059/1.1}$
(c) $K_c = 10^{-2.2 \times 0.059}$ (d) $K_c = 10^{0.059/1.1}$

79. For the given reaction how much quantity of electricity in Coulomb is required?



- (a) $6 \times 96500\text{C}$ (b) $2 \times 96500\text{C}$
(c) $3 \times 96500\text{C}$ (d) $4 \times 96500\text{C}$

80. Which statement is correct for ΔG and E_{cell} ? (For cell reaction)

- (a) ΔG is intensive and E_{cell} is extensive property.
(b) Both ΔG and E_{cell} are intensive properties.
(c) ΔG is extensive and E_{cell} is intensive property.
(d) Both ΔG and E_{cell} are extensive properties.

MATHEMATICS

81. The Cartesian equation of the line through the point $(5, -2, 4)$ and which is parallel to the vector $3\hat{i} - 2\hat{j} + 8\hat{k}$ is ____

- (a) $\frac{x-5}{3} = \frac{y+2}{-2} = \frac{z-4}{8}$ (b) $\frac{x+5}{-3} = \frac{y-2}{2} = \frac{z+4}{8}$
(c) $\frac{x+5}{3} = \frac{y-2}{-2} = \frac{z+4}{8}$ (d) $\frac{x-5}{-3} = \frac{y+2}{2} = \frac{z-4}{8}$

82. The shortest distance between the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z+4}{6}$ and $\frac{x-3}{2} = \frac{y-3}{3} = \frac{z+5}{6}$ is ____.

- (a) $\sqrt{\frac{209}{49}}$ (b) $\sqrt{\frac{293}{49}}$
(c) $\sqrt{\frac{209}{7}}$ (d) $\sqrt{\frac{293}{7}}$

83. The angle between the pair of lines $\vec{r} = -3\hat{i} + \hat{j} + 3\hat{k} + \lambda(3\hat{i} + 5\hat{j} + 4\hat{k})$ and $\vec{r} = -\hat{i} + 4\hat{j} + 5\hat{k} + \mu(\hat{i} + \hat{j} + 2\hat{k})$ is ____

- (a) $\sin^{-1}\left(\frac{8\sqrt{3}}{15}\right)$ (b) $\cos^{-1}\left(\frac{6\sqrt{2}}{15}\right)$
(c) $\cos^{-1}\left(\frac{8\sqrt{3}}{15}\right)$ (d) $\sin^{-1}\left(\frac{6\sqrt{2}}{15}\right)$

84. The goordi nates of the corner points of the bounded feasible region are

$(0, 0)$, $(0, 40)$, $(20, 40)$, $(60, 20)$, $(60, 0)$. The maximum of the objective function $z = 40x + 30y$ is ____.

- (a) 2000 (b) 3400
(c) 2400 (d) 3000

85. The maximum value of $z = 5x + 3y$ subject to constraints $3x + 5y \leq 15, x \geq 0, y \geq 0$ is :
- (a) 10 (b) 25
(c) 0 (d) 9
86. Two events E and F are independent. If $P(E) = \frac{3}{5}$ and $P(F) = \frac{3}{10}$ then $P(E'/F) + P(F'/E) =$ _____
- (a) $\frac{1}{10}$ (b) $\frac{11}{10}$
(c) $\frac{9}{10}$ (d) $\frac{10}{11}$
87. Let A and B be two events such that $P(A) = \frac{3}{8}, P(B) = \frac{5}{8}$ and $P(A \cup B) = \frac{3}{4}$. Then $P(A' | B) - P(A | B) =$ _____
- (a) $\frac{1}{5}$ (b) $\frac{3}{5}$
(c) $\frac{2}{5}$ (d) $\frac{4}{5}$
88. A man is known to speak truth 4 out of 5 times. He throws a die and reports that it is a six. The probability that actually there was a six is
- (a) $\frac{5}{9}$ (b) $\frac{4}{9}$
(c) $\frac{5}{35}$ (d) $\frac{4}{35}$
89. Let $A = \{1, 2, 3\}$. Then number of relations containing $(1, 2)$ which are symmetric and transitive but not reflexive is ____ .
- (a) 4 (b) 2
(c) 3 (d) 1
90. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be defined as $f(x) = x^3$. Then f is ____
- (a) Neither one - one nor onto
(b) Many - one and onto
(c) One - one but not onto
(d) One - one and onto
91. $\tan^{-1} \left[\frac{\sqrt{2}}{\sqrt{3}} \cos \left(5 \sin^{-1} \frac{1}{\sqrt{2}} \right) \right] =$ ____
- (a) $-\pi/3$ (b) $\pi/3$
(c) $-\pi/6$ (d) $\pi/6$
92. If $y = 3 \sin^{-1} x + \sin^{-1}(3x - 4x^3)$ for all $x \in [-1/2, 1/2]$, then
- (a) $-\pi \leq y \leq \pi$ (b) $-\pi/3 \leq y \leq \pi/3$
(c) $-\pi/2 \leq y \leq \pi/2$ (d) $-\pi/6 \leq y \leq \pi/6$
93. The number of real solutions of the equation $\tan^{-1} \sqrt{x(x+1)} + \sin^{-1} \sqrt{x^2 + x + 1} = \frac{\pi}{2}$ is ____
- (a) 1 (b) 3
(c) 2 (d) 4
94. $\begin{vmatrix} \cos^2 \theta & -\sin^2 \theta \\ \sin^2 \theta & \cos^2 \theta \end{vmatrix} =$ ____
- (a) $\frac{1}{2} - \frac{1}{2} \cos^2 2\theta$
(b) $\frac{1}{4} (3 + \cos 4\theta)$
(c) $1 + \frac{1}{2} \sin^2 2\theta$
(d) $1 + 2 \sin^2 \theta \cdot \cos^2 \theta$
95. Let A be an invertible square matrix of order 3×3 . Then $|(adj A) \cdot A|$ is ____ .
- (a) $3|A|$ (b) $|A|^2$
(c) $|A|^3$ (d) $|A|$

96. Find the area of a triangle given that midpoints of its sides are $(2, 7)$, $(1, 1)$ and $(10, 8)$.

- (a) $\frac{47}{4}$ (b) 47
(c) 94 (d) $\frac{47}{2}$

97. If the matrix $\begin{bmatrix} x & x^2 + 3x & 5 \\ -2x - 6 & x^2 & -4x - 2 \\ 5 & x^2 + 2 & x^3 \end{bmatrix}$ is a symmetric matrix, then the value of x is ____.

- (a) -2 (b) 3, 2
(c) -3 (d) -3; -2

98. If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, then $(A + I)^3 + (A - I)^3 =$ ____.

- (a) 8A (b) 8I
(c) 6A (d) 6I

99. For matrix $A = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$, if $A^2 - 2I = KA$ then $K =$ ____

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

100. $\frac{d}{dx}(5^{\log x}) =$ ____

- (a) $\log 5 \cdot x^{\log(5e)}$
(b) $\log_x 5 \cdot 5^{\log x}$
(c) $\log 5 \cdot x^{\log(\frac{5}{e})}$
(d) $\log 5 \cdot 5^{\log x}$

101. If $x = a \cos \theta$, $y = a \sin \theta$, then $\frac{d^2 y}{dx^2} =$ ____ ($a \neq 0$; $\theta \neq k\pi$, $k \in \mathbb{Z}$)

- (a) $-\frac{1}{a} \operatorname{cosec}^3 \theta$ (b) $-\frac{1}{a} \operatorname{cosec}^2 \theta \cdot \sec \theta$
(c) $\frac{1}{a} \cot^3 \theta$ (d) $\operatorname{cosec}^2 \theta$

102. $\frac{d}{dx}[3\sin(60^\circ - x^\circ) - 4\cos^3(30^\circ + x^\circ)] =$ ____

- (a) $-\frac{\pi}{60} \sin(3x^\circ)$ (b) $\frac{\pi}{60} \sin(3x^\circ)$
(c) $\frac{\pi}{60} \cos(3x^\circ)$ (d) $-\frac{\pi}{60} \cos(3x^\circ)$

103. If $f(x) = \begin{cases} \frac{x^3 + x^2 - 16x + 20}{(x-2)^2} & , x \neq 2 \\ k & , x = 2 \end{cases}$ is continuous at $x = 2$ then $k =$ ____.

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

104. The total cost $C(x)$ in Rupees, associated with the production of x units of an item is given by $C(x) = 0.05x^3 - 0.2x^2 + 3x + 500$. The marginal cost, where $x = 3$ is ____ (in Rupees)

- (a) 3.15 (b) 30.15
(c) 3.015 (d) 30.015

105. The function $f(x) = \tan x - 4x$ is strictly decreasing on ____.

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

106. The absolute minimum value of the function $f(x) = x^3 - 18x^2 + 96x$, $x \in [0, 9]$ is ____.

- (a) -160 (b) 0
(c) -135 (d) 126

107. If $\int \frac{3e^x - 5e^{-x}}{4e^x + 5e^{-x}} dx = px + q \cdot \log|4e^x + 5e^{-x}| + C$, then

- (a) $p = 1/8, q = -7/8$

(b) $p = 1/8, q = 7/8$

(c) $p = -1/8, q = -7/8$

(d) $p = -1/8, q = 7/8$

108. $\int_0^{\pi/4} \sqrt{1 + \sin 2x} dx = \underline{\hspace{2cm}}$

(a) 2 (b) 1

(c) $1/2$ (d) 0

109. $\int e^{\tan^{-1}x} \cdot \left(\frac{1+x+x^2}{1+x^2}\right) dx = \underline{\hspace{2cm}} + C$

(a) $\frac{e^{\tan^{-1}x}}{x}$ (b) $\frac{1+x^2}{x} \cdot e^{\tan^{-1}x}$

(c) $x \cdot e^{\tan^{-1}x}$ (d) $\frac{x \cdot e^{\tan^{-1}x}}{1+x^2}$

110. $\int \frac{dx}{\sqrt{4x-9x^2}} = L C$

(a) $\frac{1}{3} \sin^{-1} \left(\frac{9x-2}{2}\right)$ (b) $\frac{1}{9} \sin^{-1} \left(\frac{3x-2}{2}\right)$

(c) $\frac{1}{9} \sin^{-1} \left(\frac{2x-3}{3}\right)$ (d) $\frac{1}{2} \sin^{-1} \left(\frac{9x-3}{2}\right)$

111. If $\int \tan^{-1} x dx = Ax \cdot \tan^{-1} x + B \log(1+x^2) + C$ then, $A + B = \underline{\hspace{2cm}}$

(a) -1 (b) $1/2$

(c) 1 (d) $-1/2$

112. The area bounded by the curve $y = \sin x$ between $x = -\pi/2$ and $x = \pi/2$ is $\underline{\hspace{2cm}}$

(a) 4 (b) 2

(c) 3 (d) 1

113. Area of the region bounded by the curve $x^2 = 4y$ and the line $y = 3$ is

(a) $4\sqrt{3}$ (b) $2\sqrt{3}$

(c) $\sqrt{3}$ (d) $3\sqrt{3}$

114. Area of the region bounded by the curve $y = x^3$, x -axis and the ordinates $x = -1$ and $x = 2$ is

(a) $17/4$ (b) $\frac{19}{4}$

(c) $15/4$ (d) $9/4$

115. The degree of the differential equation $\left(1 + \frac{dy}{dx}\right)^{\frac{1}{2}} = \left(\frac{d^2y}{dx^2}\right)^{1/b}$ is $\underline{\hspace{2cm}}$

(a) 4 (b) 2

(c) 3 (d) 1

116. The general solution of the differential equation $\frac{dy}{dx} = e^{y-x}$ is $\underline{\hspace{2cm}}$.

(a) $e^{-x} - e^{-y} = c$ (b) $e^x - e^y = c$

(c) $e^{-x} - e^y = c$ (d) $e^x - e^{-y} = c$

117. The Integrating Factor of the differential equation $x \cdot \frac{dy}{dx} + 2y = x^2, (x \neq 0)$ is $\underline{\hspace{2cm}}$

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

(c) e^{-y} (d) x^2

118. $\hat{i} \cdot (\hat{k} \times \hat{j}) + \hat{j} \cdot (\hat{i} \times \hat{k}) + \hat{k} \cdot (\hat{i} \times \hat{j}) = \underline{\hspace{2cm}}$.

(a) -3 (b) 1

(c) -1 (d) 0

119. A unit vector perpendicular to each of the vectors $(\vec{a} + \vec{b})$ and $(\vec{a} - \vec{b})$ is $\underline{\hspace{2cm}}$ where $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ and

$\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}$

(a) $-\frac{1}{\sqrt{6}}\hat{i} + \frac{2}{\sqrt{6}}\hat{j} - \frac{1}{\sqrt{6}}\hat{k}$

(b) $-\frac{1}{\sqrt{12}}\hat{i} + \frac{2}{\sqrt{12}}\hat{j} - \frac{1}{\sqrt{12}}\hat{k}$

(c) $\frac{1}{\sqrt{12}}\hat{i} + \frac{2}{\sqrt{12}}\hat{j} - \frac{1}{\sqrt{12}}\hat{k}$

(d) $\frac{1}{\sqrt{6}}\hat{i} + \frac{2}{\sqrt{6}}\hat{j} + \frac{1}{\sqrt{6}}\hat{k}$

120. Area of a rectangle having vertices A, B, C and D with position vectors $-\hat{i} + \frac{1}{2}\hat{j} + 4\hat{k}, \hat{i} + \frac{1}{2}\hat{j} + 4\hat{k}, \hat{i} - \frac{1}{2}\hat{j} + 4\hat{k}$ and $-\hat{i} - \frac{1}{2}\hat{j} + 4\hat{k}$, respectively is ____ .

(a) 4

(b) 1

(c) 2

(d) $\frac{1}{2}$

