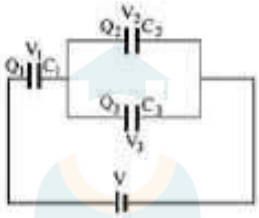
VITEEE SAMPLE PAPER 2023

Max. Marks : 125 **Time : 2½ hrs**

PART - I : PHYSICS

1. In an inelastic collision, which of the following does not remain conserved?
   (a) Momentum
   (b) kinetic energy
   (c) Total energy
   (d) Neither momentum nor kinetic energy

2. Three capacitors C_1, C_2 and C_3 are connected to a battery as shown. With symbols having their usual meanings, the correct conditions are



   (a) $Q_1 = Q_2 = Q_3$ and $V_1 = V_2 = V$
   (b) $V_1 = V_2 = V_3 = V$
   (c) $Q_1 = Q_2 + Q_3$ and $V = V_1 + V_2$
   (d) $Q_2 = Q_3$ and $V_2 = V_3$

3. A parallel plate condenser with oil between the plates (dielectric constant of oil K = 2) has a capacitance C. If the oil is removed, then capacitance of the capacitor becomes

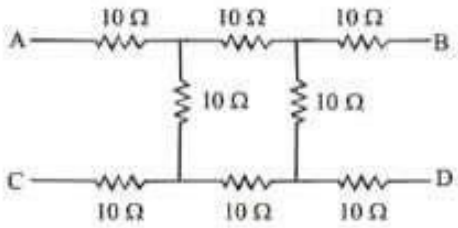
   (a) $\sqrt{2}C$ (b) $2C$

   (c) $\frac{C}{\sqrt{2}}$ (d) $\frac{C}{2}$

4. At the centre of a cubical box + Q charge is placed. The value of total flux that is coming out a wall is

   (a) Q/ε_o (b) $Q/3\varepsilon_o$
   (c) $Q/4\varepsilon_o$ (d) $Q/6\varepsilon_o$

5. What will be the equivalent resistance of circuit shown in figure between two points A and D



   (a) 10Ω (b) 20Ω
   (c) 30Ω (d) 40Ω

6. According to stokes law, the relation between terminal velocity (v_t) and viscosity of the medium (n) is
   (a) $v_t = n$ (b) $v_t \propto n$
   (c) $v_t \propto \frac{1}{n}$
   (d) v_t is independent of n.

7. Kirchhoff's first law, i.e. $\Sigma i = 0$ at a junction, deals with the conservation of
   (a) charge (b) energy
   (c) momentum (d) angular momentum

8. The potential difference between the terminals of a cell in an open circuit is 2.2 V. When a resistor of 5Ω is connected across the terminals of the cell, the potential difference between the terminals of the cell is found to be 1.8 V. The internal resistance of the cell is

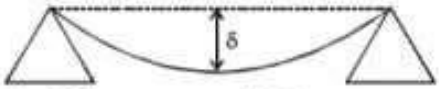
   (a) $\frac{7}{12}\Omega$ (b) $\frac{10}{9}\Omega$

   (c) $\frac{9}{10}\Omega$ (d) $\frac{12}{7}\Omega$

9. Direct current is passed through a copper sulphate solution using platinum electrodes. The elements liberated at the electrodes are
   (a) copper at anode and sulphur at cathode
   (b) sulphur at anode and copper at cathode
   (c) oxygen at anode and copper at cathode
   (d) copper at anode and oxygen at cathode

10. Two electric bulbs, one of 200 V, 40W and other of 200 V, 100W are connected in a domestic circuit. Then
(a) they have equal resistance
(b) the resistance of 40W bulb is more than 100W bulb
(c) the resistance of 100W bulb is more than 40 W bulb
(d) they have equal current through them

11. A beam of metal supported at the two edges is loaded at the centre. The depression at the centre is proportional to



(a) Y^2 (b) Y
(c) 1/Y (d) $1/Y^2$

12. A charged particle of charge q and mass m enters perpendicularly in a magnetic field $\vec{B}$. Kinetic energy of the particle is E; then frequency of rotation is

(a) $\frac{qB}{m\pi}$ (b) $\frac{qB}{2\pi m}$

(c) $\frac{qBE}{2\pi m}$ (d) $\frac{qB}{2\pi E}$

13. If N is the number of turns in a coil, the value of self inductance varies as
(a) N^0 (b) N
(c) N^2 (d) N^{-2}

14. In an A.C. circuit with voltage V and current I the power dissipated is
(a) dependent on the phase between V and I
(b) $\frac{1}{\sqrt{2}}$ VI
(c) $\frac{1}{2}$ VI
(d) VI

15. A magnetic field of 2×10^{-2} T acts at right angles to a coil of area 100 cm^2, with 50 turns. The average e.m.f. induced in the coil is 0.1 V, when it is removed from the field in t sec. The value of t is
(a) 10 s (b) 0.1 s
(c) 0.01 s (d) 1 s

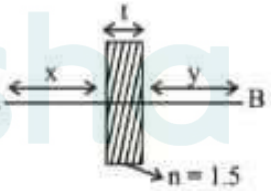
16. Two coils of self inductances 2 mH and 8 mH are placed so close together that the effective flux in one coil is completely linked with the other. The mutual inductance between these coils is
(a) 6mH (b) 4mH
(c) 16mH (d) 10mH

17. Which one of the following electromagnetic radiations has the smallest wavelength?
(a) Ultraviolet waves (b) X-rays
(c) γ-rays (d) Microwaves

18. Which one of the following phenomena is not explained by Huygen's construction of wavefront?
(a) Refraction (b) Reflection
(c) Diffraction (d) Orgin of spectra

19. Two light waves having their intensities in the ratio 16 : 9 interfere to produce interference pattern. What is the ratio of maximum intensity to minimum intensity in this pattern ?
(a) 4 : 3 (c) 25 : 7
(b) 625 : 49 (d) 49 : 1

20. A slab of thickness t and refractive index 1.5 is placed in between point A and B as shown in the figure given below. The optical path length between A and B is



(a) $\left(x+\frac{t}{2}+y\right)$ (b) $(x+t+y)$

(c) $\left(x+\frac{3}{2}t+y\right)$ (d) $\left(x+\frac{5}{2}t+y\right)$

21. If according to the Bohr model of the hydrogen atom, the ionization energy of the atom in its ground state is 13.6 eV, then the energy required to ionize the atom from its first excited state will be
(a) 6.8 eV (b) 3.4 eV
(c) 1.7 eV (d) 0.85 eV

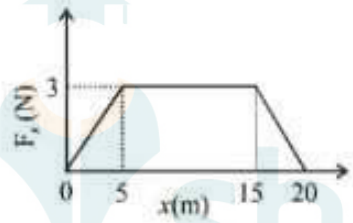
22. Match List-I with List-II and select the correct answer using the codes given belowthe Lists

List-I	List-II
A. Balmer series	1. $\bar{\nu} = R_H\left(\frac{1}{3^2} - \frac{1}{n^2}\right)$
B. Brakett series	2. $\bar{\nu} = R_H\left(\frac{1}{1^2} - \frac{1}{n^2}\right)$
C. Lyman series	3. $\bar{\nu} = R_H\left(\frac{1}{2^2} - \frac{1}{n^2}\right)$
D. Paschen series	4. $\bar{\nu} = R_H\left(\frac{1}{4^2} - \frac{1}{n^2}\right)$

Codes :

	A	B	C	D
(a)	3	2	1	4
(b)	3	4	2	1
(c)	4	3	2	1
(d)	2	3	1	4

23. A force F_x acts on a particle such that its position x changes as shown in the figure.



The work done by the particle as it moves from x = 0 to 20 m is

(a) 37.5 J (b) 10 J
(c) 45 J (d) 22.5 J

24. The population inversion necessary for laser action used in solid state lasers is

(a) electrical discharge
(b) inelastic atom-atom collision
(c) direct conversion
(d) optical pumping

25. The photo electric threshold of Tungsten is 2300Å. The energy of the electrons ejected from the surface by ultraviolet light of wavelength 1800Å is

(a) 0.15 eV (b) 1.5 eV
(c) 15 eV (d) 150 eV

26. Radiations of two photon's energy, twice and ten times the work function of metal are incident on the metal surface successsively. The ratio of maximum velocities of photoelectrons emitted in two cases is

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

27. If an electron and positron annihilate, then the energy released is

(a) 3.2×10^{-13} J (b) 1.6×10^{-13} J
(c) 4.8×10^{-13} J (d) 6.4×10^{-13} J

28. The ratio of molar specific heat at constant pressure C_P, to molar specific heat at constant volume C_v for a monoatomic gas is

(a) $\frac{C_P}{C_V} = \frac{3}{5}$ (b) $\frac{C_P}{C_V} = \frac{5}{3}$
(c) $\frac{C_P}{C_V} = \frac{7}{9}$ (d) $\frac{C_P}{C_V} = \frac{9}{7}$

29. Which of the following are true regarding forces between nucleons inside the nucleus :

1. attractive in nature
2. electrical in nature
3. extremely short range
4. strongest forces in nature

Which of the above are correct ?

(a) 1, 2 and 4 (b) 2 and 3
(c) 1, 3 and 4 (d) 3 and 4

30. $^2_1H + {}^2_1H \rightarrow {}^3_2He + {}^1_0n + 13$ MeV

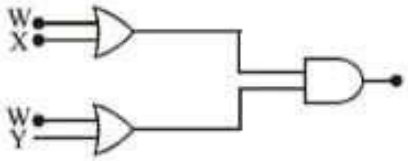
In the above nuclear reaction, the binding energy of ^2_1H is 2.2 MeV. The binding energy of ^3_2He is

(a) 4.4 MeV (b) 8.6 MeV
(c) 13 MeV (d) 17.4 MeV

31. A radioactive nucleus has a half-life of 100 years. If the number of nuclei at t = 0 is N_0, what will be the number of nuclei which have decayed in 300 years ?

(a) $\frac{7N_0}{8}$ (b) $\frac{N_0}{2}$
(c) $\frac{3N_0}{4}$ (d) $\frac{N_0}{8}$

32. The diagram of a logic circuit is given below.



The output F of the circuit is represented by

(a) $W+(X+Y)$ (b) $W+(X.Y)$

(c) $W.(X+Y)$ (d) $W.(X.Y)$

33. NAND and NOR gates are called universal gates primarily because they

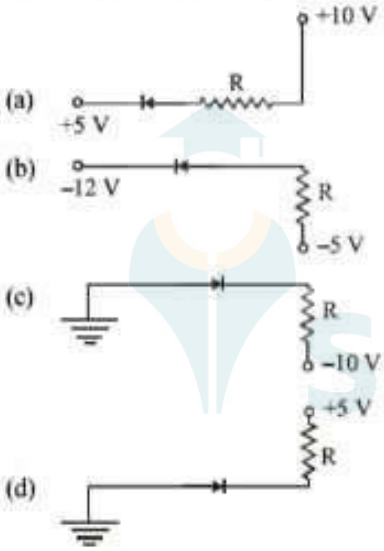
(a) are available universally

(b) can be combined to produce OR, AND and NOT gates

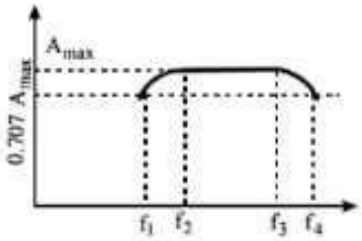
(c) are widely used in Integrated circuit packages

(d) are easiest to manufacture

34. Of the diodes shown in the following diagrams, which one is reverse biased ?



35. The frequency response curve of RC coupled amplifier is shown in figure. The band with of the amplifier will be



(a) $f_3 - f_2$ (b) $f_4 - f_2$

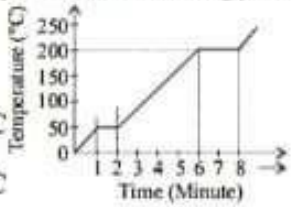
(c) $\frac{f_4 - f_2}{2}$ (d) $f_3 - f_1$

36. In common emitter amplifier the $\frac{I_c}{I_e}$ is 0.98. The current gain will be

(a) 4.9 (b) 7.8

(c) 49 (d) 78

37. A student takes 50gm wax (specific heat = 0.6 kcal/kg°C) and heats it till it boils. The graph between temperature and time is as follows. Heat supplied to the wax per minute and boiling point are respectively



(a) 500 cal, 50°C

(b) 1000 cal, 100°C

(c) 1500 cal, 200°C

(d) 1000 cal, 200°C

38. Consider telecommunication through optical fibres. Which of the following statements is not true ?

(a) Optical fibres may have homogeneous core with a suitable cladding

(b) Optical fibres can be of graded refractive index

(c) Optical fibres are subject to electromagnetic interference from outside

(d) Optical fibres have extremely low transmission loss

39. What should be the maximum acceptance angle at the aircore interface of an optical fibre if n_1 and n_2 are the refractive indices of the core and the cladding, respectively

(a) $\sin^{-1}(n_2/n_1)$ (b) $\sin^{-1}\sqrt{n_1^2 - n_2^2}$

(c) $\left[\tan^{-1}\frac{n_2}{n_1}\right]$ (d) $\left[\tan^{-1}\frac{n_1}{n_2}\right]$

40. The length of a metal is ℓ_1 when the tension in it is T_1 and is ℓ_2 when the tension is T_2. The original length of the wire is

(a) $\frac{\ell_1 + \ell_2}{2}$ (b) $\frac{\ell_1 T_2 + \ell_2 T_1}{T_1 + T_2}$

(c) $\frac{\ell_1 T_2 - \ell_2 T_1}{T_2 - T_1}$ (d) $\sqrt{T_1 T_2 \ell_1 \ell_2}$

PART - II : CHEMISTRY

41. Identify the correct statement for change of Gibbs energy for a system (ΔG_{system}) at constant temperature and pressure :
(a) If $\Delta G_{system} = 0$, the system has attained equilibrium
(b) If $\Delta G_{system} = 0$, the system is still moving in a particular direction
(c) If $\Delta G_{system} < 0$, the process is not spontaneous
(d) If $\Delta G_{system} > 0$, the process is not spontaneous

42. Which is a planar molecule ?
(a) XeO4 (b) XeF4
(c) XeOF4 (d) XeO2F2

43. Considering entropy (S) as a thermodynamic parameter, the criterion for the spontaneity of any process is
(a) $\Delta S_{system} + \Delta S_{surroundings} > 0$
(b) $\Delta S_{system} - \Delta S_{surroundings} > 0$
(c) $\Delta S_{system} > 0$ only
(d) $\Delta S_{surroundings} > 0$ only

44. In the solid state, MgO has the same structure as that of sodium chloride. The number of oxygens surrounding each magnesium in MgO is
(a) 6 (b) 1
(c) 2 (d) 4

45. A solid with high electrical and thermal conductivity from the following is
(a) Si (b) Li
(c) NaCl (d) Ice

46. Four successive members of the first row transition elements are listed below with their atomic numbers. Which one of them is expected to have the highest third ionization enthalpy?
(a) Vanadium (Z = 23)
(b) Chromium (Z = 24)
(c) Manganese (Z = 25)
(d) Iron (Z = 26)

47. Which one of the following is expected to exhibit optical isomerism?
(en = ethylenediamine)
(a) cis-$[Pt(NH_3)_2Cl_2]$
(b) trans-$[Pt(NH_3)_2Cl_2]$
(c) cis-$[Co(en)_2Cl_2]$
(d) trans-$[Co(en)_2Cl_2]$

48. For orthorhombic system axial ratios are $a \neq b \neq c$ and the axial angles are
(a) $\alpha = \beta = \gamma \neq 90°$
(b) $\alpha = \beta = \gamma = 90°$
(c) $\alpha = \beta = \gamma = 90°, \beta = 90°$
(d) $\alpha \neq \beta \neq \gamma = 90°$

49. Which one of the following will show paramagnetism corresponding to 2 unpaired electrons?(Atomic numbers : Ni = 28, Fe = 26)
(a) $[FeF_6]^{3-}$ (b) $[NiCl_4]^{2-}$
(c) $[Fe(CN)_6]^{3-}$ (d) $[Ni(CN)_4]^{2-}$

50. In gaseous equilibrium the correct relation between K_c and K_p is
(a) $K_c = K_p(RT)^{\Delta n}$ (b) $K_p = K_c(RT)^{\Delta n}$
(c) $\frac{K_c}{RT} = (K_p)^{\Delta n}$ (d) $\frac{K_p}{RT} = (K_c)^{\Delta n}$

51. Which one of the following reaction occurs at the cathode?
(a) $2OH^- \longrightarrow H_2O + O + 2e^-$
(b) $Ag \longrightarrow Ag^+ + e^-$
(c) $Fe^{2+} \longrightarrow Fe^{3+} + e^-$
(d) $Cu^{2+} + 2e^- \longrightarrow Cu$

52. Which of the following coordination compounds would exhibit optical isomerism?
(a) pentamminenitrocobalt(III) iodide
(b) diamminedichloroplatinum(II)
(c) trans-dicyanobis (ethylenediamine) chromium (III) chloride
(d) tris-(ethylendiamine) cobalt (III) bromide

53. Lanthanoids are
(a) 14 elements in the sixth period (atomic no. = 90 to 103) that are filling 4f sublevel
(b) 14 elements in the seventh period (atomic no. = 90 to 103) that are filling 5f sublevel
(c) 14 elements in the sixth period (atomic no. = 58 to 71) that are filling 4f sublevel
(d) 14 elements in the seventh period (atomic no. = 58 to 71) that are filling 4f sublevel

54. The radioactive isotope $^{60}_{27}Co$ which is used in the treatment of cancer can be made by (n, p) reaction. For this reaction the target nucleus is
(a) $^{59}_{28}Ni$ (b) $^{59}_{27}Co$
(c) $^{60}_{28}Ni$ (d) $^{60}_{27}Co$

55. The age of most ancient geological formations is estimated by
(a) Potassium–argon method
(b) Carbon-14 dating method
(c) Radium-silicon method
(d) Uranium-lead method.

56. The activation energy for a simple chemical reaction $A \rightarrow B$ is E_a in forward direction. The activation energy for reverse reaction
(a) Is always double of E_a
(b) Is negative of E_a
(c) Is always less than E_a
(d) Can be less than or more than E_a

57. Select the rate law that corresponds to data shown for the following reaction
$A + B \longrightarrow$ products.

Exp.	[A]	[B]	Initial rate
1	0.012	0.035	0.1
2	0.024	0.070	0.8
3	0.024	0.035	0.1
4	0.012	0.070	0.8

(a) rate = $k[B]^3$ (b) rate = $k[B]^4$
(c) rate = $k[A][B]^3$ (d) rate = $k[A]^2[B]^2$

58. The plot of concentration of the reactant vs. time for a reaction is a straight line with a negative slope. The reaction follows a
(a) zero order rate equation
(b) first order rate equation
(c) second order rate equation
(d) third order rate equation

59. A substance 'A' decomposes by a first order reaction starting initially with [A] = 2.00 m and after 200 min, [A] becomes 0.15 m. For this reaction $t_{1/2}$ is
(a) 53.72 min (b) 50.49 min
(c) 48.45 min (d) 46.45 min

60. Which one of the following information can be obtained on the basis of Le Chatelier principle?
(a) Dissociation constant of a weak acid
(b) Entropy change in a reaction
(c) Equilibrium constant of a chemical reaction
(d) Shift in equilibrium position on changing value of a constraint.

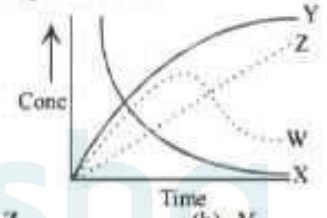
61. Equivalent conductances of NaCl, HCl and CH_3COONa at infinite dilution are 126.45, 426.16 and 91 $ohm^{-1}\ cm^2$ respectively. The equivalent conductance of CH_3COOH at infinite dilution would be
(a) 101.38 $ohm^{-1}\ cm^2$ (b) 253.62 $ohm^{-1}\ cm^2$
(c) 390.71 $ohm^{-1}\ cm^2$ (d) 678.90 $ohm^{-1}\ cm^2$

62. The standard e.m.f. of a galvanic cell involving cell reaction with $n = 2$ is found to be 0.295 V at 25°C. The equilibrium constant of the reaction would be (Given F = 96500 C mol^{-1}; $R = 8.314 JK^{-1}mol^{-1}$)
(a) 2.0×10^{11} (b) 4.0×10^{12}
(c) 1.0×10^{2} (d) 1.0×10^{10}

63. In the silver plating of copper, $K[Ag(CN)_2]$ is used instead of $AgNO_3$. The reason is
(a) A thin layer of Ag is formed on Cu
(b) More voltage is required
(c) Ag^+ ions are completely removed from solution
(d) Less availability of Ag^+ ions, as Cu cannot displace Ag from $[Ag(CN)_2]^-$ ion

64. If 0.5 amp current is passed through acidified silver nitrate solution for 100 minutes. The mass of silver deposited on cathode, is (eq.wt.of silver nitrate = 108)
(a) 2.3523 g (b) 3.3575 g
(c) 5.3578 g (d) 6.3575 g

65. For the reaction $A + B \longrightarrow C + D$. The variation of the concentration of the products is given by the curve



(a) Z (b) Y
(c) W (d) X

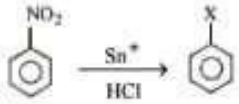
66. Acetamide and ethylamine can be distinguished by reacting with
(a) Aqueous HCl and heat
(b) Aqueous NaOH and heat
(c) Acidified $KMnO_4$
(d) Bromine water.

67. Aniline when diazotized in cold and when treated with dimethyl aniline gives a coloured product. Its structure would be
(a) $CH_3NH-C_6H_4-N=N-C_6H_4-NHCH_3$
(b) $CH_3-C_6H_4-N=N-C_6H_4-NH_2$
(c) $(CH_3)_2N-C_6H_4-N=N-C_6H_5$
(d) $(CH_3)_2N-C_6H_4-NH-C_6H_5$

68. Electrolytic reduction of nitrobenzene in weakly acidic medium gives
(a) N-Phenylhydroxylamine
(b) Nitrosobenzene
(c) Aniline
(d) p-Hydroxyaniline

69. If an organic compound shows a streching ($>C=O$) frequency of 1720 cm^{-1}. The organic compound is _____.
(a) An aliphatic aldehyde
(b) An α, β unsaturated aldehyde
(c) A phenolic aldehyde
(d) An aromatic aldehyde

70. In the given reaction,

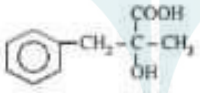
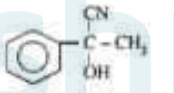
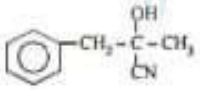
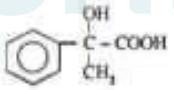


X- stands for
(a) $-NH_2$ (b) $SnCl_2$
(c) $-Cl$ (d) $-NH_3^+Cl^-$

71. In a set of reactions acetic acid yielded a product D.

$$CH_3COOH \xrightarrow{SOCl_2} A \xrightarrow[\text{Anhy. } AlCl_3]{\text{Benzene}} B \xrightarrow{HCN} C \xrightarrow{H_3O^+} D$$

The structure of D would be:

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

72. Ketones

[$R-\underset{\underset{O}{\|}}{C}-R_1$, where $R = R_1$ = alkyl groups]\

can be obtained in one step by
(a) oxidation of primary alcohols
(b) hydrolysis of esters
(c) oxidation of tertiary alcohols
(d) reaction of acid halides with alcohols

73. Phenylmethyl ketone can be converted into ethylbenzene in one step by which of the following reagents?
(a) $LiAlH_4$ (b) Zn-Hg/HCl
(c) $NaBH_4$ (d) CH_3MgI

74. Ethanol and dimethyl ether form a pair of functional isomers. The boiling point of ethanol is higher than that of dimethyl ether, due to the presence of
(a) H-bonding in ethanol
(b) H-bonding in dimethyl ether
(c) CH_3 group in ethanol
(d) CH_3 group in dimethyl ether

75. Propan - 1 - ol may be prepared by the reaction of propene with
(a) H_3BO_3
(b) H_2SO_4/H_2O
(c) B_2H_6,NaOH–H_2O_2
(d) $CH_3\overset{\overset{O}{\|}}{C}-O-O-H$

76. Sodium formate on heating yields
(a) Oxalic acid and H_2
(b) Sodium oxalate and H_2
(c) CO_2 and NaOH
(d) Sodium oxalate.

77. An ester (A) with molecular fomula, $C_9H_{10}O_2$ was treated with excess of CH_3MgBr and the complex so formed was treated with H_2SO_4 to give an olefin (B). Ozonolysis of (B) gave a ketone with molecular formula C_8H_8O which shows +ve iodoform test. The structure of (A) is
(a) $C_6H_5COOC_2H_5$
(b) $C_2H_5COOC_6H_5$
(c) $H_3COCH_2COC_6H_5$
(d) $p-H_3CO-C_6H_4-COCH_3$

78. Self condensation of two moles of ethyl acetate in presence of sodium ethoxide yields
(a) acetoacetic ester
(b) methyl acetoacetate
(c) ethyl propionate
(d) ethyl butyrate

79. Methanol is industrially prepared by
(a) Oxidation of CH_4 by steam at 900°C
(b) Reduction of HCHO using $LiAlH_4$
(c) Reaction HCHO with a solution of NaOH
(d) Reduction of CO using H_2 and $ZnO-Cr_2O_3$.

80. Indicate which of the nitrogen compounds amongst the following would undergo Hoffmann's reaction, i.e., reaction with Br_2 and strong KOH to furnish the primary amine ($R-NH_2$)?
(a) $R-CO-NHCH_3$ (b) $R-CO-ONH_4$
(c) $R-CO-NH_2$ (d) $R-CO-NHOH$.

PART - III : MATHEMATICS

81. If $\sin(y+z-x)$, $\sin(z+x-y)$ and $\sin(x+y-z)$ are in A.P. (with $x, y, z \neq \pi/2$), then $\tan x$, $\tan y$ and $\tan z$ are in
(a) A.P. (b) G.P.
(c) H.P. (d) none of these.

82. The number of roots of equation $\tan^{-1} 2x + \tan^{-1} 3x = \frac{\pi}{4}$ is
(a) 0 (b) 1
(c) 2 (d) infinite

83. In order that the equation $2ax(ax+nc)+(n^2-2)c^2 = 0$ may have real roots, n belongs to interval
(a) $[-2, 2]$ (b) $(-\infty, -2)$
(c) $(2, \infty)$ (d) $(-\infty, \infty)$

84. The portion of a tangent to a parabola $y^2 = 4ax$ cut off between the directrix and the curve subtends an angle θ at the focus, where $\theta =$
(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{3}$
(c) $\frac{\pi}{2}$ (d) $\frac{2\pi}{3}$

85. There are 25 trees at equal distances of 5 meters in a line with a well, the distance of the well from the nearest tree being 10 metres. A gardener waters all the trees separately starting from the well and he returns to the well after watering each tree to get water for the next. The total distance the gardener will cover in order to water all the trees is
(a) 3550m (b) 3434m
(c) 3370m (d) 3200m

86. If ${}^nC_r$ denotes the number of combination of n things taken r at a time, then the expression ${}^nC_{r+1} + {}^nC_{r-1} + 2\times{}^nC_r$ equals
(a) ${}^{n+1}C_{r+1}$ (b) ${}^{n+2}C_r$
(c) ${}^{n+2}C_{r+1}$ (d) ${}^{n+1}C_r$

87. A printing company prints two types of magazines A and B. The company earns ₹10 and ₹15 on each magazine A and B respectively. These are processed on three machines I, II & III and total time in hours available per week on each machine is as follows:

Magzine →	A(x)	B(y)	Time available
↓ Machine			
I	2	3	36
II	5	2	50
III	2	6	60

The number of constraints is
(a) 3 (b) 4
(c) 5 (d) 6

88. If $\int \sin^3 x \cos^5 dx = A\sin^4 x + B\sin^6 x + C\sin^8 x + D$.
Then
(a) $A = \frac{1}{4}, B = -\frac{1}{3}, C = \frac{1}{8}, D \in R$
(b) $A = \frac{1}{8}, B = \frac{1}{4}, C = \frac{1}{3}, D \in R$
(c) $A = 0, B = -\frac{1}{6}, C = \frac{1}{8}, D \in R$
(d) none of these.

89. In a ΔABC, the area of the triangle is $b^2 - (c-a)^2$, then $\tan B$ is equal to
(a) $\frac{1}{4}$ (b) $\frac{8}{15}$
(c) $\frac{1}{2}$ (d) $\frac{15}{8}$

90. If $\varphi(x) = \log_5 \log_3 x$, then $\varphi'(e) =$
(a) 1 (b) $e\log_e 5$
(c) $\frac{1}{e}\log_5 e$ (d) $\log_e 5$

91. If $f(x) = x^\alpha \log x$ and $f(0) = 0$, then the value of α for which Rolle's theorem can be applied in $[0, 1]$ is
(a) –2 (b) –1
(c) 0 (d) 1/2

92. The spheres $x^2+y^2+z^2+x+y+z-1=0$ and $x^2+y^2+z^2+x+y+z-5=0$

(a) intersect in a plane
(b) intersect in five points
(c) do not intersect
(d) none of these.

93. The function $f: R \to R$ defined by $f(x)=(x-1)(x-2)(x-3)$ is

(a) one-one but not onto
(b) onto but not one-one
(c) both one-one and onto
(d) neither one-one nor onto

94. If $f: R \to S$, defined by $f(x)=\sin x-\sqrt{3}\cos x+1$, is onto, then the interval of S is

(a) $[-1, 3]$ (b) $[-1, 1]$
(c) $[0, 1]$ (d) $[0, 3]$

95. The locus of the mid points of the focal chords of the parabola $y^2=4ax$ is another parabola whose vertex is given by

(a) $(a, 0)$ (b) $(0, a)$
(c) $(-a, 0)$ (d) None of these

96. The solution to the differential equation $(x+y)^2\frac{dy}{dx}=a^2$ is

(a) $x+y=a\tan\left(\frac{y+c}{a}\right)$

(b) $y=a\tan^{-1}(x+y)+c$

(c) $y\left(1-\frac{x}{4}\right)=\tan\frac{y}{a}+c$

(d) none of these

97. If $\sum_{k=1}^{m}(k^2+1)k!=1999\times 2000!$, then m is

(a) 1999 (b) 2000
(c) 2001 (d) None of these

98. If $\sin^{-1}(1-x)=2\sin^{-1}x+\frac{\pi}{2}$, then :

(a) $x=0, \frac{1}{2}$ (b) $x=\frac{1}{2}$
(c) $x=0$ only (d) none of these

99. If a is a non-zero real number, then the vectors

$\vec{\alpha}=a\hat{i}+2a\hat{j}-3a\hat{k}$,

$\vec{\beta}=(2a+1)\hat{i}+(2a+3)\hat{j}+(a+1)\hat{k}$,

$\vec{\gamma}=(3a+5)\hat{i}+(a+5)\hat{j}+(a+2)\hat{k}$ are

(a) coplanar if $a<0$ (b) coplanar if $a>0$
(c) always coplanar (d) never coplanar

100. If B is a non-singular matrix and A is a square matrix, then det $(B^{-1}AB)$ is equal to

(a) det (A^{-1}) (b) det (B^{-1})
(c) det (A) (d) det (B)

101. $\int\sqrt[3]{x}\sqrt[7]{1+\sqrt[3]{x^4}}\,dx$ is equal to

(a) $\frac{21}{32}\left(1+\sqrt[3]{x^4}\right)^{8/7}+C$ (b) $\frac{32}{21}\left(1+\sqrt[3]{x^4}\right)^{8/7}+C$

(c) $\frac{7}{32}\left(1+\sqrt[3]{x^4}\right)^{8/7}+C$ (d) None of these.

102. For a binary operation * on the set $\{1, 2, 3, 4, 5\}$, consider the following multiplication table.

*	1	2	3	4	5
1	1	1	1	1	1
2	1	2	1	2	1
3	1	1	3	1	1
4	1	2	1	4	1
5	1	1	1	1	5

Which of the following is correct?

(a) $(2*3)*4=1$
(b) $2*(3*4)=2$
(c) * is not commutative
(d) $(2*3)*(4*5)=2$

103. If $x\cos\alpha + y\sin\alpha = p$, a variable chord of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{2a^2} = 1$ subtends a right angle at the centre of the hyperbola, then the chords touch a fixed circle whose radius is equal to

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

(c) $2a$ (d) $\sqrt{5}a$

104. If $\int x^2 \cos x\,dx = f(x)\sin x + g(x)\cos x + c$.

Then

(a) $f(x) = x^2,\ g(x) = x$

(b) $f(x) = x^2 + 2, g(x) = x$

(c) $f(x) = x^2,\ g(x) = 2x - 1$

(d) $f(x) = x^2 - 2,\ g(x) = 2x$

105. Let P be a variable point on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ with foci F_1 and F_2. If A is the area of the triangle PF_1F_2 then the maximum value of A is

(a) 2abe (b) abe

(c) $\frac{1}{2}$abe (d) None of these

106. In each of a set of games it is 2 to 1 in favour of the winner of the previous game. The chance that the player who wins the first game shall win three at least of the next four is

(a) $\frac{8}{27}$ (b) $\frac{4}{81}$

(c) $\frac{4}{9}$ (d) None

107. The normal to the curve represented parametrically by $x = a(\cos\theta + \theta\sin\theta)$ and $y = a(\sin\theta - \theta\cos\theta)$ at any point θ, is such that it

(a) makes a constant angle with x-axis

(b) is at a contant distance from the origin

(c) touches a fixed circle

(d) satisfies (b) and (c)

108. Consider the following statements

p : A tumbler is half empty.

q : A tumbler is half full.

Then, the combination form of "p if and only if q" is

(a) a tumbler is half empty and half full

(b) a tumbler is half empty if and only if it is half full

(c) Both (a) and (b)

(d) None of the above

109. A car will hold 2 in the front seat and 1 in the rear seat. If among 6 persons 2 can drive, then the number of ways in which the car can be filled is

(a) 10 (b) 20

(c) 30 (d) None of these

110. The value of

$$\int_0^{\frac{\pi}{2}} \log_e \sin x\,dx = \int_0^{\frac{\pi}{2}} \log_e \cos x\,dx \quad \text{is}$$

(a) $\frac{\pi}{2}\log 2$ (b) $-\frac{\pi}{2}\log 2$

(c) $\pi\log\left(\frac{1}{2}\right)$ (d) none of these.

111. If A, B, C are the angles of a triangle then the value of determinant $\begin{vmatrix} \sin 2A & \sin C & \sin B \\ \sin C & \sin 2B & \sin A \\ \sin B & \sin A & \sin 2C \end{vmatrix}$ is

(a) π (b) 0

(c) 2π (d) None of these

112. The length of projection of the segment joining P(–1, 2, 0) and Q (1, –1, 2) on the plane $2x - y - 2z = 4$ is

(a) 3 (b) 4

(c) 5 (d) $3\sqrt{3}$

113. $f(x) = \begin{cases} x\sin 1/x & , x \neq 0 \\ 0 & , x = 0 \end{cases}$ at $x = 0$ is

(a) continuous as well as differentiable

(b) differentiable but not continuous

(c) continuous but not differentiable

(d) neither continuous nor differentiable

114. Area enclosed between the curves $y = \sin^2 x$, $y = \cos^2 x$ and $y = 0$ in the interval $[0, \pi/2]$ is

(a) $\frac{1}{3}(2\pi - 1)$ sq. units

(b) $\frac{1}{2}(\pi - 3)$ sq. units

(c) $\frac{1}{4}(\pi - 2)$ sq. units

(d) $(2\pi + 3)$ sq. units

115. If ABCDEF is a regular hexagon and $\overrightarrow{AB}+\overrightarrow{AC}+\overrightarrow{AD}+\overrightarrow{AE}+\overrightarrow{AF}=n\overrightarrow{AD}$. Then n is

(a) 1 (b) 2

(c) 3 (d) $\frac{5}{2}$

116. The altitude through vertex C of a triangle ABC, with position vectors of vertices $\vec{a}, \vec{b}, \vec{c}$ respectively is :

(a) $\frac{|\vec{b}\times\vec{c}+\vec{c}\times\vec{a}+\vec{a}\times\vec{b}|}{|\vec{b}-\vec{a}|}$ (b) $\frac{|\vec{a}+\vec{b}+\vec{c}|}{|\vec{b}-\vec{a}|}$

(c) $\frac{|\vec{b}\times\vec{c}+\vec{c}\times\vec{a}+\vec{a}\times\vec{b}|}{|\vec{b}\times\vec{a}|}$ (d) None of these

117. If the solution of the differential equation $\frac{dy}{dx}=\frac{ax+3}{2y+f}$ represents a circle, then the value of 'a' is

(a) 2 (b) -2

(c) 3 (d) -4

118. Let A = {1,2,3,4,5,6,7,8} which of the following relations from A to **R** is NOT a function?

(a) $R_1=\{(x,f(x)):x\in A, f(x)=6x+7\}$

(b) $R_2=\{(x,f(x)):x\in A, f(x)=|x|+9\}$

(c) $R_3=\left\{(x,f(x)):x\in A, f(x)=\frac{1}{x^2+7}\right\}$

(d) $R_4=\{(x,f(x)):x\in A, f(x)=\pm 4x\}$

119. Let $f:R\to R$ be such that f(1) = 3 and f'(1) = 6. Then $\lim_{x\to 0}\left(\frac{f(1+x)}{f(1)}\right)^{1/x}$ equals

(a) 1 (b) $e^{2/3}$

(c) e^2 (d) e^3

120. The value of $(2-\omega)(2-\omega^2)(2-\omega^{10})(2-\omega^{11})$ is

(a) 49 (b) 16

(c) 16ω (d) $49\omega^2$

PART - IV : ENGLISH

Direction (Qs. 121 - 125) : Read the passage carefully and answer the questions given below.

I felt the wall of the tunnel shiver. The master alarm squealed through my earphones. Almost simultaneously, Jack yelled down to me that there was a warning light on. Fleeting but spectacular sights snapped into ans out of view, the snow, the shower of debris, the moon, looming close and big, the dazzling sunshine for once unfiltered by layers of air. The last twelve hours before re-entry were particular bone-chilling. During this period, I had to go up in to command module. Even after the fiery re-entry splashing down in 81o water in south pacific, we could still see our frosty breath inside the command module.

121. The word 'Command Module' used twice in the given passage indicates perhaps that it deals with

(a) an alarming journey
(b) a commanding situation
(c) a journey into outer space
(d) a frightful battle.

122. Which one of the following reasons would one consider as more as possible for the warning lights to be on?

(a) There was a shower of debris.
(b) Jack was yelling.
(c) A catastrophe was imminent.
(d) The moon was looming close and big.

123. The statement that the dazzling sunshine was "for once unfiltered by layers of air" means

(a) that the sun was very hot
(b) that there was no strong wind
(c) that the air was unpolluted
(d) none of above

124. His musical tastes are certainly ____ ; he has recordings ranging from classical piano performances to rock concerts, jazz and even Chinese opera.

(a) antediluvian (b) eclectic
(c) harmonious (d) sonorous

125. Choose the best pronunciation of the word, Poignant, from the following options.

(a) poig-nant (b) pohing-nant
(c) poing-nat (d) poi-nyant

ANSWER KEY

1. B
2. C
3. D
4. D
5. C
6. C
7. A
8. B
9. C
10. B
11. C
12. B
13. C
14. A
15. B
16. B
17. C
18. D
19. D
20. C
21. B
22. B
23. C
24. C
25. B
26. B
27. B
28. B
29. C
30. D
31. A
32. B
33. B
34. D
35. B
36. C
37. C
38. C
39. B
40. C
41. A
42. B
43. C
44. A
45. B
46. C
47. C
48. B
49. B
50. B
51. D
52. D
53. C
54. C
55. D
56. D

57. A
58. B
59. A
60. D
61. C
62. C
63. D
64. B
65. B
66. B
67. C
68. D
69. A
70. A
71. D
72. C
73. B
74. A
75. C
76. B
77. A
78. A
79. D
80. C
81. A
82. B
83. A
84. C
85. C
86. C
87. C
88. A
89. B
90. C
91. D
92. C
93. B
94. A
95. A
96. A
97. A
98. C
99. D
100. C
101. A
102. A
103. A
104. D
105.B
106. C
107. D
108. B
109.D
110. B
111. B
112. B
113. C

114. C

115. C

116. A

117. B

118. B

119. C

120. A

121. C

122. C

123. D

124. B

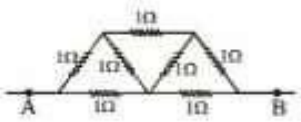
125. D

VITEEE SAMPLE PAPER 2022

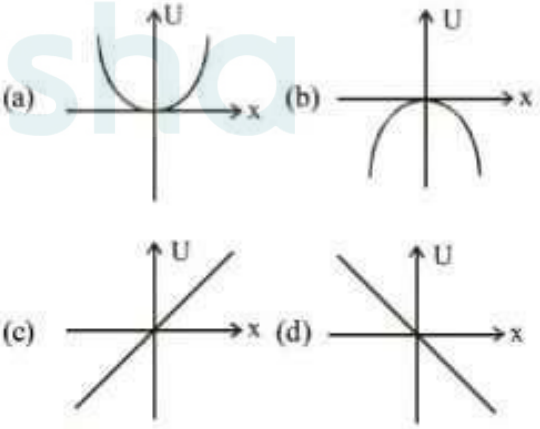
Max. Marks : 125 **Time : 2½ hrs**

PART - I : PHYSICS

1. If μ_s, μ_k and μ_r are coefficients of static friction, sliding friction and rolling friction, then
   (a) $\mu_s < \mu_k < \mu_r$ (b) $\mu_k < \mu_r < \mu_s$
   (c) $\mu_r < \mu_k < \mu_s$ (d) $\mu_r = \mu_k = \mu_s$
2. In a region of space having a uniform electric field E, a hemispherical bowl of radius r is placed. The electric flux ϕ through the bowl is
   (a) $2\pi rE$ (c) $4\pi r^2 E$
   (c) $2\pi r^2 E$ (d) $\pi r^2 E$
3. Which of the following relation is true ?
   (a) $3Y = K(1-\sigma)$ (b) $K = \frac{9\eta Y}{Y+\eta}$
   (c) $\sigma = (6K+\eta)Y$ (d) $\sigma = \frac{05.Y-\eta}{\eta}$
4. A capacitor C_1 is charged to a potential difference V. The charging battery is then removed and the capacitor is connected to an uncharged capacitor C_2. The potential difference across the combination is
   (a) $\frac{VC_1}{(C_1+C_2)}$ (b) $V\left(1+\frac{C_2}{C_1}\right)$
   (c) $V\left(1+\frac{C_1}{C_2}\right)$ (d) $\frac{VC_2}{(C_1+C_2)}$
5. In the network shown in the Fig, each resistance is 1Ω. The effective resistance between A and B is



   (a) $\frac{4}{3}\Omega$ (b) $\frac{3}{2}\Omega$
   (c) 7Ω (d) $\frac{8}{7}\Omega$
6. Kirchhoff's first law of electricity follows
   (a) law of conservation of energy only
   (b) law of conservation of charge only
   (c) law of conservation of both energy and charge
   (d) sometimes law of conservation of energy and some other times law of conservation of charge
7. In a Wheatstone's bridge all the four arms have equal resistance R. If the resistance of the galvanometer arm is also R, the equivalent resistance of the combination as seen by the battery is
   (a) 2R (b) $\frac{R}{4}$
   (c) $\frac{R}{2}$ (d) R
8. A particle is acted by a force F = kx, where k is a +ve constant. Its potential energy at x = 0 is zero. Which curve correctly represents the variation of potential energy of the block with respect to x

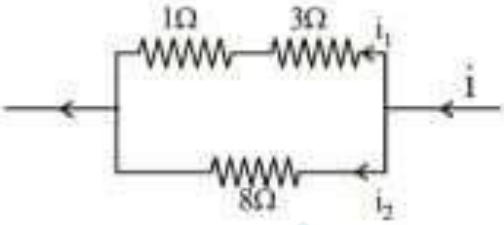


9. A straight wire of diameter 0.5 mm carrying a current of 1 A is replaced by another wire of 1 mm diameter carrying same current. The strength of magnetic field far away is

(a) twice the earlier value
(b) same as the earlier value
(c) one-half of the earlier value
(d) one-quarter of the earlier value

10. A positively charged particle moving due east enters a region of uniform magnetic field directed vertically upwards. The particle will
(a) continue to move due east
(b) move in a circular orbit with its speed unchanged
(c) move in a circular orbit with its speed increased
(d) gets deflected vertically upwards.

11. Power dissipated across the 8Ω resistor in the circuit shown here is 2 watt. The power dissipated in watt units across the 3Ω resistor is



(a) 1.0 (b) 0.5
(c) 3.0 (d) 2.0

12. A battery is charged at a potential of 15V for 8 hours when the current flowing is 10A. The battery on discharge supplies a current of 5A for 15 hour. The mean terminal voltage during discharge is 14V. The "Watt-hour" efficiency of the battery is
(a) 87.5% (b) 82.5%
(c) 80% (d) 90%

13. A coil of 40 henry inductance is connected in series with a resistance of 8 ohm and the combination is joined to the terminals of a 2 volt battery. The time constant of the circuit is
(a) 20 seconds (b) 5 seconds
(c) 1/5 seconds (d) 40 seconds

14. In an inductor of self-inductance L = 2 mH, current changes with time according to relation $i = t^2e^{-t}$. At what time emf is zero?
(a) 4s (b) 3s
(c) 2s (d) 1s

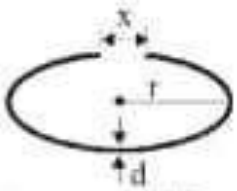
15. A varying current in a coil changes from 10A to zero in 0.5 sec. If the average e.m.f induced in the coil is 220V, the self-inductance of the coil is
(a) 5 H (b) 6 H
(c) 11 H (d) 12 H

16. In a region of uniform magnetic induction $B = 10^{-2}$ tesla, a circular coil of radius 30 cm and resistance π^2 ohm is rotated about an axis which is perpendicular to the direction of B and which forms a diameter of the coil. If the coil rotates at 200 rpm the amplitude of the alternating current induced in the coil is
(a) $4\pi^2$ mA (b) 30 mA
(c) 6 mA (d) 200 mA

17. If ε_0 and μ_0 are the electric permittivity and magnetic permeability in vacuum, ε and μ are corresponding quantities in medium, then refractive index of the medium is
(a) $\sqrt{\frac{\varepsilon}{\varepsilon_0}}$ (b) $\sqrt{\frac{\varepsilon_0\mu}{\varepsilon\mu_0}}$
(c) $\sqrt{\frac{\varepsilon_0\mu_0}{\varepsilon\mu}}$ (d) $\sqrt{\frac{\varepsilon\mu}{\varepsilon_0\mu_0}}$

18. The Young's double slit experiment is performed with blue and with green light of wavelengths 4360Å and 5460Å respectively. If x is the distance of 4th maxima from the central one, then
(a) x (blue) = x (green)
(b) x (blue) > x (green)
(c) x (blue) < x (green)
(d) $\frac{x(\text{blue})}{x(\text{green})} = \frac{5460}{4360}$

19. A cylindrical metal rod is shaped into a ring with a small gap as shown. On heating the system :



(a) *x* decreases, *r* and *d* increase
(b) *x* and *r* increase, *d* decreases
(c) *x*, *r* and d all increase
(d) *x* and *r* decreased, *d* remains constant

20. The angular separation $d\theta$ between two wavelength λ and $\lambda + d\lambda$ in a diffraction grating is directly proportional to
(a) frequency of light
(b) grating element
(c) spatial frequency of grating
(d) wavelength of light

21. In the Bragg scattering of a beam of electrons each of mass m and velocity v by a nickel crystal, the first maximum is observed at $\theta = 30°$ (θ being the angle the beam makes with the crystal plane). What is the inter-planar distance d for the crystal?

(a) $\frac{h}{mv}$ (b) $\frac{2h}{mv}$

(c) $\frac{h}{2mv}$ (d) $\frac{mv}{h}$

22. What is the ground state energy of positronium? (The ground state energy of hydrogen is $-13.6\,eV$)
(a) $-3.4\,eV$ (b) $-6.8\,eV$
(c) $-13.6\,eV$ (d) $-27.2\,eV$

23. The minimum wavelength in Lymann series of hydrogen spectra is 91.2 nm, the longest wavelength in this series must be

(a) $\frac{eh}{Vc}$ (b) $\frac{ch}{eV}$

(c) $\frac{eV}{ch}$ (d) $\frac{cV}{eh}$

24. The glancing angle in a X-rays diffraction experiment is 30° and the wavelength of the X-rays used is 20 mm. The interplanar spacing of the crystal diffracting these X-rays will be
(a) 40 nm (b) 20 nm
(c) 15 nm (d) 10 nm

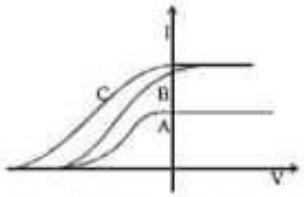
25. The velocity of a body of rest mass m_o is $\frac{\sqrt{3}}{2}c$ (Where c is the velocity of light in vacuum). The mass of this body is

(a) $\left(\frac{\sqrt{3}}{2}\right)m_o$ (b) $\left(\frac{1}{2}\right)m_o$

(c) $2m_o$ (d) $\left(\frac{2}{\sqrt{3}}\right)m_o$

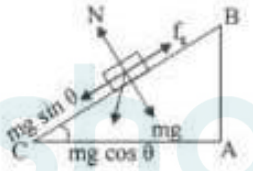
26. Einstein's photoelectric equation is $E_k = h\nu - \phi$. In this equation E_k refers to
(a) kinetic energy of all the emitted electrons.
(b) mean kinetic energy of emitted electrons
(c) maximum kinetic energy of emitted electrons.
(d) minimum kinetic energy of emitted electrons.

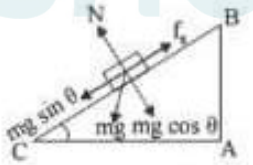
27. In a photoelectric experiment anode potential is plotted against plate current

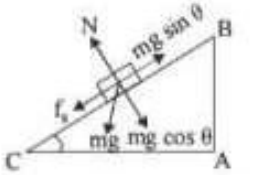


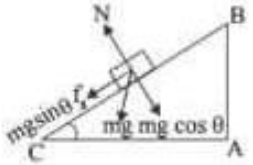
(a) A and B will have different intensities while B and C will have different frequencies
(b) B and C will have different intensities while A and C will have different frequencies
(c) A and B will have different intensities while A and C will have equal frequencies
(d) A and B will have equal intensities while B and C will have different frequencies

28. Which figure shows the correct force acting on the body sliding down an inclined plane? ($m \rightarrow$ mass, $f_s \rightarrow$ force of friction)

(a)


(b)


(c)


(d)


29. The energy released per fission of a $_{92}U^{235}$ nucleus is nearly
(a) 200 eV (b) 20 eV
(c) 200 MeV (d) 2000 eV

30. Half-lives of two radioactive substances A and B are respectively 20 minutes and 40 minutes. Initially, the sample of A and B have equal number of nuclei. After 80 minutes, the ratio of remaining number of A and B nuclei is
(a) 1 : 16 (b) 4 : 1
(c) 1 : 4 (d) 1 : 1

31. The binding energy per nucleon is largest for
(a) ^{56}Fe (b) ^{16}O
(c) ^{4}He (d) ^{208}Pb

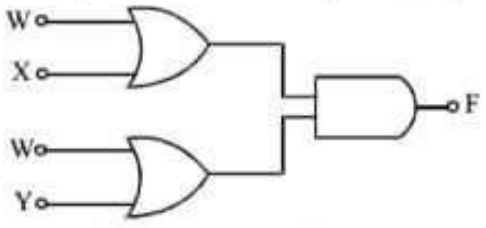
32. The radius of Ge nucleus is measured to be twice the radius of $^{9}Be_4$ nucleus. How many nucleons are there in the Ge nucleus ?
(a) 72 (b) 96
(c) 120 (d) 144

33. A Zener diode has a breakdown voltage of 9.1 V with a maximum power dissipation of 364 mW. What is the maximum current that the diode can withstand ?
(a) 0.04 A (b) 0.4 A
(c) 4.0 A (d) 40 A

34. The voltage across a diode in a full wave rectifier having input voltage of peak value V_m during its non conducting period is
(a) 0 (b) $-V_m$
(c) $-2V_m$ (d) $-4V_m$

35. A n-p-n transistor conducts when
(a) both collector and emitter are negative with respect to the base
(b) both collector and emitter are positive with respect to the base
(c) collector is positive and emitter is negative with respect to the base
(d) collector is positive and emitter is at same potential as the base

36. The diagram of a logic circuit is given below. The output F of the circuit is represented by



(a) W . (X + Y) (b) W . (X . Y)
(c) W + (X . Y) (d) W + (X + Y)

37. In frequency modulation
(a) the amplitude of modulated wave varies as frequency of carrier wave
(b) the frequency of modulated wave varies as amplitude of modulating wave
(c) the amplitude of modulated wave varies as frequency of carrier wave
(d) the frequency of modulated wave varies as frequency of modulating wave

38. Two liquids of densities d_1 and d_2 are flowing in identical capillary tubes uder the same pressure difference. If t_1 and t_2 are time taken for the flow of equal quantities (mass) of liquids, then the ratio of coefficient of viscosity of liquids must be

(a) $\frac{d_1 t_1}{d_2 t_2}$ (b) $\frac{t_1}{t_2}$

(c) $\frac{d_2\ t_2}{d_1\ t_1}$ (d) $\sqrt{\frac{d_1 t_1}{d_2 t_2}}$

39. Two masses m_a and m_b moving with velocities v_a and v_b in opposite direction collide elastically and after the collision m_a and m_b move with velocities V_b and V_a respectively. Then the ratio m_a/m_b is

(a) $\frac{V_a - V_b}{V_a + V_b}$ (b) $\frac{m_a + m_b}{m_a}$

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

40. The most suitable device at present for solid state picture tube is
(a) LED (b) LCD
(c) Silicon (d) Quartz crystal

PART - II : CHEMISTRY

41. Some Gem stones used to show colour. Ruby shows colour due to _____.
(a) d-d transition of Al^{3+} and Cr^{3+}
(b) $d\pi$-$d\pi$ transition of Al^{3+}
(c) $d\pi$-$d\pi$ transition of Cr^{3+}
(d) d-d transition of Cr^{3+}

42. The lanthanide contraction is responsible for the fact that
(a) Zr and Y have about the same radius
(b) Zr and Nb have similar oxidation state
(c) Zr and Hf have about the same radius
(d) Zr and Zn have the same oxidation states
(Atomic numbers : Zr = 40, Y = 39, Nb = 41, Hf = 72, Zn = 30)

43. At equilibrium, if $K_p = 1$, then
(a) $\Delta G^\circ = 0$ (b) $\Delta G^\circ > 1$
(c) $\Delta G^\circ < 1$ (d) None of these

44. Carbon - 14 dating method is based on the fact that:
(a) C-14 fraction is same in all objects
(b) C-14 is highly insoluble
(c) Ratio of carbon-14 and carbon-12 is constant
(d) all the above

45. $^{235}_{92}U + ^{1}_{0}n \rightarrow ^{236}_{92}U \rightarrow$ fission products + neutrons + 3.20×10^{-11} J

The energy released when 1 g of $^{235}_{92}U$ finally undergoes fission is
(a) 12.75×10^8 kJ (b) 16.40×10^7 kJ
(c) 8.20×10^7 kJ (d) 6.50×10^6 kJ

46. $K_3[Al(C_2O_4)_3]$ is called
(a) Potassium alumino oxalate
(b) Potassium trioxalateoaluminate (III)
(c) Potassium aluminium (III) oxalate
(d) Potassium trioxalato aluminate (VI)

47. A co-ordination complex compound of cobalt has the molecular formula containing five ammonia molecules, one nitro group and two chlorine atoms for one cobalt atom. One mole of this compound produces three mole ions in an aqueous solution. On reacting this solution with excess of $AgNO_3$ solution, we get two moles of AgCl precipitate. The ionic formula for this complex would be
(a) $[Co(NH_3)_4(NO_2)Cl][(NH_3)Cl]$
(b) $[Co(NH_3)_5Cl][Cl(NO_2)]$
(c) $[Co(NH_3)_5(NO_2)]Cl_2$
(d) $[Co(NH_3)_5][(NO_2)_2Cl_2]$

48. Which of the following does **not** have a metal-carbon bond?
(a) $Al(OC_2H_5)_3$ (b) C_2H_5MgBr
(c) $K[Pt(C_2H_4)Cl_3]$ (d) $Ni(CO)_4$

49. Which one of the following octahedral complexes will not show geometric isomerism? (A and B are monodentate ligands)
(a) $[MA_5B]$ (b) $[MA_2B_4]$
(c) $[MA_3B_3]$ (d) $[MA_4B_2]$

50. Which one of the following ionic species will impart colour to an aqueous solution?
(a) Ti^{4+} (b) Cu^+
(c) Zn^{2+} (d) Cr^{3+}

51. When electrons are trapped into the crystal in anion vacancy, the defect is known as :
(a) Schottky defect
(b) Frenkel defect
(c) Stoichiometric defect
(d) F-centres

52. The number of atoms contained in a fcc unit cell of a monoatomic substance is
(a) 1 (b) 2
(c) 4 (d) 6

53. The second order Bragg diffraction of X-rays with = 1.00 Å from a set of parallel planes in a metal occurs at an angle 60°. The distance between the scattering planes in the crystal is
(a) 0.575 Å (b) 1.00 Å
(c) 2.00 Å (d) 1.15 Å

54. Identify the correct statement regarding entropy:
(a) At absolute zero of temperature, entropy of a perfectly crystalline substance is taken to be zero
(b) At absolute zero of temperature, the entropy of a perfectly crystalline substance is +ve
(c) At absolute zero of temperature, the entropy of all crystalline substances is taken to be zero
(d) At 0°C, the entropy of a perfectly crystalline substance is taken to be zero

55. Standard Gibb's free energy change for isomerization reaction

cis-2 pentene $\rightleftharpoons$ trans-2-pentene

is – 3.67 kJ/mol at 400 K. If more trans-2 pentene is added to the reaction vessel, then
(a) more cis-2 pentene is formed
(b) equilibrium remains unaffected
(c) additional trans-2 pentene is formed
(d) equilibrium is shifted in forward direction

56. In the following reaction, how is the rate of appearance of the underlined product related to the rate of disappearance of the underlined reactant ?

$$BrO^-_{3(aq)} + \underline{5Br^-_{(aq)}} + 6H^+_{(aq)} \longrightarrow \underline{3Br_{2(l)}} + 3H_2O_{(l)}$$

(a) $\frac{d[Br_2]}{dt} = -\frac{5}{3}\frac{d[Br^-]}{dt}$

(b) $\frac{d[Br_2]}{dt} = -\frac{d[Br^-]}{dt}$

(c) $\frac{d[Br_2]}{dt} = \frac{3}{5}\frac{d[Br^-]}{dt}$

(d) $\frac{d[Br_2]}{dt} = -\frac{3}{5}\frac{d[Br^-]}{dt}$

57. The rate of reaction between two reactants A and B decreases by a factor of 4 if the concentration of reactant B is doubled. The order of this reaction with respect to reactant B is:

(a) 2 (b) –2
(c) 1 (d) –1

58. According to Le-chatelier's principle, adding heat to a solid $\rightleftharpoons$ liquid equilibrium will cause the

(a) temperature to increase
(b) temperature to decrease
(c) amount of liquid to decrease
(d) amount of solid to decrease.

59. Which of the following is true at chemical equilibrium?

(a) $(\Delta G)_{T,p}$ is minimum and $(\Delta S)_{U,V}$ is also minimum
(b) $(\Delta G)_{T,V}$ is minimum and $(\Delta S)_{U,V}$ is maximum
(c) $(\Delta G)_{T,V}$ is maximum and $(\Delta S)_{U,V}$ is zero
(d) $(\Delta G)_{T,p}$ is zero and $(\Delta S)_{U,V}$ is also zero

60. The racemisation of α - pinene is first order reaction. In the gas the specific reaction rate was found to be $2.2\times10^{-5}\,mm^{-1}$ at 457.6 K and 3.07×10^{-3} at 510.1 K. The energy of activation is

(a) $K(510.1-457.6)\ln(3.07\times10^{-3}/2.2\times10^{-5})$
(b) 3.048×10^{-3}
(c) $\ln 2.2\times10^{-5}\times457.6$ K cal.
(d) $(510.1\times457.6/52.5)\,R\ln(307)/2.2)$ cal.

61. The ionic conductance of Ba^{2+} and Cl^- are respectively 127 and 76 $ohm^{-1}\,cm^2$ at infinite dilution. The equivalent conductance (in $ohm^{-1}\,cm^2$) of $BaCl_2$ at infinite dilution will be :

(a) 139.5 (b) 203
(c) 279 (d) 101.5

62. On passing a current of 1.0 ampere for 16 min and 5 sec through one litre solution of $CuCl_2$, all copper of the solution was deposited at cathode. The strength of $CuCl_2$ solution was (Molar mass of Cu= 63.5; Faraday constant = 96,500 $Cmol^{-1}$)

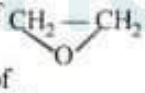
(a) 0.01 N (b) 0.01 M
(c) 0.02 M (d) 0.2 N

63. Standard electrode potentials are :
$Fe^{+2}/Fe\ E^\circ = -0.44$; $Fe^{+3}/Fe^{+2}\ E^\circ = +0.77$; If Fe^{+2}, Fe^{+3} and Fe blocks are kept together, then

(a) Fe^{+2} increases
(b) Fe^{+3} decreases
(c) $\frac{Fe^{+2}}{Fe^{+3}}$ remains unchanged
(d) Fe^{+2} decreases

64. The most durable metal plating on iron to protect against corrosion is

(a) nickel plating (b) copper plating
(c) tin plating (d) zinc plating.

65. Reaction of  with RMgX leads to formation of

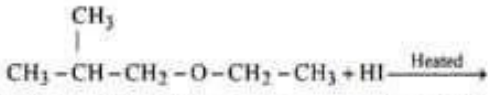
(a) RCHOHR (b) $RCHOHCH_3$
(c) RCH_2CH_2OH (d) 

66. Increasing order of acid strength among p-methoxyphenol, p-methylphenol and p-nitrophenol is

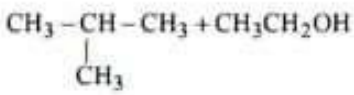
(a) p-Nitrophenol, p-Methoxyphenol, p-Methylphenol
(b) p-Methylphenol, p-Methoxyphenol, p-Nitrophenol
(c) p-Nitrophenol, p-Methylphenol, p-Methoxyphenol.
(d) p-Methoxyphenol, p-Methylphenol, p-Nitrophenol

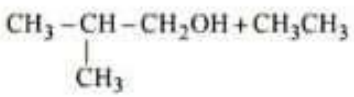
67. When phenol is treated with excess bromine water. It gives
(a) m-Bromophenol
(b) o-and p-Bromophenols
(c) 2,4-Dibromophenol
(d) 2,4,6-Tribomophenol.

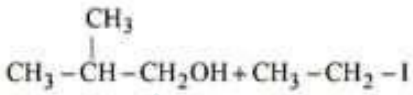
68. In the reaction:

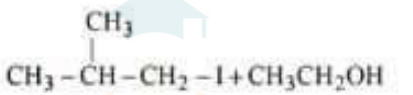


Which of the following compounds will be formed?

(a) 

(b) 

(c) 

(d) 

69. *n*-Propyl alcohol and isopropyl alcohol can be chemically distinguished by which reagent?
(a) PCl_5
(b) Reduction
(c) Oxidation with potassium dichromate
(d) Ozonolysis

70. The thermodynamic efficiency of cell is given by
(a) $\Delta H/\Delta G$ (b) $nFE/\Delta G$
(c) $nFE/\Delta H$ (d) nFE

71. Pinacolone is
(a) 2, 3-Dimethyl-2 3-butanediol
(b) 3, 3-Dimethyl-2 butanone
(c) 1-Phenyl-2Propanone
(d) 1,1-Diphenyl-2-ethandiol.

72. An ester is boiled with KOH. The product is cooled and acidified with concentrated HCl. A white crystalline acid separates. The ester is
(a) Methyl acetate (b) Ethyl acetate
(c) Ethyl formate (d) Ethyl benzoate

73. Aspirin is an acetylation product of
(a) o-hydroxybenzoic acid
(b) o-dihydroxybenzene
(c) m-hydroxybenzoic acid
(d) p-dihydroxybenzene

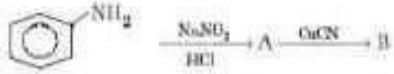
74. Which of the following is incorrect?
(a) $NaHSO_3$ is used in detection of carbonyl compound
(b) $FeCl_3$ is used in detection of phenolic group
(c) Tollen reagent is used in detection of unsaturation
(d) Fehling solution is used in detection of glucose

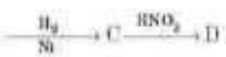
75. Formic acid is obtained when
(a) Calcium acetate is heated with conc. H_2SO_4
(b) Calcium formate is heated with calcium acetate
(c) Glycerol is heated with oxalic acid at 373 K
(d) Acetaldehyde is oxidised with $K_2Cr_2O_7$ and H_2SO_4.

76. When aniline reacts with oil of bitter almonds (C_6H_5CHO) condensation takes place and benzal derivative is formed. This is known as
(a) Million's base
(b) Schiff's reagent
(c) Schiff's base
(d) Benedict's reagent

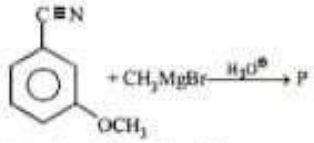
77. The consituent of the powerful explosive RDX is formed during the nitration of
(a) toluene (b) phenol
(c) glycerol (d) urotropine

78. Aniline in a set of reactions yielded a product D.

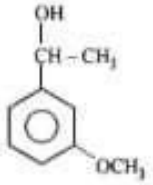


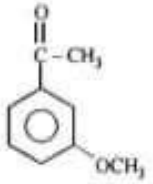


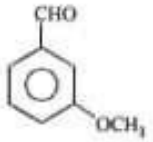
The structure of the product D would be:
(a) C_6H_5NHOH
(b) $C_6H_5NHCH_2CH_3$
(c) $C_6H_5CH_2NH_2$
(d) $C_6H_5CH_2OH$

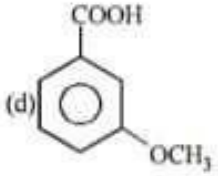
79. 

Product 'P' in the above reaction is

(a) 

(b) 

(c) 

(d) 

80. What is the decreasing order of basicity of primary, secondary and tertiary ethylamines and NH_3?

(a) $NH_3 > C_2H_5NH_2 > (C_2H_5)_2NH > (C_2H_5)_3N$

(b) $(C_2H_5)_3N > (C_2H_5)_2NH > C_2H_5NH_2 > NH_3$

(c) $(C_2H_5)_2NH > C_2H_5NH_2 > (C_2H_5)_3N > NH_3$

(d) $(C_2H_5)_2NH > (C_2H_5)_3N > C_2H_5NH_2 > NH_3$.

PART - III : MATHEMATICS

81. If R be a relation "less than" from A = {1, 2, 3, 4} B = {1, 3, 5}, i.e. (a, b) ∈R iff a < b, then ROR^{-1} is

(a) {(1, 3), (1, 5), (2, 3), (2, 5), (3, 5), (4, 5)}

(b) {(3,1), (5, 1), (3, 2), (5, 2), (5, 3), (5, 4)}

(c) {(3, 3), (3, 5), (5, 3), (5, 5)}

(d) {(3, 3), (3, 4), (4, 5)}

82. The smallest positive integer n for which $\left(\frac{1+i}{1-i}\right)^n = 1$ is

(a) 4 (b) 3

(c) 2 (d) 1

83. If $\tan x + \tan(x + \pi/3) + \tan(x + 2\pi/3) = 3$, then

(a) $\tan x = 1$ (b) $\tan 2x = 1$

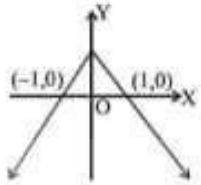
(c) $\tan 3x = 1$ (d) none of these.

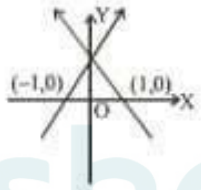
84. If $\vec{b}$ and $\vec{c}$ are any two non-collinear mutually perpendicular unit vectors and $\vec{a}$ is any vector, then $(\vec{a}\cdot\vec{b})\vec{b} + (\vec{a}\cdot\vec{c})\vec{c} + \frac{\vec{a}\cdot(\vec{b}\times\vec{c})}{|\vec{b}\times\vec{c}|^2}(\vec{b}\times\vec{c})$ is equal to :

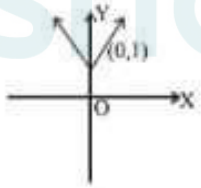
(a) $\vec{a}$ (b) $2\vec{a}$

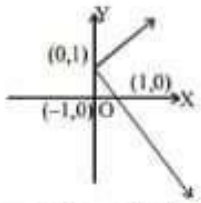
(c) $3\vec{a}$ (d) None

85. Which one of the following graphs represents the function $y = 1 + |x|$ for all $x \in R$?

(a) 

(b) 

(c) 

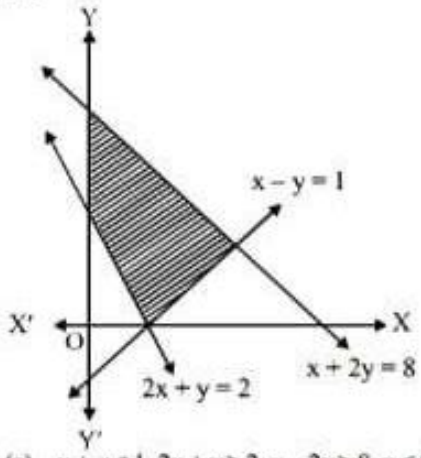
(d) 

86. The point (2a, a) lies inside the region bounded by the parabola $x^2 = 4y$ and its latus rectum. Then,

(a) $0 \le a \le 1$ (b) $0 < a < 1$

(c) $a > 1$ (d) $a < 0$

87. The linear inequations for which the shaded area in the following figure is the solution set, are



(a) $x+y\le 1, 2x+y\ge 2, x-2y\ge 8, x\le 0, y\ge 0$
(b) $x-y\ge 1, 2x+y\ge 2, x+2y\ge 8, x\ge 0, y\ge 0$
(c) $x-y\le 1, 2x+y\ge 2, x+2y\le 8, x\ge 0, y\ge 0$
(d) $x+y\ge 1, 2x+y\le 2, x+2y\ge 8, x\ge 0, y\ge 0$

88. The roots of the equation $(3-x)^4+(2-x)^4=(5-2x)^4$ are
(a) two real and two imaginary
(b) all imaginary
(c) all real
(d) none of these

89. Coloured balls are distributed in four boxes as shown in the following table

Box	Colour			
	Black	White	Red	Blue
I	3	4	5	6
II	2	2	2	2
III	1	2	3	1
IV	4	3	1	5

A box is selected at random and then a ball is randomly drawn from the selected box. The colour of the ball is black. Probability that the ball drawn from Box III, is
(a) 0.161 (b) 0.162
(c) 0.165 (d) 0.104

90. If $\begin{vmatrix} p & q-y & r-z \\ p-x & q & r-z \\ p-x & q-y & r \end{vmatrix}=0$, then the value of $\frac{p}{x}+\frac{q}{y}+\frac{r}{z}$ is
(a) 0 (b) 1
(c) 2 (d) 4pqr

91. Three concurrent lines with direction cosines $l_1, m_1, n_1; l_2, m_2, n_2$ and l_3, m_3, n_3 are coplanar then $\begin{vmatrix} l_1 & m_1 & n_1 \\ l_2 & m_2 & n_2 \\ l_3 & m_3 & n_3 \end{vmatrix}=$
(a) 0 (b) 1
(c) −1 (d) 2

92. The resultant moment of three forces $\hat{i}+2\hat{j}-3\hat{k}$, $2\hat{i}+3\hat{j}+4\hat{k}$ and $-\hat{i}-\hat{j}+\hat{k}$ acting on a particle at a point P (0, 1, 2) about the point A (1, −2, 0) is
(a) $6\sqrt{2}$ (b) $\sqrt{140}$
(c) $\sqrt{21}$ (d) None

93. If the p^{th}, q^{th}, r^{th}, terms of a G.P. are respectively x, y, z, then the value of $x^{q-r}\ y^{r-p}\ z^{p-q}$ is
(a) xyz (b) pqr
(c) 1 (d) none of these

94. A signal which can be green or red with probability 4/5 and 1/5 respectively, is received by station A and then trasmitted to station B. The probability of each station receiving the signal correctly is 3/4. If the signal received at station B is given, then the probability that the original signal is green, is
(a) $\frac{3}{5}$ (b) $\frac{6}{7}$
(c) $\frac{20}{23}$ (d) $\frac{9}{20}$

95. If A and B are two events, the probability that at most one of these events occurs is :
(a) $P(A')+P(B')-P(A'\cap B')$
(b) $P(A')+P(B')+P(A\cup B)-1$
(c) $P(A\cap B')+P(A'\cap B)+P(A'\cap B')$
(d) All above are correct.

96. If x, y, z are distinct number in A.P. with common differences d and the rank of the matrix $\begin{bmatrix} 4 & 5 & x \\ 5 & 6 & y \\ 6 & k & z \end{bmatrix}$ is 2 then the values of d and k are :
(a) $\frac{x}{4}$; arbitrary number
(b) arbitrary number, 7
(c) x, 5 (d) $\frac{x}{2}$, 6

97. The solution of $\sin^{-1}x - \sin^{-1}2x = \pm\frac{\pi}{3}$ is

(a) $\pm\frac{1}{3}$ (b) $\pm\frac{1}{4}$

(c) $\pm\frac{\sqrt{3}}{2}$ (d) $\pm\frac{1}{2}$

98. If $y = \tan\left(\frac{1}{2}\cos^{-1}\frac{1-u^2}{1+u^2} + \frac{1}{2}\sin^{-1}\frac{2u}{1+u^2}\right)$

and $x = \frac{2u}{1-u^2}$, then $\frac{dy}{dx} =$

(a) -1 (b) 0

(c) 1 (d) None of these

99. If the sides of a triangle ABC are in A.P., and a is the smallest side, then cos A equals to :

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

(c) $\frac{4c-3b}{2c}$ (d) none of these.

100. The octal numeral 23450 is equal to the binary number

(a) 10011100101000 (b) 10011100011000

(c) 10111000101000 (d) 10011100111000

101. ${}^nC_r + 2\,{}^nC_{r-1} + {}^nC_{r-2}$ is equal to:

(a) ${}^{n+2}C_r$ (b) ${}^nC_{r+1}$

(c) ${}^{n-1}C_{r+1}$ (d) None of these

102. The domain of the function defined by $f(x) = \sin^{-1}\sqrt{x-1}$ is

(a) $[1,2]$ (b) $[-1,1]$

(c) $[0,1]$ (d) None of these

103. Let f(x) be a continuous function such that the area bounded by the curve y = f(x), x-axis and the lines x = 0 and x = a is $\frac{a^2}{2} + \frac{a}{2}\sin a + \frac{\pi}{2}\cos a$, then $f\left(\frac{\pi}{2}\right) =$

(a) 1 (b) $\frac{1}{2}$

(c) $\frac{1}{3}$ (d) None of these

104. The number of all five digit numbers which are divisible by 4 that can be formed from the digits 0, 1, 2, 3, 4 (without repetition) is

(a) 36 (b) 30

(c) 34 (d) None of these

105. If the parabola $x^2 = ay$ makes an intercept of length $\sqrt{40}$ on the line $y - 2x = 1$, then a is equal to

(a) 1 (b) 3

(c) -1 (d) 2

106. If $\int \sin^{-1}x\,dx = f(x)\sin^{-1}x + g(x) + c$. Then

(a) $f(x) = x, g(x) = \sqrt{1-x^2}$

(b) $f(x) = \sqrt{1-x^2}, g(x) = 1 + x^2$

(c) $f(x) = x, g(x) = \frac{x}{\sqrt{1-x^2}}$

(d) none of these

107. The line $x\cos\alpha + y\sin\alpha = p$ is a tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ if

(a) $p = a\cos\alpha + b\sin\alpha$

(b) $p^2 = a^2\cos^2\alpha + b^2\sin^2\alpha$

(c) $p^2 = a^2\sec^2\alpha + b^2\tan^2\alpha$

(d) $p = a\sec\alpha + b\tan\alpha$

108. If $f: B \to A$ is defined by $f(x) = \frac{3x+4}{5x-7}$ and $g: A \to B$ is defined by $g(x) = \frac{7x+4}{5x-3}$, where A $= R - \left\{\frac{3}{5}\right\}$ and B $= R - \left\{\frac{7}{5}\right\}$ and I_A is an identity function on A and I_B is identity function on B, then

(a) $fog = I_A$ and $gof = I_A$

(b) $fog = I_A$ and $gof = I_B$

(c) $fog = I_B$ and $gof = I_B$

(d) $fog = I_B$ and $gof = I_A$

109. In [0,1] Lagranges Mean Value theorem is NOT applicable to

(a) $f(x)=\begin{cases}\frac{1}{2}-x & x<\frac{1}{2}\\ \left(\frac{1}{2}-x\right)^2 & x\geq\frac{1}{2}\end{cases}$

(b) $f(x)=\begin{cases}\frac{\sin x}{x}, & x\neq 0\\ 1, & x=0\end{cases}$

(c) $f(x)=x|x|$

(d) $f(x)=|x|$

110. With respect to multiplication modulo 5, the set $G=\{1,2,3,4\}$ is
(a) a finite abelian group of order 4
(b) not a finite abelian group of order 4
(c) both (a) and (b)
(d) none

111. Let f be function such that $f(x+y)=f(x)+f(y)$ for all x and y and $f(x)=(2x^2+3x)g(x)$ for all x, where g (x) is continuous and $g(0)=3$. Then f'(x) is equal to
(a) 9 (b) 3
(c) 6 (d) none of these

112. The differential equation
$(1+y^2)x\,dx-(1+x^2)y\,dy=0$
represents a family of:
(a) ellipses of constant eccentricity
(b) ellipses of variable eccentricity
(c) hyperbolas of constant eccentricity
(d) hyperbolas of variable eccentricity

113. $\int\frac{\sqrt{1+\sqrt{x}}}{x}dx$ is equal to

(a) $2\sqrt{1+\sqrt{x}}-2\log\left(\frac{\sqrt{1+\sqrt{x}}-1}{\sqrt{1+\sqrt{x}}+1}\right)+c$

(b) $4\sqrt{1+\sqrt{x}}+2\log\left(\frac{\sqrt{1+\sqrt{x}}+1}{\sqrt{1+\sqrt{x}}-1}\right)+c$

(c) $4\sqrt{1+\sqrt{x}}+2\log\left(\frac{\sqrt{1+\sqrt{x}}-1}{\sqrt{1+\sqrt{x}}+1}\right)+c$

(d) None of these.

114. The locus of a point, such that the sum of the squares of its distances from the planes $x+y+z=0$, $x-z=0$ and $x-2y+z=0$ is 9, is

(a) $x^2+y^2+z^2=3$

(b) $x^2+y^2+z^2=6$

(c) $x^2+y^2+z^2=9$

(d) $x^2+y^2+z^2=12$

115. The distance of the point (–5, –5, –10) from the point of intersection of the line $\vec{r}=2\hat{i}-\hat{j}+2\hat{k}+\lambda\left(3\hat{i}+4\hat{j}+2\hat{k}\right)$ and the plane $\vec{r}\cdot\left(\hat{i}-\hat{j}+\hat{k}\right)=5$ is
(a) 13 (b) 12
(c) $4\sqrt{15}$ (d) $10\sqrt{2}$

116. The asymptotes of the hyperbola $xy-3x+4y+2=0$ are
(a) $x=-4$ and $y=3$ (b) $x=4$ and $y=-3$
(c) $x=-4$ and $y=-4$ (d) $x=-3$ and $y=3$

117. The integer n for which
$\lim_{x\to 0}\frac{(\cos x-1)(\cos x-e^x)}{x^n}$ is a finite non-zero number is
(a) 1 (b) 2
(c) 3 (d) 4

118. The order and degree of the differential equation whose solution is $y=cx+c^2-3c^{3/2}+2$, where c is a parameter, are respectively
(a) 1 and 4 (b) 1 and 3
(c) 1 and 2 (d) none of these

119. A football is inflated by pumping air in it. When it acquires spherical shape its radius increases at the rate of 0.02 cm/s. The rate of increase of its volume when the radius is 10 cm is _____ π cm/s
(a) 0 (b) 2
(c) 8 (d) 9

120. Let B is a set containing the elements of boolean algebra and $a,b\in B$, then $a.(a+b)=$
(a) b (b) a . b
(c) a + b (d) a

PART - IV : (ENGLISH)

Direction (Qs. 121 - 123) : Read the passage carefully and answer the questions given below.

At this stage of civilization, when many nations are brought in to close and vital contact for good and evil, it is essential, as never before, that their gross ignorance of one another should be diminished, that they should begin to understand a little of one another's historical experience and resulting mentality. It is the fault of the English to expect the people of other countries to react as they do, to political and international situations. Our genuine goodwill and good intentions are often brought to nothing, because we expect other people to be like us. This would be corrected if we knew the history, not necessarily in detail but in broad outlines, of the social and political conditions which have given to each nation its present character.

121. According to the author the 'Mentality' of a nation is mainly product of its-
   (a) present character
   (b) international position
   (c) politics
   (d) history

122. The character of a nation is the result of its-
   (a) gross ignorance
   (b) cultural heritage
   (c) socio-political conditions
   (d) mentality

123. The need for a greater understanding between nations-
   (a) is more today than ever before
   (b) was always there
   (c) is no longer there
   (d) will always be there

124. **Direction: Choose the correct meaning of the idiom from the options given below.**
   At one's wit's end
   (a) Perplexed
   (b) Clear Up
   (c) Explain
   (d) Enlighten

125. Choose the best pronunciation of the word, Poem, from the following options.
   (a) poy-em (b) poe-um
   (d) poh-om (d) poi-um

ANSWER KEY

1. C
2. D
3. D
4. A
5. D
6. B
7. D
8. B
9. B
10. B
11. C
12. A
13. B
14. C
15. C
16. C
17. D
18. C
19. B
20. C
21. A
22. B
23. B
24. B
25. C
26. C
27. A
28. B
29. C
30. C
31. A
32. A
33. A
34. C
35. C
36. C
37. B
38. A
39. C
40. A
41. D
42. C
43. A
44. C
45. C
46. B
47. C
48. A
49. A
50. D
51. D
52. C
53. D
54. A
55. A
56. D
57. B
58. D
59. D
60. D
61. A
62. A
63. B
64. D
65. C
66. D
67. D
68. C
69. C
70. C
71. B
72. D
73. A
74. A
75. C
76. C
77. C
78. D
79. B
80. D

81. C
82. A
83. C
84. A
85. C
86. B
87. C
88. A
89. C
90. C
91. A
92. B
93. C
94. C
95. D
96. B
97. D
98. C
99. C
100.A
101.A
102.B
103.B
104.B
105.A
106.A
107.B
108.B
109.A
110.A
111.A
112.D
113.C
114.C
115.A
116.A
117.C
118.A
119.C
120.F
121.D
122.C
123.A
124.A
125.B