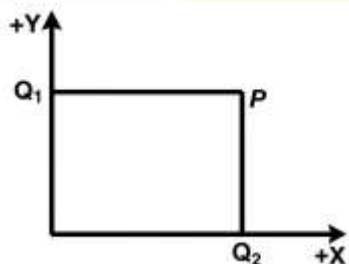


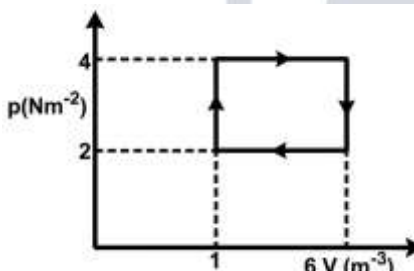
PHYSICS

- The number of neutrons in ${}_{92}\text{U}^{235}$ nucleus is
 (a) 327 (b) 235
 (c) 143 (d) 92
- Reverse saturation current of a diode
 (a) is independent of temperature
 (b) increases with increase in temperature
 (c) decreases with increase in temperature
 (d) may increase or decrease with increase in temperature depending on the semiconductor
- A radioactive sample has a half-life of 10 min . If 64 nuclei are contained in the sample the number of nuclei that would decay after, 50 min is
 (a) 2 (b) 5
 (c) 59 (d) 62
- The carrier of electromagnetic interaction is
 (a) gluon (b) photon
 (c) meson (d) graviton
- The output of NOT gate when its input is 0
 (a) is 1 (b) is 0
 (c) can be 0 or 1 (d) is 0 and 1
- LCD stands for
 (a) Light Carrying Diode
 (b) Liquid Crystal Display
 (c) Long Crystal Display
 (d) Light Crystal Display
- Which of the following statement is false?
 (a) Sound and light waves exhibit interference.
 (b) Sound and light waves exhibit diffraction.
 (c) Light wave exhibits polarisation, while sound wave does not.
 (d) Sound wave exhibits polarisation, while light wave does not.
- The correct relation between S, θ , L and C for an optically active solution is
 (a) $S = \theta LC$ (b) $\theta = SLC$
 (c) $L = \theta SC$ (d) $C = \theta LS$
- An inductor and a resistor are connected to an AC supply of 50 V and 50 Hz . If the voltage across the resistor is 40 V , then the voltage across the inductor will be
 (a) 10 V (b) 20 V
 (c) 30 V (d) 60 V
- A $10\mu\text{F}$ capacitor is charged to 10 V and disconnected from the battery. If another uncharged $10\mu\text{F}$ capacitor is connected across it in parallel, then the voltage across the combination will be
 (a) 5 V (b) 10 V
 (c) 20 V (d) Zero
- When two light nuclei fuse to form a relatively heavier nucleus, then the specific binding energy of the product nucleus is
 (a) lower than that of the reacting nuclei
 (b) equal to that of the reacting nuclei
 (c) greater than that of the reacting nuclei
 (d) equal to exactly half of either of the reacting nuclei
- Two point charges $Q_1 = 2\mu\text{C}$ and $Q_2 = 1\mu\text{C}$ are placed as shown. The coordinates of the point P are (2 cm, 1 cm). The electric intensity vector at P subtends an angle θ with the positive X-axis. The value of θ is given by



- (a) $\tan\theta = 1$ (b) $\tan\theta = 2$
 (c) $\tan\theta = 3$ (d) $\tan\theta = 4$

13. The direction of the force on a current carrying conductor held perpendicular to an uniform magnetic field is given by
 (a) Fleming's right hand rule
 (b) Ampere's swimming rule
 (c) Maxwell's right hand cork screw rule
 (d) Fleming's left hand rule
14. A convex lens of focal length F is placed in contact with a concave lens of focal length F . The equivalent focal length of the combination is
 (a) infinity (b) $F/2$
 (c) $2F$ (d) zero
15. If $x = at + bt^2$, where x is measured in metre and t in second, then the dimension of (b/a) is
 (a) $[LT^{-2}]$ (b) $[LT^{-1}]$
 (c) $[T]$ (d) $[T^{-1}]$
16. A particle is moving eastward with a velocity 5 ms^{-1} . In 10 s the velocity changes to 5 ms^{-1} northwards. The average acceleration in this time is
 (a) $\frac{1}{\sqrt{2}} \text{ ms}^{-2}$, towards North-West
 (b) $\frac{1}{2} \text{ ms}^{-2}$, towards North-West
 (c) $\frac{1}{\sqrt{2}} \text{ ms}^{-2}$, towards North-East
 (d) $\frac{1}{2} \text{ ms}^{-2}$, towards North-East
17. A mass of 0.1 kg is hung at the 20 cm mark from a 1 m rod weighing 0.25 kg pivoted at its centre. The rod will not topple if
 (a) No other mass is attached to the rod
 (b) 0.15 kg is hung at 80 cm mark
 (c) 0.15 kg is hung at 70 cm mark
 (d) 0.10 kg is hung at 70 cm mark
18. Which of the following cannot be explained on the basis of Bernoulli's principle?
 (a) Lift on an aircraft's wing
 (b) Ink filler
 (c) Swing of a cricket ball
 (d) Atomizer
19. The layer in the Earth's atmosphere which reflects radio waves from the Earth, thus helping radio communication is
 (a) stratosphere (b) mesosphere
 (c) troposphere (d) ionosphere
20. The reaction of the floor on an object placed on the floor of an elevator is maximum when elevator
 (a) is stationary
 (b) accelerates upwards
 (c) cable snaps and it falls freely towards the Earth
 (d) accelerates downwards

21. A particle is projected at an angle of 30° with the horizontal with a momentum p . At the highest point its momentum is
- (a) $\frac{\sqrt{3}}{4}p$ (b) $\frac{2}{\sqrt{3}}p$
 (c) p (d) $\frac{1}{2}p$
22. A block of mass 0.1 kg is held against a wall by applying a horizontal force of 5 N on it. If μ_x between the wall and the block is 0.5 , the magnitude of the frictional force acting on the block is
- (a) 0.98 N (b) 0.49 N
 (c) 4.9 N (d) 2.5 N
23. A ring rolls down an inclined plane. The ratio of the rotational kinetic energy to translational kinetic energy is
- (a) $1:3$ (b) $1:1$
 (c) $3:1$ (d) $2:1$
24. If 120 J of work is done in 2 min by a water pump, then the power of the pump is
- (a) 14.4 kW (b) 240 W
 (c) 60 W (d) 1 W
25. Assuming, $g_{(\text{Moon})} = \left(\frac{1}{6}\right) g_{\text{Earth}}$ and $D_{(\text{Moon})} = \left(\frac{1}{4}\right) D_{\text{Earth}}$, where g and D are the acceleration due to gravity and diameter respectively, the escape velocity from the Moon is
- (a) $\frac{11.2}{24} \text{ kms}^{-1}$ (b) $11.2 \times \sqrt{24} \text{ kms}^{-1}$
 (c) $\frac{11.2}{\sqrt{24}} \text{ kms}^{-1}$ (d) $11.2 \times 24 \text{ kms}^{-1}$
26. The work done in taking an ideal gas through one cycle of operation as shown in the indicator diagram below
- 
- (a) 10^{-5} J (b) 10^{-3} J
 (c) 10^{-2} J (d) 10 J
27. The ratio of speed of sound in hydrogen to that in oxygen at the same temperature is
- (a) $1:4$ (b) $4:1$
 (c) $1:1$ (d) $16:1$
28. A black body at a temperature T radiates energy at the rate of $E \text{ W m}^{-2}$. If the temperature is decreased by $T/2$, then the energy radiated will be
- (a) $E/4$ (b) $E/16$
 (c) $E/8$ (d) $E/32$
29. A particle executes simple harmonic motion with amplitude A . The distance moved by the particle in one oscillation is
- (a) zero (b) A
 (c) $2A$ (d) $4A$
30. A capacitor of $10 \mu\text{F}$ is connected to a 10 V cell. The maximum charge on the capacitor will be
- (a) $1 \mu\text{C}$ (b) $10 \mu\text{C}$
 (c) $100 \mu\text{C}$ (d) $1000 \mu\text{C}$
31. A wire of uniform cross-section has a resistance R . It is cut into ten equal parts. The parts are connected in parallel between two points A and B. The effective resistance between A and B will be

- (a) $0.01R$ (b) $0.1R$
(c) R (d) $10R$

32. Wires made of iron and silicon are cooled from 50°C to 30°C , then

- (a) resistance of both wires decreases
(b) resistance of both wires increases
(c) resistance of iron increases and that of silicon decreases
(d) resistance of iron decreases and that of silicon increases

33. In a meter bridge a copper coil is connected in the right gap and a resistance of 10Ω in the left gap. The balance point is obtained at 0.2 m . The resistance of the coil is

- (a) 40Ω (b) 5Ω
(c) 20Ω (d) 2.5Ω

34. Two identical concentric coils X and Y carrying currents in the ratio 1: 2 are arranged in mutually perpendicular planes. If the magnetic field due to coil X is B, then the net field at their common centre is

- (a) B (b) $2B$
(c) $3B$ (d) $\sqrt{5}B$

35. Which of the following is based on mechanical effect of electric current?

- (a) AC dynamo (b) DC dynamo
(c) AC or DC motor (d) Electric geyser

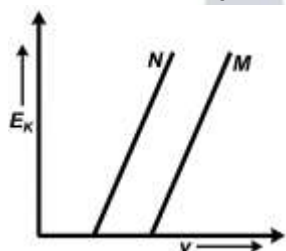
36. According to Faraday's law of electromagnetic induction an emf is induced in a coil, if

- (a) electric flux links with the coil
(b) magnetic flux links with the coil
(c) magnetic flux linked with the coil changes
(d) electric flux linked with the coil changes

37. The current in a coil changes from 1 mA to 5 mA in 4 milli second . If the coefficient of self-induction of the coil is 10 mH , then the magnitude of the self-induced emf is

- (a) 10 mV (b) 5 mV
(c) 2.5 mV (d) 1 mV

38. The graph of kinetic energy of photoelectron versus frequency of incident radiation is shown for two metals M and N. We may definitely conclude



- (a) work function of M > work function of N
(b) work function of M < work function of N
(c) work function of M = work function of N
(d) at the threshold frequency of M the kinetic energy of the photoelectron emitted by M is more than that emitted by N

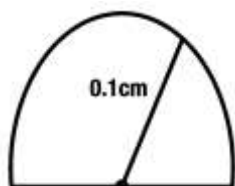
39. Choose the wrong statement.

- (a) Alpha particles can be scattered by Gold nucleus.
(b) X-ray can be diffracted by crystals.
(c) UV-radiation can cause photoelectric effect.
(d) Electrons cannot be diffracted by crystals.

40. In the case of the Bohr atom model if E_K and U are the kinetic and potential energies of an electron in an orbit, then

- (a) $E_K + U = 0$ (b) $E_K - U = 0$
(c) $2E_K + U = 0$ (d) $E_K + 2U = 0$

41. The ratio of the magnetic fields at the centre of a circular coil carrying current to that at a point whose distance is half of the radius of the coil is
 (a) $2\sqrt{5}:8$ (b) $5\sqrt{5}:8$
 (c) $5\sqrt{5}:4$ (d) $2\sqrt{5}:4$
42. The difference between the wavelengths of the stokes line and anti-stokes lines in the Raman spectrum of H – Br molecule is $100\text{\AA}$. If the wavelength of the anti-stokes line is $5000\text{\AA}$, then the wavelength of the incident radiation is
 (a) $5050\text{\AA}$ (b) $4950\text{\AA}$
 (c) $5100\text{\AA}$ (d) $4900\text{\AA}$
43. Optical pumping means transferring electrons
 (a) from ground state to metastable state
 (b) from metastable state to a higher excited state
 (c) from a state higher than the metastable state to the metastable state
 (d) from a state lower than the metastable state to a state higher than the metastable state
44. An open pipe immersed in water to half its length. The ratio of the fundamental frequency of the pipe before and after immersion in water is
 (a) 1: 2 (b) 1: 1
 (c) 1: 3 (d) 1: 4
45. Assuming, $R = 8.3 \text{ J mol}^{-1} \text{ K}^{-1}$ and $\gamma = 1.4$ the values of C_p and C_v of a gas are
 (a) $29.05 \text{ J mol}^{-1} \text{ K}^{-1}$, $20.75 \text{ J mol}^{-1} \text{ K}^{-1}$
 (b) $20.75 \text{ J mol}^{-1} \text{ K}^{-1}$, $29.05 \text{ J mol}^{-1} \text{ K}^{-1}$
 (c) $16.60 \text{ J mol}^{-1} \text{ K}^{-1}$, $8.300 \text{ J mol}^{-1} \text{ K}^{-1}$
 (d) $8.300 \text{ J mol}^{-1} \text{ K}^{-1}$, $16.60 \text{ J mol}^{-1} \text{ K}^{-1}$
46. A star A is 100 times brighter than star B. Then, $m_B - m_A$ the difference in their apparent magnitudes is
 (a) 100 (b) 0.01
 (c) 5 (d) 0.2
47. A monochromatic ray of light enters into a glass slab ($n = 1.5$) along the normal to the surface. The angle of deviation of the refracted ray is
 (a) 90° (b) 45°
 (c) 30° (d) 0°
48. A ray of light passing from glass to water is incident on the glass-water interface at 65° . If the critical angle for the pair of media is 63° .
 (a) The ray will emerge into water with a deviation of 2° from the normal
 (b) The ray will be refracted into water with a deviation of 2°
 (c) The ray will be totally internally reflected back into glass with a deviation of 50°
 (d) The ray will be totally internally reflected back into glass with a deviation of 2°
49. An equilateral prism is kept in the minimum deviation position. If the angle of incidence of a monochromatic ray at a refracting face is $49^\circ 30'$, then the angle of minimum deviation of the ray will be
 (a) 39° (b) $49^\circ 30'$
 (c) $40^\circ 30'$ (d) 51°
50. A glass hemisphere of radius 0.1 cm and refractive index 1.5 is placed over a spot on a table and the spot is viewed from above. The spot appears to be



- (a) 0.1 m above the top surface of the hemisphere

- (b) 0.1 m below the top surface of the hemisphere
- (c) 0.033 m above the top surface of the hemisphere
- (d) exactly on the top surface of the hemisphere

51. Photoelectric effect and Raman effect can be explained on the basis of

- (a) Newton's corpuscular theory of light
- (b) Huygens wave theory of light
- (c) Maxwell's electromagnetic theory of light
- (d) Planck's quantum theory of light

52. In an interference pattern the ratio of the intensity of light at the bright fringe to that at the dark fringe is 9: 1. Then, the ratio of the amplitudes of the two interfering waves

- (a) 3: 1
- (b) 2: 1
- (c) 1: 4
- (d) 5: 4

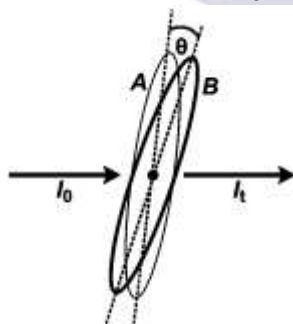
53. Diffraction effects are more easily detected in the case of sound waves than light waves because

- (a) sound waves are longitudinal
- (b) sound waves have smaller wavelength
- (c) sound waves have larger wavelength
- (d) sound waves are transverse

54. If θ is the polarising angle for a medium in which the speed of light is v , then according to Brewster's law

- (a) $\theta = \sin^{-1}(c/v)$
- (b) $\theta = \tan^{-1}(c/v)$
- (c) $\theta = \cos^{-1}(c/v)$
- (d) $\theta = \sin^{-1}(v/c)$

55. Two polaroid A and B are kept with their transmission axes at an angle θ with respect to one another. If the transmitted intensity of light $I_t = 0.75I_0$, where I_0 is the intensity of light incident on the system, then θ is



- (a) 30°
- (b) 45°
- (c) 60°
- (d) 90°

56. The electric force between two point charges separated by a certain distance in air is F . The distance at which they should be placed in a medium of relative permittivity k , so that the force remains the same, is

- (a) d
- (b) $\frac{d}{k}$
- (c) kd
- (d) $\frac{d}{\sqrt{k}}$

57. A positively charged particle is released from rest in a region of uniform electric field. The particle will move

- (a) with constant speed
- (b) with constant velocity
- (c) with constant acceleration
- (d) with variable acceleration

58. Two charges q and $-2q$ are separated by a distance d . If the electric intensity at the site of q is E , then the electric field at the site of $-2q$ is

- (a) E
- (b) $E/2$
- (c) $-2E$
- (d) $-E/2$

59. Choose the correct statement.

- (a) A p-type semiconductor is positively charged.
- (b) The Boolean expression $1 \cdot 0 = 0$.

- (c) The majority carrier in *n*-type semiconductor is hole.
 (d) A transistor cannot be used as a switch.

60. "Plum pudding" model of an atom was proposed by

- (a) C.V. Raman (b) N. Bohr
 (c) E. Rutherford (d) J.J. Thomson

CHEMISTRY

61. Which of the following is not a protein?

- (a) Wool (b) Cellulose
 (c) Hair (d) Nail

62. Which of the following is not true for the adsorption of a gas on a solid?

- (a) Increase in temperature favors adsorption
 (b) ΔH change is negative
 (c) Adsorption is more specific
 (d) Entropy change is negative

63. Peptisation is a process in which

- (a) precipitate becomes true solution
 (b) true solution becomes a suspension
 (c) a colloid gets coagulated
 (d) a suspension gets converted into a colloid

64. The mole fraction of benzene in a solution containing 39% by mass in an organic solvent of molecular mass 122 is

- (a) 0.5 (b) 0.6
 (c) 0.4 (d) 0.35

65. $\text{Zn(s)} + \text{Cl}_2(1 \text{ atm}) \rightarrow \text{Zn}^{2+} + 2\text{Cl}^-$; $E^\circ = 2.0 \text{ V}$

To increase the emf of the above cell

- (a) $[\text{Zn}^{2+}]$ should be increased
 (b) $[\text{Zn}^{2+}]$ should be decreased
 (c) $[\text{Cl}^-]$ should be increased
 (d) partial pressure of Cl_2 should be decreased

66. Two ions A^+ and B^- have radii 104 and 200 pm respectively, in a cubic close packed crystal of compound AB. The coordination number of A^+ is

- (a) 4 (b) 8
 (c) 6 (d) 3

67. The mass of a non-volatile solute of molar mass 60 g mol^{-1} that should be dissolved in 126 g of water to reduce its vapour pressure to 99% will be

- (a) 2.8 g (b) 5.6 g
 (c) 8.4 g (d) 4.2 g

68. The pH of boiling water is 6.4. This implies that boiling water is

- (a) slightly basic (b) slightly acidic
 (c) neutral (d) amphoteric

69. The spin only magnetic moment of Ni^{2+} (in BM) in aqueous solution will be

- (a) 1.73 (b) 2.84
 (c) 3.42 (d) 2.25

70. An organic compound which produces a bluish green flame when heated on a copper wire is

- (a) benzaldehyde (b) aniline
 (c) chlorobenzene (d) benzoic acid

71. Phenol can be distinguished from ethyl alcohol using

- (a) Na (b) AlCl_3
 (c) NaOH (d) FeCl_3

72. The time required for 100% completion of zero order reaction is
 (a) $\frac{a}{k}$ (b) $\frac{a}{2k}$
 (c) $\frac{2a}{k}$ (d) $\frac{k}{a}$
73. The EAN of central metal atom in $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$ is [Atomic number of Co = 27]
 (a) 34 (b) 35
 (c) 36 (d) 32
74. The alcohol obtained during the hydrolysis of ground nut oil is
 (a) glycol (b) butan-1-ol
 (c) pentan-2-ol (d) propane 1, 2, 3-triol
75. Which one of the following ores is concentrated by froth floatation process?
 (a) Magnesite (b) Magnetite
 (c) Galena (d) Malachite
76. Which of the following electron transitions in the H -atom will release the largest amount of energy?
 (a) $n = 3$ to $n = 2$ (b) $n = 2$ to $n = 1$
 (c) $n = 5$ to $n = 2$ (d) $n = 6$ to $n = 2$
77. An electron having spin quantum number of $s = \frac{-1}{2}$ and magnetic quantum number, $m = +3$ can be present in
 (a) both s-orbital and p-orbital
 (b) only p-orbital
 (c) only f-orbital
 (d) both d-orbital and f-orbital
78. The atomic number of the element with highest ionisation energy among the following is
 (a) $Z = 16$ (b) $Z = 14$
 (c) $Z = 13$ (d) $Z = 15$
79. Number of atoms in 560 cm^3 of oxygen at STP is
 (a) $\frac{1}{20} \times 6.022 \times 10^{23}$
 (b) $\frac{1}{40} \times 6.022 \times 10^{23}$
 (c) $\frac{1}{16} \times 6.022 \times 10^{23}$
 (d) $\frac{1}{32} \times 6.022 \times 10^{23}$
80. The volume of CO_2 (in cm^3) liberated at STP, when 1.06 g of anhydrous sodium carbonate is treated with excess of dilute HCl is [atomic mass of Na = 23]
 (a) 112 (b) 224
 (c) 56 (d) 2240
81. The oxidation number of oxygen is -1 in
 (a) NO_2 (b) PbO_2
 (c) Na_2O_2 (d) MnO_2
82. The heat of formation of $\text{H}_2\text{O}(l)$ is -286 kJ .
 The heat of formation of $\text{H}_2\text{O}(g)$ is likely to be
 (a) -286 kJ (b) +286 kJ
 (c) -341 kJ (d) -2428 kJ
83. The temperature of one mole of an ideal gas increases from 298 K to 308 K, when it absorbs 200 J of heat at constant volume. The change in the internal energy of the gas is
 (a) 200 J (b) 140 J
 (c) -200 J (d) -140 J
84. 100 mL of $\frac{N}{5}$ HCl was added to 1 g of pure CaCO_3 . What would remain after the reaction?
 (a) 0.5 g of CaCO_3

- (b) Neither CaCO_3 nor HCl
 (c) 50 mL of HCl
 (d) 25 mL of HCl
85. The RMS velocity of CH_4 , He and SO_2 are in the ratio of
 (a) 16: 4: 64 (b) 2: 1: 4
 (c) 2: 4: 1 (d) 1: 4: 2
86. A negative catalyst will
 (a) lower the activation energy of the reaction
 (b) does not alter the activation energy of the reaction
 (c) provide a new and easy path to the reaction
 (d) increases the activation energy of the reaction
87. The number of σ and π -bonds in pent-2-yne is
 (a) 12 and 2 (b) 11 and 2
 (c) 13 and 2 (d) 12 and 3
88. In Lassaigne's test for nitrogen in an organic compound, the blue colouration is due to the formation of
 (a) ferro-ferricyanide
 (b) ferric-ferrocyanide
 (c) potassium ferrocyanide
 (d) potassium ferrocyanide
89. The organic compound obtained during the addition of HBr to propene in the presence of peroxide catalyst is
 (a) 2-bromopropane (b) 2-bromopropene
 (c) 1-bromopropane (d) 1-bromopropene
90. On passing H_2S into a solution containing both Zn^{2+} and Cu^{2+} in acidic medium, only CuS gets precipitated. This is because
 (a) K_{sp} of $\text{CuS} < K_{\text{sp}}$ of ZnS
 (b) K_{sp} of $\text{CuS} = K_{\text{sp}}$ of ZnS
 (c) K_{sp} of $\text{CuS} > K_{\text{sp}}$ of ZnS
 (d) CuS is more stable than ZnS
91. The volume of H_2 obtained at STP, when Mg obtained by passing a current of 0.5 A through molten MgCl_2 for 32.2 min is treated with excess of dilute HCl is approximately [Equivalent mass of $\text{Mg} = 12$]
 (a) 56 cm^3 (b) 28 cm^3
 (c) 5.6 cm^3 (d) 112 cm^3
92. Markownikoff's rule is applicable to
 (a) $\text{C}_3\text{H}_6 + \text{HBr}$ (b) $\text{C}_2\text{H}_4 + \text{HCl}$
 (c) $\text{C}_3\text{H}_6 + \text{Cl}_2$ (d) $\text{C}_2\text{H}_4 + \text{HBr}$
93. The reaction of ethene in the presence of H^+ can be example for
 (a) -I-effect (b) +E-effect
 (c) -E-effect (d) +I-effect
94. $\text{CH}_3 - \text{CN} \xrightarrow{\text{Dil. HCl}} \text{A} \xrightarrow{\text{LiAlH}_4} \text{B} \xrightarrow{\text{PCl}_5} \text{C} \xrightarrow{\text{Ale. KOH}} \text{D}$.
 The product D in the above sequence of reaction is
 (a) acetaldehyde (b) ethyne
 (c) ethene (d) acetyl chloride
95. An organic compound is optically active if, it
 (a) is planar
 (b) is super imposable on its mirror image
 (c) contains chiral centres
 (d) is non-super imposable on its mirror image

96. Identify the electrophile in the following.

- (a) $R - NH_2$ (b) NH_3
(c) $AlCl_3$ (d) CN_6

97. The ionisation constant of phenol is more than that of ethanol because

- (a) phenoxide ion is a stronger base than ethoxide ion
(b) phenoxide ion is stabilised by resonance
(c) ethoxide ion is stabilised by resonance
(d) phenoxide ion is aromatic while ethoxide ion is aliphatic

98. The product C in the following sequence of chemical reaction is $CH_3 - COOH \xrightarrow{Ca(OH)_2} A \xrightarrow{Heat} B \xrightarrow{NH_2OH} C$

- (a) acetaldoxime (b) formaldoxime
(c) ethane nitril (d) acetoxime

99. Which of the following statements is not true?

- (a) Acetic acid is stronger than chloro acetic acid.
(b) Formic acid is the strongest of all aliphatic monocarboxylic acids.
(c) Benzoic acid is stronger acid than acetic acid.
(d) Propanoic acid is weaker than acetic acid.

100. Maximum number of molecules of methyl iodide that can react with one molecule of methyl amine is

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

101. The amine which will not liberate nitrogen with nitrous acid is

- (a) ethyl amine (b) methyl amine
(c) dimethyl amine (d) 2-amino propane

102. Which of the following is aromatic?

- (a) Lysine (b) Proline
(c) Serine (d) Tyrosine

103. The mass of hydrogen in gram required to completely saturate 1 mole of triolein is

- (a) 6 (b) 3
(c) 2 (d) 9

104. $CH_3 - CH_2 - OH \xrightarrow{A} CH_3 - CH_2 - Cl \xrightarrow{B} CH_2 = CH_2$. A and B in this sequence of reactions are

- (a) $KOH(aq)$ and PCl_5 (b) PCl_5 and $KOH(aq)$
(c) Cl_2 and $KOH(alc)$ (d) PCl_5 and $KOH(alc)$

105. The enthalpy of neutralisation of HCl and NaOH is x kJ. The heat evolved, when 500 mL of 2 N HCl is mixed with 250 mL of 4 N NaOH will be

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

106. $A + B \rightleftharpoons C + D$. The initial concentrations of A and B are equal. At equilibrium, the concentration of C is twice that of A. The equilibrium constant of the reaction is

- (a) $\frac{9}{4}$ (b) 4
(c) $\frac{1}{9}$ (d) $\frac{4}{9}$

107. The dissociation of lime stone in the slag zone of the blast furnace is

- (a) exothermic accompanied by increase in entropy
(b) endothermic accompanied by decrease in entropy
(c) endothermic accompanied by increase in entropy
(d) exothermic with no change in entropy

108. Which of the following is not true for concentrated H_2SO_4 ?

- (a) Sulphonating agent
(b) Oxidising agent

- (c) Dehydrating agent
(d) Deliquescent in nature
109. Which of the following noble gases has the highest van der Waals' force of attraction?
(a) Ar (b) Ne
(c) Xe (d) He
110. Which one of the following metal ions is coloured?
(a) Ti^+ (b) Cu^+
(c) V^{4+} (d) Zn^{2+}
111. Coordination number of nickel in $[\text{Ni}(\text{C}_2\text{O}_4)_3]^{4-}$ is
(a) 3 (b) 12
(c) 6 (d) 4
112. IUPAC name of $[\text{CrCl}_2(\text{NH}_3)_4]\text{NO}_3$ is
(a) tetraamminedichlorochromium (I) nitrate
(b) dichlorotetraamminechromium (III) nitrate
(c) tetraamminedichlorochromium (IV) nitrate
(d) tetraamminedichlorochromium (III) nitrate
113. Decomposition of NH_3 on the surface of platinum has a rate constant of $2.5 \times 10^{-4} \text{ mol dm}^{-3} \text{ s}^{-1}$ at 350 K. The order of the reaction is
(a) 0 (b) 1
(c) $1/2$ (d) 2
114. The rate equation of a gaseous reaction is given by $r = k[\text{A}][\text{B}]$. If the volume of the reaction vessel is suddenly reduced to $1/2$ of the initial volume, the reaction rate relating to the original rate will be
(a) $\frac{1}{4}$ (b) 4
(c) $\frac{1}{2}$ (d) 2
115. The reduction potential of an electrode can be increased by
(a) increasing the area of the electrode
(b) decreasing the temperature
(c) increasing the temperature
(d) decreasing the concentration of metal ions
116. An electric current is passed through silver and water voltmeters connected in series. The cathode of the silver voltmeter weighed 0.054 g more at the end of electrolysis. The volume of O_2 evolved at the anode of water voltmeter is
(a) 5.6 cm^3 (b) 11.2 cm^3
(c) 224 cm^3 (d) 28 cm^3
117. The pH of a mixture of 10 mL of 0.1M H_2SO_4 , 5 mL of 0.2 N HCl and 5 mL of 0.1M $\text{Ca}(\text{OH})_2$ is
(a) 1 (b) 0.5
(c) 0 (d) 1.5
118. The conjugate acid of NH_2^- is
(a) NH_4^+ (b) NH_3
(c) NH_2OH (d) NH^-
119. Phenyl isocyanide is formed when chloroform is treated with alcoholic potassium hydroxide and
(a) benzaldehyde (b) aniline
(c) phenol (d) nitrobenzene
120. Which of the following does not undergo aldol condensation reaction?
(a) $\text{CH}_3 - \text{CHO}$ (b) $\text{ClCH}_2 - \text{CHO}$
(c) $\text{C}_6\text{H}_5 - \text{CHO}$ (d) $\text{CHCl}_2 - \text{CHO}$

MATHEMATICS

121. If the area of the circle $7x^2 + 7y^2 - 7x + 14y + k - 0$ is 12π sq units, then the value of k is
 (a) $\frac{-43}{4}$ (b) $\frac{-301}{4}$
 (c) -16 (d) ± 4
122. A man running a race-course notes that the sum of the distances from the two flag posts from him is always 10 m and the distance between the flag posts is 8 m. The equations of the path traced by the man is given by
 (a) $\frac{x^2}{9} + \frac{y^2}{25} = 1$ (b) $\frac{x^2}{9} + \frac{y^2}{16} = 1$
 (c) $\frac{x^2}{25} + \frac{y^2}{9} = 1$ (d) $\frac{x^2}{16} + \frac{y^2}{25} = 1$
123. The number of common tangents to the circles $x^2 + y^2 - 2x - 4y + 1 = 0$ and $x^2 + y^2 - 12x - 16y + 91 = 0$ is
 (a) 1 (b) 2
 (c) 3 (d) 4
124. Equation of the chord of the circle $x^2 + y^2 + 4x - 6y - 9 = 0$ bisected at $(0, 1)$ is
 (a) $y - 1 = x$ (b) $y + 1 = x$
 (c) $y + 1 = 2x$ (d) $y - 1 = 3x$
125. The angle between two asymptotes of the hyperbola $\frac{x^2}{25} - \frac{y^2}{16} = 1$ is
 (a) $\tan^{-1} \frac{4}{5}$ (b) $2\tan^{-1} \frac{4}{5}$
 (c) $2\tan^{-1} \frac{5}{4}$ (d) $\pi - 2\tan^{-1} \frac{4}{5}$
126. The parametric equation of a parabola is $x = t^2 + 1, y = 2t + 1$. The cartesian equation of its directrix is
 (a) $y = 0$ (b) $x = -1$
 (c) $x = 0$ (d) $x - 1 = 0$
127. If $|\mathbf{a} \times \mathbf{b}| = 5$ and $|\mathbf{a} \cdot \mathbf{b}| = 3$, then $|\mathbf{a}|^2 |\mathbf{b}|^2$ is equal to
 (a) 16 (b) 31
 (c) 25 (d) 34
128. The direction cosines of the vector $2\hat{i} + \hat{j} - 2\hat{k}$ is equal to
 (a) $\frac{2}{3}, \frac{1}{3}, -\frac{2}{3}$ (b) $\frac{2}{3}, \frac{1}{3}, \frac{2}{3}$
 (c) $\frac{1}{3}, \frac{2}{3}, -\frac{2}{3}$ (d) $\frac{2}{3}, \frac{2}{3}, \frac{1}{3}$
129. If $1, \omega, \omega^2$ are the cube roots of unity, then $(3 + 3\omega^2 + 5\omega)^6 - (2 + 6\omega^2 + 2\omega)^3$ is equal to
 (a) 32 (b) 64
 (c) 0 (d) -1
130. If $\int_{\log 2}^x \frac{dy}{\sqrt{e^y - 1}} = \frac{\pi}{6}$, then x is equal to
 (a) $\log_e 4$ (d) $\log_e 2$
 (c) 4 (d) 2
131. $\int_{-8}^8 (\sin^{93} x + x^{295}) dx =$
 (a) 1 (b) -1
 (c) 0 (d) $\frac{8}{3}$
132. Area of the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ is given by
 (a) 25π sq units (b) 20π sq units
 (c) 4π sq units (d) 5π units

133. The order of the differential equation $\left[1 + \left(\frac{dy}{dx}\right)^5\right]^{\frac{2}{3}} = \frac{d^3y}{dx^3}$
- (a) 2 (b) 1
(c) 3 (d) $\frac{2}{3}$
134. The solution of $\frac{dy}{dx} - 1 = e^{x-y}$ is
- (a) $e^{x-y} + x = c$ (b) $e^{-(x-y)} + x = c$
(c) $e^{-(x-y)} = x + c$ (d) $e^{x-y} = x + c$
135. If $\sin^{-1}\left(\frac{2p}{1+p^2}\right) - \cos^{-1}\left(\frac{1-q^2}{1+q^2}\right) = \tan^{-1}\left(\frac{2x}{1+x^2}\right)$, then the value of x is equal to
- (a) $\frac{p+q}{1+pq}$ (b) $\frac{p-q}{1-pq}$
(c) $\frac{p-q}{pq-1}$ (d) $\frac{p-q}{1+pq}$
136. The unit vector in the direction of the vector $a + 2b - c$ is equal to
- (a) $\frac{a+2b-c}{\sqrt{6}}$ (b) $\frac{a+2b-c}{2}$
(c) $\frac{a+2b-c}{4}$ (d) $\frac{a+2b-c}{6}$
137. Identify the false statement.
- (a) A non-empty subset H of group G is a subgroup of G if and only if for every $a, b \in H \rightarrow a \cdot b^{-1} \in H$
(b) The intersection of two subgroups of a group G is again a subgroup.
(c) A group of order three is not abelian
(d) If in a group F, $(ab)^2 = a^2b^2, \forall a, b \in G$ then G is abelian
138. If $y = \tan^{-1}\left(\frac{1}{1+x+x^2}\right) + \tan^{-1}\left(\frac{1}{x^2+3x+3}\right) + \tan^{-1}\left(\frac{1}{x^2+5x+7}\right) + \dots$ upto n terms then, $\frac{dy}{dx}$ at $x = 0$ and $n = 1$ is equal to
- (a) $\frac{1}{2}$ (b) $-\frac{1}{2}$
(c) 0 (d) $\frac{1}{3}$
139. If $\cot\alpha\cot\beta = 2$, then $\frac{\cos(\alpha+\beta)}{\cos(\alpha-\beta)}$ is equal to
- (a) 3 (b) $\frac{2}{3}$
(c) $\frac{1}{3}$ (d) $\tan\alpha\tan\beta$
140. If ω is a cube root of unity, then the value of determinant $\begin{vmatrix} 1+\omega & \omega^2 & \omega \\ \omega^2+\omega & -\omega & \omega^2 \\ 1+\omega^2 & \omega & \omega^2 \end{vmatrix}$ is equal to
- (a) $1 + \omega$ (b) $1 - \omega$
(c) 0 (d) ω^2
141. If the tangent to the curve $2y^3 = ax^2 + x^3$ at the point (a, a) cuts off intercepts α and β on the coordinate axes, where $\alpha^2 + \beta^2 = 61$, then the value of a is equal to
- (a) 25 (b) 36
(c) ± 30 (d) ± 40
142. Length of the subtangent at (a, a) on the curve $y^2 = \frac{x^2}{2a+x}$ is equal to
- (a) $\frac{18}{5}$ (b) $\frac{18a}{5}$
(c) $-\frac{18a^2}{5}$ (d) $\frac{18a^2}{5}$
143. The function $f(x) = 5 + 36x + 3x^2 - 2x^3$ is increasing in the interval
- (a) $(-2, 3)$ (b) $(2, 3)$
(c) $[2, 3)$ (d) $(2, 3]$

144. Divide 20 into two parts such that the product of one part and the cube of the other is maximum. The two parts are
 (a)(12,8) (b)(15,5)
 (c)(10,10) (d)(2,18)
145. The number of positive divisors of 4896 is
 (a)32 (b)34
 (c)36 (d)38
146. The last digit of $583! + 7^{291}$ is
 (a)1 (b)2
 (c)0 (d)3
147. $\int x^x(1 + \log x)dx =$
 (a) $x^x + C$ (b) $x^{-x} + x$
 (c) $x \log x + x$ (d) $\log x + x$
148. If $\int \frac{xe^x}{(1+x)^2} dx = e^x f(x) + c$, then $f(x)$ is equal to
 (a) $\frac{1}{(1+x)^2}$ (b) $\frac{x}{(1+x)}$
 (c) $\frac{1}{1+x}$ (d) $\frac{x}{(1+x)^2}$
149. $\int_0^{\pi/2} \frac{\sin 2t}{\sin^4 t + \cos^4 t} dt =$
 (a) π (b) $\frac{\pi}{3}$
 (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{2}$
150. If $4^{\log_9 3} + 9^{\log_2 4} = 10^{\log_x 83}$, then x is equal to
 (a)10 (b)4
 (c)-10 (d)-4
151. If $p = 3^{\frac{1}{3}} \cdot 3^{\frac{2}{9}} \cdot 3^{\frac{3}{27}} \dots \infty$, then $p^{\frac{4}{3}} =$
 (a) $3^{\frac{1}{4}}$ (b)3
 (c)9 (d) $3^{\frac{3}{4}}$
152. If α, β, γ are the roots of the equation $x^3 - 3x^2 + 2x - 1 = 0$, then the value of $(1 - \alpha)(1 - \beta)(1 - \gamma)$ is
 (a)1 (b)2
 (c)-1 (d)-2
153. The middle term in the expansion of $(1 + x)^{2n}$ is
 (a) $\frac{1 \cdot 3 \cdot 5 \dots (2n-1)}{n} x^n$ (b) $\frac{1 \cdot 3 \cdot 5 \dots (2n-1)}{n!} 2^{n-1} x^n$
 (c) $\frac{1 \cdot 3 \cdot 5 \dots (2n)}{n!} x^n$ (d) $\frac{1 \cdot 3 \cdot 5 \dots (2n-1)}{n!} 2^n x^n$
154. If $p \rightarrow (\sim q \vee r)$ is false, then the truth values of p, q and r are
 (a)T, T, F (b)T, F, T
 (c)F, T, T (d)F, F, T
155. If $\frac{2}{9!} + \frac{2}{3!7!} + \frac{1}{5!5!} = \frac{2^a}{b!}$, where $a, b \in \mathbb{N}$, then the ordered pair (a, b) is
 (a)(10,9) (b)(10,7)
 (c)(9,10) (d)(5,10)
156. $\tan 10^\circ \tan 20^\circ \tan 30^\circ \tan 40^\circ \tan 50^\circ \tan 60^\circ \tan 70^\circ \tan 80^\circ =$
 (a)0 (b)-1
 (c) $\frac{1}{\sqrt{3}}$ (d)1

157. If $\tan\theta = \frac{m}{n}$, then $n\cos 2\theta + m\sin 2\theta$ is equal to

- (a) n (b) n^2
(c) $\frac{n}{m}$ (d) $\frac{m^2}{n^2}$

158. If $\frac{b+c}{11} = \frac{c+a}{12} = \frac{a+b}{13}$, then $\cos A$ is equal to

- (a) $\frac{5}{7}$ (b) $\frac{1}{5}$
(c) $\frac{2}{5}$ (d) $\frac{1}{7}$

159. If $a = \cos 2\alpha + i\sin 2\alpha$, $b = \cos 2\beta + i\sin 2\beta$, then $\sqrt{\frac{a}{b}} + \sqrt{\frac{b}{a}} =$

- (a) $2i\sin(\alpha - \beta)$ (b) $2i\sin(\alpha + \beta)$
(c) $2\cos(\alpha + \beta)$ (d) $2\cos(\alpha - \beta)$

160. If $y = \log \left[\tan \left(\frac{\pi}{4} + \frac{x}{2} \right) \right]$, then $\frac{dy}{dx} =$

- (a) $\sec x$ (b) $\sin x$
(c) $\operatorname{cosec} x$ (d) $\sec \frac{x}{2}$

161. If $y = \sin^2 \left(\tan^{-1} \sqrt{\frac{1-x^2}{1+x^2}} \right)$, then $\frac{dy}{dx} =$

- (a) x (b) $-x$
(c) 1 (d) -1

162. If $\sqrt{\frac{x}{y}} + \sqrt{\frac{y}{x}} = \sqrt{a}$, then $y \cdot \frac{dx}{dy} =$

- (a) $\frac{x}{y}$ (b) $\frac{y}{x}$
(c) x (d) 0

163. If $x = \frac{1-t}{1+t}$, $y = \frac{2t}{1+t^2}$, then $\frac{d^2y}{dx^2} =$

- (a) $\frac{2t}{(1+t)^2}$ (b) $\frac{1}{(1+t)^4}$
(c) $\frac{2t}{(1+t)^2}$ (d) 0

164. In the group $G = \{1, 5, 7, 11\}$ under $\otimes_{12}$ the value of $7 \otimes_{12} 11^{-1}$ is equal to

- (a) 5 (b) 7
(c) 11 (d) 1

165. Which of the following is a subgroup of the group $G = \{1, 2, 3, 4, 5, 6\}$ under $\otimes_7$?

- (a) $\{2, 6, 1\}$ (b) $\{1, 2, 4\}$
(c) $\{5, 4, 2\}$ (d) $\{2, 3, 1\}$

166. If $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$, $B = (\operatorname{adj} A)$ and $C = 5A$, then $\frac{|C|}{|\operatorname{adj} B|}$ is equal to

- (a) 25 (b) -1
(c) 5^3 (d) -5

167. If $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 7 \\ 16 \\ 22 \end{bmatrix}$, $X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$ and $AX = B$, then z is equal to

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

168. If $A = \begin{bmatrix} 1 & \log_b a \\ \log_a b & 1 \end{bmatrix}$, then $|A|$ is equal to

- (a) 0 (b) $\log_a b$
(c) -1 (d) $\log_b a$

169. If a vertex of triangle is $(3, 3)$ and the mid-points of two sides through this vertex are $(2, \frac{3}{2})$ and $(4, \frac{3}{2})$, then the centroid of the triangle is given by

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

170. The image of the point $(2, 4)$ on the line $x + y - 10 = 0$ is

- (a) $(4, 8)$ (b) $(6, 5)$
(c) $(6, 8)$ (d) $(0, 10)$

171. If the sum of the slopes of the lines given by $x^2 - 4pxy + 8y^2 = 0$ is three times their product, then p has the value

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

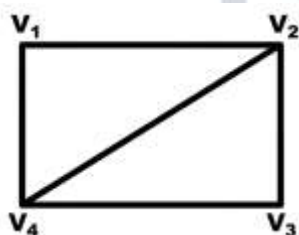
172. $\lim_{x \rightarrow 0} \left(\frac{1+5x^2}{1+3x^2} \right)^{\frac{1}{x^2}} =$

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

173. If $f(x) = \begin{cases} \frac{e^x - 1}{4x} & \text{for } x \neq 0 \\ \frac{k+x}{4} & \text{for } x = 0 \end{cases}$ is continuous at $x = 0$, then $k =$

- (a) 5 (b) 3
(c) 2 (d) 0

174. The non-adjacent vertex in the graph is



- (a) V_1V_2 (b) V_4V_3
(c) V_2V_4 (d) V_1V_3

175. $\sin \left[2\cos^{-1} \cot \left(2\tan^{-1} \frac{1}{2} \right) \right]$ is equal to

- (a) $\frac{3\sqrt{7}}{8}$ (b) $\frac{5\sqrt{7}}{8}$
(c) $\frac{5\sqrt{7}}{2}$ (d) $\frac{3\sqrt{7}}{2}$

176. The multiplicative inverse of $\frac{3+4i}{4-5i}$ is

- (a) $\left(\frac{-8}{25}, \frac{31}{25} \right)$ (b) $\left(\frac{-8}{25}, \frac{-31}{25} \right)$
(c) $\left(\frac{8}{25}, \frac{-31}{25} \right)$ (d) $\left(\frac{-8}{25}, \frac{31}{5} \right)$

177. The general solution of $\tan x - \sin x = 1 - \tan x \cdot \sin x$

- (a) $x = n\pi + \frac{\pi}{4}$ and or $x = n\pi + (-1)^n \left(\frac{-\pi}{2} \right)$
(b) $x = \frac{n\pi}{4} - \frac{\pi}{4}$ and or $x = n\pi + (-1)^n \left(-\frac{\pi}{2} \right)$
(c) $x = n\pi + \frac{\pi}{4}$
(d) $x = n\pi + \frac{\pi}{6}$ and or $x = n\pi + (-1)^n \left(-\frac{\pi}{2} \right)$

178. The angle between the circles $x^2 + y^2 + 4x + 2y + 1 = 0$ and $x^2 + y^2 - 2x + 6y - 6 = 0$ is

(a) $\frac{\pi}{6}$

(b) $\frac{\pi}{3}$

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

(d) $\cos^{-1}\left(\frac{7}{16}\right)$

179. If $|\mathbf{a}| = 2$, $|\mathbf{b}| = 7$ and $\mathbf{a} \times \mathbf{b} = 3\hat{\mathbf{i}} + 2\hat{\mathbf{j}} + 6\hat{\mathbf{k}}$, then the angle between $\mathbf{a}$ and $\mathbf{b}$ is

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

(b) $\frac{\pi}{6}$

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

(d) $\frac{\pi}{4}$

180. The domain of the function $f(x) = \log(1 - x) + \sqrt{x^2 - 1}$

(a) $(-\infty, -1)$

(b) $(-\infty, -1]$

(c) $(-\infty, 2]$

(d) $(-\infty, 0)$

