1. The intensity of radiation emitted by sun is maximum for the wavelength of 560 nm and that emitted by a star is maximum for the wavelength of 350 nm. If the average temperature of the sun is 2×10^7 K, the temperature of the star is

(A) 3.2×10^7K

(B) 4.3×10^6K

(C) 3.2×10^6K

(D) 5.4×10^7K

2. A mass *m* is suspended from a spring of negligible mass and the system oscillates with a frequency f_1. The frequency of oscillations is f_2 when a mass 16 m is suspended from the same spring. The value of $\frac{f_1}{f_2}$ is

(A) 1 :16
(B) 1 : 4
(C) 4 : 1
(D) 1 : 32

3. A capacitor of capacitance *C* has reactance X_c. If capacitance and frequency become double, then the capacitive reactance will be

(A) $2X_c$

(B) $4X_c$

(C) $\frac{X_c}{2}$

(D) $\frac{X_c}{4}$

4. A solid sphere of radius R and mass M is rotating about its diameter. A solid cylinder of same mass and same radius is also rotating about its geometrical axis with an angular speed twice that of the sphere. The ratio of their kinetic energies of rotation $\frac{KE_{sphere}}{KE_{cylinder}}$ will be

(A) 3 : 1
(B) 2 : 3
(C) 1 : 5
(D) 1 : 4

5. Two particles of the same mass are revolving with the same speed on circular paths of radii r_1 and r_2. The ratio of their centripetal forces will be

(A) $\sqrt{\frac{r_1}{r_2}}$

(B) $\frac{r_2}{r_1}$

(C) $\left(\frac{r_1}{r_2}\right)^2$

(D) $\left(\frac{r_2}{r_1}\right)^2$

6. A child stands at the centre of a turntable with two arms outstretched. The turntable is set rotating with an angular speed of 40 rev/min. If he holds his hand back and thereby reduces his moment of inertia to $\frac{2}{5}$ times the initial value, and the turntable rotates without the friction, the angular speed of the child is

(A) 100 rev/min
(B) 80 rev/min
(C) 40 rev/min
(D) 16 rev/min

7. The bulk modulus of a spherical object is B. If it is subjected to uniform pressure P, the fractional decrease in radius is

(A) $\frac{P}{B}$

(B) $\frac{B}{3P}$

(C) $\frac{3P}{B}$

(D) $\frac{P}{3B}$

8. The dimension and unit of coefficient of viscosity is

(A) $[ML^{-1}T^{-1}]$ and poise
(B) $[ML^{-1}T^{-2}]$ and poise
(C) $[ML^{-2}T^{-2}]$ and newton
(D) $[ML^{-1}T^{-2}]$ and newton

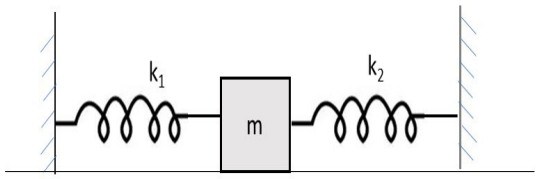
9. A spherical black body with a radius of 12 cm radiates 450 watt power at 500 K. If the radius were halved and the temperature doubled, the power radiated in watt would be

(A) 450
(B) 900
(C) 1800
(D) 225

10. The number of degrees of freedom of a rigid diatomic molecule is

(A) 2
(B) 3
(C) 4
(D) 5

11. Two springs of force constant k_1 and k_2 are attached to mass m as shown. The time period of the oscillation is



(A) $\frac{1}{2\pi}\sqrt{\frac{m}{k}}$

(B) $2\pi\sqrt{\frac{m(k_1+k_2)}{k_1+k_2}}$

(C) $2\pi\sqrt{\frac{m}{k_1+k_2}}$

(D) $\frac{1}{2\pi}\sqrt{\frac{m(k_1+k_2)}{k_1+k_2}}$

12. In a circuit the current lags behind the voltage by a phase difference of $\frac{\pi}{2}$. The circuit contains which of the following?

(A) only *R*
(B) only *L*
(C) only *C*
(D) *R* and *C*

13. Four metal conductors having different shapes: (i) a sphere, (ii) a cylinder (iii) a pear (iv) a lightning conductor are mounted on an insulating stands and charged. The one which is best suited to retain the charges for a longer time is

(A) sphere
(B) cylinder
(C) pear
(D) lightning conductor

14. A solid sphere and a hollow sphere of equal diameters are raised to the same potential. Then

(A) hollow sphere has more charge
(B) both have equal charge
(C) only hollow sphere has charge
(D) solid sphere has more charge

15. The free electrons of a copper wire of cross sectional area $10^{-6}m^2$ acquire a drift velocity of 10^{-4} m/sec when a certain potential difference is applied across the wire. If the density of free electrons in copper is 8.5×10^{28} electrons/m^3, then current flowing in the wire is

(A) 1.36 A
(B) 2.45 A
(C) 3.65 A
(D) 13.6 A

16. If two identical heaters each rated as 1000 W, 220 V are connected in parallel to 220 V, then the total power consumed is

(A) 200 W
(B) 250 W
(C) 2000 W
(D) 2500 W

17. The emf E (in volts) of a certain thermocouple is found to vary with θ (in °C) according to the equation $E = 20\theta - \frac{\theta^2}{20}$, where θ is the temperature of the hot function, the cold function being kept at 0°C. Then, the neutral temperature of the thermocouple is

(A) 300°C
(B) 100°C
(C) 340°C
(D) 200°C

18. A solenoid coil of 300 turns/m is carrying a current of 5 A. The length of the solenoid is 0.5 m and has a radius of 1 cm. The magnitude of the magnetic field inside the solenoid is

(A) 1.9×10^{-3} T

(B) 4.5×10^{-3} T

(C) 2.3×10^{-3} T

(D) 3.2×10^{-3} T

19. Magnetic field at the centre of a current carrying circular loop having 1 A current and number of turns one (radius of the loop is 1 m) will be

(A) $\frac{\mu_o}{2}$

(B) $2\mu_o$

(C) $\frac{\mu_o}{4}$

(D) $4\mu_o$

20. A substance has a critical angle of 45° for yellow light. Then its refractive index is

(A) $\sqrt{2}$

(B) $\frac{1}{\sqrt{2}}$

(C) $\frac{\sqrt{3}}{2}$

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

21. The β particle is emitted from the nucleus of mass number A with velocity v, then the recoil speed of nucleus will be

(A) $\frac{M_e v}{A - M_e}$

(B) $\frac{4v}{A + 4}$

(C) v

(D) $\frac{4v}{A - 4}$

22. The existence of positively charged nucleus in an atom was first established by

(A) Bohr's theory of hydrogen atom
(B) Positive rays analysis
(C) α-particle scattering experiment
(D) Thomson's model of atom

23. A photocell is illuminated by a small bright source placed 1 m away. When the source of light is placed 0.5 m away, the number of electrons emitted by photo cathode would

(A) decrease by a factor of 4
(B) increase by a factor of 4
(C) decrease by a factor of 2
(D) increase by a factor of 2

24. Which of the phenomena is not common to sound and light waves?

(A) Interference
(B) Diffraction
(C) Coherence
(D) Polarisation

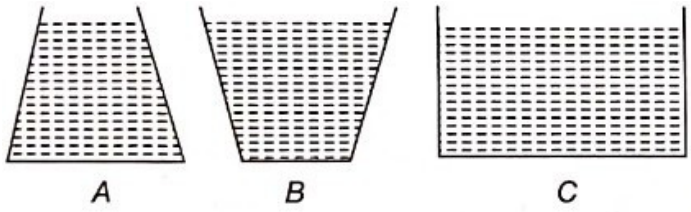
25. Suppose the number of turns in a coil be tripled, the value of magnetic flux linked with it

(A) remains unchanged
(B) becomes $\frac{1}{3}$
(C) is tripled
(D) None of the above

26. Two equal and opposite charges of 2×10^{-10} C are placed at a distance of 1 cm forming a dipole and are placed in an electric field of 2×10^{5} N/C. The maximum torque on dipole is

(A) $2\sqrt{2} \times 10^{-6}$ Nm
(B) 4×10^{-9} Nm
(C) 8×10^{8} Nm
(D) 4×10^{-7} Nm

27. Three vessels *A*, *B* and *C* of different shapes contain a water up to the same height as shown in the figure. P_A, P_B and P_C be the pressures exerted by the water at the bottom of the vessels *A*, *B* and *C* respectively. Then



(A) $P_A > P_B > P_C$
(B) $P_B > P_C > P_A$
(C) $P_C > P_B > P_A$
(D) $P_A = P_B = P_C$

28. The length of a metallic rod is 5 m at 0°C and becomes 5.01 m, on heating up to 100°C. The linear expansion of the metal will be

(A) 2.33×10^{-5}/°C
(B) 6.0×10^{-5}/°C
(C) 4.0×10^{-5}/°C
(D) 2.0×10^{-5}/°C

29. A Carnot engine absorbs 750 J of heat energy from a reservoir at 137°C and rejects 500 J of heat during each cycle, then the temperature of sink is

(A) 0.25°C
(B) 0.34°C
(C) 0.44°C
(D) 0.54°C

30. An alternating voltage E (in V) = $200\sqrt{2}$ sin (100 t) is applied to a 1 μ F capacitor through an *AC* ammeter. Then the ammeter will read a current of

(A) 10 mA
(B) 20 mA
(C) 40 mA
(D) 80 mA

31. To establish an instantaneous current of 2 A through a 1 μF capacitor; the potential difference across the capacitor plates should be changed at the rate of

(A) 2×10^4 V/s
(B) 4×10^6 V/s
(C) 2×10^6 V/s
(D) 4×10^4 V/s

32. A 90 pF capacitor is connected to a 12 V battery. How many electrons are transferred from one plate to another?

(A) 1.1×10^9
(B) 6.7×10^9
(C) 4×10^{19}
(D) 5×10^{19}

33. A small angle prism ($\mu = 1.62$) gives a deviation of 4.8°. The angle of prism is

(A) 5°
(B) 6.36°
(C) 3°
(D) 7.74°

34. A proton, a neutron, an electron and an α -particle have same energy. Then their de-Broglie wavelengths compare as

(A) $\lambda_p = \lambda_n > \lambda_e > \lambda_\alpha$
(B) $\lambda_\alpha < \lambda_p = \lambda_n < \lambda_e$
(C) $\lambda_e < \lambda_p = \lambda_n > \lambda_\alpha$
(D) $\lambda_e = \lambda_p > \lambda_n > \lambda_\alpha$

35. According to wave theory, time required for photo emission is

(A) less than 10s
(B) around $10^{-9}s$
(C) around 1s
(D) around few hours

36. A black body is at a temperature of 300 K. It radiates energy at a rate proportional to

(A) 300
(B) $(300)^2$
(C) $(300)^3$
(D) $(300)^4$

37. Range of frequencies allotted for commercial FM radio broadcast is

(A) 88 to 108 MHz
(B) 88 to 108 KHz
(C) 8 to 88 MHz
(D) 88 to 108 GHz

38. For an AM wave, the maximum voltage was found to be $10V$ and minimum voltage was $4V$. The modulation index of the wave is

(A) 0.33
(B) 0.43
(C) 0.56
(D) 0.64

39. A disc is rotating with angular velocity ω. If a child sits on it, what is conserved ?

(A) Linear momentum
(B) Angular momentum
(C) Kinetic energy
(D) Moment of inertia

40. Two astronauts are floating in gravitational free space after having lost contact with their spaceship. The two will

(A) keep floating at the same distance between them
(B) move towards each other
(C) move away from each other
(D) will become stationary

41. The acceleration due to gravity on the planet A is 9 times the acceleration due to gravity on the planet B. A man jumps to a height of 2 m on the surface of A. What is the height of jump by the same person on the planet B?

(A) 6 m

(B) $\frac{2}{3}$ m

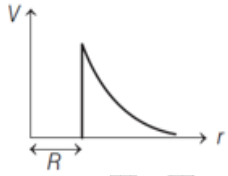
(C) $\frac{2}{9}$ m

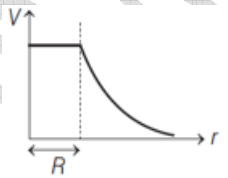
(D) 18 m

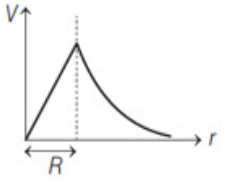
42. In a guitar, two strings A and B made of same material are slightly out of tune and produce beats of frequency 6 Hz. When tension in B is slightly decreased, the beat frequency increases to 7 Hz. If the frequency of A is 530 Hz, the original frequency of B will be

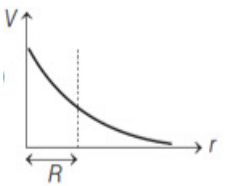
(A) 524 Hz
(B) 536 Hz
(C) 537 Hz
(D) 523 Hz

43. The variation of electrostatic potential with radial distance r from the centre of a positively charged metallic thin shell of radius R is given by the graph

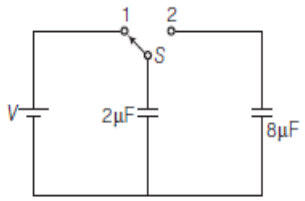
(A) 

(B) 

(C) 

(D) 

44. A capacitor of 2 μF is charged as shown in the figure. When the switch *S* is turned to position 2, the percentage of its stored energy dissipated is



(A) 20%
(B) 75%
(C) 80%
(D) 0%

45. Energy in a current carrying coil is stored in the form of

(A) electric field
(B) magnetic field
(C) dielectric strength
(D) heat

46. A step down transformer connected to an AC mains supply of 220 V is made to operate at 11 V, 44 W lamp. Ignoring power losses in the transformer, what is the current in the primary circuit?

(A) 0.2 A
(B) 0.4 A
(C) 2 A
(D) 4 A

47. An electron is accelerated from rest through a potential difference of *V* volt. If the de-Broglie wavelength of the electron is 1.227×10^{-2} nm, the potential difference is

(A) 10^2 V
(B) 10^3 V
(C) 10^4 V
(D) 10 V

48. The spectrum obtained from a sodium vapour lamp is an example of

(A) band spectrum
(B) continuous spectrum
(C) emission spectrum
(D) absorption spectrum

49. A solenoid of inductance L = 2H is connected to a battery. If the current changes uniformly at the rate of 5 A/s, what is the EMF induced in the solenoid?

(A) 2 V
(B) 5 V
(C) 10 V
(D) 20 V

50. A plane electromagnetic wave has an electric field amplitude E_0 = 300 V/m and propagates in free space. What is the amplitude of the magnetic field (B_0) associated with the wave?

(A) 0.5×10^{-6} T
(B) 1×10^{-6} T
(C) 1.5×10^{-6} T
(D) 2×10^{-6} T

51. Which of the following phenomena cannot be explained by the wave theory of light?

(A) Diffraction
(B) Interference
(C) Polarization
(D) Photoelectric effect

52. The work function of a metal is 4.5 eV. When monochromatic light with a wavelength of 200 nm strikes the metal surface, what is the maximum kinetic energy of the emitted photoelectrons?

(A) 1.1 eV
(B) 1.7 eV
(C) 2.1 eV
(D) 2.7 eV

53. What prevents protons in a nucleus from collapsing together despite the short-range nuclear attraction?

(A) Pauli exclusion principle
(B) Coulomb repulsion
(C) Quantum mechanical zero-point energy
(D) Shell model of the nucleus

54. What is the main purpose of doping a semiconductor material?

(A) Increase its resistance
(B) Enhance its conductivity
(C) Reduce its melting point
(D) Increase its hardness

55. A signal is transmitted through an optical fiber with a refractive index of $n = 1$. If the length of the fiber is 10 km, what is the time taken for the signal to travel through it?

(A) 33.3 μs
(B) 51.3 μs
(C) 63.3 μs
(D) 70 μs

56. The electromagnetic waves travel in a medium at a speed of 2.0×10^8 m/s. The relative permeability of the medium is 1.0. The relative permittivity of the medium will be

(A) 2.25
(B) 4.25
(C) 6.25
(D) 8.25

57. A microscope is focused on an object at the bottom of a bucket. If liquid with refractive index $\frac{5}{3}$ is poured inside the bucket, the microscope have to raised by 30 cm to focus the object again. The height of the liquid in the bucket is

(A) 75 cm
(B) 50 cm
(C) 18 cm
(D) 12 cm

58. An electron accelerated through a potential difference V_1 has a de-Broglie wavelength of λ. When the potential is changed to V_2, its de-Broglie wavelength increases by 50%. The value of $\left(\frac{V_1}{V_2}\right)$ is equal to

(A) 3

(B) $\frac{9}{4}$

(C) $\frac{3}{2}$

(D) 4

59. Half-lives of two radioactive elements *A* and *B* are 20 minutes and 40 minutes, respectively. Initially, the samples have equal number to nuclei. After 80 minutes, the ratio of decayed numbers of *A* and *B* nuclei will be

(A) 1 : 16
(B) 4 : 1
(C) 1 : 4
(D) 5 : 4

60. If an emitter current is changed by 4 mA, the collector current changes by 3.5 mA. The value of β will be

(A) 7
(B) 0.5
(C) 0.875
(D) 3.5

61. In a cuboid of dimension $2L \times 2L \times L$, a charge q is placed at the centre of the surface 'S' having area of $4\ L^2$. The flux through the opposite surface to 'S' is given by

(A) $\frac{q}{12\varepsilon_0}$

(B) $\frac{q}{3\varepsilon_0}$

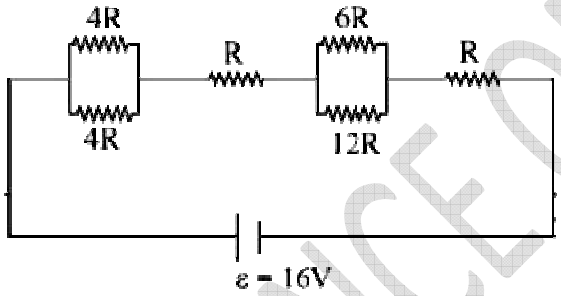
(C) $\frac{q}{2\varepsilon_0}$

(D) $\frac{q}{6\varepsilon_0}$

62. A galvanometer having a coil resistance 100 Ω gives a full- scale deflection when a current of mA is passed through it. What is the value of the resistance which can convert this galvanometer into a voltmeter giving full-scale deflection for a potential difference of 10 V ?

(A) 9.9 kΩ
(B) 8.9 kΩ
(C) 7.9 kΩ
(D) 10 kΩ

63. The resistive network shown below is connected to a D.C source pf 16 V. The power consumed by the network is 4 Watt. The value of R is



(A) 8 Ω
(B) 6 Ω
(C) 1 Ω
(D) 16 Ω

64. A magnetic needle of magnetic moment 6.7×10^{-2} Am^2 and moment of inertia 7.5×10^{-6} kg m^2 is performing simple harmonic oscillations in a magnetic field of 0.01 T. Time taken for 10 complete associations is

(A) 6.98 s
(B) 8.76 s
(C) 6.65 s
(D) 8.89 s

65. The AC current is given by $I = I_1 \sin \omega t + \cos \omega t$. A hot wire ammeter will give a reading

(A) $\sqrt{\frac{I_1^2 - I_2^2}{2}}$

(B) $\sqrt{\frac{I_1^2 + I_2^2}{2}}$

(C) $\frac{I_1 + I_2}{\sqrt{2}}$

(D) $\frac{I_1 + I_2}{2\sqrt{2}}$

66. Which of the following physical quantities have the same dimensions?

(A) Electronic displacement (D) and surface charge density
(B) Displacement current and electric field
(C) Current density and surface charge density
(D) Electric potential and energy

67. A porter lifts a heavy suitcase of mass 80 kg and at the destination lowers it down by a distance of 80 cm with a constant velocity. Calculate the work done by the porter in lowering the suitcase. (take g = 9.8 ms^{-2})

(A) -62720.0 J
(B) -627.2 J
(C) +627.2 J
(D) +784.0 J

68. Moment of inertia of square plate of side l about the axis passing through one of the corner and perpendicular to the plane of square plate is given by

(A) $\frac{Ml^2}{6}$

(B) $\frac{2}{3}Ml^2$

(C) Ml^2

(D) $\frac{Ml^2}{12}$

69. The time period of satellite, revolving above earth's surface at a height equal to R will be (given $G = \pi^2 m/s^2$, R = radius of earth)

(A) $\sqrt{4R}$
(B) $\sqrt{8R}$
(C) $\sqrt{32R}$
(D) $\sqrt{2R}$

70. A hydraulic automobile lift is designed to lift vehicles of mass 5000 kg. The area of cross section of the cylinder carrying the Load is 250 cm^2. The maximum pressure the smaller piston would have to bear is [Assuming g = 10 m/s^2]

(A) 2×10^5 Pa
(B) 200×10^6 Pa
(C) 20×10^6 Pa
(D) 2×10^6 Pa

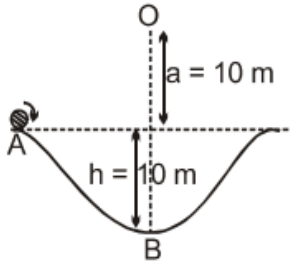
71. If two similar springs each of spring constant K are joined in series, the new spring constant and time period (T) would be changed by a factor

(A) $\frac{1}{2}, \sqrt{2}$
(B) $\frac{1}{4}, \sqrt{2}$
(C) $\frac{1}{4}, 2\sqrt{2}$
(D) $\frac{1}{2}, 2\sqrt{2}$

72. A certain charge Q is divided into two parts q and $(Q - q)$. How should the charges Q and q be divided so that q and $(Q - q)$ placed at a certain distance apart experience maximum electrostatic repulsion ?

(A) $Q = \frac{q}{2}$
(B) $Q = 2q$
(C) $Q = 4q$
(D) $Q = 3q$

73. A particle of mass 20 g is released with an initial velocity 5 m/s along the curve from the point *A* as shown in the figure. The point *A* is at height *h* from the point *B*. The particle slides along the frictionless surface. When the particle reaches point *B*, its angular momentum about *O* will be



(A) 8 kg-m^2/s
(B) 6 kg-m^2/s
(C) 3 kg-m^2/s
(D) 2 kg-m^2/s

74. A body sliding down on a smooth inclined plane, slides $\frac{1}{4}^{th}$ of its distance in 2 s. The time required for sliding the complete plane is

(A) 4 s
(B) 2 s
(C) 5 s
(D) 3 s

75. The ratio of magnitude of displacement to distance for a moving object is always

(A) equal to 1
(B) greater than 1
(C) less than 1
(D) less than or equal to 1

76. In a thermochemical process, 500 J of heat is absorbed by a system and 250 J of work is done by the system. The change in internal energy during the entire process is ……..

(A) +750 J
(B) +250 J
(C) -250 J
(D) -750 J

77. Spontaneous adsorption of gas molecules on solid surfaces is an exothermic process because of ……

(A) Increase in enthalpy
(B) Increase in entropy
(C) Decrease in entropy
(D) Decrease in enthalpy

78. Which of the following condition favors formation of ammonia in Haber Process?

(A) High Temperature and High Pressure
(B) Low Temperature and Low Pressure
(C) Low Temperature and High Pressure
(D) High Temperature and Low Pressure

79. The exhaust of a car shows a carbonmonoxide (CO) emission of 400 ppm. The concentration of CO per Liter of exhaust is …….

(A) 0.004 mL
(B) 0.04 mL
(C) 0.4 mL
(D) 4.0 mL

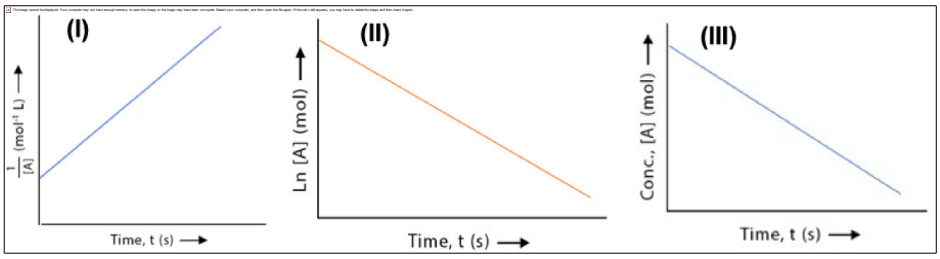
80. During an experiment on observing depression in freezing point of an organic solvent (5g) by the addition of an non-volatile, non-electrolytic miscible solute (weight = 0.5 g), depression of freezing point 5 ^{o}C was observed. Molal depression constant of the pure solvent is 7.0 K. Kg.mol^{-1}. The molecular weight of the solute is …….g/mol

(A) 280
(B) 210
(C) 140
(D) 70

81. The mass of Cu deposited on cathode during electrolysis when 268 milli-amperes (268 mA) of current was passed through a Faradaic cell containing a Cu cathode in saturated CuSO4 solution for 1 hour is …….. (atomic weight of Cu is 63.546 u)

(A) 415 mg
(B) 315 mg
(C) 215 mg
(D) 115 mg

82. Which of the following graph represents integrated rate equation for a second order reaction? [A is the reactant]



(A) (I)
(B) (II)
(C) (III)
(D) None of the above

83. Radioactive decay follows …….. order kinetics

(A) Zero
(B) First
(C) Second
(D) Third

84. Which of the following explains the sequence of filling the electrons in different shells?

(A) Aufbau principle
(B) Octet rule
(C) Hund's rule
(D) All of the above

85. For the reaction $H_2(g) + I_2(g) \rightarrow 2HI(g)$ the change in enthalpy (ΔH) will be

(A) $= \Delta U$
(B) $> \Delta U$
(C) $< \Delta U$
(D) zero

86. When a catalyst is added to a reversible reaction in equilibrium state the value of the equilibrium constant

(A) increases
(B) decreases
(C) does not change
(D) becomes zero

87. How many gram of CaC_2O_4 will dissolve in one litre of saturated solution? Ksp of CaC_2O_4 is 2.5×10^{-9} mol^{-2} and its molecular weight is 128

(A) 0.0064 g
(B) 0.0128 g
(C) 0.0032 g
(D) 0.0640 g

88. During the decomposition of H_2O_2 to give dioxygen, 48 g O_2 is formed per minute at certain point of time. The rate of formation of water at this point is

(A) 0.75 mol min^{-1}
(B) 1.5 mol min^{-1}
(C) 2.25 mol min^{-1}
(D) 3.0 mol min^{-1}

89. For which one of the following equilibria, $K_p = K_c$?

(A) $2SO_2(g)+O_2(g) \rightleftharpoons 2SO_3(g)$
(B) $C_2H_6(g) \rightleftharpoons C_2H_4(g) + H_2(g)$
(C) $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$
(D) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

90. The standard reduction potentials of X, Y, Z metals are 0.52, −3.03, −1.18 respectively. The order of reducing power of the corresponding metals is

(A) Y > Z > X
(B) X > Y > Z
(C) Z > Y > X
(D) Z > X > Y

91. Which of the following solutions shows positive deviation from Raoult's law?

(A) Acetone + Aniline
(B) Acetone + Ethanol
(C) Water + Nitric acid
(D) Chloroform + Benzene

92. An element with atomic mass 100 has a bcc structure and edge length 400 pm. The density of element is

(A) 10.37 g cm^{-3}
(B) 5.19 g cm^{-3}
(C) 7.29 g cm^{-3}
(D) 2.14 g cm^{-3}

93. An element possesses cubic close packing structure. Calculate the radius (r) of the atom in the unit cell. (The edge length of unit cell is a = 252 nm)

(A) 89.36 nm
(B) 126 nm
(C) 152 nm
(D) 109.1 nm

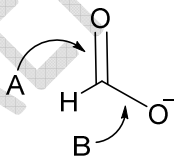
94. Which of the following relationship is correct?

(A) 1 poise = 1 g $cm^{-1}s^{-1}$
(B) 1 poise = 10^{-2} kg $m^{-1}s^{-1}$
(C) 1 poise = 10^{-1} kg $m^{-1}s^{-2}$
(D) 1 poise = 1 g $cm^{-1}s^{-2}$

95. An ideal gas is allowed to expand from 1 *l* to 10 *l* at 300 K against constant external pressure of 1 atm. The work done is

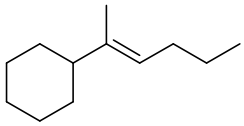
(A) 6 kJ
(B) 6 *l* atm.
(C) 9 *l* atm.
(D) 9 kJ

96. Formate ion is resonance stabilized. One of the two contributing structures (canonical forms) of formate anion is shown below. Consider other contributing structure and answer the following question on C-O bonds marked A and B. Which C–O bond is longer?



(A) A
(B) B
(C) Both A and B are of equal length
(D) Depends on the nature of the counter ion

97. The IUPAC name of the following compound is:

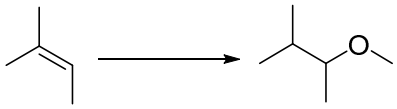


(A) (*E*)-1-cyclohexyl-2-hexene
(B) (*E*)-2-cyclohexyl-2-hexene
(C) (*Z*)-1-cyclohexyl-1-hexene
(D) (*Z*)-2-cyclohexyl-2-hexene

98. Major product formed when 2-bromo-2-methylpentane is treated with NaOEt in ethanol is (Note: under these conditions Zaitsev elimination predominates):

(A) 2-methylpent-1-ene
(B) 2-methylpent-2-ene
(C) (*E*)-4-methylpent-2-ene
(D) (*Z*)-4-methylpent-2-ene

99. Which sets of reagents would selectively give the expected product?



(A) $Hg(CF_3CO_2)_2$
(B) $Hg(OAc)_2$ in THF/H_2O, $NaBH_4$
(C) BH_3, $NaOH/H_2O_2$
(D) BH_3, H_2O_2/HO^-, NaH, CH_3I

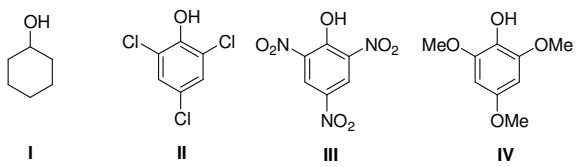
100. Which among the following organic halide/halides on reaction with sodium metal (Wurtz coupling reaction) will give *n*-hexane as the only product?

(A) 1:1 mixture of chloroethane and 1-chlororobutane
(B) 1:1 mixture of bromomethane and 1-bromopentane
(C) 1-bromopropane only
(D) 1-bromopropane and propene

101. Which of the following does not give a yellow precipitate with I_2+NaOH?

(A) CH_3CH_2OH
(B) CH_3OH
(C) CH_3CHO
(D) CH_3COCH_3

102. Cyclohexanol (I), 2,4,6-trichlorophenol (II), 2,4,6-trinitrophenol (III) and 2,4,6-trimethoxyphenol (IV) are given. In these, the order of decreasing acidic character will be:



(A) III > II > IV > I
(B) II > III > I > IV
(C) II > III > IV > I
(D) III > IV > II > I

103. Which of the following amino acid has a $–CH_2OH$ residue?

(A) Tyrosine
(B) Serine
(C) Threonine
(D) Lysine

104. Pick the correct statement on C-H bond distance in ethane, ethene and ethyne.

(A) C-H bond distance is equal in all the three compounds
(B) C-H bond distance in ethene is shorter than that in ethane but longer than that in ethyne
(C) C-H bond distance is shortest in ethyne and highest in ethane
(D) C-H bond distance is shortest in ethane and highest in ethyne

105. Peptide bonds are formed by what type of linkages?

(A) ester
(B) amide
(C) urethane
(D) disulfide

106. Styrene ($PhCH=CH_2$) is *not used* as a monomer in the industrial production of which among the following polymers?

(A) ABS
(B) PPS
(C) SAN
(D) SBR

107. Preservative used widely in processed food is:

(A) Saccharin
(B) Menthol
(C) Corn starch
(D) Sodium benzoate

108. Which among the following carboxylic acid derivatives is least reactive towards dilute NaOH solution in water?

(A) Amide
(B) Ester
(C) Acid chloride
(D) Anhydride

109. Arrange following carbanions in decreasing stability order.

(i) $(CH_3)_3C^-$
(ii) CH_3^-
(iii) Benzyl anion ($C_6H_5CH_2^-$)
(iv) $CH_3COCH_2^-$

(A) (ii) > (iii) > (iv) > (i)
(B) (iv) > (iii) > (ii) > (i)
(C) (iii) > (iv) > (ii) > (i)
(D) (ii) > (iii) > (i) > (iv)

110. Which among the following vitamins is considered as a steroid?

(A) A
(B) E
(C) D
(D) K

111. What is common for both Cannizzaro reaction and Meerwein-Pondroff-Verley reduction?

(A) Aluminium triisopropoxide is used in both reactions
(B) Cannot be performed successfully with aromatic aldehydes
(C) Both reactions give a 1:1 mixture of the corresponding alcohol and carboxylic acid from aliphatic aldehydes
(D) Both reactions involve hydride (H^-) transfer in a key step.

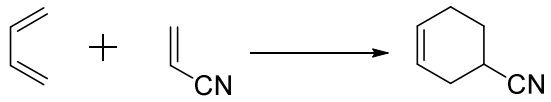
112. The compound formed as a result of oxidation of ethylbenzene with alkaline $KMnO_4$ followed by acidification is:

(A) benzyl alcohol
(B) benzophenone
(C) acetophenone
(D) benzoic acid

113. The Catalyst used for stereoregular polymerization of propene is:

(A) Ziegler-Natta catalyst
(B) Wilkinson's catalyst
(C) Lindlar catalyst
(D) Zeise's salt complex

114. Name of following Nobel Prize winning reaction.



(A) Claisen Condensation
(B) Diel's Alder reaction
(C) Dieckmann cyclisation
(D) Michael addition reaction

115. RNA is different from DNA because RNA contains

(A) Ribose sugar and thymine
(B) Ribose sugar and uracil
(C) Deoxyribose sugar and thymine
(D) Deoxyribose sugar and uracil

116. Which of the following complex ions shows geometrical isomerism?

(A) $[Cr(H_2O)_4Cl_2]^+$
(B) $[Pt(NH_3)_3Cl]^{2-}$
(C) $[Co(NH_3)_6]^{3-}$
(D) $[Co(CN)_5(NC)]^{3-}$

117. Which is the reason for the purple colour of $KMnO_4$?

(A) Ligand to metal charge transfer
(B) Metal to ligand charge transfer
(C) d-d transition
(D) p-d transition

118. Which of the following is a hexadentate ligand?

(A) Ethylene diamine
(B) Ethylene diamine tetraacetic acid
(C) 1,10-phenanthroline
(D) Acetyl acetonato

119. How many atoms are present in hexagonal close-packed unit cell?

(A) 4
(B) 2
(C) 8
(D) 6

120. Identify the product in the nuclear reaction $_{12}Mg^{24} + _{2}He^{4} = _{0}n^{1} + \ldots\ldots\ldots\ldots\ldots?$

(A) $_{13}Al^{27}$
(B) $_{14}Si^{27}$
(C) $_{13}Al^{28}$
(D) $_{12}Mg^{25}$

121. What is the n/p ratio of a stable nuclides?

(A) n/p =1
(B) n/p = 2
(C) n/p > 1
(D) n/p < 1

122. Which of the following is a π-acid ligand?

(A) NH_3
(B) CO
(C) F^-
(D) H_2O

123. Which of the following shows +7 oxidation state?

(A) Co
(B) Cr
(C) V
(D) Mn

124. A compound having molecular mass of 99 has face-centred cubic structure. Its ` density is 3.4g cm^{-3}. The length of unit cell in Å (in Angstroms) is

(A) 6.783
(B) 5.783
(C) 7.783
(D) 8.683

125. Which of the following statements is not true?

(A) Si, Ga can be purified by zone refining
(B) Zone refining is carried out in an inert atmosphere
(C) Zinc can be refined by distillation
(D) Principle of zone refining is different from fractional crystallization

126. The essential element for nitrogen fixation is

(A) Zn
(B) Cu
(C) Co
(D) Mo

127. The ligand system present in Vitamin B_{12} is

(A) Porphyrine
(B) Corrin
(C) Crown ether
(D) Chlorin

128. The hybridization and geometry in SF_4 is

(A) sp^3 - Tetrahedral
(B) dsp^2 - Square planar
(C) sp^3d - See-saw
(D) sp^3d^2 - Octahedral

129. Which of the following has highest magnetic moment?

(A) Fe^{2+}
(B) Cr^{2+}
(C) Mn^{2+}
(D) Co^{2+}

130. Volume of O_2 liberated from 0.96g of H_2O_2 at STP is

(A) 316.2 ml
(B) 224. 6 ml
(C) 613.2 ml
(D) 449.2 ml

131. In the reaction $2[K_3Fe(CN)_6] + 2\ KOH + H_2O_2 \rightarrow 2[K_4Fe(CN)_6] + 2H_2O + O_2$, H_2O_2 acts as

(A) Oxidizing agent
(B) Reducing agent
(C) Bleaching agent
(D) Both oxidizing agent and bleaching agent

132. Shape of ClO_4^- ion is

(A) Tetrahedral
(B) Square planar
(C) Square Pyramidal
(D) Trigonal bipyramidal

133. Appearance of colour in solid alkali metal halides is generally due to

(A) F-centres
(B) Frenkel defects
(C) Schottky defects
(D) Interstitial positions

134. Bell metal is an alloy of

(A) Sn and Pb
(B) Cu and Sn
(C) Sn and Sb
(D) Cu and Pb

135. The bond order of O_2^+ is

(A) 1
(B) 1.5
(C) 2
(D) 2.5

136. Which of the following is the equation of a circle?

(A) $x^2 + (y+3)^2 + 27 = 0$

(B) $x^2 + y^2 - x + 2y + 3 = 0$

(C) $x^2 + y^2 + x = 9$

(D) $x^2 + y^2 + y + 3 = 0$

137. The minimum value of $\text{cosec}^{-1}x$ is

(A) 0

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

(C) $-\frac{\pi}{2}$

(D) π

138. $\begin{vmatrix} 2025 & 2024 & 0 \\ 2020 & 2019 & 0 \\ 2027 & 2026 & 1 \end{vmatrix} =$

(A) -5
(B) 5
(C) -3
(D) 3

139. Which of the following equation is satisfied by $A = \begin{pmatrix} 2 & 3 \\ 1 & 2 \end{pmatrix}$?

(A) $A^2 - I = 2A$

(B) $A^2 - 2A + I = 0$

(C) $A^2 - I = 0$

(D) $A^2 - 4A + I = 0$

140. When $m \leq 4$ is a positive integer, the probability of getting real roots for $2x^2 + 2mx + 1 = 0$ is

(A) $\frac{3}{5}$

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

(C) $\frac{3}{4}$

(D) $\frac{2}{5}$

141. Let $f:[-1,1] \to B$ be defined by $f(x) = x^2$. Then the set B for which f is onto, is

(A) (0, 1)
(B) $[-1,1]$
(C) $(-1,1]$
(D) $[0,1]$

142. The absolute maximum value of the function $f(x) = 4x^5 + 5x^4$ on [1, 2] is

(A) -1
(B) 2
(C) 0
(D) 1

143. The least value of n such that $n!$ is a multiple of 2025 is

(A) 10
(B) 25
(C) 81
(D) 9

144. The area bounded by the curve $\cos x$ and the x-axis in $\left[0, \frac{\pi}{2}\right]$ is

(A) 0
(B) $\frac{1}{2}$
(C) 1
(D) 2

145. The minimum value of $f(x) = (19 - x)e^{19-x}$ is

(A) e
(B) $\frac{1}{e}$
(C) $-\frac{1}{e}$
(D) $-\frac{1}{e^2}$

146. If $f, g : \mathbb{R} \to \mathbb{R}$ are defined by $f(x) = |x|$, $g(x) = x^2$, then $g \circ f$ is

(A) $|x|$

(B) x^2

(C) x

(D) 1

147. The function f defined by $f(x) = x^2$ is a bijection if the domain and the range are respectively

(A) $\mathbb{R}, \mathbb{R}$
(B) $\mathbb{R}, (0, \infty)$
(C) $(0, \infty), \mathbb{R}$
(D) $[0, \infty), [0, \infty)$

148. The number of arrangements of alphabets $\alpha, \alpha, \alpha, \alpha, \beta, \gamma, \delta$ such that no two α's are adjacent is

(A) 3!
(B) 4!
(C) 5!
(D) 6!

149. How many five digit even numbers can be formed using the digits 3, 4, 5, 6, 7 in all possible ways?

(A) 120
(B) 240
(C) 10
(D) 24

150. The polynomial $f(x) = x^4 + ax^3 + bx^2 + cx + d$ has real coefficients, and $f(3i) = f(3+i) = 0$. Then the value of $a + b + c + d$ is equal to

(A) 16
(B) 25
(C) 36
(D) 49

151. $\lim_{n\to\infty}\left(1-\frac{1}{n^2}\right)^n$ equals

(A) 1

(B) $e^{\frac{-1}{2}}$

(C) e^{-2}

(D) e^{-1}

152. The value of $\left(1+\omega-2\omega^2\right)^4$, where ω is the cube root of unity is

(A) -81

(B) $81\omega^2$

(C) $-81\omega^2$

(D) 81

153. The number of 'x' satisfying $\cos 2x > \sin\frac{5\pi}{2}$ is

(A) 0
(B) 1
(C) 2
(D) ∞

154. Which of the following function is onto?

(A) $f:\mathbb{N}\to\mathbb{N}$ defined by $f(n)=n+2$

(B) $f:\mathbb{R}-\{0\}\to\mathbb{R}$ defined by $f(x)=\frac{1}{x}$

(C) $f:[0,\infty)\to\mathbb{R}$ defined by $f(x)=\sqrt{x}$

(D) $f:\mathbb{N}\cup\{0\}\to\mathbb{N}$ defined by $f(n)=n+1$

155. The 5th and 6th term of an arithmetic progression are 20 and 17. Then which term of the arithmetic progression lies between -1127 and -1125?

(A) 375
(B) 376
(C) 377
(D) 378

156. One of possible values of $\lim_{x \to 1} \frac{\sqrt{x} - 1}{x - 1}$

(A) -1

(B) 0

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

(D) 1

157. The total number of proper factors of 2025 is

(A) 13
(B) 14
(C) 15
(D) 2

158. The solution of the differential equation $2x\frac{dy}{dx} - y = 5$ represents

(A) circles
(B) straight lines
(C) ellipses
(D) parabolas

159. Let $A(2, -1)$ and $B(6, 5)$ be two points. The ratio in which the foot of the perpendicular from (4, 1) divides AB is

(A) 8 : 15
(B) 5 : 8
(C) −5 : 8
(D) −8 : 5

160. A circle touches both the axes. Then the locus of its center is given by

(A) $x^2 - y^2 = 0$

(B) $x^2 + y^2 = 0$

(C) $x^2 - y^2 = 1$

(D) $x^2 + y^2 = 1$

161. With respect to multiplication, the set $\{0,1,-1\}$ does not form a group, since it fails to satisfy

(A) associativity
(B) existence of inverse
(C) existence of identity
(D) closure law

162. The generators of the cyclic group $G=\{8^n \mid n \in Z\}$ are

(A) 2 and $\frac{1}{2}$

(B) 4 and $\frac{1}{4}$

(C) 6 and $\frac{1}{6}$

(D) 8 and $\frac{1}{8}$

163. $\cos\left(i\log\frac{a-ib}{a+ib}\right)$ is equal to

(A) ab

(B) $\frac{a^2-b^2}{a^2+b^2}$

(C) $\frac{a^2-b^2}{2ab}$

(D) $\frac{2ab}{a^2+b^2}$

164. The product of all values of $(\cos\alpha+i\sin\alpha)^{\frac{3}{5}}$ is

(A) 1
(B) $\cos\alpha+i\sin\alpha$
(C) $\cos 3\alpha+i\sin 3\alpha$
(D) $\cos 5\alpha+i\sin 5\alpha$

165. The product $16(16)^{1/3}(16)^{1/9}\ldots\infty$ is equal to

(A) 16
(B) 32
(C) 64
(D) 0

166. The sum of 25 terms of the series $\sqrt{2}+\sqrt{8}+\sqrt{18}+\sqrt{32}+...$ is

(A) $325\sqrt{2}$
(B) $225\sqrt{2}$
(C) $265\sqrt{2}$
(D) $125\sqrt{2}$

167. If x^2-3x+2 be one of the factors of the expression $x^4-px^2+q,$ then

(A) $p=4,\ q=5$
(B) $p=-5,\ q=-4$
(C) $p=5,\ q=4$
(D) $p=-5,\ q=4$

168. How many numbers greater than 2000, but not greater than 3000 can be formed with the digits 0, 1, 2 and 3, where repetition of digits being allowed?

(A) 128
(B) 64
(C) 65
(D) 52

169. The sides *PQ*, *QR*, *RP* of a triangle *PQR* have 3,4,5 interior points on them. Total number of triangles that can be formed using these points as vertices is equal to

(A) 135
(B) 145
(C) 178
(D) 205

170. The solution set of the equation $\begin{bmatrix} 2 & 3 & x \\ 2 & 1 & x^2 \\ 6 & 7 & 3 \end{bmatrix} = 0$ is

(A) ϕ
(B) $\{0,1\}$
(C) $\{1,-1\}$
(D) $\{1,-3\}$

171. $\begin{vmatrix} \log e & \log e^2 & \log e^3 \\ \log e^2 & \log e^3 & \log e^4 \\ \log e^3 & \log e^4 & \log e^5 \end{vmatrix}$ is equal to

(A) 0
(B) 1
(C) $4\log e$
(D) $5\log e$

172. If $a = 1+3+\frac{9}{2!}+\frac{27}{3!}+\frac{81}{4!}+...,$ then a^{-1} is

(A) e^{-3}
(B) e^{3}
(C) $e^{\frac{1}{3}}$
(D) $e^{\frac{-1}{3}}$

173. Let R be the relation over the set all real numbers as x and y are related under R if $xy \geq 0$. Then R is

(A) reflexive and transitive
(B) reflexive and symmetric
(C) symmetric and transitive
(D) an equivalence relation

174. The number of onto mappings from the set $X = \{1, 2, ..., 11\}$ to the set $Y = \{1, 2\}$ is

(A) $2^{11} - 2$
(B) 2^{11}
(C) $2^{10} - 2$
(D) 22

175. The probability that a man will live 10 more years, is $\frac{4}{9}$ and the probability that his wife will live 10 more years, is $\frac{3}{5}$. Then the probability that none of them will be alive after 10 years is

(A) $\frac{2}{5}$

(B) $\frac{2}{9}$

(C) $\frac{3}{7}$

(D) $\frac{5}{9}$

176. A committee of 5 is to be chosen from a group of 10 people. The probability that a certain married couple will either serve together or not at all is

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

(B) $\frac{5}{9}$

(C) $\frac{4}{9}$

(D) $\frac{2}{3}$

177. A coin with probability p , $0 < p < 1$ for getting a head is tossed until a head appears for the first time. If the probability that the number of tosses required is odd is $\frac{2}{5}$, then p equals

(A) $\frac{1}{3}$

(B) $\frac{2}{3}$

(C) $\frac{2}{5}$

(D) $\frac{3}{5}$

178. If $p = \cos 55°, q = \cos 65°$ and $r = \cos 175°$, then the value of $\frac{1}{p} + \frac{1}{q} + \frac{r}{pq}$ is

(A) 0
(B) -1
(C) 1
(D) 2

179. Given that the sides of a triangle ABC are in AP. If $c < b < a$, then cos$A$ is equal to

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

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

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

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

180. The equation $\sqrt{x^2+4y^2-4xy+4} + x - 2y = 1$ represents

(A) a straight line
(B) an ellipse
(C) a circle
(D) a parabola

181. The number of points on the circle $2x^2 + 2y^2 - 5x = 0$ which are at distance 2 from the point (1, −3) is

(A) 2
(B) 0
(C) 1
(D) 3

182. If $\sec^{-1}\left(\frac{1+x}{1-y}\right) = a$, then $\frac{dy}{dx}$ is

(A) $\frac{y-1}{x+1}$

(B) $\frac{y+1}{x-1}$

(C) $\frac{x-1}{y-1}$

(D) $\frac{x-1}{y+1}$

183. $\lim_{x\to 0} \log_e (\sin x)^{\tan x}$ is

(A) 1
(B) −1
(C) 0
(D) ∞

184. Angle of intersection of the curves $r = \sin\theta + \cos\theta$ and $r = 2\sin\theta$ is equal to

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

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

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

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

185. If $L = \lim_{n\to\infty} \frac{1}{\sqrt[n]{n!}}$, then

(A) $L = 0$

(B) $L = 1$

(C) $0 < L < 1$

(D) $L = \infty$

186. The solution of the differential equation $\cos x \; dy = y(\sin x - y)dx,\ 0 < x < \frac{\pi}{2}$ is

(A) $\sec x = \tan x + c$

(B) $y \sec x = \tan x + c$

(C) $y(\tan x + c) = \sec x$

(D) $\tan x = (\sec x + c)\, y$

187. If $|\vec{a}| = |\vec{b}| = |\vec{a} + \vec{b}| = 1$, then $|\vec{a} - \vec{b}|$ is equal to

(A) 1

(B) $\sqrt{2}$

(C) $\sqrt{3}$

(D) 2

188. If $\vec{a} + \vec{b} + \vec{c} = 0$ and $|\vec{a}| = 3, |\vec{b}| = 4$ and $|\vec{c}| = \sqrt{37}$, then the angle between $\vec{a}$ and $\vec{b}$ is

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

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

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

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

189. If $\frac{3}{2 + \cos\theta + i \sin\theta} = a + ib$, then $(a-2)^2 + b^2$ is equal to

(A) 0

(B) 1

(C) -1

(D) 2

190. If $x > 0$ and $\log_2 x + \log_2\left(\sqrt{x}\right) + \log_2\left(\sqrt[4]{x}\right) + \log_2\left(\sqrt[8]{x}\right) + \log_2\left(\sqrt[16]{x}\right) + \ldots = 4$ then x equals

(A) 2
(B) 3
(C) 4
(D) 5

191. In a polygon no three diagonals are concurrent. If the total number of points of intersection of diagonals interior to the polygon be 70, then the number of diagonals of the polygon is

(A) 20
(B) 10
(C) 28
(D) 8

192. An integer is chosen at random from first two hundred numbers. Then the probability that the integer chosen is divisible by 6 or 8 is

(A) $\frac{1}{4}$

(B) $\frac{2}{4}$

(C) $\frac{3}{4}$

(D) $\frac{1}{3}$

193. In a set of $(2n + 1)$ elements, the number of subsets which contain at most n elements is

(A) 2^n
(B) 2^{n+1}
(C) 2^{n-1}
(D) 2^{2n}

194. If $3f(x)-2f\left(\frac{1}{x}\right)=x,$ then $f'(2)=$

(A) $\frac{2}{7}$

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

(C) 2

(D) $\frac{7}{2}$

195. The value of $\int_0^1 e^{x^2}\,dx$

(A) $> e$
(B) $< e$
(C) > 2
(D) < 1

196. In a deck of 52 cards, two cards are drawn without replacement. Then the probability that both cards are aces is

(A) $\frac{2}{211}$

(B) $\frac{2}{221}$

(C) $\frac{1}{211}$

(D) $\frac{1}{221}$

197. Which of the following is not divisible by any prime number less than 10 ?

(A) $2^{606}-1$

(B) $2^{606}+1$

(C) $2^{607}-1$

(D) $2^{607}+1$

198. If $a + b + c = 0$ and a, b, c are rational, then the roots of the equation $(b + c - a)x^2 + (c + a - b)x + (a + b - c) = 0$ are

(A) rational
(B) irrational
(C) imaginary
(D) equal

199. If $\left(1 - x + x^2\right)^n = a_0 + a_1 x + a_2 x^2 + ... + a_{2n} x^{2n}$, then $a_0 + a_2 + a_4 + ... + a_{2n}$ is equal to

(A) $3n^2 + \frac{1}{2}$

(B) $\frac{1 - 3^n}{2}$

(C) $\frac{3^n - 1}{2}$

(D) $\frac{3^n + 1}{2}$

200. If the ellipse $\frac{x^2}{4} + y^2 = 1$ meets the ellipse $x^2 + \frac{y^2}{a^2} = 1$ in four distinct points and $a = b^2 - 5b + 7$, then b does not lie in

(A) [4, 5]
(B) $(-\infty, 2) \cup (3, \infty)$
(C) $(-\infty, 0)$
(D) [2, 3]

201. The ratio of w to x is 4 : 3 , the ratio of y to z is 3 : 2 , and the ratio of z to x is 1 : 6 . Then the ratio of w to y is

(A) 4 : 3
(B) 3 : 2
(C) 8 : 3
(D) 16 : 3

202. The largest term common to the sequences, 1, 11, 21, 31, …..to 100 terms and 31, 36, 41, ….. to 100 terms is

(A) 281
(B) 381
(C) 471
(D) 521

203. If $a>0$ and $\lim_{x\to a}\frac{a^x-x^a}{x^x-a^a}=-1$ then $a=$

(A) 0
(B) 1
(C) e
(D) $2e$

204. 12 seats in a row are to be occupied by 4 boys the number of possible arrangement of there should be at least two empty seats between any two boys is

(A) $4!\times 6C_4$

(B) $\left(12C_4-5C_3\right)\times 3!$

(C) $\frac{12P_4\times 4!}{3!}$

(D) $\frac{8P_4\times 4!}{2!}$

205. The median of a set of 9 distinct observations is 20.5. If each of the largest 4 observations of the set is increased by 2, then the median of the new set

(A) is increased by 2
(B) is decreased by 2
(C) is two times the original median
(D) remains the same as the that of the original set

206. If $f(x)+2f\left(\frac{1}{x}\right)=3x,\ x\neq 0$ and $S=\{x\in R: f(x)=f(-x)\}$ then the set S

(A) contains exactly two elements
(B) contains more than two elements
(C) is an empty set
(D) contains exactly one element

207. If $\left|Z-\frac{4}{z}\right|=2,$ then the maximum value of $|z|$ is equal to

(A) $\sqrt{5}+1$
(B) 2
(C) $2+\sqrt{2}$
(D) $\sqrt{3}+1$

208. If $f(x)=\left(\frac{3}{5}\right)^x+\left(\frac{4}{5}\right)^x-1,\ x\in R$ then the equation $f(x)=0$ has

(A) no solution
(B) one solution
(C) two solutions
(D) more than two solutions

209. The shortest distance between the line $y-x=1$ and the curve $x=y^2$ is

(A) $\frac{2\sqrt{3}}{8}$

(B) $\frac{3\sqrt{2}}{5}$

(C) $\frac{\sqrt{3}}{4}$

(D) $\frac{3\sqrt{2}}{8}$

210. Let $f:R\to[0,\alpha)$ be such that $\lim_{x\to5} f(x)$ exists and $\lim_{x\to5}\frac{f(x)^2-9}{\sqrt{x-5}}=0$, then $\lim_{x\to5} f(x)=$

(A) 0
(B) 1
(C) 2
(D) 3

211. If $1,\omega,\omega^2$ are the cube roots of unity, then $\Delta=\begin{bmatrix}1 & \omega^n & \omega^{2n}\\ \omega^n & \omega^{2n} & 1\\ \omega^{2n} & 1 & \omega^n\end{bmatrix}=$

(A) ω^2
(B) 0
(C) 1
(D) ω

212. The number of real values of l for which the system of linear equations $2x+4y-\lambda z=0,\ 4x+\lambda y+2z=0,\ \lambda x+2y+2z=0$ has infinitely many solutions, is

(A) 0
(B) 1
(C) 2
(D) 3

213. The polar form of the complex number $-1+i$ is

(A) $\left(\sqrt{2},\frac{5\pi}{4}\right)$

(B) $\left(\sqrt{2},\frac{3\pi}{4}\right)$

(C) $\left(-\sqrt{2},\frac{\pi}{4}\right)$

(D) $\left(\sqrt{2},\frac{\pi}{4}\right)$

214. If the general term of an A.P. is$3n$, then the common difference is

(A) 2
(B) 3
(C) 5
(D) 6

215. The three points $A(1,2,3),\ B(3,1,2),\ C(2,3,1)$ form

(A) an equilateral triangle
(B) a right angled triangle
(C) an isosceles triangle
(D) a right angled isosceles triangle

216. The variance of the first 10 natural numbers is

(A) 7.25
(B) 7
(C) 8.25
(D) 8

217. If $A^2 - A + I = 0,$ then the inverse of the matrix A is

(A) $A + I$
(B) A
(C) $A - I$
(D) $I - A$

218. The value of λ for which the vectors $3\hat{i} - 6\hat{j} + \hat{k}$ and $2\hat{i} - 4\hat{j} + \lambda\hat{k}$ are parallel is

(A) $\frac{3}{2}$

(B) $\frac{2}{3}$

(C) $\frac{2}{5}$

(D) $\frac{5}{2}$

219. If $P(A) = 0.4,\ P(B) = 0.8,\ P(B \mid A) = 0.6$ then $P(A \cup B)$ is

(A) 0.24
(B) 0.30
(C) 0.48
(D) 0.96

220. If $S = \left\{ z \in \mathbb{C} : \frac{z - i}{z + 2i} \in \mathbb{R} \right\}$, then

(A) S contains exactly two elements
(B) contains only one element
(C) S is a circle in the complex plane
(D) S is a straight line in the complex plane

221. $\lim_{n \to \infty} \left(1 + \frac{5}{n}\right)^n$ is equal to

(A) $5 \log e$
(B) e^5
(C) $5e$
(D) $\log e$

222. The sum of the series $\frac{1}{1!}+\frac{1+2}{2!}+\frac{1+2+3}{3!}+\ldots$ to ∞ equals

(A) e

(B) $2e$

(C) $\frac{3e}{2}$

(D) $1+\frac{e}{2}$

223. If $x=a(\cos t+t\sin t)$ and $y=a(\sin t-t\cos t)$, then $\frac{dy}{dx}=$

(A) $\tan t$
(B) $\cot t$
(C) $-\tan t$
(D) $-\cot t$

224. The number of tangents that can be drawn from $(1,2)$ to $x^2+y^2=5$ is

(A) 0
(B) 1
(C) 2
(D) infinitely many

225. If $\cos^{-1}x+\cos^{-1}y+\cos^{-1}z=3\pi$; then the value of $xy+yz+zx$ is

(A) 3
(B) 1
(C) -1
(D) 0

ANSWER BOOK															
SI No	**Key**	**SI No**	**Key**	**SI No**	**Key**	**SI No**	**Key**	**SI No**	**Key**	**SI No**	**Key**	**SI No**	**Key**	**SI No**	**Key**
1	A	**31**	C	**61**	D	**91**	B	**121**	A	**151**	A	**181**	A	**211**	B
2	C	**32**	B	**62**	A	**92**	A	**122**	B	**152**	B	**182**	A	**212**	B
3	D	**33**	D	**63**	A	**93**	A	**123**	D	**153**	A	**183**	C	**213**	B
4	C	**34**	B	**64**	C	**94**	C	**124**	B	**154**	D	**184**	C	**214**	B
5	B	**35**	D	**65**	B	**95**	C	**125**	D	**155**	D	**185**	A	**215**	A
6	A	**36**	D	**66**	A	**96**	B	**126**	D	**156**	C	**186**	C	**216**	C
7	D	**37**	A	**67**	B	**97**	B	**127**	B	**157**	A	**187**	C	**217**	D
8	A	**38**	B	**68**	B	**98**	C	**128**	C	**158**	D	**188**	D	**218**	B
9	C	**39**	B	**69**	C	**99**	D	**129**	C	**159**	B	**189**	B	**219**	D
10	D	**40**	B	**70**	D	**100**	C	**130**	A	**160**	A	**190**	C	**220**	D
11	C	**41**	D	**71**	A	**101**	B	**131**	B	**161**	B	**191**	A	**221**	B
12	B	**42**	A	**72**	B	**102**	A	**132**	A	**162**	D	**192**	A	**222**	C
13	A	**43**	B	**73**	B	**103**	B	**133**	A	**163**	B	**193**	D	**223**	A
14	B	**44**	C	**74**	A	**104**	C	**134**	B	**164**	C	**194**	B	**224**	B
15	A	**45**	B	**75**	D	**105**	B	**135**	D	**165**	C	**195**	B	**225**	A
16	C	**46**	A	**76**	B	**106**	B	**136**	C	**166**	A	**196**	D		
17	D	**47**	C	**77**	C	**107**	D	**137**	C	**167**	C	**197**	C		
18	A	**48**	C	**78**	C	**108**	A	**138**	A	**168**	B	**198**	A		
19	A	**49**	C	**79**	C	**109**	B	**139**	D	**169**	D	**199**	D		
20	A	**50**	B	**80**	C	**110**	C	**140**	C	**170**	D	**200**	D		
21	A	**51**	D	**81**	B	**111**	D	**141**	D	**171**	A	**201**	D		
22	C	**52**	B	**82**	A	**112**	D	**142**	D	**172**	A	**202**	D		
23	B	**53**	B	**83**	B	**113**	A	**143**	A	**173**	D	**203**	B		
24	D	**54**	B	**84**	A	**114**	B	**144**	C	**174**	A	**204**	A		
25	C	**55**	A	**85**	A	**115**	B	**145**	C	**175**	B	**205**	D		
26	D	**56**	A	**86**	C	**116**	A	**146**	B	**176**	C	**206**	A		
27	D	**57**	A	**87**	A	**117**	A	**147**	D	**177**	A	**207**	A		
28	D	**58**	B	**88**	D	**118**	B	**148**	A	**178**	B	**208**	B		
29	B	**59**	D	**89**	A	**119**	D	**149**	B	**179**	D	**209**	D		
30	B	**60**	A	**90**	B	**120**	B	**150**	D	**180**	A	**210**	D		