1. The acceleration due to gravity on the earth's surface is g. If the diameter of the earth reduces to half of its original value and mass remains constant, then acceleration due to gravity on the surface of earth would be

(A) $2g$

(B) $4g$

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

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

2. A particle of unit mass undergoes one dimensional motion such that its velocity varies according to $v(x) = bx^{-2n}$ where b and n are constants and x is the position of the particle. The acceleration of the particle as a function of x is given by

(A) $-2nb^2x^{-4n-1}$

(B) $-2nb^2x^{-2n-1}$

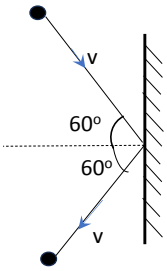
(C) $-2nb^2x^{-2n+1}$

(D) $-2nbx^{-4n+1}$

3. When two parallel wires carry currents in the same direction

(A) they attract each other
(B) they repel each other
(C) magnetic forces on two wires are perpendicular to each other
(D) they do not experience any magnetic force

4. A rigid ball of mass m strikes a rigid wall and gets reflected without loss of speed as shown in figure. The value of impulse imparted by the wall to the ball will be



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

(B) mv

(C) $2mv$

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

5. A refrigerator works between 4°C and 30°C. It is required to remove 600 calories of heat every second in order to keep the temperature of the refrigerated space constant. The power required is (Take 1 cal = 4.2 J)

(A) 2.365 W
(B) 23.65 W
(C) 236.5 W
(D) 2365 W

6. The distance between the centres of carbon and oxygen atoms in CO molecule is 0.12 nm. The distance of the centre of the mass of the molecule from the carbon atom is

(A) 0.03 nm
(B) 0.05 nm
(C) 0.06 nm
(D) 0.07 nm

7. Kepler's second law is based on which one of the following physical quantity?

(A) Energy
(B) Mass
(C) Linear momentum
(D) Angular momentum

8. The moment of inertia of a sphere about a diameter of a sphere is $\frac{2}{5}MR^2$, M is the mass and R is the radius, then the moment of inertia of a sphere about a tangent to the sphere is

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

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

(C) $\frac{3}{5}MR^2$

(D) $\frac{7}{5}MR^2$

9. The wettability of a surface by a liquid depends primarily on

(A) viscosity
(B) surface tension
(C) angle of contact between the surface and the liquid
(D) density

10. C_p and C_v are specific heat at constant pressure and constant volume respectively. It is observed that $C_p - C_v = a$ for hydrogen gas and $C_p - C_v = b$ for nitrogen gas. The correct relation between a and b is

(A) $a = 28b$

(B) $a = \frac{1}{14}b$

(C) $a = b$

(D) $a = 14b$

11. An ideal gas undergoes a quasi static reversible process in which its molar heat capacity C remains constant. If during this the relation of pressure P and volume V is given by PV^n = constant, then n is given by

(A) $n = \dfrac{C - C_p}{C - C_v}$

(B) $n = \dfrac{C_p - C}{C - C_v}$

(C) $n = \dfrac{C - C_v}{C - C_p}$

(D) $n = \dfrac{C_p}{C_v}$

12. The displacement equation of a progressive wave is $y = 3\sin(2000t - 5x)$, where the distance x and y are in metre and time in second the speed of the wave is

(A) 200 m/sec
(B) 400 m/sec
(C) 600 m/sec
(D) 800 m/sec

13. The extension in a string, obeying Hook's law is x. The speed of sound in the stretched string is v. If the extension in the string is increased to $1.5x$, the speed of sound will be

(A) $1.22\ v$
(B) $0.61\ v$
(C) $1.50\ v$
(D) $0.75\ v$

14. 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) $\dfrac{C}{\sqrt{2}}$

(C) $2C$

(D) $\dfrac{C}{2}$

15. The electrical conductivity of the material of a conductor of length 3 m, area of cross section 0.02 mm^2 having a resistance of 2 Ω is

(A) 75×10^6/ Ω-m
(B) 85×10^5/Ω-m
(C) 75×10^5/ Ω-m
(D) 85×10^6/ Ω-m

16. A carbon resistance is having a following coding: green, orange, black, gold. The resistance of the resistor is

(A) $53 \times 10^0 \pm 5\%$
(B) $53 \times 10^1 \pm 5\%$
(C) $53 \times 10^0 \pm 10\%$
(D) $53 \times 10^1 \pm 10\%$

17. A heater coil is cut into two equal parts and only one part is now used in the heater. The heat generated will be

(A) doubled
(B) four times
(C) one fourth
(D) one third

18. Which of the following statement is FALSE?

(A) Wheatstone bridge is most sensitive when all the four resistances are of the same order of magnitude
(B) In a balanced Wheatstone bridge if the cell and the galvanometer are exchanged, the null point is disturbed
(C) A rheostat can be used as a potential divider
(D) Kirchhoff's second law represents energy conservation

19. A boy standing on a stationary lift (open from above) throws a ball upwards with the maximum initial speed he can, equal to 49 m/sec. How much time does the ball take to return to his hands?

(A) 5 secs
(B) 10 secs
(C) 15 secs
(D) 30 secs

20. The most penetrating radiation out of the following is

(A) β- rays
(B) γ-rays
(C) X-rays
(D) α-rays

21. The half life of radium is 1600 years. The fraction of a sample of radium that would remain after 6400 years

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

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

(C) $\frac{1}{8}$

(D) $\frac{1}{16}$

22. What is the ratio of Bohr magneton to the nuclear magneton?

(A) $\frac{m_p}{m_e}$

(B) 1

(C) $\frac{{m_p}^2}{{m_e}^2}$

(D) $\frac{m_e}{m_p}$

23. The energy of a photon whose wavelength 6840 Å is

(A) 1.81 eV
(B) 3.6 eV
(C) 12.1 eV
(D) 13.2 eV

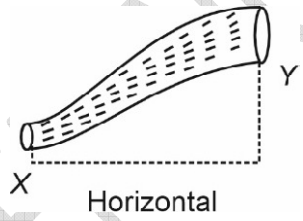
24. In Thomson's experiment to measure e/m of electrons, the electric and magnetic fields are

(A) in the same direction
(B) in the opposite direction
(C) at an angle of 45° with each other
(D) perpendicular to each other

25. Two thin lenses, one of focal length 60 cm and the other of focal length −20 cm are put in contact, the combined focal length is

(A) 15 cm
(B) −15 cm
(C) −30 cm
(D) 30 cm

26. An ideal fluid is flowing in a non-uniform cross-sectional tube XY (as shown in the figure) from end X to end Y. If K_1 and K_2 are the kinetic energy per unit volume of the fluid at X and Y respectively, then the correct option is



(A) $K_1 = \frac{K_2}{2}$

(B) $K_1 = K_2$

(C) $K_1 < K_2$

(D) $K_1 > K_2$

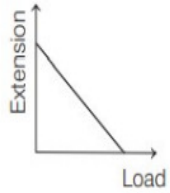
27. If a body moves in such a way that its linear momentum is constant, then

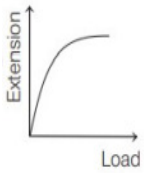
(A) its kinetic energy is zero
(B) the net force acting on it must be zero
(C) its acceleration must be non-zero and constant
(D) its center of mass must remain at rest

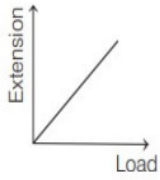
28. Two spheres of masses m and M are situated in air and the gravitational force between them is F. The space around the masses is now filled with a liquid of specific gravity 5. The gravitational force will now be

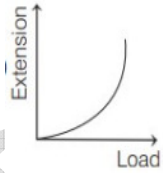
(A) $3F$
(B) F
(C) $\frac{F}{6}$
(D) $5F$

29. Within the limit of elasticity, which of the following graphs obey Hooke's law?

(A) 

(B) 

(C) 

(D) 

30. The current density is a

(A) Scalar with SI units $\frac{A}{m}$

(B) Vector with SI units $\frac{A}{m^2}$

(C) Scalar with SI units $\frac{A}{m^2}$

(D) Vector with SI units $\frac{A}{m}$

31. A long, straight wire of radius R carries a current distributed uniformly over its cross-section. The magnitude of the magnetic field is

(A) maximum at the axis of the wire
(B) minimum at the axis of the wire
(C) maximum at the surface of the wire
(D) minimum at the surface of the wire

32. The equation $\varphi = 3t^2 + 4t + 9$ represents the magnetic flux (in Weber) linked with a coil. Then the magnitude of the *emf* induced after $t = 2s$ will be

(A) 2 V
(B) 4 V
(C) 8 V
(D) 16 V

33. When light is incident normally on an air-glass interface, what percentage of light is reflected back, if the refractive index of the glass is 1.5?

(A) 80%
(B) 50%
(C) 10%
(D) 4%

34. An image of an object is formed by a lens. If half of the lens is covered with black paper, how will the image change?

(A) Size of the image will be reduced to one half
(B) Brightness of the image will be reduced
(C) The image will disappear
(D) An inverted image will be formed

35. In Young's double slit experiment, when two light waves interfere to produce a interference pattern of maxima and minima, at the third minima, the two waves have

(A) phase difference of 3π

(B) phase difference of $\frac{5\pi}{2}$

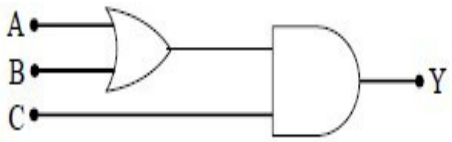
(C) path difference of 3λ

(D) path difference of $\frac{5\lambda}{2}$

36. Which one of the following statements is NOT correct?

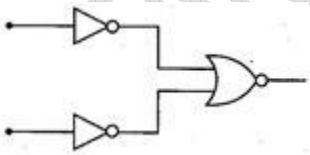
(A) A diode does not obey Ohm's law.
(B) A *p-n* junction diode symbol shows an arrow identifying the direction of current (forward) flow
(C) An ideal diode is an open switch
(D) An ideal diode is an ideal one way conductor

37. To get output 1for the following circuit, the correct choice for the input is



(A) A = 1, B = 0, C = 0
(B) A = 1, B = 1, C = 0
(C) A = 0, B = 0, C = 1
(D) A = 0, B = 1, C = 1

38. The combination of gates as shown in the figure forms the



(A) AND gate
(B) OR gate
(C) NOR gate
(D) NOT gate

39. A position dependent force $F = (7 - 2x + 3x^2)$ N, acts on a small body of mass 2 kg and displaces it from x =0 to x = 5 m. Work done is

(A) 35 J
(B) 70 J
(C) 135 J
(D) 270 J

40. Water falls from a height of 60 m at the rate of 15 kg/s to operate a turbine. The losses due to frictional force are 10% of the input energy. How much power is generated by the turbine? (g = 10 m/s^2)

(A) 10.2 kW
(B) 8.1 kW
(C) 12.3 kW
(D) 7.0 kW

41. In a carbon monoxide molecule, the carbon and the oxygen atoms are separated by a distance 1.12×10^{-10} m. The distance of the centre of mass from the carbon atom is

(A) 0.64×10^{-10} m
(B) 0.56×10^{-10} m
(C) 0.51×10^{-10} m
(D) 0.48×10^{-10} m

42. A cylinder contains hydrogen gas at pressure of 249 kPa and temperature 27°C. Its density is (R = 83 Jmol^{-1}K^{-1})

(A) 0.2 kg/m^3
(B) 0.1 kg/m^3
(C) 0.02 kg/m^3
(D) 0.5 kg/m^3

43. Three containers of the same volume contain three different gases. The masses of the molecules are m_1, m_2 and m_3 and the number of molecules in their respective containers are N_1, N_2 and N_3. The gas pressure in the containers are p_1, p_2 and p_3 respectively. All the gases are now mixed and put in one of these containers. The pressure p of the mixture will be

(A) $p < (p_1 + p_2 + p_3)$
(B) $p = \dfrac{p_1 + p_2 + p_3}{3}$
(C) $p = p_1 + p_2 + p_3$
(D) $p > (p_1 + p_2 + p_3)$

44. For hydrogen gas $C_p - C_v = a$ and for oxygen gas $C_p - C_v = b$, so the relation between a and b is given by

(A) $a = 16b$
(B) $16b = a$
(C) $a = 4b$
(D) $a = b$

45. In which of the following devices, the eddy current effect is NOT used?

(A) Magnetic braking in train
(B) Electromagnet
(C) Electric heater
(D) Induction furnace

46. The magnetic potential energy stored in a certain inductor is 25 mJ, when the current in the inductor is 60 mA. This inductor is of inductance

(A) 1.389 H
(B) 138.88 H
(C) 0.138 H
(D) 13.89 H

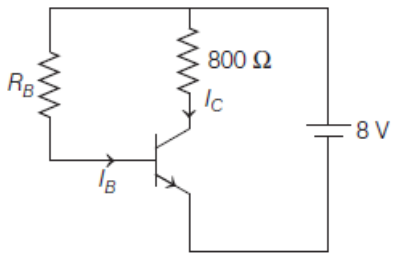
47. The cathode of a photoelectric cell is changed such that the work function changes from W_1 to W_2 ($W_1 > W_2$). If the current before and after changes are I_1 and I_2, all other conditions remaining unchanged, then (assuming $h\nu > W_2$)

(A) $I_1 = I_2$
(B) $I_1 < I_2$
(C) $I_1 > I_2$
(D) None of the above

48. The 21 cm radio wave emitted by hydrogen in interstellar space is due to the interaction called the hyperfine interaction in atomic hydrogen. The energy of the emitted wave is nearly

(A) 10^{-17} J
(B) 1 J
(C) 7×10^{-6} J
(D) 10^{-24} J

49. An *n-p-n* transistor is connected in common emitter configuration (see figure) in which collector voltage drop across load resistance (800 Ω) connected to the collector circuit is 0.8 V. The collector current is

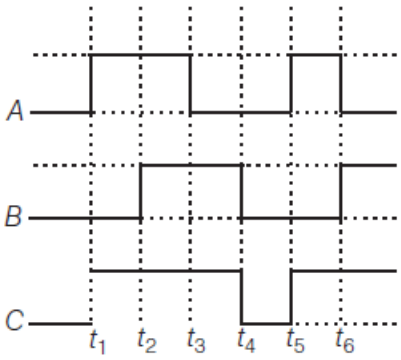


(A) 2 mA
(B) 0.1 mA
(C) 1 mA
(D) 0.2 mA

50. The voltage gain of an amplifier with 9% negative feedback is 10. The voltage gain without feedback will be

(A) 90
(B) 10
(C) 1.25
(D) 100

51. The figure shows a logic circuit with two inputs *A* and *B* and the output *C*. The voltage wave forms across *A*, *B* and *C* are as given. The logic circuit gate is



(A) OR gate
(B) NOR gate
(C) AND gate
(D) NAND gate

52. If the tension in a stretched string is increased, what happens to the velocity of a wave traveling through the string?

(A) Increases
(B) Decreases
(C) Remains the same
(D) Becomes zero

53. A parallel-plate capacitor initially has a capacitance of 10 μF and is charged to 100 V. If the plate separation is reduced by half while maintaining the same charge on the capacitor, what is the resulting capacitance?

(A) 5 μF
(B) 10 μF
(C) 20 μF
(D) 40 μF

54. A steady current of 5A flows through a copper wire for 10 s. Calculate the total charge that passes through the wire during this time.

(A) 2 C
(B) 5 C
(C) 15 C
(D) 50 C

55. The magnetic dipole moment of a current-carrying circular coil is doubled by

(A) Doubling the radius of the loop
(B) Doubling the current through the loop
(C) Doubling the number of turns
(D) Doubling the current through the loop and the number of turns

56. The electric field of a plane electromagnetic wave is given by $E = E_0 (x + y) \sin (kx - \omega t)$, its magnetic field will be given by

(A) $\frac{E_0}{C} (x - y) \cos (kx - \omega t)$

(B) $\frac{E_0}{C} (-x + y) \sin(kz - \omega t)$

(C) $\frac{E_0}{C} (x - y) \sin(kz - \omega t)$

(D) $\frac{E_0}{C} (x + y) \sin(kz - \omega t)$

57. Find the critical angle of a medium for a specific wavelength, if the medium has relative permittivity 3 and relative permeability $\frac{4}{3}$ for this wavelength.

(A) 60°
(B) 15°
(C) 45°
(D) 30°

58. The de-Broglie wavelength of a molecule in a gas at room temperature (300 K) is λ_1. If the temperature of the gas is increased to 600 K, then the de Broglie wavelength of the same gas molecule becomes

(A) $\frac{1}{\sqrt{2}}\lambda_1$

(B) $2\,\lambda_1$

(C) $\frac{1}{2}\lambda_1$

(D) $\sqrt{2}\,\lambda_1$

59. An electron having de-Broglie wavelength λ is incident on a target in an *X*- ray tube. Cut-off wavelength of emitted *X*-ray is

(A) 0

(B) $\frac{2m^2c^2\lambda^2}{h^2}$

(C) $\frac{2mc\lambda^2}{h}$

(D) $\frac{hc}{mc}$

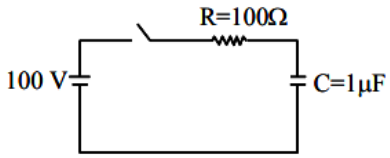
60. An NPN transistor is used in common emitter configuration as an amplifier with 1 kΩ load resistance. Signal voltage of 10 mV is applied across the base-emitter. This produces a 3 mA change in the collector and 15 μA change in the base current of the amplifier. The input resistance and voltage gain are

(A) 0.033 kΩ, 1.5
(B) 0.67 kΩ, 200
(C) 0.33 kΩ, 300
(D) 0.67 kΩ, 300

61. The modulation index for an A.M. wave having maximum and minimum peak to peak voltages of 14 mV and 6 mV respectively is

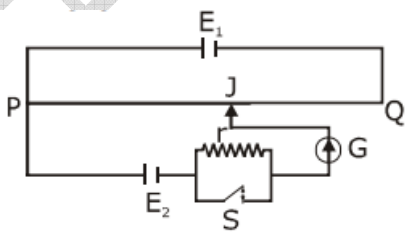
(A) 1.4
(B) 0.4
(C) 0.2
(D) 0.6

62. A capacitor of capacitance $C = 1\ \mu F$ is suddenly connected to a battery of 100 volt through a resistance $R = 100\ \Omega$. The time taken for the capacitor to be charged to get 50 V is [Take $\ln 2 = 0.69$]



(A) 1.44×10^{-4} S
(B) 3.33×10^{-4} S
(C) 0.69×10^{-4} S
(D) 0.30×10^{-4} S

63. A potentiometer wire PQ of 1 m length is connected to a standard cell E_1. Another cell E_2 of emf 1.02 V is connected with a resistance 'r' and switch S (as shown in figure). With switch S open, the null position is obtained at a distance of 49 cm from Q. The potential gradient in the potentiometer wire is



(A) 0.02 V/cm
(B) 0.04 V/cm
(C) 0.01 V/cm
(D) 0.03 V/cm

64. A beam of protons with speed 4×10^5 ms^{-1} enters a uniform magnetic field of 0.3 T at an angle of 60^o to the magnetic field. Then the pitch of the resulting helical path of protons is close to

[Mass of the proton $=1.67 \times 10^{-27}$ kg, charge of the proton $=1.69 \times 10^{-19}$ C]

(A) 12 cm
(B) 4 cm
(C) 5 cm
(D) 2 cm

65. In an LC oscillator, if values of inductance and capacitance become twice and eight times, respectively, then the resonant frequency of oscillator becomes 'x' times its initial resonance frequency ω_0. The value of 'x' is

(A) $\frac{1}{4}$
(B) 4
(C) 16
(D) $\frac{1}{6}$

66. In a series, LCR Resonance circuit, if we change the resistance only, from a lower to higher value then

(A) the bandwidth of resonance circuit will increase
(B) the resonance frequency will increase
(C) the quality factor will increase
(D) the quality factor and the residence frequency will remain constant

67. A uniform cable of mass 'M' and length 'L' is placed on a horizontal surface that is $\left(\frac{1}{n}\right)^{\text{th}}$ part is hanging below the edge of the surface. To lift the hanging part of the cable up to the surface, the work done should be

(A) $\frac{MgL}{n^2}$
(B) $\frac{MgL}{2n^2}$
(C) $\frac{2MgL}{n^2}$
(D) $nMgL$

68. A fly wheel is accelerated uniformly from the rest and rotates through 5 rad in the first second. The angle rotated by fly wheel in the next second, will be

(A) 7.5 rad
(B) 15 rad
(C) 20 rad
(D) 30 rad

69. The time period of satellite revolving around earth in a given orbit is 7 hours. If the radius of orbit is increased to 3 times its previous value, then approximate new time period of the satellite will be

(A) 40 hours
(B) 36 hours
(C) 30 hours
(D) 25 hours

70. The elastic limit of brass is 379 MPa. What should be the minimum diameter of brass rod if it is to support a 400 N load without exceeding its elastic limit?

(A) 1.16 mm
(B) 0.90 mm
(C) 1.36 mm
(D) 1.00 mm

71. A gas has n degrees of freedom. The ratio of specific heat of gas at constant volume to the specific heat of gas at constant pressure will be

(A) $\frac{n}{n+2}$

(B) $\frac{n+2}{n}$

(C) $\frac{n}{2n+2}$

(D) $\frac{n}{n-2}$

72. A string of length 1m and mass 5 kg is fixed at both ends. The tension in the string is 8.0 N. The string is set into vibration using an external vibrator of frequency 100 Hz. The separation between successive nodes and the string is close to

(A) 16.6 cm
(B) 20.0 cm
(C) 10.0 cm
(D) 33.3 cm

73. Moment of inertia of a body about a given axis is 1.5 kg m^2. Initially the body is at rest. In order to produce rotational kinetic energy of 1200 J, the angular acceleration of 20 rad /s^2 must be applied about the axis for a duration of

(A) 2 s
(B) 5 s
(C) 2.5 s
(D) 3 s

74. 10^5 Fermi is equal to

(A) 1 meter
(B) 100 micron
(C) 1 Angstrom
(D) 1 mm

75. Which of the following have same dimensions?

(A) Planck's constant and momentum
(B) Torque and force
(C) Potential energy and force
(D) Torque and potential energy

76. According to the first law of thermodynamics, for an isolated system, ΔU =

(A) Negative
(B) Zero
(C) Positive
(D) The value of ΔU cannot be predicted by using first law

77. The ionization of water ($H_2O(l) \rightleftharpoons H^+(aq) + OH^-(aq)$) has an equilibrium constant of 1×10^{-14} at 298 K. The ΔG^0 of the reaction is ……..kJ/mol

(A) – 79.8 kJ/mol
(B) +79.8 kJ/mol
(C) +39.9 kJ/mol
(D) – 39.9 kJ/mol

78. Yellow and Red phosphorous are two important allotropes of Phosphorous. Heat of combustion of red and yellow phosphorous are –8.78 kJ and – 9.91 kJ respectively. The heat of transition of yellow to Red phosphorous is

(A) –18.69 kJ
(B) +1.13 kJ
(C) +18.69 kJ
(D) –1.13 kJ

79. pOH of a 1×10^{-9} M aqueous solution of hydronium ion in room temperature will be

(A) 9
(B) 7.9
(C) 5
(D) 10.9

80. A solution containing equimolar concentration of $SnCl_2$, $NiCl_2$, $MgCl_2$, $AgNO_3$, $AuCl_3$ is being electrolyzed by using inert electrodes. The standard electrode potentials (in Volts) for each metal ions is

$Sn^{2+}/Sn = -0.14V$, $Ni^{2+}/Ni = -0.25$ V, $Mg^{2+}/Mg = -2.36$ V, $Ag^{+}/Ag = 0.80$ V and $Au^{3+}/Au = 1.40V$

With an increasing voltage, the order of metal deposition on the cathode will be

(A) Sn, Ni, Ag, Au, Mg
(B) Au, Ag, Sn, Ni, Mg
(C) Mg, Ni, Sn, Ag, Au
(D) Mg, Au, Ag, Ni, Sn

81. The amount of O_2 dissolved in one liter of water at 25°C under a partial pressure of oxygen 0.75 atm is ……. (Henry's law constant $k_H = 1.4 \times 10^{-3}$ mol/L/atm)

(A) 33.6 mg
(B) 3.36 mg
(C) 33.6 g
(D) 3.36 g

82. …… gets deposited on both anodic and cathodic plates of a discharged lead-acid battery

(A) Pb
(B) PbO_2
(C) Pb_2O_4
(D) $PbSO_4$

83. Which of the following expression gives the de Broglie relationship?

(A) $\lambda = \frac{h}{mp}$

(B) $p = \frac{h}{mv}$

(C) $\varepsilon = mc^2$

(D) $\lambda = \frac{h}{mv}$

84. The enthalpies of all elements in their standard states are

(A) Unity
(B) Zero
(C) < 0
(D) Different for each element

85. Half-life of 10 g of radioactive substance is 10 days. The half-life of 20 g is

(A) 10 days
(B) 20 days
(C) 40 days
(D) 15 days

86. Ksp for AgCl (mol wt 143.5) is 17×10^{-11} at 298 K. The molar solubility of AgCl at 298 K is

(A) 18.7×10^{-5}
(B) 2.3×10^{-3}
(C) 9.90×10^{-3}
(D) 1.3×10^{-5}

87. What is the activation energy for a reaction if its rate doubles when the temperature is raised from 200 K to 400 K? ($R = 8.314\ JK^{-1}mol^{-1}$)

(A) 234.65 kJ mol^{-1}
(B) 434.65 kJ mol^{-1}
(C) 229.1 J mol^{-1}
(D) 334.65 J mol^{-1}

88. DDT on exposure to water decomposes. Half-life = 10 years. How much time will it take for its 90% decomposition?

(A) 50 years
(B) 33.3 years
(C) 70 years
(D) 80 years

89. Which of the following is used as an electrolyte in an H_2-O_2 fuel cell?

(A) KOH
(B) NH_4OH
(C) $Fe(OH)_2$
(D) $Cu(OH)_2$

90. If Zn^{2+}/Zn electrode is diluted 100 times, then the change in emf is

(A) increase of 59 mV
(B) decrease of 59 mV
(C) increase of 29.5 mV
(D) decrease of 29.5 mV

91. In Zinc blende structure

(A) zinc ions occupy half of the tetrahedral sites
(B) each Zn^{2-} ion is surrounded by six sulphide ions
(C) each S^{2-} ion is surrounded by six Zn^{2+} ions
(D) it has fcc structure

92. $A + 2B \rightarrow C + D$. If $-d[A]/dt = 5 \times 10^{-4}$ mol L^{-1} s^{-1}, then $-d[B]/dt$ is

(A) 2.5×10^{-4} mol L^{-1} s^{-1}
(B) 5.0×10^{-4} mol L^{-1} s^{-1}
(C) 2.5×10^{-3} mol L^{-1} s^{-1}
(D) 1.0×10^{-3} mol L^{-1} s^{-1}

93. A metal crystallizes into two cubic phases, body centered cubic and face centered cubic whose unit cell length are 2.5 and 2.0 Aº respectively. The ratio of densities of body centered cubic and face centered cubic is

(A) 0.24
(B) 0.25
(C) 0.26
(D) 0.23

94. The vapour pressure of *A* and *B* at 27°C are 60 mm Hg and 40 mm Hg respectively. If *A* and *B* are mixed such that the mole fraction of *A* in the mixture is 0.8, then the mole of *B* in the vapour phase is $Z \times 10^{-1}$. The value of *Z* is

(A) 1.0
(B) 1.2
(C) 1.4
(D) 1.6

95. A buffer solution was prepared by mixing equal concentration of acid (ionization constant Ka) and a salt. The pH of the buffer is

(A) 14 – pKa
(B) pKa + 1
(C) pKa
(D) pKa – 14

96. When the hybridization state of carbon atom changes from sp^3 to sp^2 and finally to *sp*, the angle between the hybridized orbitals

(A) decreases gradually
(B) decreases when hybridization state changes from sp^3 to sp^2 and increases when hybridization state changes from sp^2 to *sp*
(C) remains unchanged
(D) increases progressively

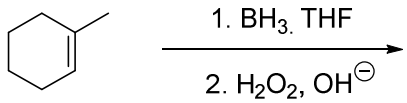
97. IUPAC name of $(CH_3)_2CHCH=CHCH_3$ is

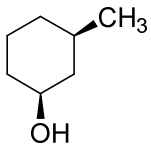
(A) 2-methylpent-3-ene
(B) 4-methylpent-2-ene
(C) 1,1-dimethylbut-2-ene
(D) 4,4,-dimethylbut-2-ene

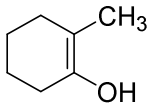
98. Major product formed when 2,2-dibromobutane is heated at 200 °C in presence of molten KOH is (note: reaction is carried out under thermodynamically controlled conditions)

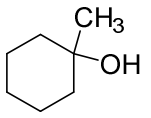
(A) 1-bromo-but-1-yne
(B) 1-bromo-but-2-yne
(C) but-1-yne
(D) but-2-yne

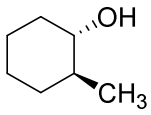
99. Pick the major product formed in the following reaction sequence.



(A) 

(B) 

(C) 

(D) 

100. Which of the following does not give a white precipitate with ammoniacal $AgNO_3$ solution?

(A) propyne
(B) but-1-yne
(C) but-2-yne
(D) ethyne

101. Benzoic acid is treated with thionyl chloride to give compound Q which is converted to benzaldehyde as shown below. What reagent is required to convert Q to benzaldehyde?

$$PhCOOH \rightarrow Q \rightarrow PhCHO$$

(A) NH_4Cl
(B) H_2/Pd-C
(C) H_2, Pd/$BaSO_4$
(D) O_2, Pt

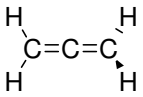
102. Which of the following reactions will not result in the formation of new carbon-carbon bonds?

(A) Reimer-Tieman reaction
(B) Cannizaro reaction
(C) Wurtz reaction
(D) Friedel-Crafts acylation

103. Which among the following amino acids does not have a primary amino (NH_2) group?

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

104. Pick the correct statement about allene (propa-1,2-diene):



(A) only sp^2 hybridized carbons are present in allene
(B) both sp^2 and sp hybridized carbons are present in allene
(C) all four hydrogens in allene lie in the same plane
(D) C-C-C bond angle in allene is about 120 ± 5 degrees

105. An example of a polar protic solvent is:

(A) Acetonitrile
(B) Methanol
(C) Acetone
(D) Dimethyl formamide

106. The exterior surface of a soap micelle in water is:

(A) hydrophobic
(B) hydrophilic
(C) amphiphilic
(D) lipophilic

107. The term invert sugar refers to an equimolar mixture of:

(A) D-glucose and D-galactose
(B) D-glucose and D-fructose
(C) D-glucose and D-mannose
(D) D-glucose and D-ribose

108. SN1 substitution on a chiral carbon of an optically active compound proceeds with:

(A) retention in configuration
(B) inversion in configuration
(C) racemization
(D) inversion at higher temperature and retention at lower temperature

109. Formal charge of nitrogen atom in nitric acid (HNO_3) and nitrous acid (HNO_2) is

(A) +1 and 0 respectively
(B) 0 and +1 respectively
(C) +1 and -1 respectively
(D) +1 and +1 respectively

110. Additive that was used as an anti-knock agent in petrol that has now been banned due to environmental and health concerns is:

(A) Ethyl acetate
(B) Lead tetrachloride
(C) Lead acetate
(D) Tetraethyllead [$(C_2H_5)_4Pb$]

111. Which among the following name reactions is best suited to convert acetic acid to bromoacetic acid?

$$CH_3CO_2H \rightarrow Br\text{-}CH_2CO_2H$$

(A) Hell-Volhard-Zelinsky reaction
(B) Hunsdiecker reaction
(C) Reformatsky raction
(D) Hoffmann bromamide reaction

112. Which one of the following bases is not present in DNA?

(A) Adenine
(B) Guanine
(C) Cytosine
(D) Uracil

113. Which of the following halides can undergo nucleophilic substitution under mild conditions?

(i) 3-chloroprop-1-ene
(ii) 1-chloropropane
(iii) Benzyl chloride
(iv) Chloroethene (Vinyl Chloride)

(A) (i), (ii), and (iii)
(B) (i) and (ii)
(C) (ii) and (iv)
(D) (i) and (iii)

114. Major product formed when hex-3-yne reacts with Na/liq. NH_3 is:

(A) *cis*-hex-3-ene
(B) *trans*-hex-3-ene
(C) 3-aminohexane
(D) 3,4-diaminohexane

115. Which among the following reactions is best suited to convert benzyl bromide to benzylamine with minimal side product formation?

(A) Reaction with liquid ammonia
(B) Reaction with KCN followed by reduction with $LiAlH_4$
(C) Reaction with potassium phthalimide followed by hydrolysis with strong base
(D) Reaction with sodium nitrite ($NaNO_2$)followed by reduction with $LiAlH_4$

116. What is the correct set of four quantum numbers for the valence electron of an atom with Z = 37 ?

(A) $5,0,1,+\frac{1}{2}$
(B) $5,1,0,-\frac{1}{2}$
(C) $5,0,0,+\frac{1}{2}$
(D) $5,1,1,-\frac{1}{2}$

117. What is the number of radial nodes for 3p orbital ?

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

118. The wave function (Ψ) of 2s is given by $\Psi_{2s} = \frac{1}{2\sqrt{2\pi}}\left(\frac{1}{a_0}\right)^{\frac{1}{2}}\left(2-\frac{r}{a_0}\right)e^{-r/2a_0}$. Find the value of *r* where radial node is formed

(A) 0
(B) a_0
(C) $2a_0$
(D) $3a_0$

119. Which transition in the hydrogen atom spectrum would have the same wavelength as the Balmer type transition from n = 4 to n = 2 of He^+ spectrum

(A) n = 2 to n = 1
(B) n = 3 to n = 1
(C) n = 2 to n = 4
(D) n = 3 to n = 4

120. Which of the following represents isoelectronic species?

(A) Li^+, Na^+, Mg^{2+}, Ca^{2+}
(B) Ba^{2+}, Sr^{2+}, K^+, Ca^{2+}
(C) O^{2-}, F^-, S^{2-}, Ca^{2+}
(D) Ar, K^+, Cl^-, Sc^{3+}

121 Which among the atomic orbitals 6s, 7s, 7p, 8p and 8d have 5 radial nodes?

(A) 7s, 7p, 8d
(B) 6s, 7s, 8p
(C) 6s, 7p, 8d
(D) 7s, 7p, 8p

122. Statement I: 5f electrons can participate in bonding to a far greater extent than 4f electrons
Statement II: 5f orbitals are not as buried as 4f orbitals

Choose the correct option

(A) Both the Statements are true
(B) Statement I is true but Statement II is false
(C) Statement I is false and Statement II is true
(D) Both the Statements are false

123. Which of the following have highest bond dissociation energy?

(A) F_2
(B) Cl_2
(C) Br_2
(D) I_2

124. Which among the following is the most basic oxide?

(A) Ga_2O_3
(B) Al_2O_3
(C) B_2O_3
(D) In_2O_3

125. Identify the correct order of electronegativity

(A) Br > O > P > C
(B) C > P > O > Br
(C) O > Br > C > P
(D) P > C > O > Br

126. What is the spin only magnetic moment value of $[Pt(NH_3)_2Cl(NH_2CH_3)]Cl$?

(A) 0
(B) 2.6
(C) 3.4
(D) 4.9

127. Which of the following has square pyramidal shape?

(A) $[Ni(CN)_4]^{2-}$
(B) PCl_5
(C) BrF_5
(D) PF_5

128. Which of the following transition metal has the highest third ionization enthalpy?

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

129. What is the change of oxidation state of Cr in potassium dichromate as a strong oxidising agent in acidic solution?

(A) +3 to +1
(B) +6 to 0
(C) +6 to +3
(D) +3 to +2

130. Why boric acid is solid and BF_3 is gas at room temperature?

(A) Strong ionic bond in boric acid
(B) Strong covalent bond in BF_3
(C) Strong van der Waal's interaction in boric acid
(D) Strong hydrogen bond in boric acid

131. What is the geometry of B in BF_3 and BF_3NMe_3?

(A) Trigonal planar and tetrahedral
(B) Trigonal planar and pentagonal bipyramidal
(C) Tetrahedral and pentagonal bipyramidal
(D) Tetrahedral and trigonal planar

132. Identify the correct statement about B_2H_6.

(A) All B─H─B angles are 120°
(B) The two B─H─B bonds have different length
(C) Terminal B─H bonds have less p-character than the bridging B─H bonds
(D) Its fragment BH3 is a Lewis base

133. How many geometrical isomers are possible for the square planar complex [Pd(py)(Cl)(Br)(NH_3)], py = pyridine?

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

134. Why is cuprous ion colourless while cupric ion is coloured?

(A) Both have half-filled p- and d-orbitals
(B) Cuprous ion has incomplete d-orbital and cupric ion has a complete d-orbital
(C) Both have unpaired electrons in the d-orbitals
(D) Cuprous ion has complete d-orbital and cupric ion has an incomplete d-orbital

135. Identify the correct geometry and magnetic property of [$Ni(CO)_4$] complex.

(A) Square planar and diamagnetic
(B) Tetrahedral and diamagnetic
(C) Tetrahedral and paramagnetic
(D) Square planar and paramagnetic

136. The number of one-one functions from A to A , where $A = \{1, 2, 3\}$, is

(A) 1
(B) 2
(C) 4
(D) 6

137. If the directional cosines of a straight line are 0, 0, 1, then the equation of the straight line is

(A) $x = 0,\ y = 0$
(B) $y = 0,\ z = 0$
(C) $x = 0,\ z = 0$
(D) $x + y + z = 0$

138. If a non zero matrix A of order 5×5 satisfies the equation $A^2 - 5A = 0,$ then the matrix A is

(A) $A = \begin{pmatrix} 5 & 5 \\ 5 & 5 \end{pmatrix}$

(B) $A = \begin{pmatrix} 5 & 0 \\ 0 & 5 \end{pmatrix}$

(C) $A = \begin{pmatrix} 5 & 0 \\ 0 & 0 \end{pmatrix}$

(D) $A = \begin{pmatrix} 0 & 5 \\ 5 & 0 \end{pmatrix}$

139. If the system of equations $x + ay = 0,\ az + y = 0,\ ax + z = 0$ has infinite number of solutions, then the value of a is

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

140. The function $f(x) = \dfrac{\sin x}{x}$ is continuous in the interval

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

141. Let S be the set of points at which the function $f:\mathbb{R}\to\mathbb{R}$ defined by $f(x)=|\cos x|$ is not differentiable. Then $|S|$ is equal to

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

142. Let f be a continuous function on [0, 4]. If $f(x)$ takes rational values for all x and $f(4)=2025$, then $f(\pi)$ is

(A) 0
(B) 2025
(C) π
(D) 1

143. The sum of three numbers is 96. The first number is 6 times the third number, and the third number is 40 less than the second number. Then the absolute value of the difference between the first and second numbers is

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

144. If $\sin a+\sin b=\sqrt{\frac{5}{3}}$ and $\cos a+\cos b=1$, then $\cos(a-b)$ is equal to

(A) $\frac{1}{3}$
(B) $\frac{2}{3}$
(C) $\frac{3}{4}$
(D) 1

145. The equation $3x^{13}+5x^{5}-7=0$ has

(A) exactly one real root
(B) more than one real root
(C) exactly 13 real roots
(D) no real root

146. The mapping $f:[-2,2]\to\mathbb{R},$ defined by $f(x)=x|x|$, is

(A) bijective
(B) not one-one but onto
(C) not onto
(D) not a function

147. The number of constant functions from a set containing *m* elements to a set containing *n* elements is

(A) *mn*
(B) *m*
(C) *n*
(D) *m* + *n*

148. The mapping $f:\left[\frac{-\pi}{2},\frac{\pi}{2}\right]\to\mathbb{R},$ defined by $f(x)=\tan x$, is

(A) one-one
(B) onto
(C) bijective
(D) not a function

149. The value of $\cos^{-1}x+\sin^{-1}x$ is

(A) 0
(B) 1
(C) $\frac{\pi}{2}$
(D) π

150. Let a, b, c and d be distinct integers such that $(6-a)(6-b)(6-c)(6-d) = 36$. Then $a+b+c+d$ is equal to

(A) 23
(B) 24
(C) 13
(D) 14

151. Let $f : X \to X$ be a mapping such that $f\left(f(x)\right) = x$ for all $x \in X$. Then

(A) f is one-to-one and onto
(B) f is one-to-one but not onto
(C) f is onto but not one-to-one
(D) f is neither one-to-one nor onto

152. The number of transition points for the function $f(x) = e^{-2x}$ is

(A) ∞
(B) 2
(C) 1
(D) 0

153. The least number of positive integers 'n' satisfying $\sqrt{n\sqrt{n\sqrt{n...}}} = n$ is

(A) 0
(B) 1
(C) 2
(D) ∞

154. Let $G = \{(a,b) / a \in \mathbb{R}^*, b \in \mathbb{R}\}$ and be defined as $(a, b) \blacklozenge (c,d) = (ac, bc, d)$. Then which of the property that G does not satisfy under the operation $\blacklozenge$?

(A) Associative
(B) Existence of identity
(C) Existence of inverse
(D) Commutative

155. The question paper in a test consists of 15 questions. In how many ways the test can be attempted if each question has four choices?

(A) 15^4

(B) 15

(C) 4^{15}

(D) 1

156. The derivative of $f(x) = \sqrt{x}$ exists in

(A) $\mathbb{R}$

(B) $\mathbb{R} - \{0\}$

(C) $(0, \infty)$

(D) $[0, \infty)$

157. Let M be the set of all $n \times n$ matrices such that each matrix is both symmetric and skew symmetric. Then $|M|$ is

(A) n

(B) 1

(C) n^2

(D) ∞

158. Which of the following function has maxima?

(A) $f(x) = e^{2x}$, $x \in \mathbb{R}$

(B) $f(x) = \frac{1}{x^2}$, $x \in \mathbb{R}$

(C) $f(x) = \cot(x)$, $x \in \mathbb{R}$

(D) $f(x) = \cos(x)$, $x \in \mathbb{R}$

159. If the point $P(4,5)$ is shifted by a distance $2\sqrt{2}$ units parallel to the line $y = x,$ then the coordinates of P in new position is

(A) $(6,7)$

(B) $\left(4+\sqrt{2}, 5+\sqrt{2}\right)$

(C) $\left(4+\sqrt{2}, 5-\sqrt{2}\right)$

(D) $(5,4)$

160. The solution set of $\log_3 |9-5x| > 2$ is

(A) $\left(\frac{18}{5}, \infty\right)$

(B) $\left(\frac{3}{5}, \frac{18}{5}\right)$

(C) $(-\infty, 0) \cup \left(\frac{18}{5}, +\infty\right)$

(D) $\left(-\infty, -\frac{18}{5}\right)$

161. The angle between the tangents drawn from the point (1, 4) to the parabola $y^2 = 4x$ is

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

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

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

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

162. A set of matrices of same order under matrix multiplication can never be

(A) a monoid
(B) a non abelian group
(C) a semi group
(D) an abelian group

163. If $a = \cos\frac{4\pi}{3} + i\sin\frac{4\pi}{3}$, then the value of $\left(\frac{1+a}{2}\right)^{3n}$ is

(A) $(-1)^n$

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

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

(D) $(-1)^n + 1$

164. Locus of the point z satisfying the equation $|iz-1|+|z-i|=2$ is

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

165. Sum of all terms of an infinite GP is $\frac{1}{7}$ times the sum of odd terms. The common ratio is

(A) $\frac{6}{7}$

(B) $\frac{-1}{7}$

(C) $\frac{-6}{7}$

(D) $\frac{1}{7}$

166. The number of solutions of the equation $\log_{0.5}\sin x = 1-\log_{0.5}\cos x$, in $[-2\pi, 2\pi]$, is

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

167. If x^2-1 is a factor of $x^4+mx^3+4x-nk$, then

(A) $m=4, n=-1$
(B) $m=-4, n=1$
(C) $m=4, n=1$
(D) $m=-4, n=-1$

168. If $\frac{{}^{n}P_{r-1}}{x} = \frac{{}^{n}P_{r}}{y} = \frac{{}^{n}P_{r+1}}{z}$, then

(A) $\sum \frac{1}{x} = 1$

(B) $xyz = 1$

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

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

169. The number of triangles which can be formed by using the vertices of a regular polygon of $n + 3$ sides is 220. Then n is equal to

(A) 8
(B) 9
(C) 10
(D) 11

170. The middle term in the expansion of $\left(x - \frac{1}{x}\right)^{18}$ is

(A) ${}^{18}C_9$

(B) $-{}^{18}C_9$

(C) ${}^{18}C_{10}$

(D) $-{}^{18}C_{10}$

171. If the matrix $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ commutes with the matrix $\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$, then

(A) $a = 0,\ b = c$
(B) $b = 0,\ c = d$
(C) $b = 0,\ d = a$
(D) $d = 0,\ a = b$

172. The values of x for which the matrix $\begin{bmatrix} -x & x & 2 \\ 2 & x & -x \\ x & -2 & -x \end{bmatrix}$ will be invertible are

(A) $-2 \le x \le 2$
(B) $x \ne 2$ and $x \ne -2$
(C) $x \ge 2$
(D) $x \le -2$

173. Let $X = \{a : a^2 = 1 \text{ and } a \text{ is a complex value}\}$ and $Y = \{b : b^4 = 1 \text{ and } b \text{ is a complex value}\}$. Then the set $X \Delta Y$ is equal to

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

174. If $g(x) = \cos(\log x)$, then $g(x)g(y) - \frac{1}{2}\left[g\left(\frac{x}{y} + g(xy) \right) \right]$ is equal to

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

175. Let $A = \{1, 2, 3, 4\}$ and $r = \{(2,2), (3,3), (4,4), (1,2)\}$. Then this relation R is

(A) reflexive
(B) symmetric
(C) transitive
(D) anti-symmetric

176. The probability density function of a continuous random variate is given by

$$f(x) = \begin{cases} 0, & x < 2 \\ \dfrac{(3+2x)}{18}, & 2 \le x \le 4 \\ 0, & x > 4 \end{cases}$$

Then, the probability that x will lie between $2 \le x \le 3$ is

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

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

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

(D) $\frac{-2}{9}$

177. An urn contains 3 red and 5 blue balls. The probability that two balls are drawn in which the second ball drawn is blue without replacement is

(A) $\frac{5}{16}$

(B) $\frac{5}{56}$

(C) $\frac{5}{8}$

(D) $\frac{20}{56}$

178. The number of integral values of k for which the equation $7 \cos x + 5 \sin x = 2k + 1$ has a solution is

(A) 4
(B) 8
(C) 10
(D) 12

179. In a triangle, sides are a, b, c and angles are A, B, C. If $b + c = 3a$, then $\cot\frac{B}{2}\cot\frac{C}{2}$ is equal to

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

180. The lines $x+2y+3=0$, $x+2y-7=0$ and $2x-y-4=0$ are the sides of a square. The equation of the remaining side of the square can be

(A) $2x-y+6=0$
(B) $2x-y+8=0$
(C) $2x-y-10=0$
(D) $2x-y-6=0$

181. The four straight lines given by $12x^2+7xy-12y^2=0$ and $-12x^2+7xy-12y^2-x+7y-1=0$ lie along the sides of a

(A) square
(B) parallelogram
(C) rectangle
(D) rhombus

182. If $\sin^{-1}x+\sin^{-1}y=\frac{\pi}{2}$, then $\frac{dy}{dx}$ is equal to

(A) $\frac{x}{y}$
(B) $-\frac{x}{y}$
(C) $\frac{y}{x}$
(D) $-\frac{y}{x}$

183. The value of $\lim_{x\to 3} \frac{e^{3x-9}+7}{\cos(3-x)}$ is equal to

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

(B) ∞

(C) 3

(D) 0

184. If $f(x) = 2x^3 + 9x^2 + \lambda x + 20$ is a decreasing function of x in the interval $(-2, -1)$, then λ is equal to

(A) 12
(B) -12
(C) 6
(D) -6

185. A polynomial of odd degree with real coefficients must have

(A) at least one real root
(B) no real root
(C) only real roots
(D) at least one root which is not real

186. The solution of the differential equation $xdy - ydx = 0$ represents a

(A) parabola whose vertex is at origin
(B) circle whose center is at origin
(C) rectangular hyperbola
(D) straight line passing through origin

187. The integrating factor of the differential equation $(y \log y)dx = (\log y - x)dy$ is

(A) $\frac{1}{\log y}$

(B) $\log(\log y)$

(C) $1 + \log y$

(D) $\log y$

188. If the vectors $\vec{a} = \hat{i} + a\hat{j} + a^2\hat{k}$, $\vec{b} = \hat{i} + b\hat{j} + b^2\hat{k}$, $\vec{c} = \hat{i} + c\hat{j} + c^2\hat{k}$ are three non-coplanar vectors and $\begin{vmatrix} a & a^2 & 1+a^3 \\ b & b^2 & 1+b^3 \\ c & c^2 & 1+c^3 \end{vmatrix} = 0,$ then the value of *abc* is

(A) 0
(B) 1
(C) 2
(D) −1

189. The complex numbers $\sin x + i\cos 2x$ and $\cos x - i\sin 2x$ are conjugate to each other for

(A) $x = n\pi$
(B) $x = \left(n + \frac{1}{2}\right)\pi$
(C) $x = 0$
(D) no value of *x*

190. The sum of *n* terms of the series
$\tan^{-1}\frac{1}{2} + \tan^{-1}\frac{2}{5} + \tan^{-1}\frac{1}{8} + \tan^{-1}\frac{2}{25} + \tan^{-1}\frac{1}{18} + \ldots$ is

(A) $\tan^{-1}(-3)$
(B) $\cot^{-1}\left(\frac{1}{3}\right)$
(C) $\tan^{-1}\left(\frac{1}{3}\right)$
(D) $\cot^{-1}\left(\frac{2}{3}\right)$

191. An urn contains 3 red pens, 4 green pens and 6 yellow pens. The number of ways of drawing 4 pens from the urn if at least one red pen is to be included in the draw is

(A) 500
(B) 505
(C) 510
(D) 520

192. There are 12 white and 12 red balls in a bag. Balls are drawn one by one with replacement from the bag. The probability that 7^{th} drawn ball is 4^{th} white is

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

(B) $\frac{1}{8}$

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

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

193. The sum of the digits in the unit place of all the numbers formed by 3, 4, 5, 8 taken all at a time is

(A) 432
(B) 108
(C) 36
(D) 18

194. Let f be a continuous function on [2, 5] . If $f(x)$ takes rational values for all x and $f(4)=8$ then $f(3.6)=$

(A) 0
(B) 8
(C) −1
(D) 5

195. The number of ways of choosing 10 balls from infinite white, red, blue and green balls is

(A) 70
(B) 84
(C) 286
(D) 86

196. The tangents to the hyperbola $x^2-y^2=3$ are parallel to the straight line $2x+y+8=0$ at the points

(A) (2, 1) or (1, 2)
(B) (2,−1) or (−2, 1)
(C) (−1,−2)
(D) (−2,−1)

197. Let M be the least common multiple of all the integers 10 through 30, inclusive. Let N be the least common multiple of M, 32, 33, 34, 35, 36, 37, 38, 39, and 40. What is the value of $\frac{N}{M}$?

(A) 1
(B) 2
(C) 37
(D) 74

198. The number of ordered pairs (a, b) of integers that the polynomial $x^3 + ax^2 + bx + 6$ have 3 distinct integer roots is

(A) 4
(B) 5
(C) 6
(D) 7

199. Which of the following is correct?

(A) Skew symmetric matrix of even order is always singular
(B) Skew symmetric matrix of odd order is always non-singular
(C) Skew symmetric matrix of odd order is always singular
(D) None of the above

200. If $\lim_{x\to 0}(1+ax)^{\frac{b}{x}} = e^4$, where a and b are natural numbers, then

(A) $a = 4, b = 2$
(B) $a = 8, b = 4$
(C) $a = 16, b = 8$
(D) None of the above

201. If $AB = A$ and $BA = B$, then B^2 is equal to

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

202. The number of complex numbers that satisfy the equation $z^5 = \overline{z}$ is

(A) 2
(B) 3
(C) 5
(D) 7

203. The maximum or minimum value of $\frac{1}{4x^2+2x+1}$ on R is

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

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

(C) 3

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

204. The equation of the plane which is parallel to Y- axis and making intercepts of length 3 and 4 on X-axis and Z-axis respectively is

(A) $2x+2z=20$
(B) $4x+3z=12$
(C) $4x-3z=12$
(D) $46x+13z=15$

205. A plane passes through the point (1, −2, 3) and is parallel to the plane $2x-2y+z=0$. The distance of the point (−1, 2, 0) from the plane is

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

206. Nine digit numbers are formed using 1, 2, 3,…. ,9 without repetition. The probability that a number so formed is divisible by 4 is

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

(B) $\frac{3}{8}$

(C) $\frac{1}{9}$

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

207. The value of $\left(\frac{-1+i\sqrt{3}}{1-i}\right)^{30}$ is

(A) -2^{15}

(B) $2^{15}i$

(C) $-2^{15}i$

(D) 6^5

208. If $A=\{x\in R, |x|<2\}$ and $B=\{x\in R, |x-2|\geq 3\}$, then

(A) $A\cap B=(-2,-1)$

(B) $B-A=R-(-2,5)$

(C) $A\cup B=R-(-2,5)$

(D) $A-B=[-1,2]$

209. A point on the straight line, $3x + 5y = 15$ which is equidistant from the coordinate axes will lie only in

(A) 4^{th} quadrant

(B) 1^{st} quadrant

(C) 1^{st} and 2^{nd} quadrant

(D) 1^{st}, 2^{nd} and 4^{th} quadrant

210. The slope of the line touching both the parabolas $y^2=4x$ and $x^2=-32y$ is

(A) $\frac{1}{8}$

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

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

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

211. If $A=\begin{bmatrix}-4 & -1\\ 3 & 1\end{bmatrix}$, the determinant of the matrix $\left(A^{2016}-2A^{2015}-A^{2014}\right)$ is

(A) -175
(B) 2014
(C) 2016
(D) -25

212. At present, a firm is manufacturing 2000 items. It is estimated that the rate of change of production P w.r.t. additional number of workers x is given by $\frac{dP}{dx}=100-12\sqrt{x}$. If the firm employs 25 more workers, then the new level of production of items is

(A) 2500
(B) 3000
(C) 3500
(D) 4500

213. If $\cos x=\frac{1}{2}$ then $\cos 2x$ is

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

214. In how many ways 2 red balls, 3 blue balls and 4 black balls can be arranged if same colour balls are indistinguishable?

(A) 362880
(B) 1260
(C) 24
(D) 105680

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

(A) 0
(B) 1
(C) 2
(D) more than 2

216. What are the critical points of the function $f(x)=\dfrac{\left|x^2-1\right|}{x^2}$?

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

217. If the matrix A is both symmetric and skew-symmetric, then

(A) A is a diagonal matrix
(B) A is a zero matrix
(C) A is a square matrix
(D) None of the above

218. Area of the region bounded by the curve $y^2=4x$, y-axis and the line $y=1$ is

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

(B) $\dfrac{1}{4}$

(C) $\dfrac{1}{12}$

(D) $\dfrac{3}{4}$

219. If the lines $\dfrac{x-2}{k}=\dfrac{y-3}{3}=\dfrac{z+2}{-1}$ and $\dfrac{x-2}{8}=\dfrac{y-3}{6}=\dfrac{z+2}{-2}$ are parallel, then the value of k is

(A) -2
(B) $\dfrac{1}{2}$
(C) 2
(D) 4

220. The value of $\sin\left(\log i^i\right)+\cos\left(\log i^i\right)$ is

(A) -1
(B) 1
(C) 0
(D) $-i$

221. The smallest positive integer for which $\left(\frac{1-i}{1+i}\right)^{2n}=-1$ where $i=\sqrt{-1}$ is

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

222. The integral of partial fraction $\int\frac{dx}{(x+1)(x+2)}$ is

(A) $\log\left|\frac{x+1}{x+2}\right|+c$

(B) $\log\left|\frac{x+2}{x+1}\right|+c$

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

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

223. If a,b,c are in G.P., and $a^{\frac{1}{x}}=b^{\frac{1}{y}}=c^{\frac{1}{z}}$, then

(A) $y=x+z$

(B) $y^2=xz$

(C) $x+y+z=0$

(D) $2y=x+z$

224. If $A=\begin{bmatrix} a & 0 & 1 \\ 0 & a & 1 \\ 0 & 0 & a \end{bmatrix}$, then the value of $|Adj\ A|$ is

(A) a^3

(B) a^9

(C) a^6

(D) a^2

225. The degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^3 = \left(1+\frac{dy}{dx}\right)^{\frac{1}{2}}$ is

(A) 2

(B) 3

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

(D) 6

KEY (PROVISIONAL)															
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	B	**31**	A	**61**	B	**91**	C	**121**	C	**151**	A	**181**	A	**211**	D
2	A	**32**	D	**62**	C	**92**	D	**122**	A	**152**	D	**182**	B	**212**	C
3	A	**33**	D	**63**	A	**93**	B	**123**	B	**153**	D	**183**	B	**213**	B
4	B	**34**	B	**64**	B	**94**	C	**124**	D	**154**	D	**184**	A	**214**	B
5	C	**35**	D	**65**	A	**95**	C	**125**	C	**155**	C	**185**	A	**215**	B
6	D	**36**	C	**66**	A	**96**	D	**126**	A	**156**	C	**186**	D	**216**	C
7	D	**37**	D	**67**	B	**97**	B	**127**	C	**157**	B	**187**	D	**217**	B
8	D	**38**	A	**68**	B	**98**	D	**128**	B	**158**	D	**188**	D	**218**	C
9	C	**39**	C	**69**	B	**99**	D	**129**	C	**159**	A	**189**	D	**219**	D
10	D	**40**	B	**70**	A	**100**	C	**130**	D	**160**	C	**190**	B	**220**	A
11	A	**41**	A	**71**	A	**101**	C	**131**	A	**161**	C	**191**	B	**221**	A
12	B	**42**	A	**72**	B	**102**	B	**132**	C	**162**	D	**192**	C	**222**	A
13	A	**43**	C	**73**	A	**103**	B	**133**	D	**163**	B	**193**	B	**223**	D
14	D	**44**	D	**74**	C	**104**	B	**134**	D	**164**	D	**194**	B	**224**	C
15	A	**45**	C	**75**	D	**105**	B	**135**	B	**165**	C	**195**	C	**225**	D
16	A	**46**	D	**76**	B	**106**	B	**136**	D	**166**	B	**196**	B		
17	A	**47**	A	**77**	B	**107**	B	**137**	A	**167**	B	**197**	D		
18	B	**48**	D	**78**	D	**108**	C	**138**	B	**168**	C	**198**	B		
19	B	**49**	C	**79**	C	**109**	A	**139**	B	**169**	B	**199**	C		
20	B	**50**	D	**80**	B	**110**	D	**140**	D	**170**	B	**200**	D		
21	D	**51**	A	**81**	A	**111**	A	**141**	D	**171**	C	**201**	A		
22	A	**52**	A	**82**	D	**112**	D	**142**	B	**172**	B	**202**	D		
23	A	**53**	C	**83**	D	**113**	A	**143**	D	**173**	A	**203**	A		
24	D	**54**	D	**84**	B	**114**	B	**144**	A	**174**	D	**204**	B		
25	C	**55**	D	**85**	A	**115**	C	**145**	A	**175**	C	**205**	D		
26	D	**56**	B	**86**	D	**116**	C	**146**	C	**176**	A	**206**	D		
27	B	**57**	D	**87**	C	**117**	A	**147**	C	**177**	C	**207**	C		
28	B	**58**	A	**88**	B	**118**	C	**148**	C	**178**	B	**208**	B		
29	C	**59**	C	**89**	A	**119**	A	**149**	C	**179**	D	**209**	C		
30	B	**60**	D	**90**	B	**120**	D	**150**	B	**180**	A	**210**	C		