UPSEE - 2000

Full Paper

Section-1

Physics

1. Amplification factor of a triode is 20. Its plate resistance is 10 k Ω. Then its mutual conductance is :

   1) 2×10^{-3} mho
   2) 500 mho
   3) 2×10^4 mho
   4) 2×10^3 mho

2. An open pipe is suddenly closed at one end with the result that the frequency of third harmonic of the closed pipe is found to be higher by 100 Hz, then the fundamental frequency of open pipe is :

   1) 480 Hz
   2) 300 Hz
   3) 240 Hz
   4) 200 Hz

3. If the earth is treated as a sphere of radius R and mass M, its angular momentum about the axis of its rotation with period T, is :

   1) $\pi MR^3/T$
   2) $MR^2\pi/T$
   3) $2\pi MR^2/5T$
   4) $4\pi MR^2/5T$

4. When a horse pulls a wagon, the force that causes the horse to move forward is the force :

   1) the ground exerts on him
   2) he exerts on the ground
   3) the wagon exerts on him
   4) he exerts on the wagon

5. A body intially at 80°C cools to 64°C in 5 min and to 52°C in 10 min. The temperature of the body after 15 min, will be :

   1) 42.7°C
   2) 35°C

4) $40\,°C$

6. If a shell fired from a cannon, explodes in mid air, then :

    1) its total kinetic energy increases

    2) its total momentum increases

    3) its total momentum decreases

    4) none of the above

7. When U^{235} is bombarded with one neutron, the fission occurs and the products are three neutrons, $_{36}Kr^{94}$ and :

    1) $_{53}I^{142}$

    2) $_{56}Ba^{139}$

    3) $_{58}Ce^{139}$

    4) $_{54}Xe^{139}$

8. A particle moves in a circle of radius 25 cm at 2 rev/s. The acceleration of particle is :

    1) $2\pi^2 m/s^2$

    2) $4\pi^2 m/s^2$

    3) $8\pi^2 m/s^2$

    4) $\pi^2 m/s^2$

9. The photoelectric effect can be understood on the basis of :

    1) the principle of superposition

    2) the electromagnetic theory of light

    3) the special theory of relativity

    4) Planck's quantum theory

10. The self-induced emf is 4 H in the coil when current in it changes at the rate of 500 A/s, is :

    1) 8×10^{-4} V

    2) 8×10^{-3} V

    3) 200 V

    4) 500 V

11. The energy equivalent to a kilogram of matter is about :

    1) 10^{20} J

    2) 10^{17} J

    3) 10^{14} J

    4) 10^{11} J

12. The temperature at which the speed of sound in air becomes double of its value at 27°C, is :

   1) -123°C

   2) 927°C

   3) 327°C

   4) 54°C

13. The index of refraction of diamond is 2.0. The velocity of light in diamond is approximately :

   1) 1.5×10^{10} cm/s

   2) 2×10^{10} cm/s

   3) 3.0×10^{10} cm/s

   4) 6×10^{10} cm/s 14. A particle moves along x-axis in such a way that its co-ordinate (x) varies with time t

   according to the expression $x = (2 - 5t + 6t^2)$ m, the initial velocity of the particle is :

   1) 3 m/s

   2) 6 m/s

   3) -3 m/s

   4) -5 m/s

15. A force of 100 dyne acts on a mass of 5 g for 10 s. The velocity produced is :

   1) 2000 cm/s

   2) 200 cm/s

   3) 20 cm/s

   4) 2 cm/s

16. A current of 1 mA flows through a copper wire. How many electrons will pass through a given point in each second :

   1) 6.25×10^8

   2) 6.25×10^{31}

   3) 6.25×10^{15}

   4) 6.25×10^{19}

17. A hollow sphere of charge does not produce an electric field at any :

   1) outer point

   2) interior point

   3) beyond 2 m

   4) beyond 10 m

18. The line on the earth's surface joining the point where the field is horizontal, is called :

1) magnetic equator

2) magnetic line

3) magnetic axis

4) magnetic inertia

19. How many wavelength of the Kr^{89} are there in 1 m ?

1) 658189.63

2) 2348123.73

3) 1650763.73

4) 1553164.12

20. A bomb of 12 kg explodes into two pieces of masses 4 kg and 8 kg. The velocity of 8 kg mass is 6 m/s. The kinetic energy of the other mass will be :

1) 288 J

2) 24 J

3) 12 J

4) 48 J

21. Venus looks brighter than other stars, due to :

1) atomic fusion takes place on its surface

2) it is closer to the earth than other stars

3) its has higher density than other stars

4) it is heavier than other stars

22. The equation of wave travelling in a string can be written as
$y = 3 \cos \pi (100t - x)$, its wavelength is :

1) 5 cm

2) 2 cm

3) 100 cm

4) 3 cm

23. How many calories of heat will be produced approximately in a 210 W electric bulb in 5 min ?

1) 80000 cal

2) 63000 cal

3) 1050 cal

4) 15000 cal

24. An adiabatic process occurs at constant :

1) temperature and pressure

2) heat

3) temperature

4) pressure

25. Consider an iceberg floating in sea water. The density of sea water is 1.03 g/cc and that of ice is 0.92 g/cc. The fraction of total volume of iceberg above the level of sea water is nearby :

1) 1.8%   2) 3%   3) 8%   4) 11%

26. Two lenses of power +12 and -2 D are placed in contact. The combined focal length of the combination will be :

1) 8.33 cm

2) 16.6 cm

3) 12.5 cm

4) 10 cm

27. A stretched string of length l fixed at both ends can sustain stationary waves of wavelength λ, given by :

1) $\lambda = 2\,ln$

2) $\lambda = (2\,l/n)$

3) $\lambda = (l^2/2\,n)$

4) $\lambda = (n^2/2\,l)$

28. Eight drops of mercury of equal radius and possessing equal charge combine to form a big drop. The capacitance of bigger drop as compared to each small drop is :

1) 16 times

2) 8 times

3) 4 times

4) 2 times

29. Two waves having the intensities in the ratio of 9 : 1 produce interference. The ratio of maximum to the minimum intensity, is equal to :

1) 2 : 1

2) 4 : 1

3) 9 : 1

4) 10 : 8

30. Ultraviolet radiation of 6.2 eV falls on an aluminium of surface (work function 4.2 eV). The kinetic energy of the faster electron emitted is approximately :

1) 3.2×10^{-15} J

2) 3.2×10^{-17} J

3) 3.2×10^{-19} J

4) 3.2×10^{-21} J

31. Two heater wires of equal length are first connected in series and then in parallel. The ratio of heat produced in the two cases is :

1) 1 : 4
2) 4 : 1
3) 1 : 2
4) 2 : 1

32. A cell of emf E is connected across a resistance R. The potential difference between the terminals of the cell is found to be V volt. Then the internal resistance of the cell must be :

1) (E - V) R
2) ((E - V)/V) R
3) (2(E - V)/E) R
4) (2(E - V)/R) V

33. Two satellites A and B go round a planet in circular orbit having radii 4R and R, respectively. If the speed of satellite A is 3v, then speed of satellite B is :

1) 3 v/2
2) 4 v/2
3) 6 v
4) 12 v

34. A particle moves in x - y plane under the action of force $\vec{F}$ and $\vec{p}$ at a given time t is $p_x =$ cos t, $p_y = 2$ sin t. Then the angle θ between $\vec{F}$ and $\vec{p}$ at a given time t is :

1) θ = 30°
2) θ = 180°
3) θ = 0°
4) θ = 90°

35. A simple harmonic wave having an amplitude A and time period T is represented by the equation $y = 5$ sin π $(t + 4)$m. Then the value of A in metre and T in second are :

1) A = 10, T = 2
2) A = 5, T = 1
3) A = 10, T = 1
4) A = 5, T = 2

36. In a room where the temperature is 30°C a body cools from 61°C to 59°C in 4 min. The time (in minutes) taken by the body to cool from 51°C to 49°C will be :

1) 8   2) 5   3) 6   4) 4

37. A tuning fork vibrating with a sonometer having 20 cm wire produces 5 beats/s. The beat frequency does not change, if the length of the wire is changed to 21 cm, the frequency of the tuning fork must be :

1) 215 Hz

2) 205 Hz

3) 210 Hz

4) 200 Hz

38. The potential energy of a certain spring when stretched through a distance s is 10 J. The amount of work done in joule that must be done on this spring to stretch, it through an additional distance s, will be :

1) 20   2) 10   3) 30   4) 40

39. The reading of a spring balance when a block is suspended from it in air is 60 N. This reading is changed to 40 N when the block is submerged in water. The specific gravity of the block must be therefore :

1) 3/2   2) 6   3) 2   4) 3

40. A double convex thin lens made of glass (refractive index $\mu = 1.5$) has both radii of curvatures of magnitude 20 cm. Incident light rays parallel to the axis of the lens, will converge at a distance L such that :

1) L = (20/3)

2) L = 40

3) L = 20 cm

4) L = 10 cm

41. An astronomical telescope has a magnifying power 10, the focal length of the eye-piece is 20 cm. The focal length of the objective is :

1) (1/200) cm

2) (1/2) cm

3) 200 cm

4) 2 cm

42. A particle A has a charge q and particle B has charge $+4q$ with each of them having the mass m. When allowed to fall from rest through same potential difference, the ratio of their speeds $v_A : v_B$ will be :

1) 4 : 1

2) 1 : 4

3) 1 : 2

4) 2 : 1

43. When a sound wave of frequency 300 Hz passes through a medium, the maximum displacement of a particle of the medium is 0.1 cm. The maximum velocity of the particle is equal to :

1) 60 cm/s

2) 30 cm/s

4) 30π cm/s

44. When the current in coil changes form 8 A to 2 A in 3×10^{-2} s, the emf induced in the coil is 2 V. The self-inductance of the coil is :

1) 10 mH
2) 20 mH
3) 5 mH
4) 1 mH

45. A uniform metal rod of 2 mm^2 cross-section is heated from 0°C to 20°C. The coefficient of the linear expansion of the 20 m rod is 12×10^{-6}/°C. If Young's modulus of elasticity is 10^{11} N/m^2, the energy stored per unit volume of the rod is :

1) 1440 J/m^3
2) 15760 J/m^3
3) 1500 J/m^3
4) 2880 J/m^3

46. In an electroplating experiment m gram of silver is deposited when 4A of current flows per 2 min. The amount of silver deposited by 6A of a current flowing for 40 s will be :

1) 2m gram
2) (m/4) gram
3) (m/2) gram
4) 4m gram

47. The temperature of a body on Kelvin scale is found to x K. When it is measured by Fahrenheit thermometer, it is found to be $x°$ F, then the value of x is :

1) 40
2) 313
3) 574.25
4) 301.25

48. A magnetic needle lying parallel to a magnetic field requires W units of work to turn it through 60°. The torque needed to maintain the needle in the position will be :

1) 2 W
2) $\sqrt{3}$ W
3) W
4) $\sqrt{3 W}$

49. A double convex thin lens made of refractive index 1.6 has radii of curvature 15 cm each. The focal length of this lens when immersed in a fluid of refractive index 1.63, is :

1) 25 cm
2) 125 cm

3) 250 cm

4) -407.5 cm

50. The wavelength of most energetic X-ray emitted when a metal target is bombarded by 40 keV electron, is approximately :

1) 0.31 Å

2) 4 Å

3) 10 Å

4) 300 Å

51. Current i is carried in a wire of length L. If the wire is formed into a circular coil, the maximum magnitude of torque in a given field B, will be :

1) $LiB^2/2$

2) $Li^2B/2$

3) $L^2iB/4\pi$

4) $L^2iB/2\pi$

52. A particle of mass m is projected with a velocity v making an angle of 45º with the horizontal. The magnitude of the angular momentum of the particle about the point of projection when the particle is at its maximum height, is :

1) $m\surd(2\ gh^3)$

2) $mv^3/\surd(2\ g)$

3) $mv^3/4\surd(2\ g)$

4) zero

53. Voltmeters V_1 and V_2 are connected in series across a DC line. V_1 reads 80 V and has a resistance of 200 Ω/V and V_2 has a total resistance of 32 kΩ. The line voltage is :

1) 240 V

2) 220 V

3) 160 V

4) 120 V

54. A constant volume gas thermometer shows pressure reading of 50 cm and 90 cm of mercury at 0°C and 100°C respectively. When the pressure reading is 60 cm of mercury, the temperature is :

1) 12.5ºC

2) 15ºC

3) 25ºC

4) 40ºC

55. The counting rate observed from a radioactive source at t = 0 s was 1600 count/s and at t = 8 s, it was 100 count/s. The counting ratio observed as counts per second at r = 6 s will

be :

1) 150   2) 200   3) 300   4) 400

56. An atomic power nuclear reactor can deliver 300 MW. The energy released due to fission of each of uranium atom U^{238} is 170 MeV. The number of uranium atoms fissioned per hour, will be :

1) 30×10^{25}

2) 4×10^{22}

3) 10×10^{20}

4) 5×10^{15}

57. A wire of density 9×10^3 kg/m^3 is stretched between two clamps 1 m apart

and is

subjected to an extension of 4.9×10^{-4} m. The lowest frequency of transverse vibration in the wire is :

$(Y = 9 \times 10^{10}$ N/m$^2)$

1) 40 Hz

2) 35 Hz

3) 30 Hz

4) 25 Hz

58. A body executing simple harmonic motion has a maximum acceleration equal to 24 m/s^2 and maximum velocity 16 m/s, the amplitude of the simple harmonic motion is :

1) (1024/9) m

2) (32/3) m

3) (64/9) m

4) (3/32) m

59. An engineer of a train which is moving at a speed v_1. sees a fright train at distance d ahead of him on the same track moving in the same direction with a slower speed v_2. He puts on the brakes and gives his train a constant deceleration, then there will be no collision, if :

1) $d < \dfrac{(v_1 - v_2)^2}{2a}$

2) $d = \dfrac{v_2 - v_1}{2a}$

3) $d > \dfrac{(v_1 - v_2)^2}{2a}$

4)

$_P/C_V)$ for a gaseous mixture consisting of $n_1 = 3.0$ moles of carbon dioxide and $n_2 = 2$ moles of oxygen will be :

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($\gamma_2 = 0.4$, $\gamma_1 = 1.3$)

   1) 1.37   2) 1.34   3) 1.55   4) 1.63

61. A force $\vec{F} = (5\,\hat{i} + 3\,\hat{j})$ N is applied over a particle which displaces, it from its origin to the point $\vec{r} = (2\,\hat{i} - \hat{j})$ m. Then the work done on the particle is :

   1) 13 J

   2) 10 J

   3) 7 J

   4) -7 J

62. Two satellites S_1 and S_2 are orbiting around a planet of radius R, S_1 moves just above the surface of planet while S_2 is in orbit of radius 4R. The value of the ratio of orbital speed $(v_o)_1$ and orbital speed $(v_o)_2$ is :

   1) 4 : 1

   2) 2 : 1

   3) (1/2) : 1

   4) (1/4) : 1

63. Which is true for a cyclotron ?

   1) The final energy achieved is proportional to $(radius)^4$ of the dees

   2) The orbiting frequency is one time the AC voltage frequency

   3) The final energy achieved is proportional to $(radius)^2$ of the dees

   4) The orbiting frequency is porportional to $(kinetic\ energy)^{1/2}$

64. The half-life of $_{19}K^{42}$ is 12.5 h. If the original sample contains 256 g, the amount of $_{19}K^{42}$ after 100 h, will be :

   1) 5.12 g

   2) 2.56 g

   3) 2.00 g

   4) 1.00 g

65. The radius of first orbit of hydrogen atom is 0.053 nm. The radius of third orbit is :

   1) 0.477 nm

   2) 0.212 nm

   3) 0.159 nm

   4) 0.106 nm

66. A vessel contains 110 g of water. The heat capacity of the vessel is equal to 10 g of water. The initial temperature of water in vessel is 10°C. If 220 g of hot water at 70°C is poured in the vessel, the final temperature neglecting radiation loss, will be :

   1) 70°C

2) 80°C

3) 60°C

4) 50°C

67. A gas with specific heat ratio γ = (5/3) is compressed suddenly to (1/8) of its initial volume. If the initial pressure is P, then the final pressure is :

1) 8 P

2) 16 P

3) 24 P

4) 32 P

68. An electric tea kettle has two heating coils. When first coil of resistance R_1 is switched on, the kettle begins to boil tea in 6 min. When second coil of resistance R_2 is switched on, the boiling begins in 8 min. The value of R_1/R_2 is :

1) 7/3   2) 3/7   3) 3/4   4) 4/3

69. When a beam of light (
λ = 6000Å) travelling in air enters a glass medium
(μ = 1.5), the
wavelength of light in glass, would be :

1) 2000 Å

2) 3000 Å

3) 4000 Å

4) 5000 Å

70. An object is placed at a distance of 20 cm from a convex lens of focal length 10 cm. The image is formed on the other side of the lens at a distance of :

1) 10 cm

2) 40 cm

3) 25 cm

4) 20 cm

71. The condition for an achromatic doublet, is :
(here, f_1 and f_2 are the focal lengths of individual lenses)

1) $f_1 - f_2 = \dfrac{\omega_1 \omega_2}{2}$

2) $\omega_1 f_1 + \omega_2 f_2 = 0$

3) $\dfrac{\omega_1}{f_1} + \dfrac{\omega_2}{f_2} = 0$

4) $\dfrac{f_1}{f_2} + \dfrac{\omega_1}{\omega_2} = 0$

72. In a straight line motion, the distance covered is proportional to the square root of the time

1) $\sqrt{v}$

2) v

3) v^2

4) v^3

73. A sounding body gives 5 beats with source of frequency 100 Hz as well as 110 Hz, then the frequency is :

1) 100 Hz

2) 105 Hz

3) 110 Hz

4) 115 Hz

74. The horizontal component of the earth's magnetic field is 3.6×10^{-5} T. Where the dip angle is $60°$, the magnitude of the earth's magnetic field is :

1) 2.8×10^{-4} T

2) 2.1×10^{-4} T

3) 7.2×10^{-5} T

4) 3.6×10^{-5} T 75. A wavelength 0.60 cm is produced in air and it travels at a speed of

300 m/s. It will be an/a

:

1) ultrasonic wave

2) audible wave

3) infrasonic

4) none of these

76. A magnet of magnetic moment M is freely suspended in a uniform horizontal magnetic field intensity H. If the magnet is deflected at an angle θ from the direction of H. The work done is :

1) MH sin θ

2) nH

3) MH cos θ

4) MH (1 - cos θ)

77. A 3 m conductor is moving at right angles in a magnetic field intensity of 10^{-5} T, at the velocity 10^2 m/s. The potential difference across conductor is :

1) 3×10^{-3} V

2) 0.03 V

3) 0.3 V

4) 3 V

78. The period of oscillation of freely suspended bar magnet in earth's horizontal field H is 4 s.

When another magnet is brought near it, the period of oscillation is reduced to 2 s. The magnetic field of second bar magnet is :

1) 4 H

2) 3 H

3) 2 H

4) $\sqrt{3}$ H

79. Three point charges Q_1, Q_2, Q_3 in the order are placed equally spaced along a straight line. Q_2 and Q_3 are equal in magnitude but opposite in sign. If the net force on Q_3 is zero, the value of Q_1 is :

1) Q_1 - 4 (Q_3)

2) Q = 2 (Q_3)

3) Q1 = $\sqrt{2}$ (Q_3)

4) Q_1 = |Q_3|

80. The electric field intensity just sufficient to balance the earth's gravitational attraction on an electron will be :

(given mass and charge of an electron respectively are 9.1×10^{-31} kg and 1.6×10^{-19} C)

1) -5.6×10^{-11} N/C

2) -4.8×10^{-15} N/C

3) -1.6×10^{-19} N/C

4) -3.2×10^{-19} N/C 81. Two resistors R and 2 R are connected in series in an electric

circuit, the thermal energy produced in R and 2 R are in the ratio :

1) 4 : 1

2) 1 : 4

3) 2 : 1

4) 1 : 2

82. The shortest wavelength of X-rays emitted from an X-ray tube operated at 2×10^6 V, is the order of :

1) 10^{-5} Å

2) 10^{-2} Å

3) 0.15 Å

4) 1 Å

83. The ionic emission of electron is due to :

1) photoelectric effect

2) high temperature

3) electromagnetic induction

4) electrostatic field

84. A voltmeter of internal resistance 25×10^6 Ω, connected across resistance R, read 100 V. An ammeter connected in series with this arrangement reads 5 A the value of R, is :

1) 40 Ω

2) 30 Ω

3) 20 Ω

4) 10 Ω

85. First ionization energy of the caesium is 6.24×10^{-19} J/atom. The minimum frequency of light that is required to ionise caesium atom is :

($h = 63 \times 10^{-34}$ J-s)

1) 9.0×10^{14} Hz

2) 4.13×10^{14} Hz

3) 9.42×10^{11} Hz

4) 1.02×10^{12} Hz

86. The photon of energy 12.4 eV is completely absorbed by a hydrogen atom, initially in the ground state, so that it is excited. The quantum number of the excited state is :

1) $n = \infty$

2) $n = 3$

3) $n = 4$

4) $n = 1$

87. The dimensions of torque are :

1) $[MLT^{-2}]$

2) $[ML^2T^2]$

3) $[ML^2T^{-2}]$

4) $[M^2L^2T^{-2}]$

88. Sodium light ($\lambda = 6 \times 10^{-7}$ m) is used to produce interference pattern. The observed fringe width is 0.12 mm. The angle between two interfering wave trains is :

1) 1×10^{-3} rad

2) 1×10^{-2} rad

3) 5×10^{-3} rad

4) 5×10^{-2} rad

89. Light propagates with speed of 2.2×10^8 m/s and 2.4×10^8 m/s in the media P and Q respectively. The critical angle of incidence for light undergoing reflection from P and Q is :

1) $\sin^{-1}\left(\dfrac{1}{11}\right)$

2) $\sin^{-1}\left(\dfrac{11}{12}\right)$

3) $\sin^{-1}\left(\dfrac{10}{11}\right)$

4) $\sin^{-1}\left(\dfrac{5}{11}\right)$

90. Two capacitors C_1 = 2µF and C_2 = 6µF are connected in series, then connected in parallel to a third capacitor C_3 = 4µF. This arrangement is then connected to a battery of emf 2V as shown in figure. How much energy is lost by the battery in charging the capacitor ?
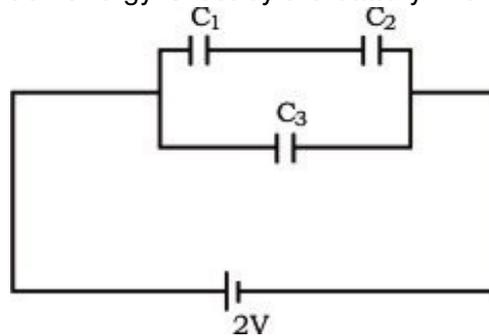
1) (16/3) × 10^{-6} J

2) (32/3) × 10^{-6} J

3) 11 × 10^{-6} J

4) 22 × 10^{-6} J

91. A proton and an α-particle are separately projected in a region where a uniform magnetic field exists. Their initial velocities are perpendicular to the direction of magnetic field. If both the particles move around magnetic field in circles of equal radii, the ratio of momentum of α-particle is :

1) 4/1   2) 2   3) 1/2   4) 1

92. A resistance of 20 Ω is connected to a source of an alternating potential V = 200 cos (100 πt). The time taken by the current to change from its peak value to rms value is :

1) 2.5 × 10^{-3} s

2) 25 × 10^{-3} s

3) 0.25 s

4) 0.020 s

93. The current flowing in a step-down transformer 220 V to 22 V, having impedance 220 Ω is :

1) 0.1 mA

2) 1 mA

3) 0.1 A

4) 1 A

94. The expansion of galaxies is supported by :

    1) black hole

    2) red shift

    3) white dwarf

    4) neutron star

95. In the given circuit with steady current, the potential drop across the capacitor must be :
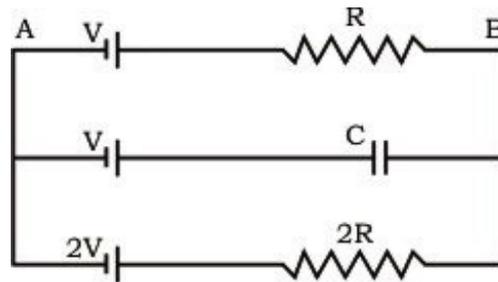
    1) 2V/3   2) V/3   3) V/2   4) V

96. A charge is placed at the centre of a cube, the flux emitted through its one face is :

    1) $q/12\,\varepsilon_0$

    2) $q/6\,\varepsilon_0$

    3) $q/2\,\varepsilon_0$

    4) q/ε_0

97. In the case of forward biasing, there is an increase in :

    1) voltage

    2) current

    3) time

    4) resistance

98. The spectral series of hydrogen which lies entirely in the ultraviolet part is :

    1) Pfund

    2) Balmer

    3) Lyman

    4) Paschan

99. The kinetic energy of the photoelectrons emitted when light of wavelength 4000 Å is incident on a metal of work function 2 eV, is approximately :

    1) 0.5 eV

    2) 1.1 eV

    3) 2.5 eV

4) 3 eV

100. On a rainy day, if there is an oil drop on tar road, coloured rings are seen around this drop. This is due to :

1) total internal reflection of light

2) polarisation

3) diffraction pattern

4) interference pattern produced due to the oil film

Section-2

Chemistry

101. One would expect proton to have very large :

1) ionization potential

2) radius

3) charge

4) hydration energy

102. The mass of 1 mol of electrons is :

1) 9.1×10^{-28} g

2) 1.008 mg

3) 0.55 mg

4) 9.1×10^{-27} g

103. The C^{14} to C^{12} ratio in a wooden article is 13% that of the fresh wood. Calculate the age of the wooden article. Given that the half-life of C^{14} is 5770 yr :

1) 16989 yr

2) 16858 yr

3) 15675 yr

4) 17700 yr

104. The number of neutrons in the parent nucleus which gives N^{14} on β emission is :

1) 7   2) 14   3) 6   4) 8

105. A reversible chemical reaction is having two reactants, in equilibrium. If the concentration of the reactants are doubled then the equilibrium constant will :

1) be doubled

2) become one fourth

3) be halved

4) remain the same

106. Amongst LiCl, RbCl, $BeCl_2$ and $MgCl_2$, the compounds with the greatest and least ionic

character respectively are :

1) LiCl and RbCl

2) $MgCl_2$ and $BeCl_2$

3) RbCl and $BeCl_2$

4) RbCl and $MgCl_2$

107. In which of the following compounds carbon atom undergoes hybridization of more than one type (sp, sp^2 and sp^3) ?

   i. $CH_3 - CH_2 - CH_2 - CH_3$
   ii. $CH_3 - CH = CH - CH_3$
   iii. $CH_2 = CH - CH_2 - CH_3$
   iv. $H - C = C - H$

1) (iii) and (iv)

2) (i) and (iv)

3) (ii) and (iii)

4) only (i)

108. This low density of ice compared to water is due to :

1) induced dipole-induced dipole interactions

2) dipole-induced dipole interactions

3) hydrogen bonding interactions

4) dipole-dipole interactions

109. The bond order in N_2^+ is :

1) 1.5   2) 3.0   3) 2.5   4) 2.0

110. The oxidation number of N in NH_3 is :

1) +3   2) +5   3) -3   4) 0

111. Which one of the following reactions involves oxidation-reduction ?

1) $H_2 + Br_2 \rightarrow 2HBr$

2) $NaBr + HCl \rightarrow NaCl + HBr$

3) $HBr + AgNO_3 \rightarrow AgBr + HNO_3$

4) $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

112. For the electrochemical cell, M $|M^+|$ $|X^-|$ X, $E°(M^+ | M)$ = 0.44 V, E° (X | X^-) = 0.33 V From this data, one can deduce that :

1) $E°_{cell}$ = -0.77 V

2) $M^+ + X^- \rightarrow M + X$ is the spontaneous reaction

3) M + X → M^+ + X^- is the spontaneous reaction

4) $E°_{cell}$ = 0.77 V

113. What is the molarity of 0.2 N Na_2CO_3 solution ?

1) 0.1 M

2) 0 M

3) 0.4 M

4) 0.2 M

114. For the reversible reaction

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ at 500°C, the value of K_p is 1.44 × 10^{-5} when partial pressure is measured in atmospheres. The corresponding value of K_c with concentration in mol/L is :

1) 1.44 × 10^{-5} / $(0.082 × 773)^{-3}$

2) 1.44 × 10^{-5} / $(0.082 × 500)^{-2}$

3) 1.44 × 10^{-5} / $(8.314 × 773)^{2}$

4) 1.44 × 10^{-5} / $(0.082 × 773)^{-2}$

115. One litre oxygen gas at STP will weigh :

1) 1.43 g

2) 2.24 g

3) 11.2 g

4) 22.4 g

116. Rate of a reaction :

1) decreases with increase in temperature

2) increases with increase in temperature

3) may increase or decrease with increase in temperature

4) does not depend on temperature

117. The rate constant for the reaction $2N_2O_5 → 4NO_2 + O_2$ is 3.0 × 10^{-5} s^{-1}. If the rate is 2.4 × 10^{-5} mol $L^{-1}s^{-1}$, then the concentration of N_2O_5 (in mol L^{-1}) is :

1) 0.04   2) 0.8   3) 0.07   4) 0.4

118. A catalyst is a substance which :

1) is always in the same phase as in the reactions

2) alters the equilibrium in a reaction

3) does not participate in the reaction but alters the rate of reaction

4) participates in the reaction and provide an easier pathway for the same

119. The relationship between the values of osmotic pressure of 0.1 M solutions of KNO_3 (P_1)

The relationship between the values of osmotic pressure of 0.1 M solutions of KNO_3 (P_1) and $CH_3COOH(P_2)$ is :

1) $\dfrac{P_1}{P_1 + P_2} = \dfrac{P_2}{P_1 + P_2}$

2) $P_1 > P_2$

3) $P_2 > P_1$

4) $P_1 = P_2$

120. An aqueous solution of glucose is 10% in strength. The volume in which 1 g-mol of it is dissolved, will be :

1) 9 L

2) 1.8 L

3) 8 L

4) 0.9 L

121. The strongest Bronsted base is :

1) ClO_3^-

2) ClO_2^-

3) ClO_4^-

4) ClO^-

122. A solution contains 10 mL 0.1 NaOH and 10 mL 0.05 N H_2SO_4, pH of this solution is :

1) less than 7

2) 7

3) zero

4) greater than 7

123. A saturated solution of Ag_2SO_4 is 2.5×10^{-2} M; The value of its solubility product is :

1) 62.5×10^{-6}

2) 6.25×10^{-4}

3) 15.625×10^{-6}

4) 3.125×10^{-6}

124. What is the freezing point of a solution containing 8.1 g HBr in 100 g water assuming the acid to be 90% ionised ? (k_f for water = 1.86 K mol^{-1}) :

1) 0.85°C

2) -3.53°C

3) 0°C

4) -0.35°C

125. The pH value for 1/1000 N-KOH solution is :

1) 3

2) 10^{-11}

3) 2

4) 11

126. The pH of 0.1 M solution of the following salts increases in the order :

1) $NaCl < NH_4Cl < NaCN < HCl$

2) $HCl < NH_4Cl < NaCl < NaCN$

3) $NaCN < NH_4Cl < NaCl < HCl$

4) $HCl < NaCl < NaCN < NH_4Cl$

127. Energy required to dissociate 4g of gaseous hydrogen into free gaseous atoms is 208 kcal at 25°C. The bond energy of H—H will be :

1) 104 kcal

2) 52 kcal

3) 10.4 kcal

4) 1040 kcal

128. Which one of the following will have highest coagulating power for As_2S_3 colloid ?

1) Al^{3+}

2) PO_4^{3-}

3) SO_4^{2-}

4) Na^+

129. The density of gold is 19 g/cm^3. If 1.9×10^{-4} g of gold is dispersed in one litre of water to give a sol having spherical gold particles of radius 10 nm, then the number of gold particles per mm^3 of the sol will be :

1) 1.9×10^{12}

2) 6.3×10^{14}

3) 6.3×10^{10}

4) 2.4×10^6

130. Most acidic oxide is :

1) Na_2O

2) ZnO

3) MgO

4) P_2O_5

131. Which element forms maximum compound in chemistry ?

1) O   2) H   3) Si   4) C

132. The correct order of acidic strength :

1) $Cl_2O_7 > SO_2 > P_4O_{10}$

2) $K_2 > CaO > MgO$

3) $CO_2 > N_2O_5 > SO_3$

4) $Na_2O > MgO > Al_2O_3$

133. The volume strength of 1.5 N H_2O_2 solution is :

                                           3) 4.8   4) 3.0

134. Black jack is an ore of :

1) Cr   2) Sn   3) Zn   4) Ni

135. Thermite is a mixture of :

1) $Cr_2O_3 + Al_2O_3$

2) $Fe_2O_3 + Al$

3) $Fe_2O_3 + Al_2O_3$

4) $Al_2O_3 + 2Cr$

136. Flux is used to :

1) remove silica

2) remove silica and undesirable metal oxide

3) remove all impurities from ores

4) reduce metal oxide

137. Which group is called buffer group of the periodic table ?

1) I   2) VII   3) VIII   4) Zero

138. Brass is an alloy of :

1) Zn and Sn

2) Zn and Cu

3) Cu, Zn and Sn

4) Cu and Sn

139. Microcosmic salt is :

1) $Na(NH_4) \cdot H_2O$

2) $Na(NH_3) \cdot HPO_4 \cdot 4H_2O$

3) $Na(NH_4) \cdot HPO_4 \cdot 4H_2O$

4) $K(NH_3) \cdot HPO_4 \cdot 4H_2O$

140. The decomposition temperature is maximum for :

1) $SrCO_3$

2) $CaCO_3$

3) $MgCO_3$

4) $BaCO_3$

141. Inorganic benzene is :

1) $B_3H_3N_3$

2) BH_3NH_3

3) $B_3H_6N_3$

4) $H_3B_3N_6$

142. Green house effect is caused by :

1) NO_2

2) CO

3) NO

4) CO_2

143. The most abundant metal in the earth crust is :

1) Al   2) Ca   3) Fe   4) Na

144. Bond energies in NO, NO^+ and NO^- are such as :

1) $NO^- > NO > NO^+$

2) $NO > NO^- > NO^+$

3) $NO^+ > NO > NO^-$

4) $NO^+ > NO^- > NO$

145. Iodine is formed when KI reacts with a solution of :

1) $CuSO_4$

2) $(NH_4)_2SO_4$

3) $ZnSO_4$

4) $FeSO_4$

146. Rust is :

1) $FeO + Fe(OH)_2$

2) Fe_2O_3

3) $Fe_2O_3 + Fe(OH)_2$

4) Fe_2O_3 and $Fe(OH)_3$

147. The electronic configuration of element with atomic number 24 is :

1) $1s^2, 2s^22p^6, 3s^23p^63d^4, 4s^2$

2) $1s^2, 2s^22p^6, 3s^23p^63d^{10}$

3) $1s^2, 2s^22p^6, 3s^23p^63d^6$

4) $1s^2, 2s^22p^6, 3s^23p^63d^5, 4s^1$

148. Ziegler-Natta catalyst is :

1) $(Ph_3P)_3 RhCl$

2) $K[PtCl_3 (C_2H_4)]$

3) $[Al_2(C_2H_6)_6 + TiCl_4]$

4) $[Fe(C_2H_5)_2]$

149. For gold plating, the electrolyte used is :

1) $AuCl_3$

2) $HAuCl_4$

3) $K[Au(CN)_2]$

4) none of the above

150. $[Sc(H_2O)_6]^{3+}$ ion is :

1) colourless and diamagnetic

2) coloured and octahedral

3) colourless and paramagnetic

4) coloured and paramagnetic

151. An organic compound contains 49.3% carbon, 6.84% hydrogen and its vapour density is 73 Molecular formula of the compound is :

1) $C_3H_5O_2$

2) $C_4H_{10}O_2$

3) $C_6H_{10}O_4$

4) $C_3H_{10}O_2$

152. How many isomers can be obtained from C_6H_{14} ?

1) 7   2) 5   3) 3   4) 6

153. The IUPAC name of
$CH_3 - C \equiv C - CH(CH_3)_2$ is :

1) 4-methyl-2-pentyne

2) 4, 4-dimethyl-2-butyne

3) methyl isopropyl acetylene

4) 2-methyl-4-pentyne

154. The total number of acyclic isomers including the stereoisomers with the molecular formula C_4H_7Cl :

1) 11   2) 12   3) 9   4) 10

155. The IUPAC name of

$$CH_3$$
$$|$$
$$CH_3 - CH - CH_2 - C - CH_3 \text{ is :}$$
$$\quad\quad | \quad\quad\quad\quad |$$
$$\quad\quad OH \quad\quad\quad OH$$
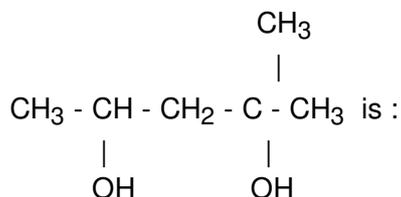
1) 1, 1-dimethyl-1, 3-butanediol

2) 2-methyl-2, 4-pentanediol

3) 4-methyl-2, 4-pentanediol

4) 1, 3, 3-trimethyl-1, 3-propane diol

156. The number of possible enantiomeric pairs that can be produced during mono-chlorination of 2-methylbutane is :

1) 3   2) 4   3) 1   4) 2

157. Most stable carbonium ion is :

1) $\overset{+}{C}_2H_5$

2) $(CH_3)_3\overset{+}{C}$

3) $(C_6H_5)_3\overset{+}{C}$

4) $C_6H_5\overset{+}{C}H_2$

158. Which one of the following possess highest m.p. ?

1) Chlorobenzene

2) *o*-dichlorobenzene

3) *m*-dichlorobenzene

4) *p*-dichlorobenzene

159. Dehydration of 2-butanol yield :

1) 1-butene

2) 2-butene

3) 2-butyne

4) both (1) and (2)

160. Ethylene di bromide on heating with metallic sodium in ether solution yields :

1) ethene
2) ethyene
3) 2-butene
4) 1-butene

161. Which of the following is the best to change glycerol to acrolein ?
    1) P_2O_5
    2) Conc. H_2SO_4
    3) Anhydrous $CaCl_2$
    4) $KHSO_4$

162. Which one of the following will most readily be dehydrated in acidic conditions ?
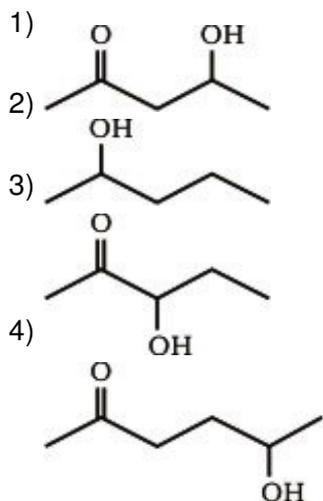
163. Cannizaro reaction does not occurs with :
    1) $CH_3 - CH_2OH$
    2) C_6H_5CHO
    3) CH_3CHO
    4) $CH_3 - CO - CH_3$

164. Which of the following gases does not form a ketone on treatment with dil. H_2SO_4 and 1% $HgSO_4$?
    1) C_2H_6
    2) C_2H_2
    3) C_3H_4
    4) All of these

165. Urea is :
    1) diacidic base
    2) neutral

3) monoacidic base

4) amphoteric

166. The acids which do not contain -COOH group is :

1) ethanoic acid

2) picric acid

3) lactic acid

4) palmitic acid

167. Urotropine is obtained by the reaction of ammonia with :

1) CH_3Cl

2) HCHO

3) NH_2CONH_2

4) CH_3CHO

168. Strongest acid among the following is :

1) CF_3COOH

2) CBr_3COOH

3) CH_3COOH

4) CCl_3COOH

169. Which amino acid is achiral ?

1) Alanine

2) Histidine

3) Proline

4) None of these

170. Hydrolysis of urea yields :

1) NH_3

2) H_2O

3) CO_2

4) all of these

171. Saccharin is a/an :

1) aliphatic hydrocarbon

2) polynuclear compound

3) sweetening agent

4) sugar

172. Product of the reaction between $C_6H_5NH_2$, $CHCl_3$ and KOH are :

1) $C_6H_5CN + KCl$

2) $C_6H_5NC + KCl$

3) $C_6H_5Cl + NH_4Cl + KCl + H_2O$

4) $C_6H_5OH + NH_4OH + KCl$

173. Peptides on hydrolysis give :

1) ammonia

2) amino acid

3) alcohol

4) urea

174. Gasoline is a mixture of :

1) $C_6 — C_{11}$ alkanes

2) $C_3 — C_5$ alkanes

3) $C_7 — C_9$ alkanes

4) $C_{15} — C_{20}$ alkanes

175. In mixture of *iso*-octane and *n*-heptane the percentage of *n*-heptane is 11, the octane number of this fuel is :

1) 89   2) 10   3) 100   4) 80

176. Aniline is separated from a mixture by :

1) fractional crystallisation

2) fractional distillation

3) vacuum distillation

4) steam distillation

177. Calcium acetate on heating gives :

1) acetic anhydride

2) acetone

3) acetaldehyde

4) ethyl alcohol

178. The ratio of σ to π bonds in benzene is :

1) 2   2) 3   3) 4   4) 8

179. When chloroform is left open in light and air, it forms :

1) phosgene

2) formic acid

3) phosphene

4) carbon tetra chloride

180. The reaction of Lucas reagent is the fastest with :

1) $(CH_3)_2CHOH$

2) $CH_3(CH_2)OH$

3) CH_3CH_2OH

4) $(CH3)_3COH$

181. In an alkaline medium acetaldehyde undergoes :

1) benzoin condensation

2) aldol condensation

3) polymerisation

4) cannizaro reaction

182. Complete combustion of CH_4 gives :

1) $CO_2 + H_2O$

2) $CO_2 + H_2$

3) $COCl_2$

4) $CO + CO_2 + H_2O$

183. $CH_2 = CH_2$ is :

1) polymer

2) isomer

3) monomer

4) epimer

184. The most reactive hydrocarbon is :

1) ethane

2) methane

3) acetylene

4) ethylene

185. Metal present in vitamin B_{12} is :

1) Co   2) Mg   3) Fe   4) Ca

186. Which one of the following is coinage metal ?

1) Zn   2) Cu   3) Sn   4) Pb

187. Producer gas is the mixture of :

1) $CO + N_2$

2) $CO + H_2$

3) CO + water vapour

4) N_2 + CH_4

188. Plaster of Paris is :

1) $CaSO_4 \cdot 2H_2O$

2) $CaSO_4 \cdot H_2O$

3) $CaSO_4 \cdot (1/2) H_2O$

4) $CaSO_4 \cdot 4H_2O$

189. Setting of cement is an :

1) exothermic reaction

2) endothermic reaction

3) neither endothermic nor exothermic

4) example of neutralisation reaction

190. How many moles of helium gas occupy 22.4 L at 0°C and 1 atm pressure ?

1) 0.11   2) 1.11   3) 0.90   4) 1.0

191. Which has highest weight ?

1) 1 m^3 of water

2) A normal adult man

3) 10 L of Hg

4) All have same weight

192. Cone. HNO_3 reacts with I_2 to form :

1) HI

2) HOI

3) HIO_2

4) HIO_3

193. For which one of the following reactions $K_p = K_c$?

1) $PCl_5 \quad PCl_3 + Cl_2$

2) $N_2 + O_2 \rightleftharpoons 2NO$

3) $N_2 + 3H_2 \rightleftharpoons 2NH_3$

4) $2SO_3 \quad 2SO_2 + O_2$

194. The orbital angular momentum of an electron in 2 s orbital is :

1) zero

2) $\sqrt{2} (h/2\pi)$

3) $(h/2\pi)$

4) + (1/2) (h/2π)

195. The order of a reaction with rate equal to $kC_A^{3/2} C_B^{-1/2}$ is :

    4) 2

196. Coal gas is a mixture of :

    1) H_2O and CO

    2) H_2, CO and CH_4

    3) H_2 and CO

    4) CH_4 and CO

197. Nitration of toluene using fuming sulphuric and nitric acid gives :

    1) p-nitrotoluene

    2) o-nitrotoluene

    3) m-nitrotoluene

    4) tri-nitrotoluene

198. Volume of 0.6 M NaOH required to neutralise 30 cm^3 of 0.4 M HCl is :

    1) 30 cm^3

    2) 45 cm^3

    3) 20 cm^3

    4) 50 cm^3

199. The heat of neutralisation is highest for the reaction between :

    1) NH_4OH - CH_3COOH

    2) HNO_3 - NH_4OH

    3) NaOH - CH_3COOH

    4) HCl - NaOH

200. The product of reaction between alcoholic silver nitrite with ethyl bromide is :

    1) ethene

    2) ethane

    3) ethyl nitrile

    4) nitro ethane

Section-3

Mathematics

201. The area of the triangle formed by the tangent at (3, 4) to the circle $x^2 + y^2 = 25$ and the

    co-ordinate axes is :

    1) (24/25) sq unit

2) 0 sq unit

3) (625/24) sq unit

4) -(24/25) sq unit

202. Which of the following functions has period 2π ?

1) $y = \sin\left(2\pi t + \dfrac{\pi}{3}\right) + 2\sin\left(3\pi t + \dfrac{\pi}{4}\right) + 3\sin 5\pi t$

2) $y = \sin\dfrac{\pi}{3}t + \sin\dfrac{\pi}{4}t$

3) y = sint t + cos 2t

4) none of the above

203. Two bodies of masses m and 4m are moving with equal momentum. The ratio of their kinetic energy is :

1) 1 : 4

2) 4 : 1

3) 1 : 1

4) 1 : 2

204. The line y = mx + 1 is a tangent to the parabola $y^2 = 4x$, if :

1) m = 1

2) m = 2

3) m = 4

4) m = 3

205. Let D be the middle point of the side BC of a triangle ABC. If the triangle ADC is equilateral, then $a^2 : b^2 : c^2$ is equal to :

1) 1 : 4 : 3

2) 4 : 1 : 3

3) 4 : 3 : 1

4) 3 : 4 : 1

206. If $4\hat{i} + 7\hat{j} + 8\hat{k}$, $2\hat{i} + 3\hat{j} + 4\hat{k}$ and $2\hat{i} + 5\hat{j} + 7\hat{k}$ are the position vectors of the vertices A, B and C respectively of triangle ABC. The position vector of the point where the bisector of angle A meets BC is :

1) (1/3) (6î + 13ĵ + 18$\hat{k}$)

2) (2/3) (6î + 12ĵ - 8$\hat{k}$)

3) (1/3) (-6î - 8ĵ - 9$\hat{k}$)

4) (2/3) (-6î - 12ĵ + 8$\hat{k}$)

207. The projection of the vector î - 2ĵ + $\hat{k}$ on the vector 4î - 4ĵ + 7$\hat{k}$ is equal to :

2) 9/19

3) √(3)/
19

4) 19/√3

$\vec{a}$ = 2î - ĵ + k̂, $\vec{b}$ = î + 2ĵ - k̂ and $\vec{c}$ = î + ĵ - 2k̂ be three vectors. A vector in the plane of $\vec{b}$ and $\vec{c}$ whose projection $\vec{a}$ is of magnitude √(2/3) is :

1) 2î + 3ĵ +3k̂

2) 2î + 3ĵ - 3k̂

3) 2î + ĵ + 5k̂

4) 2î - ĵ + 5k̂

209. The value of k for which the vectors $\vec{a}$ = î - ĵ and $\vec{b}$ = -2î + kĵ are collinear, is :

1) 2   2) 1/2   3) 1/3   4) 3

210. The area of a parallelogram whose adjacent sides are determined by the vectors $\vec{a}$ = î + 2ĵ + 3k̂ and $\vec{b}$ = -3î -2ĵ + k̂ is equal to :

1) 8√5 sq unit

2) 9√5 sq unit

3) 6√5 sq unit

4) 17√15 sq unit

211. A uniform ladder rest in limiting equilibrium with its lower end on a rough horizontal plane and its upper end against a smooth vertical wall if θ is an angle of inclination of the ladder to the vertical wall and μ is the coefficient of friction, then tan θ is equal to :

1) μ

2) 2μ

3) 3μ/2

4) μ + 1

212.
The value of $\lim_{x \to \infty} \left(\dfrac{3x - 4}{3x + 2}\right)^{\frac{x+1}{3}}$ is equal to

1) $e^{-1/3}$

2) $e^{-2/3}$

3) e^{-1}

4) e^{-2}

213. If $f(x) = (x + I)^{\cot x}$ be continuous at x = 0, then $f(0)$ is equal to :

1) 0

2) -e

3) e

4) none of these

214. If $y = (\cos x^2)^2$, then (dy/dx) is equal to :

   1) $-4x \sin 2x^2$

   2) $-x \sin x^2$

   3) $-2x \sin 2x^2$

   4) $-x \cos 2x^2$

215. The value of the derivative of $|x - 1| + |x - 3|$ at $x = 2$ is :

   1) 2   2) 1   3) 0   4) -2

216. The derivative of $\sin^{-1}\left(\dfrac{2x}{1 + x^2}\right)$ with respect to $\cos^{-1}\left(\dfrac{1 - x^2}{1 + x^2}\right)$ is equal to :

   1) 1

   2) -1

   3) 2

   4) none of these

217. The minimum value of function $f(x) = 3x^4 - 8x^3 + 12x^2 - 48x + 25$ on $[0, 3]$ is equal to :

   1) 25   2) -39   3) -25   4) 39

218. $\displaystyle\int_1^2 e^x\left[\dfrac{1}{x} - \dfrac{1}{x^2}\right] dx$ is equal to :

   1) $e\left(\dfrac{e}{2} - 1\right)$

   2) $e(e - 1)$

   3) 0

   4) none of these

219. The value of $\tan^{-1}(1/2) + \tan^{-1}(1/3)$ is :

   1) 0   2) $\pi/3$ 3) $\pi/6$ 4) $\pi/4$

220. If $^{12}P_r = 1320$, then r is equal to :

   1) 5   2) 4   3) 3   4) 2

221. A particle is projected vertically upward takes t_1 second to reach a height h. If t_2 second is the subsequent time to reach the ground, then the maximum height attained is :

   1) $(1/2)\, g\, (t_1 + t_2)^2$

   2) $(1/4)\, g\, (t_1 + t_2)^2$

3) $(1/8)\ g\ (t_1 + t_2)^2$

4) none of these

222. A cart of 100 kg is free to move on smooth rails and a block of 20 kg is resting on it. Surface of contact between the cart and the block is smooth. A force of 60 N is applied to the cart. Acceleration of 20 kg block in m/s^2 is :

1) 3   2) 0.6   3) 0.5   4) 0

223. The eccentricity of the ellipse $9x^2 + 5y^2 - 30y = 0$ is equal to :

1) 1/3

2) 2/3

3) 3/4

4) none of these

224. The radius of the circumcircle of an isosceles triangle PQR is equal to PQ (= PR), then the angle P is :

1) $\pi/6$

2) $\pi/3$

3) $\pi/2$

4) $2\pi/3$

225. If $A = \{x, y\}$, then the power set of A is :

1) $\{x^x, y^y\}$

2) $\{\phi, x, y\}$

3) $\{\phi, \{x\}, \{2y\}\}$

4) $\{f, \{x\}, \{y\}, \{x, y\}\}$

226. The degree of the differential equation

$$\frac{d^2y}{dx^2} + 3\left[\frac{dy}{dx}\right]^2 = x^2 \log\left[\frac{d^2y}{dx^2}\right]$$ is :

1) 1

2) 2

3) 3

4) none of these

227. The solution of the differential equation $x^4 \frac{dy}{dx} x^3y + \mathrm{cosec}\ (xy) = 0$ is equal to :

1) $2 \cos (xy) + x^{-2} = c$

2) $2 \cos (xy) + y^{-2} = c$

3) $2 \sin (xy) + x^{-2} = c$

4) $2 \sin (xy) + y^{-2} = c$

228. Forces of magnitudes 3 and 2 unit acting in the directions $5\hat{\imath} + 3\hat{\jmath} + 4\hat{k}$ and $3\hat{\imath} + 4\hat{\jmath} - 5k$ respectively act on a particle which is displaced from the points (1, -1, -1) to (3, 3, 1). The work done by the forces is equal to :

1) $80\sqrt{2}$ unit

2) $40\sqrt{2}$ unit

3) $(57/5)\sqrt{2}$ unit

4) $8\sqrt{2}$ unit

229. The rate of increase of bacteria in a certain culture is proportional to the number present. If it double in 5 h, then in 25 h, its number would be :

1) 8 times the original

2) 16 times the original

3) 32 times the original

4) 64 times the original

230. If $\vec{a}$ of magnitude 50 is collinear with the vector $\vec{b} = 6\hat{\imath} - 8\hat{\jmath} - (15\hat{k}/2)$, and makes an acute angle with the positive direction of z-axis, then the vector $\vec{a}$ is equal to :

1) $24\hat{\imath} - 32\hat{\jmath} + 30\hat{k}$

2) $-24\hat{\imath} + 32\hat{\jmath} + 30\hat{k}$

3) $16\hat{\imath} - 16\hat{\jmath} - 15\hat{k}$

4) $-12\hat{\imath} + 16\hat{\jmath} - 30\hat{k}$

231. The value of the determinant is $\begin{vmatrix} 1 & x & y+z \\ 1 & y & z+x \\ 1 & z & x+y \end{vmatrix}$ equal to :

1) x 2) y 3) z 4) 0

232. If a man and his wife enter in a bus, in which five seats are vacant, then the number of different ways in which they can be seated, is :

1) 2 2) 5 3) 20 4) 40

233. The differential equation of the family of curves for which the length of the normal is equal to a constant k, is given by :

1)
$$y^2 \frac{dy}{dx} = k^2 - y^2$$

2)
$$\left(y\frac{dy}{dx}\right)^2 = k^2 - y^2$$

3)
$$y\left(\frac{dy}{dx}\right)^2 = k^2 + y^2$$

4) $\left(y\dfrac{dy}{dx}\right)^2 = k^2 + y^2$

234. If ω is a complex cube root of unity, then the value of $\omega^{99} + \omega^{100} + \omega^{101}$ is :

1) 1   2) -1   3) 3   4) 0

235. The roots of the equation $(q - r) x^2 + (r - p) x + (p - q) = 0$ are :

1) $\dfrac{r-p}{q-r}, \dfrac{1}{2}$

2) $\dfrac{p-q}{q-r}, 1$

3) $\dfrac{q-r}{p-q}, 1$

4) $\dfrac{r-p}{p-q}, \dfrac{1}{2}$

236. The value of sin 10° + sin 20° + sin 30° + ... + sin 360° is equal to :

1) 0   2) 1   3) √3   4) 2

237. The mean of observations x_1, x_2, ... x_n is $\bar{x}$, then $(x_1 - \bar{x}) + (x_2 - \bar{x}) + ... + (x_n - \bar{x})$ equal to :

1) $(n - 1)\, \bar{x}$

2) $n\, \bar{x}$

3) 0

4) none of these

238. If $\sin^{-1}\left[\dfrac{2a}{1+a^2}\right] + \sin^{-1}\left[\dfrac{2b}{1+b^2}\right] = 2\tan^{-1} x$, then x is equal to :

1) (a - b)/(1 + ab)

2) b/(1 + ab)

3) b/(1 - ab)

4) (a + b)/(1 - ab)

239. The point of intersection of the lines
$\dfrac{x+1}{3} = \dfrac{y+3}{3} = \dfrac{z+5}{7}$ and $\dfrac{x-2}{1} = \dfrac{y-4}{3} = \dfrac{z-6}{5}$ is :

1) $\left(\dfrac{1}{2}, \dfrac{1}{2}, -\dfrac{3}{2}\right)$

2) $\left(-\dfrac{1}{2}, -\dfrac{1}{2}, \dfrac{3}{2}\right)$

3) $\left(\dfrac{1}{2}, -\dfrac{1}{2}, -\dfrac{3}{2}\right)$

4) $\left(-\dfrac{1}{2}, \dfrac{1}{2}, \dfrac{3}{2}\right)$

240. The area of the circle and the area of a regular polygon of n sides and of perimeter equal to that of the circle are in the ratio of :

1) $\tan\left(\dfrac{\pi}{n}\right) : \dfrac{\pi}{n}$

2) $\cos\left(\dfrac{\pi}{n}\right) : \dfrac{\pi}{n}$

3) $\sin\left(\dfrac{\pi}{n}\right) : \dfrac{\pi}{n}$

4) $\cot\left(\dfrac{\pi}{n}\right) : \dfrac{\pi}{n}$

241. Real part of $\dfrac{1}{1 - \cos\theta + i\sin\theta}$ is equal to :

1) -(1/2)

2) (1/2)

3) (1/2) tan (θ/2)

4) 2

242. An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probability of an accident involving a scooter driver, car driver and a truck driver is 0.01, 0.03, 0.15 respectively. One of the insured persons meets with an accident. The probability that he is a scooter driver, is :

1) 1/52

2) 1/53

3) 2/51

4) none of these

243. The inradius of the triangle whose sides are 3, 5, 6, is :

1) √8/7

2) √8

3) √7

4) √7/8

244. The area of the region bounded by the curve y = x |x|, x-axis and the ordinates x = 1, x = -1 is given by :

1) 0 sq unit

2) (1/3) sq unit

3) (2/3) sq unit

4) 1 sq unit

245. If $(1 + x)^n = \sum_{r=0}^{n} C_r x^r$, then value of $C_1 + 2C_2 + 3C_3 + ... + nC_n$ is equal to :

1) $n \cdot 2^n$

2) $(n + 2)2^n$

3) $n \cdot 2^{n-1}$

4) $n \cdot 2^{n+1}$

246. If $f(a) = 2$, $f'(a) = 1$; $g(a) = -1$, $g'(a) = 2$, then $\lim_{x \to a} \dfrac{g(x).f(a) - g(a).f(x)}{x - a}$ is equal to :

1) -5   2) 0   3) 1/5   4) 5

247. If x has binomial distribution with mean np and variance npq, then $\dfrac{P(x = k)}{P(x = k - 1)}$ is equal to :

1) $\dfrac{n - k}{k - 1} \cdot \dfrac{p}{q}$

2) $\dfrac{n - k + 1}{k} \cdot \dfrac{p}{q}$

3) $\dfrac{n + 1}{k} \cdot \dfrac{q}{p}$

4) $\dfrac{n - 1}{k + 1} \cdot \dfrac{q}{p}$

248. The value of the integral $\displaystyle\int \dfrac{dx}{x(1 + \log x)^2}$ is equal to :

1) $\dfrac{-1}{1 + x} + c$

2) $\dfrac{-1}{1 + \log x} + c$

3) $\dfrac{1}{1 + \log x} + c$

4) $\dfrac{1}{1 + x^2} + c$

249. Let E_1, E_2, E_3 be three arbitrary events of a sample space S consider the following statements which of the following statements are correct ?

1) P (only one of them occurs) = P $(E_1 \bar{E}_2 E_3 + \bar{E}_1 E_2 E_3 + \bar{E}_1 E_2 \bar{E}_3)$

2) P (none of them occurs) = P $(\bar{E}_1 + \bar{E}_2 + E_3)$

3) P (at least one of them occurs) = P $(E_1 + E_2 + E_3)$

4) P (all the three occur) = P (E_1) P (E_1) P (E_2) where P (E_1) denotes the probability of E_1 and $\bar{E}_1$ denotes complement of E_1

250. Consider the system of linear equations
$a_1 x + b_1 y + c_1 z + d_1 = 0$,
$a_2 x + b_2 y + c_2 z + d_2 = 0$ and
$a_3 x + b_3 y + c_3 z + d_3 = 0$.

Let us denote by $\Delta(a, b, c)$ the determinant $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$, if $\Delta(a, b, c) \neq 0$, then the

value of x in the unique solution of the above equations is :

1) $\dfrac{\Delta(b, c, d)}{\Delta(a, b, c)}$

2) $\dfrac{-\Delta(b, c, d)}{\Delta(a, b, c)}$

3) $\dfrac{\Delta(a, c, d)}{\Delta(a, b, c)}$

4) $-\dfrac{\Delta(a, b, d)}{\Delta(a, b, c)}$

251. $\displaystyle\int_{-2}^{10} (x - [x])\, dx$, where [ ] denotes greatest integer function, is equal to :

1) -12sgn　　　　　2) 10　　　　　3) 8　　　　　4) 12

252. The equations of one of the bisectors of the angles between the straight lines 3x - 4y + 7 = 0 and 12x - 5y - 8 = 0 are :

1) 21x + 27y - 131 = 0

2) 12x - 5y + 7 = 0

3) 4x - 3y + 1 = 0

4) none of the above

253. 2n boys are randomly divided into two subgroups containing n boys each. The probability that the two tallest boys are in different group, is :

1) n/(2n - 1)

2) (n - 1)/(2n - 1)

3) $(2n - 1)/4n^2$

4) none of these

254. If the sides of a triangle are in the ratio 3 : 7 : 8, then R : r is equal to :

    1) 2 : 7

    2) 7 : 2

    3) 3 : 7

    4) 7 : 3

255. If there are 6 girls and 5 boys who sit in a row, then the probability that no two boys sit together is :

    1) 6!6!/2!11!

    2) 7!5!/2!11!

    3) 6!7!/2!11!

    4) none of these

256. The latus rectum of the hyperbola $9x^2 - 16y^2 - 18x + 32y - 151 = 0$ is :

    1) 5/2

    2) 2/9

    3) 9/2

    4) none of these

257. A tower subtends an angle α at a point in the plane of its base and the angle of depression of the foot of the tower at a point b ft just above A is β. Then height of the

    tower is :

    1) b tan α cot β

    2) b cot α tan β

    3) b tan α tan β

    4) b cot α cot β

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1, \text{ if :}$$

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

    2) $p = \pm 1$

    3) $p^2 = a^2 + b^2$

    4) none of the above

259. If $I_1 = \int_x^1 \frac{1}{1+t^2} dt$ and $I_2 = \int_1^{1/x} \frac{1}{1+t^2} dt$ for x > 0, then :

    1) $I_1 = I_2$

    2) $I_1 > I_2$

    3) $I_2 > I_1$

    4) none of these

260. A particle possess simultaneously two velocities 10 m/s and 15 m/s in direction inclined at an angle of 60°, then its resultant velocity is :

    1) 15 m/s

    2) $5\sqrt{(19)}$ m/s

    3) 25 m/s

    4) none of these

261. If $\int \dfrac{dx}{x\sqrt{1-x^3}} = a \log \left| \dfrac{\sqrt{1-x^3}-1}{\sqrt{1-x^3}+1} \right| + b$, then a is equal to :

    1) 1/3

    2) 2/3

    3) -(1/3)

    4) -(2/3)

262. The angle of projection of a particle when its range on a horizontal plane is $4\sqrt{(3)}$ times the greatest height attained by it is :

    1) 15°   2) 30°   3) 45°   4) 60°

263. The integral $\int_0^a \dfrac{g(x)}{f(x) + f(a-x)}$ dx vanishes, if :

    1) g(x) is odd

    2) $f(x) = f(a - x)$

    3) g(x) = -g(a - x)

    4) $f(a - x) = g(x)$

264. $\int \dfrac{\sqrt{\tan x}}{\sin x \cos x} dx$ is equal to :

    1) $2\sqrt{(\tan x)} + c$

    2) $2\sqrt{(\cot x)} + c$

    3) $(\sqrt{(\tan x)}/2) + 2$

    4) none of these

265. The equation $x^2 + k_1 y^2 + k_2 xy = 0$ represents a pair of perpendicular lines, if :

    1) $k_1 = -1$

    2) $k_1 = 2k_2$

    3) $2k_1 = k_2$

    4) none of these

266.
If $\displaystyle\int_{\pi/2}^{\theta} \sin x \, dx = \sin 2\theta$, then the value of θ satisfying $0 < \theta < \pi$ is :

1) $3\pi/2$

2) $\pi/6$

3) $5\pi/6$

4) $\pi/2$

267. The points (-a, -b), (0, 0), (a, b) and (a^2, ab) are :

1) collinear

2) vertices of parallelogram

3) vertices of rectangle

4) none of the above

268. A bullet fired into a target loses half of its velocity after penetrating 3 cm. The bullet will penetrate further :

1) (1/2) cm

2) 1 cm

3) 2 cm

4) none of these

269. If a point moves with constant acceleration from A to B in the straight line AB has velocities u and v at A and B respectively, then the velocity at C, the mid point AB is :

1) $(u + v)/2$

2) $\sqrt{(u^2 + v^2)}$

3) $\sqrt{(u^2 + v^2)/2}$

4) none of these

270. A stone is thrown vertically upwards with an initial velocity u from the top of a tower, reaches the ground with a velocity 3u. The height of the tower is :

1) $3u^2/g$

2) $4u^2/g$

3) $6u^2/g$

4) $9u^2/g$

271. If the focus of a parabola is at (0, -3) and its directrix is y = 3, then its equation is :

1) $x^2 = -12y$

2) $x^2 = 12y$

3) $y^2 = -12x$

4) $y^2 = 12x$

272. If the second term in the expansion $\left(\sqrt[13]{a} + \dfrac{a}{\sqrt{a^{-1}}}\right)^n$ is $14a^{5/2}$ then $\left(^nC_3 / {}^nC_2\right)$ is equal to :

1) 4   2) 3   3) 12   4) 6

273. If $z = x + iy$ and $\omega = \dfrac{1 - iz}{z - i}$ then $|\omega| = 1$ implies that in the complex plane :

1) z lies on the imaginary axis

2) z lies on the real axis

3) z lies on the unit circle

4) none of the above

274. The radius of a balloon is increasing at the rate of 10 cm/s. At what rate is the surface area of the balloon increasing when the radius is 15 cm ?

1) 120π cm^2/s

2) 125π cm^2/s

3) 1200π cm^2/s

4) 1100π cm^2/s

275. If $\log_5 2$, $\log_5(2^x - 3)$ and $\log_5((17/2) + 2^{x-1})$ are in AP, then x is equal to

:

1) $\dfrac{3}{a}$ 2) -3   3) 2   4) -2 $\vec{a}$

276. If , is a non-zero vector of modulus a and m is a non-zero scalar, then m is a unit vector, if :

1) m = 1

2) a = (1/2) m$^{1/2}$

3) a = -m

4) a = (1/|m|)

277. A circular wire of radius 15 cm is cut and bent so as to lie along the circumference of a loop of radius 120 cm. The angle subtended by it at the centre is :

1) 30°

2) 45°

3) 60°

4) none of these

278. The angle of expenditure on food in a pie-chart for expenditure pattern : food - 40%, clothing - 25%, rent - 10%, education - 10%, medicine - 10%, miscellaneous - 5% is equal to :

1) 72°

2) 36°

4) none of these

279.

If $f(x) = \begin{cases} \dfrac{\log(1 + ax) - \log(1 - bx)}{x}, & x \neq 0 \\ k, & x = 0 \end{cases}$ and $f(x)$ is continuous at $x = 0$,

then the value of k is equal to :

1) log a - log b

2) a + b

3) 1

4) a - b

280. A box contains two white balls, three black balls and four red balls. In how many ways can three ball be drawn from the box, if at least one black ball is to be included in the draw ?

1) 64

2) 129

3) 84

4) None of these

281.

For which real values of x and y, the equation $\sec^2 \theta = \dfrac{(4xy)}{(x + y)^2}$ is possible ?

1) x = y

2) x > y

3) x < y

4) none of these

282. The equation of the sphere with A (2, 3, 5) and B (4, 9, -3) as the ends of a diameter is :

1) $x^2 + y^2 + z^2 - 8x - 12y + 2z = 30$

2) $x^2 + y^2 + z^2 - 6x - 12y - 2z = -20$

3) $x^2 + y^2 - z^2 + 6x - 12y + 2z = 15$

4) $x^2 + y^2 + z^2 - 6x - 12y - z = 20$

283. The string of a kite is 100 m long and it makes an angle of 60° with the horizontal. What is the height of the kite assuming that there is no slack in the string ?

1) 80 m

2) 50√(3) m

3) 40√(3) m

4) 60 m

284. The circle whose equations are
$x^2 + y^2 + c^2 = 2ax$ and $x^2 + y^2 + c^2 - 2by = 0$
will touch one another externally, if :

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1) $\dfrac{1}{c^2} + \dfrac{1}{a^2} = \dfrac{1}{b^2}$

2) $\dfrac{1}{a^2} + \dfrac{1}{b^2} = \dfrac{1}{c^2}$

3) $\dfrac{1}{b^2} + \dfrac{1}{c^2} = \dfrac{1}{a^2}$

4) none of these

285. The value of

$$\dfrac{\sin 300° \, \tan 330° \, \sec 420°}{\tan 135° \, \sin 210° \, \sec 315°} \text{ is equal to :}$$

1) $1/\sqrt{2}$

2) $\sqrt{2}$

3) $1/\sqrt{3}$

4) $\sqrt{3}$

286. $\underbrace{(666 \ldots \ldots 6)}_{n-\text{digits}}{}^{2} + \underbrace{(888 \ldots \ldots 8)}_{n-\text{digits}}$ is equal to :

1) $4/9\ (10^n - 1)^2$

2) $4/9\ (10^n - 1)$

3) $4/9\ (10^{2n} - 1)$

4) $4/9\ (10^{2n} - 1)^2$

287. If A = {x : x is a multiple of 4} and B = {x : x is a multiple of 6}, then A ∩ B consists of all

multiples of :

1) 16   2) 12   3) 8   4) 4

288. The ex-radius r_1, r_2, r_3 of a triangle ABC are in HP. Then a, b, c are in :

1) AP

2) GP

3) HP

4) a = b = c

289. The points A $(2a, 4a)$, B $(2a, 6a)$ and C $(\{2 + \sqrt{3}\}\ a, 5a)$ are the vertices of :

1) an equilateral triangle

2) a scalene triangle

3) an isosceles triangle

4) none of the above

290. If α, β, γ are in AP

$$\text{then } \dfrac{\sin \alpha - \sin \gamma}{\cos \gamma - \cos \alpha} \text{ is equal to :}$$

1) cot β

2) cos α

3) tan β

4) sin α

291. If a and b are eccentric angles of the ends of a focal chord of the ellipse $\dfrac{x^2}{a^2}+\dfrac{y^2}{b^2}=1$, then tan (α/2) tan (β/2) is equal to :

1) (e + 1)/(e - 1)

2) (1 - e)/(1 + e)

3) (e - 1)/(e + 1)

4) none of these

292. On the occasion of Deepawali festival each student of a class sends greeting cards to the others. If there are 20 students in the class, then the total number of greeting cards exchanged by the students is :

1) $^{20}C_2$

2) $2\,^{20}C_2$

3) $2\,^{20}P_2$

4) none of these

293. Let S be the set of all straight lines in a plane. A relation R is defined on S by a R $b \Longleftrightarrow a \perp b$, then R is :

1) reflexive but neither symmetric nor transitive

2) symmetric but neither reflexive nor transitive

3) transitive but neither reflexive nor symmetric

4) an equivalence relation

294. The eccentricity of the hyperbola whose latus rectum is 8 and conjugate axis is equal to half the distance between the foci, is :

1) 4/3

2) 4/√3

3) 2/√3

4) none of these

295. In a class of 45 students, 22 can speak Hindi only and 12 can speak English only. The number of students, who can speak both Hindi and English is :

1) 9   2) 11   3) 23   4) 17

296. There are 18 points in a plane such that no three of them are in the same line except five points which are collinear. The number of triangles formed by these points is :

1) 816   2) 806   3) 805   4) 813

297. The area bounded by y = |x - 1| and y = 1 is :

    1) 1 sq unit
    2) 2 sq unit
    3) (1/2) sq unit
    4) none of these

298.
    The middle term in the expansion of $\left(x - \dfrac{1}{2x}\right)^{10}$ is equal to :

    1) $105/32x^2$
    2) 63/8
    3) $-(105/32x^2)$
    4) -(63/8)

299. The equation of the chord of the hyperbola $25x^2 - 16y^2 = 400$ that is bisected at point
    (5,
    3) is :
    1) 135x - 48y = 481
    2) 125x - 48y = 481
    3) 125x - 4y = 48
    4) none of the above

300. The length of the radius of the circle which passes through the point (6, 2) and whose two
    diameters are x + y = 6 and x + 2y = 4, is :
    1) 10   2) 2√5   3) 6   4) 4

Answer Key

1) 1	2) 4	3) 4	4) 1	5) 1	6) 1	7) 2	8) 2	9) 4	10) 3
11) 2	12) 2	13) 1	14) 4	15) 2	16) 3	17) 2	18) 1	19) 3	20) 1
21) 2	22) 2	23) 4	24) 2	25) 4	26) 4	27) 2	28) 4	29) 2	30) 3
31) 1	32) 2	33) 3	34) 4	35) 4	36) 3	37) 2	38) 4	39) 4	40) 3
41) 3	42) 3	43) 3	44) 1	45) 4	46) 3	47) 3	48) 2	49) 4	50) 1
51) 3	52) 3	53) 1	54) 3	55) 2	56) 2	57) 2	58) 2	59) 4	60) 2
61) 3	62) 2	63) 3	64) 4	65) 1	66) 4	67) 4	68) 3	69) 3	70) 4
71) 3	72) 4	73) 2	74) 3	75) 1	76) 4	77) 1	78) 1	79) 1	80) 1
81) 4	82) 2	83) 2	84) 3	85) 1	86) 2	87) 3	88) 3	89) 2	90) 3
91) 1	92) 1	93) 3	94) 2	95) 2	96) 2	97) 2	98) 3	99) 2	100) 4
101) 4	102) 3	103) 1	104) 4	105) 4	106) 3	107) 3	108) 3	109) 3	110) 3
111) 1	112) 4	113) 1	114) 4	115) 1	116) 3	117) 2	118) 3	119) 2	120) 2
121) 4	122) 2	123) 1	124) 2	125) 4	126) 2	127) 1	128) 1	129) 4	130) 4
131) 2	132) 1	133) 1	134) 3	135) 2	136) 2	137) 4	138) 2	139) 3	140) 4
141) 3	142) 4	143) 1	144) 3	145) 1	146) 3	147) 4	148) 3	149) 3	150) 1
151) 3	152) 2	153) 1	154) 2	155) 2	156) 4	157) 3	158) 4	159) 4	160) 3
161) 4	162) 1	163) 2	164) 2	165) 3	166) 2	167) 2	168) 1	169) 4	170) 4
171) 3	172) 2	173) 2	174) 3	175) 1	176) 4	177) 2	178) 3	179) 1	180) 4
181) 2	182) 1	183) 3	184) 4	185) 1	186) 2	187) 1	188) 3	189) 1	190) 4
191) 1	192) 4	193) 2	194) 1	195) 1	196) 2	197) 4	198) 3	199) 4	200) 4
201) 3	202) 3	203) 2	204) 1	205) 2	206) 1	207) 1	208) 2	209) 1	210) 3
211) 2	212) 2	213) 3	214) 3	215) 3	216) 1	217) 2	218) 1	219) 4	220) 3
221) 3	222) 3	223) 2	224) 4	225) 4	226) 4	227) 1	228) 3	229) 3	230) 2
231) 4	232) 3	233) 2	234) 4	235) 2	236) 1	237) 3	238) 4	239) 3	240) 1
241) 2	242) 1	243) 1	244) 3	245) 3	246) 4	247) 2	248) 2	249) 4	250) 2
251) 4	252) 1	253) 1	254) 2	255) 3	256) 3	257) 1	258) 1	259) 1	260) 2
261) 1	262) 2	263) 3	264) 1	265) 1	266) 4	267) 1	268) 2	269) 3	270) 2
271) 1	272) 1	273) 2	274) 3	275) 1	276) 4	277) 2	278) 3	279) 2	280) 1
281) 1	282) 2	283) 2	284) 2	285) 2	286) 3	287) 2	288) 1	289) 1	290) 1
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