



UPSEE - 2001

Full Paper

Section-1

Physics

1. A sphere, a cube and a thin circular plate, all made of the same material and having the same mass are initially heated to a temperature of 1000°C . Which one of these will cool first ?
 - 1) Plate
 - 2) Sphere
 - 3) Cube
 - 4) None of these
2. A beam of light composed of red and green rays is incident obliquely at a point on the face of a rectangular glass slab. When coming out on the opposite parallel face, the red and green rays emerge from :
 - 1) two points propagating in two different non-parallel directions
 - 2) two points propagating in two different parallel directions
 - 3) one point propagating in two different directions
 - 4) one point propagating in the same direction
3. Two wires having resistances of 2Ω and 4Ω are connected to same voltage. The ratio of heat dissipated in the resistances will be :
 - 1) 4 : 3
 - 2) 1 : 2
 - 3) 5 : 2
 - 4) 2 : 1
4. A photon moves to energy level E_1 from E_2 to find more stable nucleus, then the frequency will be :
 - 1) exactly $(E_2 - E_1)/h$
 - 2) slightly greater than $(E_2 - E_1)/h$
 - 3) slightly less than $(E_2 - E_1)/h$
 - 4) $h\nu$
5. At 273°C , the emissive power of a perfect black body is R . What is its value at 0°C ?
 - 1) $R/4$
 - 2) $R/16$
 - 3) $R/2$

- 4) None of these
6. Among two discs A and B, first have radius 10 cm and charge 10^{-6} C and second have radius 30 cm and charge 10^{-5} C. When they are touched, charges on both are q_A and q_B respectively, will be :
- 1) $q_A = 2.75 \mu\text{C}$, $q_B = 3.15 \mu\text{C}$
 - 2) $q_A = 1.09 \mu\text{C}$, $q_B = 1.53 \mu\text{C}$
 - 3) $q_A = q_B = 5.5 \mu\text{C}$
 - 4) none of these
7. The potential difference between the cathode and the target electrode in a coolidge tube is 24.75 kV. The minimum wavelength of the emitted X-rays is :
- 1) 0.1 Å
 - 2) 0.5 Å
 - 3) 1 Å
 - 4) 5 Å
8. The first named planetoid (ceres) has its orbit in between the orbits of :
- 1) mars and jupiter
 - 2) neptune and pluto
 - 3) mercury and pluto
 - 4) venus and saturn
9. A torque of 10^{-5} Nm is required to hold a magnet at 90° with the horizontal component of the earth's magnetic field. The torque required to hold it at 30° will be :
- 1) 5×10^{-6} Nm
 - 2) data is insufficient
 - 3) $(1/3) \times 10^{-5}$ Nm
 - 4) $5\sqrt{3} \times 10^{-6}$ Nm
10. A 220 V, 100 W bulb is joined with a 110 V supply. The power consumed by the bulb is :
- 1) 50 W
 - 2) 25 W
 - 3) 80 W
 - 4) 100 W
11. Newton's corpuscular theory could not explain the phenomenon for :
- 1) reflection
 - 2) refraction
 - 3) diffraction
 - 4) rectilinear propagation

12. Which one of the following statements is correct ?
- 1) Conduction is a fast process
 - 2) Convection is a fast process
 - 3) Radiation is a fast process
 - 4) None of the above
13. A sample of an ideal gas occupies a volume V at pressure P and absolute temperature T . The mass of each molecule is m , then the density of the gas is :
- 1) mkT
 - 2) pm/kT
 - 3) p/km
 - 4) p/kT
14. An air column in a pipe which is closed at one end, will be in resonance with the vibration body of frequency 166 Hz, if the length of the air column is :
- 1) 0.5 m
 - 2) 1.0 m
 - 3) 1.5 m
 - 4) 2.0 m
15. A wave equation which gives the displacement along the direction is given by $y = 0.001 \sin(100t + x)$ where x and y are in metre and t in second. This equation represents a wave :
- 1) travelling with a velocity of 100 m/s in the negative x -direction
 - 2) travelling with a velocity of $(50/\pi)$ m/s in the positive x -direction
 - 3) of wavelength 1 m
 - 4) of frequency $100/\pi$ Hz
16. In order to initiate the surface loading limit, the sides of ships are marked by the lines called :
- 1) load lines
 - 2) plimsoll lines which has below those for fresh water
 - 3) safety lines
 - 4) danger (or limit) lines
17. A container partly filled in a liquid is suspended from a spring balance. A small body is gently dropped in the container. The pointer of spring balance will :
- 1) read less
 - 2) oscillate
 - 3) read the same
 - 4) read more
18. Two particles, initially at rest move towards each other under the effect of gravitational force of attraction. At the instant when their relative velocity is $3v$ where v the velocity of

the slower particle, then the speed of the centre of mass of two given particles is :

- 1) v 2) $2v$ 3) $3v$ 4) zero

19. A body of mass 10 kg moves with a velocity v of 2 m/s along a circular path of radius 8 m. The power produced by the body will be :

- 1) 10 J/s
2) 98 J/s
3) 49 J/s
4) zero

20. A ball of mass 0.5 kg is moving with a velocity v of 2 m/s. It is subjected to a force of x newton in 2 s. Because of this force, the ball moves with velocity of 3 m/s. The value of x is :

- 1) 5 N
2) 8.25 N
3) 0.25 N
4) 1.0 N

21. A thin prism P_1 with angle 4° and made from glass of refractive index 1.54 is combined with another prism P_2 made of glass of refractive index 1.72 to produce dispersion without deviation. The angle of prism P_2 is :

- 1) 5.33°
2) 4°
3) 2.6°
4) 3°

22. In a reaction ${}_{92}\text{Be}^{234} \rightarrow {}_{88}\text{Y}^{218}$, the number of α and β -particles emitted respectively, are :

- 1) 4, 4
2) 4, 6
3) 4, 8
4) 4, 2

23. If thermo emf is given by $E = at + bt^2$, then the neutral temperature is :

- 1) $-(a/2b)$
2) $(2b/a)$
3) $-(a/b)$
4) $-(b/a)$

24. In the following transitions, which one has higher frequency ?

- 1) $3 \rightarrow 1$
2) $4 \rightarrow 2$

3) $4 \rightarrow 3$

4) $3 \rightarrow 2$

25. If increase in linear momentum of a body is 50%, then change in its kinetic energy is :

1) 25%

2) 125%

3) 150%

4) 50%

26. If two soap bubbles of different radii are in contact then :

1) air rushes from smaller bubble to bigger bubble which continues to grow at the cost of the smaller bubble

2) sizes of the bubbles remain the same

3) air rushes from bigger bubble to smaller bubble until the size of two becomes same

4) none of the above

27. The current gain α of a transistor in common-base mode is 0.995. Its current gain β in the common-emitter mode is :

1) 200

2) 90.5

3) 100

4) 1.005

28. A photocell is illuminated by a small bright source placed 2 m away. When the same source of light is placed 4 m away, the electrons emitted by photo-cathode in one second :

1) carry one quarter of their previous energy

2) carry one quarter of their previous momentum

3) are half numerous

4) are one quarter numerous

29. Two thin long parallel wires separated by a distance b are carrying a current i ampere each. The magnitude of the force per unit length exerted by one wire on the other, is :

1) $\mu_0 i^2 / b^2$

2) $\mu_0 i / 2\pi b^2$

3) $\mu_0 i / 2\pi b$

4) $\mu_0 i^2 / 2\pi b$

30. A conducting wire of cross-sectional area 1 cm^2 has 3×10^{23} charge carriers per metre³.

If wire carries a current 24 mA, then drift velocity of carriers is :

1) $5 \times 10^{-2} \text{ m/s}$

2) 0.5 m/s

3) $5 \times 10^{-3} \text{ m/s}$

4) $5 \times 10^{-6} \text{ m/s}$

31. The capacitance of a metallic sphere is $1 \mu\text{F}$, then its radius is nearly :

1) 1.11 m

2) 10 m

- 3) 9 km
4) 1.11 cm
32. For a projectile (range)² is 48 times of (maximum height)² obtained. Find the angle of projection.
1) 60° 2) 30° 3) 45° 4) 75°
33. At room temperature, the rms speed of the molecules of a certain diatomic gas is found to be 1933 m/s. The gas is :
1) H₂
2) F₂
3) Cl₂
4) O₂
34. The refractive index of a piece of transparent quartz is greatest for :
1) violet light
2) green light
3) yellow light
4) red light
35. The equation of longitudinal wave is represented as $y = 20 \cos \pi (50t - x)$ cm. Then its wavelength is :
1) 120 cm
2) 50 cm
3) 2 cm
4) 5 cm
36. With the increase of temperature, the surface tension of the liquid :
1) may increase or decrease depending on the density of liquid
2) remains the same
3) always increases
4) always decreases
37. A force of $6 \times 10^6 \text{ Nm}^{-2}$ is required for breaking a material. The density ρ of the material is $3 \times 10^3 \text{ kg m}^{-3}$. If the wire is to break under its own weight, the length of the wire made of that material should be :
(take $g = 10 \text{ ms}^{-2}$)
1) 20 m
2) 200 m
3) 100 m
4) 2000 m

38. The escape velocity of a rocket launched from the surface of the earth :
- 1) depends on the mass of the rocket
 - 2) depends on the mass of the planet towards which, it is moving
 - 3) does not depend on the mass of earth
 - 4) does not depend on the mass of rocket
39. A stone is released from a tower, its total energy during its fall :
- 1) increases
 - 2) decreases
 - 3) remains constant
 - 4) first increases then remains constant
40. A ball falls from 20 m height on floor and rebounds to 5 m. Time of contact is 0.02 s. Find acceleration during impact :
- 1) 1200 m/s^2
 - 2) 1000 m/s^2
 - 3) 2000 m/s^2
 - 4) 1500 m/s^2
41. One metre long metal rod of silver at 0°C is heated to 100°C . Its length is increased by 0.19 cm. Coefficient of cubical expansion of the silver rod is :
- 1) $5.7 \times 10^{-5} / ^\circ\text{C}$
 - 2) $0.63 \times 10^{-5} / ^\circ\text{C}$
 - 3) $1.9 \times 10^{-5} / ^\circ\text{C}$
 - 4) $16.1 \times 10^{-5} / ^\circ\text{C}$
42. Two charges are at a distance d apart. If a copper plate of thickness $(d/2)$ is kept between them, the effective force will be :
- 1) $F/2$
 - 2) zero
 - 3) $2 F$
 - 4) $\sqrt{2} F$
43. Bragg's law for X-rays is :
- 1) $n \sin \theta = 2\lambda d$
 - 2) $d \sin \theta = n\lambda$
 - 3) $2d \sin \theta = n\lambda$
 - 4) none of these
44. Two mirrors are placed at right angle to each other. A man is standing between them combing his hair. How many images will he see ?

1) 2

2) 3

3) 1

4) zero

45. We can obtain polarised light with the help of which of the following instrument ?

- 1) Nicol prism
- 2) Biprism
- 3) Polarimeter
- 4) None of these

46. 15 g of ice melts to form water at 0°C. What is the change in entropy ?

- 1) 18.5
- 2) 15
- 3) zero
- 4) None of these

47. A piece of copper and another of germanium are cooled from room temperature to 50 K. The resistance of :

- 1) each of them decreases
- 2) copper decreases and germanium increases
- 3) each of them increases
- 4) copper increases and germanium decreases

48. The threshold wavelength for photoelectrons emission from a material is 5200 Å. Photoelectrons will be emitted when this material is illuminated with monochromatic radiation from a :

- 1) 1 W infrared lamp
- 2) 1 W ultraviolet lamp
- 3) 500 W infrared lamp
- 4) 1000 W infrared lamp

49. A small magnet kept in a non-uniform magnetic field experiences :

- 1) neither a force nor a torque
- 2) a force and a torque
- 3) a torque but not a force
- 4) a force but not a torque

50. In a room containing smoke particles, the intensity due to a source of light will :

- 1) obey the inverse square law
- 2) be constant at all distances
- 3) increase with distance from the source than the inverse fourth power law
- 4) fall faster with distance from source than the inverse fourth power law

51. When a ray of light enters a glass slab from air :

- 1) its wavelength increases
 - 2) neither wavelength nor frequency changes
 - 3) its wavelength decreases
 - 4) its frequency increases
52. Saturated vapour is compressed to half its volume without any change in temperature, then the pressure will be :
- 1) doubled
 - 2) halved
 - 3) the same
 - 4) zero
53. The superficial expansivity of a solid is β , then the cubical expansivity is :
- 1) $(2/3) \beta$
 - 2) $(3/2) \beta$
 - 3) 2β
 - 4) 3β
54. When a star approaches the earth, then the spectral lines are shifted towards :
- 1) red end
 - 2) blue end
 - 3) yellow colour
 - 4) green colour
55. A particle is executing SHM at mid point of mean position and extremity. What is the potential energy in terms of total energy (E) ?
- 1) $E/4$
 - 2) $E/16$
 - 3) $E/2$
 - 4) $E/8$
56. In simple harmonic motion, the ratio of acceleration of the particle to its displacement at any time is a measure of :
- 1) spring constant
 - 2) angular frequency
 - 3) $(\text{angular frequency})^2$
 - 4) restoring force
57. In case of steel wire or a metal wire, the elastic limit is reached when :
- 1) the wire just break
 - 2) the load is more than the weight of wire
 - 3) elongation is inversely proportional to the tension
 - 4) none of the above
58. A hole is drilled through the earth along the diameter and a stone is dropped into it. When

the stone is at the centre of earth, it possesses :

- 1) weight
- 2) mass
- 3) acceleration
- 4) potential energy

59. An eraser weighing 1 N is pressed against a vertical black board with a normal force of 5 N. The coefficient of friction μ between eraser and black board is approximately 0.4. The force along the black board required to move the eraser is :

- 1) 2 N
- 2) 0.4 N
- 3) 2.4 N
- 4) 9.8 N

60. A ball of mass 0.12 kg is being whirled in a horizontal circle at the end of string 0.5 m long. It is capable of making 231 revolutions in one minute. The breaking tension of the string is :

- 1) 3 N
- 2) 15.1 N
- 3) 31.5 N
- 4) 35.1 N

61. It is possible to hear beats from the two vibrating sources of frequencies :

- 1) 1000 Hz and 1500 Hz
- 2) 400 Hz and 500 Hz
- 3) 100 Hz and 150 Hz
- 4) 20 Hz and 25 Hz

62. Force between two plates of a capacitor is :

- 1) $q^2/2\epsilon_0 A$
- 2) $q^2/\epsilon_0 A$
- 3) $q/\epsilon_0 A$
- 4) none of these

63. A transistor can be used as an amplifier when :

- 1) emitter is forward biased and collector is reverse biased
- 2) both are reverse biased
- 3) both emitter and collector are forward biased
- 4) none of the above

64. A wire of length l and resistance R is stretched to get the radius of cross-section $(r/2)$. Then the new value of R is :

- 1) 16R 2) 4R 3) 8R 4) 5R

65. Calcium plate has maximum possible radiation of wavelength λ of 400 nm to eject electrons. Its work function is :

- 1) 2.3 eV
2) 3.1 eV
3) 4.5 eV
4) none of these

66. If one face of prism is silvered having prism angle 30° and $\mu = \sqrt{2}$. What will be the angle of incidence, so that the incident ray retraces its path ?

- 1) 30° 2) 60° 3) 90° 4) 45°

67. Mass number of nucleus is :

- 1) always less than its atomic number
2) always more than its atomic number
3) sometimes more than atomic number exceptionally equal to its atomic number
4) always equal to its atomic number

68. A $1\mu\text{F}$ capacitor is charged to 50 V potential difference and then discharged through a 10 mH inductor of negligible resistance. The maximum current in the inductor will be :

- 1) 0.5 A
2) 1.6 A
3) 0.16 A
4) 1.0 A

69. A 100 W bulb working on 200 V has resistance R and a 200 W bulb working on 100 V has resistance S, then R/S is :

- 1) 1/8 2) 1/4 3) 8 4) 4

70. Dimensions of capacitance is :

- 1) $[\text{M}^{-1}\text{L}^{-2}\text{T}^4\text{A}^2]$
2) $[\text{MLT}^{-3}\text{A}^{-1}]$
3) $[\text{ML}^2\text{T}^{-3}\text{A}^{-1}]$
4) $[\text{M}^{-1}\text{L}^{-2}\text{T}^3\text{A}^{-1}]$

71. In a mechanical refrigerator, the low temperature coils are at a temperature of -23°C and the compressed gas in the condenser has a temperature of 27°C . The theoretical coefficient of performance is :

- 1) 5 2) 8 3) 6 4) 7

72. The thermal capacity of a body is 80 cal, then its water equivalent is :

- 1) 80 cal/g
- 2) 80 g
- 3) 800 g
- 4) 80 kg

73. A brass disc fits simply in a hole of a steel plate. The disc from the hole can be loosened, if the system :

- 1) first heated then cooled
- 2) first cooled then heated
- 3) is heated
- 4) is cooled

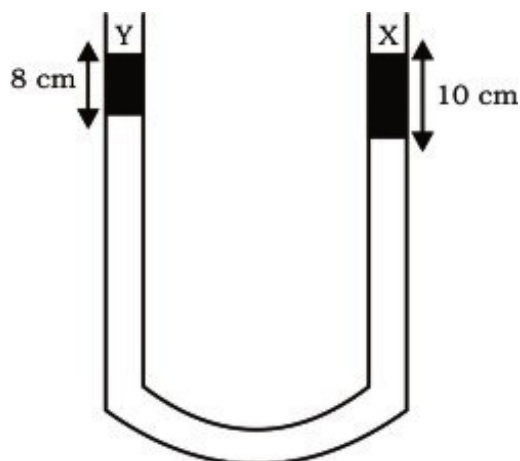
74. Velocity of sound measured in hydrogen and oxygen gas at a given temperature will be in the ratio :

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

75. The amount of the work done in blowing a bubble of radius r and surface tension σ , is :

- 1) σ
- 2) $4\pi r^2\sigma$
- 3) $8\pi r^2\sigma$
- 4) $6\pi r^2\sigma$

76. A liquid X of density 3.36 g/cm^3 is poured in a U-tube, which contains Hg. Another liquid Y is poured in left arm with height 8 cm, upper levels of X and Y are same. What is density of Y ?



- 1) 0.8 g/cc
- 2) 1.2 g/cc
- 3) 1.4 g/cc
- 4) 1.6 g/cc

77. For a given material, the Young's modulus is 2.4 times that of rigidity modulus, then poisson's ratio is :
- 1) 0.2 2) 0.4 3) 1.2 4) 2.4
78. When a body is supposed to be falling under gravity, its acceleration depends upon mass of :
- 1) both the earth and the body
2) the body but independent of mass of earth
3) the earth
4) the body
79. In BJT, maximum current flows in which of the following ?
- 1) Emitter region
2) Base region
3) Collector region
4) Equal in all the regions
80. A ball thrown vertically upwards with an initial velocity 1.4 ms^{-1} returns in 2 s. The total displacement of the ball is :
- 1) 22.4 m
2) zero
3) 44.8 m
4) 33.6 m
81. In double slit experiment, the angular width of the fringes is 0.20° for the sodium light ($\lambda = 5890 \text{ \AA}$). In order to increase the angular width of the fringes by 10%, the necessary change in wavelength is :
- 1) zero
2) increased by 6479 \AA
3) decreased by 589 \AA
4) increased by 589 \AA
82. A convex lens has mean focal length of 20 cm. The dispersive power of the material of the lens is 0.02. The longitudinal chromatic aberration for an object at infinity is :
- 1) 10^3
2) 0.80
3) 0.40
4) 0.20
83. 1 mg gold undergoes decay with 2.7 days half-life period, amount left after 8.1 days is :
- 1) 0.125 mg

- 2) 0.5 mg
- 3) 0.25 mg
- 4) 0.91 mg

84. A planet have same density and same acceleration due to gravity as of earth and universal gravitational constant G is twice of earth, the ratio of their radii is :

- 1) 1 : 4
- 2) 1 : 5
- 3) 1 : 2
- 4) 3 : 2

85. If refractive index of glass is 1.50 and of water is 1.33, then critical angle is :

- 1) $\sin^{-1}\left(\frac{8}{9}\right)$
- 2) $\sin^{-1}\left(\frac{2}{3}\right)$
- 3) $\cos^{-1}\left(\frac{8}{9}\right)$
- 4) none of these

86. If an object subtends an angle of 2° at eye when seen through telescope having objective and eye-piece of focal length $f_o = 60$ cm and $f_e = 5$ cm respectively, then angle subtend at eye-piece is :

- 1) 10°
- 2) 24°
- 3) 50°
- 4) 10°

87. The ionisation potential of mercury is 10.39 V. How far an electron must travel in an electric field of 1.5×10^6 V/m to gain sufficient energy to ionise mercury ?

- 1)
- 2) $\frac{10.39}{1.6 \times 10^{-19}} \text{ m}$
- 3) $\frac{10.39 \times 1.6 \times 10^{-19}}{2 \times 1.6 \times 10^{-19}} \text{ m}$
- 4) $2 \times 1.6 \times 10^{-19} \text{ m}$

88. A straight wire conductor of length l of 0.4 m is moving with a speed v of 7 m/s perpendicular to a magnetic field B of intensity 0.9 Wb/m^2 . The induced emf across the conductor is :

- 1) 2.52 V
- 2) 25.2 V
- 3) 5.26 V
- 4) 1.26 V

89. It takes 12 min to boil 1 L of water in an electric kettle. Due to some defect it becomes necessary to remove 20% turns of the heating coil of the kettle. After repair, how much time will it take to boil 1 L of water ?
- 1) 9.6 min
 - 2) 14.4 min
 - 3) 16.8 min
 - 4) 18.2 min
90. Electromagnetic radiation consists of photons which have the greatest energy is :
- 1) radiowaves
 - 2) γ -rays
 - 3) visible light
 - 4) X-ray
91. Sound waves from whistle of frequency 1100 Hz reaches a point by two different paths. When the paths differ by 0.15 m and 0.45 m, there is a silence at that point. The speed of sound is :
- 1) 1100×0.60 m/s
 - 2) 1100×0.45 m/s
 - 3) 1100×0.30 m/s
 - 4) 1100×0.15 m/s
92. The ratio of radiant energies radiated per unit surface area by two bodies is 16 : 1, the temperature of hotter body is 1000 K, then the temperature of colder body will be :
- 1) 250 K
 - 2) 500 K
 - 3) 1000 K
 - 4) 62.5 K
93. A cylindrical tube closed at one end contains air. It produces the fundamental note of frequency 512 Hz. If the tube is opened at both ends. The fundamental frequency that can be excited is :
- 1) 256 Hz
 - 2) 512 Hz
 - 3) 1024 Hz
 - 4) 128 Hz
94. What is the ratio of most probable speed and average speed in a gas enclosed in a vessel ?
- 1) $2/\sqrt{\pi}$
 - 2) $\sqrt{(\pi)/2}$
 - 3) 1

4) $\sqrt{(\pi)/4}$

95. A block of steel of size 5 cm × 5 cm × 5 cm is weighed in water. If the relative density of steel is 7, its apparent weight is :

- 1) $4 \times 4 \times 4 \times 6g$
- 2) $5 \times 5 \times 5 \times 9g$
- 3) $4 \times 4 \times 4 \times 7g$
- 4) $6 \times 5 \times 5 \times 5g$

96. A coin is of mass 4.8 kg and radius 1 m rolling on a horizontal surface without sliding with angular velocity 600 rot/min. What is total kinetic energy of the coin ?

- 1) 360 J
- 2) $1440 \pi^2 J$
- 3) $4000 \pi^2 J$
- 4) $600 \pi^2 J$

97. 1 N/m is equal to :

- 1) $1 Jm^{-2}$
- 2) $1 Jm^3$
- 3) $1 Jm^2$
- 4) none of these

98. A force F_1 of 500 N is required to push a car of mass 1000 kg slowly at constant speed on a levelled road. If a force F_2 of 1000 N is applied, the acceleration of the car will be :

- 1) zero
- 2) $1.5 m/s^2$
- 3) $1.0 m/s^2$
- 4) $0.5 m/s^2$

99. A particle of mass 0.2 kg tied at the end of a spring is being rotated along a vertical circle of radius 0.5 m at critical speed of 5 m/s. The tension T in the string at the highest point of its path is :

- 1) 8.04 N
- 2) 11.96 N
- 3) 10 N
- 4) 1.96 N

100. The current gain in the common-emitter mode of a transistor is 10. The input impedance is 20 k Ω and load of resistance is 100 k Ω . The power gain is :

- 1) 300
- 2) 500
- 3) 200
- 4) 100

Section-2

Chemistry

101. When phenol and benzene diazonium chloride are coupled, the main product is :

- 1) aniline
- 2) *p*-hydroxy azobenzene
- 3) azobenzene
- 4) chlorobenzene

102. pH of solution is defined by expression :

- 1) $\log [H^+]$
- 2) $\log \left[\frac{1}{[H^+]} \right]$
- 3) $\frac{1}{\log [H^+]}$
- 4) $\frac{1}{-\log [H^+]}$

103. Heating salicylic acid with acetic anhydride in presence of small quantity of cone. H_2SO_4 , results in the formation of a :

- 1) drug
- 2) dye
- 3) explosive
- 4) resin

104. Haematite is the ore of :

- 1) Pb
- 2) Cu
- 3) Fe
- 4) Au

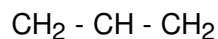
105. Phenol can be converted into salicylic acid by :

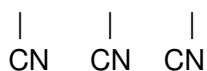
- 1) Etard reaction
- 2) Kolbe's reaction
- 3) Reimer-Tiemann reaction
- 4) Cannizaro's reaction

106. Ethylamine can be prepared by the action of bromine, caustic potash and :

- 1) acetamide
- 2) propionamide
- 3) formamide
- 4) methyl cyanide

107. The IUPAC name of the compound :





- 1) 1, 2, 3-trinitropropane
- 2) 1, 2, 3-tricyanopropane
- 3) 3-cyanopentane-1, 5-dinitrile
- 4) 1, 2, 3-pentanetrinitrile

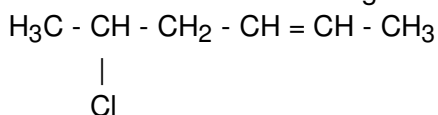
108. Methyl isocyanide on reduction gives :

- 1) dimethylamine
- 2) ethylamine
- 3) methylamine
- 4) trimethylamine

109. Number of neutrons in a parent nucleus X, which gives ${}^7\text{N}^{14}$ after two successive β -emission would be :

- 1) 7
- 2) 6
- 3) 9
- 4) 8

110. IUPAC name of the following compound is :



- 1) 5-chloro heptene
- 2) 4-chloro pent-1-ene
- 3) 5-chloro pent-3-ene
- 4) 5-chloro hex-2-ene

111. In which of the following anti-Markownikoff's addition is possible ?

- 1) $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_3 + \text{HBr} \xrightarrow{\text{Peroxide}}$
- 2) $\text{CH}_3 - \text{CH}_2 - \text{CH} = \text{CH} - \text{CH}_2 - \text{CH}_3 + \text{HBr} \xrightarrow{\text{Peroxide}}$
- 3) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3 - \text{C} = \text{CH}_2 + \text{HBr} \end{array} \xrightarrow{\text{Peroxide}}$
- 4) All of the above

112. A zero order reaction is one whose rate is independent of :

- 1) the concentration of the reactants
- 2) the temperature of the reaction
- 3) the concentration of the product
- 4) the material of the vessel in which the reaction is carried out

113. In Haber's process for the manufacture of NH_3 :

- 1) finely divided nickel is used as a catalyst
 - 2) finely divided iron is used as catalyst
 - 3) finely divided molybdenum is used as a catalyst
 - 4) no catalyst is necessary
114. An indicator for iodine titration is :
- 1) cellulose
 - 2) phenolphthalein
 - 3) starch
 - 4) galactose
115. If international atomic mass of magnesium is 24.3. The mass of one atom of magnesium weighs :
- 1) $40.34 \times 10^{-24} \text{g}$
 - 2) $4.03 \times 10^{-24} \text{g}$
 - 3) $16.6 \times 10^{-2} \text{g}$
 - 4) $1.66 \times 10^{-23} \text{g}$
116. Number of atoms in 4.25g of NH_3 is approximately :
- 1) 1.5×10^{23}
 - 2) 6×10^{23}
 - 3) 1×10^{23}
 - 4) 2×10^{23}
117. Which of the following transition involves maximum amount of energy ?
- 1) $\text{M}^{2+} (\text{g}) \rightarrow \text{M}^{3+} (\text{g})$
 - 2) $\text{M}^+ (\text{g}) \rightarrow \text{M}^{2+} (\text{g})$
 - 3) $\text{M} (\text{g}) \rightarrow \text{M}^+ (\text{g})$
 - 4) $\text{M}^- (\text{g}) \rightarrow \text{M} (\text{g})$
118. The ratio between most probable velocity, mean velocity and rms velocity is :
- 1) $\sqrt{2} : \sqrt{(8/\pi)} : \sqrt{3}$
 - 2) $\sqrt{2} : \sqrt{3} : \sqrt{(8/\pi)}$
 - 3) $1 : 2 : 3$
 - 4) $1 : \sqrt{2} : \sqrt{3}$
119. Size of colloidal particles is in the range :
- 1) $0.05 \text{ m}\mu - 0.1 \text{ m}\mu$
 - 2) $25 \mu - 30 \mu$
 - 3) $0.1 \mu - 1 \text{ m}\mu$

- 4) $10 \mu - 20 \mu$
120. Which one of the following is smallest in size ?
- 1) N^{3-}
 - 2) O^{2-}
 - 3) Na^+
 - 4) F^-
121. Na^+ , Mg^{2+} , Al^{3+} and Si^{4+} ions are isoelectronic. The value of ionic radii of these ions would be in the order :
- 1) $Na^+ > Mg^{2+} > Al^{3+} > Si^{4+}$
 - 2) $Na^+ < Mg^{2+} < Al^{3+} < Si^{4+}$
 - 3) $Na^+ > Mg^{2+} > Al^{3+} < Si^{4+}$
 - 4) $Na^+ < Mg^{2+} > Al^{3+} > Si^{4+}$
122. Brass contains :
- 1) Cu + Zn
 - 2) Cu + Sn
 - 3) Cu + Ni
 - 4) Cu + Zo
123. Benzyl alcohol is obtained from benzaldehyde by :
- 1) Perkin's reaction
 - 2) Wurtz reaction
 - 3) Cannizaro's reaction
 - 4) Claisen's reaction
124. Among the following which compound will show highest lattice energy ?
- 1) KF
 - 2) NaF
 - 3) CsF
 - 4) RbF
125. How many optically active stereoisomers are possible for lactic acid ?
- 1) 1
 - 2) 2
 - 3) 4
 - 4) 3
126. Which of the following is the most soluble ?
- 1) $Mg(OH)_2$
 - 2) $Ba(OH)_2$
 - 3) $Sr(OH)_2$
 - 4) $Be(OH)_2$
127. Optical isomerism is shown by :

- 1) butanol-1
- 2) butanol-2
- 3) 3-pentanol
- 4) 4-heptanol

128. The conjugate base of HBr is :

- 1) H^+
- 2) H_2Br^+
- 3) Br^-
- 4) Br^+

129. Which of the following atoms will contain the least number of neutrons ?

- 1) U^{238}
- 2) U^{239}
- 3) U^{240}
- 4) U^{235}

130. Water is

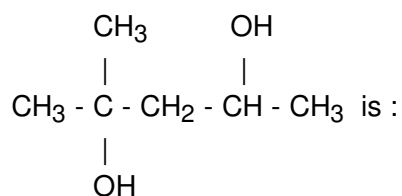
:

- 1) more polar than H_2S
- 2) more or less identical in polarity with H_2S
- 3) less polar than H_2S
- 4) none of the above

131. Geometrical isomers can exist for :

- 1) $CH_3CH(CH_3)CH_2CH_2CH_3$
- 2) $CH_3CH = CHCH_3$
- 3) $CH_3CH = CH_2$
- 4) $ClH_2C - CH_2Cl$

132. The IUPAC name for the following



- 1) 1, 1-dimethyl-1, 3-butanediol
- 2) 2-methyl-2, 4-pentanediol

133. A compound X of formula C_3H_8O yields a ketone C_3H_6O on oxidation. To which of the following classes of compound would X belong ?
- 1) Aldehyde
 - 2) Tertiary alcohol
 - 3) Secondary alcohol
 - 4) Alkene
134. Which one of the following is a natural rubber ?
- 1) Polyisoprene
 - 2) Buna-S
 - 3) Polychloroprene
 - 4) Polybutadiene
135. Butyne-2 contains :
- 1) sp hybridised carbon atoms only
 - 2) sp^3 hybridised carbon atoms only
 - 3) both sp and sp^2 hybridised carbon atoms
 - 4) both sp and sp^3 hybridised carbon atoms
136. Given the reaction at $975^\circ C$ and 1 atm,
 $CaCO_3 \rightarrow CaO(s) + CO_2(g)$;
 $\Delta H = 176 \text{ kJ}$. Then ΔE is equal to :
- 1) 186.4 kJ
 - 2) 162 kJ
 - 3) 165.3 kJ
 - 4) 180 kJ
137. In oxygen difluoride, the oxidation number of oxygen is :
- 1) -2
 - 2) -1
 - 3) +2
 - 4) +1, -2
138. The oxidation number of hydrogen in calcium hydride is :
- 1) -1
 - 2) +1
 - 3) -2
 - 4) +2
139. Osmotic pressure of 0.4% urea solution is 1.64 atm and that of 3.42% cane sugar is 2.46 atm. When the above two solutions are mixed, the osmotic pressure of the resulting solution is :
- 1) 0.82 atm
 - 2) 2.46 atm
 - 3) 1.64 atm
 - 4) 4.10 atm
140. 10g of NaCl is dissolved in 10^6 g of the solution. Its concentration is :

- 1) 100 ppm
- 2) 0.1 ppm
- 3) 1 ppm
- 4) 10 ppm

141. How many structural isomers are possible for the compound with molecular formula $C_2H_3Cl_3$?

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

142. Formation of diethyl ether from ethanol is based on a :

- 1) dehydrogenation reaction
- 2) dehydration reaction
- 3) reduction reaction
- 4) oxidation reaction

143. Bohr radius of n th orbit of an atom is given by the expression :

- 1)
- 2) $r = \frac{n^2 h^2}{4\pi^2 m e^2}$
- 3) $r = \frac{nh}{4\pi^2 m Z e^2}$
- 4) $r = \frac{n^2 h^2}{4\pi^2 m Z}$
- $r = \frac{n^2 h^2}{4\pi^2 m e^2 Z}$

144. Given the value of $\Delta H = 177.9$ kJ and $\Delta S = 160.4$ kJ mol⁻¹. For the reaction



at 298 K, the free energy change per mole would be :

- 1) +130.1 kJ
- 2) -130.1 kJ
- 3) -4.90 kJ
- 4) +4.90 kJ

145. The solubility product of $PbCl_2$ is 1.7×10^{-5} . The solubility in mol/L would be :

- 1) 1.62×10^{-4}
- 2) 1.62×10^{-8}
- 3) 1.62×10^{-2}
- 4) 1.62×10^{-6}

146. What is the emf for the given cell

?

Cr | Cr³⁺ (1.0 M) || Co²⁺ (1.0 M) | Co (E° for Cr³⁺ | Cr = -0.74 V and E° for Co²⁺ | Co = 0.28 V)

- 1) -0.46 V
- 2) -1.02 V
- 3) +0.46 V
- 4) 1.66 V

147. Transition elements :

- 1) have low melting point
- 2) exhibit variable oxidation states
- 3) do not form coloured ions
- 4) show inert pair effect

148. For a given alcohol the order of reactivity of halogen acids is :

- 1) HI > HBr > HCl
- 2) HCl > HBr < HI
- 3) HI < HBr < HCl
- 4) HCl < HI < HBr

149. On distillation with Zn dust, phenol gives :

- 1) acetophenone
- 2) benzoic acid
- 3) benzene
- 4) benzophenone

150. Which one of the following alcohols is least soluble in water ?

- 1) CH₃OH
- 2) C₃H₇OH
- 3) C₄H₉OH
- 4) C₁₀H₂₁OH

151. Which one of the following represents correct set of the four quantum numbers for

an

electron in a 4*d* subshell ?

- 1) 4, 2, 1, 0
- 2) 4, 2, 1, -1/2
- 3) 4, 3, 2, + 1/2
- 4) 4, 3, -2, -1/2

152. Which one of the following contains a co-ordinate bond ?

- 3) BaCl_2
- 4) N_2H_5^+

153. Internal energy and pressure of a gas of unit volume are related as :

- 1) $P = 2E$
- 2) $P = (3E/2)$
- 3) $P = (E/2)$
- 4) $P = (2E/3)$

154. An organic compound 'X' (molecular formula $\text{C}_6\text{H}_7\text{O}_2\text{N}$) has six atoms in a ring system, two double bonds and also a nitro group as substituent. 'X' is :

- 1) heterocyclic
- 2) homocyclic and aromatic
- 3) aromatic but not homocyclic
- 4) homocyclic but not aromatic

155. Which one of the following solution has the highest boiling point ?

- 1) 0.1 M BaCl_2
- 2) 0.1 M glucose
- 3) 0.1 M urea
- 4) 0.1 M NaCl

156. The pH of 0.005 molar solution of H_2SO_4 acid is approximately :

- 1) 0.010
- 2) 1
- 3) 2
- 4) 0.005

157. Which of the following ions is most stable ?

- 1) $\text{CH}_3 \overset{+}{\underset{\text{CH}_3}{\text{C}}} - \text{CH}_3$
- 2) $\text{CH}_3\text{CH}_2 \overset{+}{\text{C}} \text{H}_2$
- 3) $\text{CH}_3 \overset{+}{\underset{\text{C}}{\text{C}}} \text{HCH}_2\text{CH}_3$
- 4) None of the above

158. Given that heat of neutralisation of strong acid and strong base as - 57.1 kJ. The heat produced when 0.25 mole of HCl is neutralised with 0.25 mole NaOH in aqueous solution is :

- 1) 14.275 kJ
- 2) 57.1 kJ
- 3) 22.5 kJ
- 4) 28.6 kJ

159. Alkaline KMnO_4 converts ethylene into :
- 1) methanol
 - 2) ethanol
 - 3) ethane
 - 4) ethylene glycol
160. Which one of the following is not an isotope of hydrogen ?
- 1) Deuterium
 - 2) Tritium
 - 3) *Ortho* hydrogen
 - 4) None of these
161. Blue litmus turn red in a solution of pH :
- 1) below 7
 - 2) 7
 - 3) above 7
 - 4) at all pH
162. Maximum ionisation potential is of :
- 1) Ca
 - 2) Na
 - 3) Be
 - 4) Mg
163. Strongest acid among the following is :
- 1) CCl_3COOH
 - 2) CH_3COOH
 - 3) CF_3COOH
 - 4) CBr_3COOH
164. Which molecule is planar ?
- 1) SF_4
 - 2) XeF_4
 - 3) NF_3
 - 4) SiF_4
165. A certain radioactive isotope has a half-life of 50 days. Fraction of the material left behind after 100 days will be :
- 1) 125%
 - 2) 25%
 - 3) 50%
 - 4) 75%
166. The rms speed at NTP of a gas can be calculated from the expression :
- 1) $\sqrt{(3P/d)}$
 - 2) $\sqrt{(3PV/M)}$
 - 3) $\sqrt{(3RT/M)}$

- 4) all of these
167. Number of moles of NaOH present in 2 L of 0.5 M NaOH is :
1) 1.5 2) 2.0 3) 1.0 4) 2.5
168. The molar solution of H_2SO_4 is equal to :
1) N/2 solution
2) N solution
3) 2N solution
4) 3N solution
169. Point out the false statement :
1) The colloidal solution of a liquid in liquid is called gel
2) Hardy-Schulze rule is related with coagulation
3) Brownian movement and Tyndall effect are shown by colloidal system
4) Gold number is a measure of the protective power of lyophilic colloid
170. The equilibrium constant for a reaction $\text{A} + 2\text{B} \rightleftharpoons 2\text{C}$ is 40. The equilibrium constant for reaction $\text{C} \rightleftharpoons \text{B} + (1/2)\text{A}$ is :
1) 40
2) $[1/40]^2$
3) 1/40
4) $1/[40]^{1/2}$
171. In the reaction $2\text{A} + \text{B} \rightarrow \text{A}_2\text{B}$, if the concentration of A is doubled and that of B is halved, then the rate of the reaction will :
1) increase 2 times
2) increase 4 times
3) decrease 2 times
4) remains the same
172. Correct order among the following is :
1) 1 erg > 1 J > 1 cal
2) 1 cal > 1 J > 1 erg
3) 1 erg > 1 cal > 1 J
4) 1 J > 1 cal > 1 erg
173. A buffer solution is prepared by mixing 10 mL of 1.0 M CH_3COOH and 20 mL of 0.5 M CH_3COONa and then diluted to 100 mL with distilled water. If pK_a of CH_3COOH is 4.76, what is the pH of the buffer solution ?
1) 5.8 2) 4.34 3) 5.21 4) 4.76

174. The volatile metal is :
1) Fe 2) Zn 3) Cu 4) Ag
175. Gypsum on heating at 120-130° C gives :
1) anhydrous salt
2) hemihydrate
3) monohydrate
4) dihydrate
176. Which of the following metals shows allotropy ?
1) Ca 2) Pb 3) Sn 4) K
177. O₂, N₂ are present in the ratio of 1 : 4 by weight. The ratio of number of molecules is :
1) 7 : 32
2) 1 : 4
3) 2 : 1
4) 4 : 1
178. Chlorine upon reaction with NaOH in cold yields :
1) NaCl, NaClO, H₂O
2) NaCl, NaClO₃, H₂O
3) NaClO, NaClO₃, H₂O
4) NaCl, H₂O
179. Ferrius's salt is :
1) NaCl
2) HF
3) KHF₂
4) KClO₃
180. Which of the following is least polarisable ?
1) Ne 2) He 3) Xe 4) Kr
181. Which of the following configuration is correct for iron ?
1) 1s² 2s²2p⁶ 3s²3p⁶3d⁴
2) 1s² 2s²2p⁶ 3s²3p⁶ 4s²3d⁶
3) 1s² 2s²2p⁶ 3s²3p⁶3d²
4) 1s² 2s²2p⁶ 3s²3p⁶ 4s²3d²

182. Prussian blue is :

- 1) $K_2Fe[Fe(CN)_6]$
- 2) $K_4[Fe(CN)_6]$
- 3) $Fe_4[Fe(CN)_6]_3$
- 4) $K_3[Fe(CN)_6]$

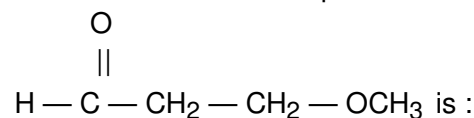
183. Among $[Ni(CO)_4]$, $[Ni(CN)_4]^{2-}$ and $[NiCl_4]^{2-}$:

- 1) $[Ni(CO)_4]$ and $[Ni(CN)_4]^{2-}$ are diamagnetic and $[NiCl_4]^{2-}$ is paramagnetic
- 2) $[Ni(CO)_4]$ is diamagnetic and $[NiCl_4]^{2-}$ and $[Ni(CN)_4]^{2-}$ are paramagnetic
- 3) $[NiCl_4]^{2-}$ and $[Ni(CN)_4]^{2-}$ are diamagnetic and $[Ni(CO)_4]$ is paramagnetic
- 4) $[Ni(CO)_4]$ and $[NiCl_4]^{2-}$ are diamagnetic and $[Ni(CN)_4]^{2-}$ is paramagnetic

184. A mixture of camphor and benzoic acid can be separated by :

- 1) fractional crystallisation
- 2) sublimation
- 3) chemical method
- 4) extraction with solvent

185. IUPAC name of the compound



- 1) 2-methoxy propanal
- 2) methoxy propanal
- 3) 3-methoxy propanal
- 4) 2-formyl methoxy ethane

186. The IUPAC name of the compound



- 1) 3-ethoxy-1-methoxy propane
- 2) 1-ethoxy-3-methoxy propane
- 3) 2, 5-dioxy hexane
- 4) ethoxy propane oxymethane

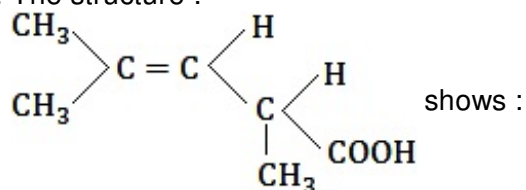
187. Geometrical isomerism can be shown by :

- 1) $>C = N-$
- 2) $-N = N-$
- 3) $>C = C<$
- 4) all of these

188. The number of optical enantiomorphs of tartaric acid is/are :

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

189. The structure :



- 1) tautomerism
2) geometrical isomerism
3) optical isomerism
4) geometrical and optical isomerism
190. The compound most likely to decolourise a solution of alkaline KMnO_4 is :

- 1) $\text{CH}_3\text{CH} = \text{CHCH}_2\text{CH}_2\text{CH}_3$
2) $\text{C}_{10}\text{H}_{22}$
3) $\text{CH}_3 - \text{CH}_3$
4) $(\text{CH}_3)_4\text{C}$

191. Which of the following reactions will yield 2, 2-dibromopropane ?

- 1) $\text{CH}_3\text{CH} = \text{CH}_2 + \text{HBr}$
2) $\text{CH}_3\text{C} \equiv \text{CH} + 2\text{HBr}$
3) $\text{CH}_3\text{CH} = \text{CHCH}_3 + \text{HBr}$
4) $\text{HC} \equiv \text{CH} + 2\text{HBr}$

192. In Friedel-Craft's reactions, besides AlCl_3 , the other reactants are :

- 1) $\text{C}_6\text{H}_6 + \text{NH}_3$
2) $\text{C}_6\text{H}_6 + \text{CH}_4$
3) $\text{C}_6\text{H}_6 + \text{CH}_3\text{Cl}$
4) none of these

193. Aromatisation of *n*-hexane gives :

- 1) cyclohexane
2) benzene
3) cycloheptane
4) toluene

194. AgNO_3 does not give precipitate with chloroform because :

- 1) CHCl_3 does not ionise in water
2) CHCl_3 is insoluble in water

- CHCl_3 is insoluble in water
- 3) AgNO_3 is insoluble in CHCl_3
- 4) CHCl_3 is an organic compound
195. Which of the following reacts with NaOH to give an alcohol ?
- 1) Propene
 - 2) Butene
 - 3) Ethanal
 - 4) Methanal
196. Intramolecular hydrogen bonding is found in :
- 1) *p*-nitrophenol
 - 2) *m*-nitrophenol
 - 3) *o*-nitrophenol
 - 4) phenol
197. The acids which do not contain $-\text{COOH}$ groups are/is :
- 1) palmitic acid
 - 2) lactic acid
 - 3) ethanoic acid
 - 4) picric acid and *p*-toluene sulphonic acid
198. Which of the following compound will show positive silver mirror test ?
- 1) HCOOH
 - 2) $\text{CH}_3(\text{CHOH})_3\text{CHO}$
 - 3) $\text{CH}_3\text{CO}(\text{CHOH})\text{CH}_3$
 - 4) Both (1) and (2)
199. Which is most important polymer ?
- 1) DDT
 - 2) PVC
 - 3) BHC
 - 4) DMF
200. An alkyne has general formula :
- 1) C_nH_{2n}
 - 2) $\text{C}_n\text{H}_{2n+1}$
 - 3) $\text{C}_n\text{H}_{2n+2}$
 - 4) $\text{C}_n\text{H}_{2n-2}$

Section-3

Mathematics

201. A man swims at a speed of 5 km/h. He wants to cross a canal of 120 m wide, in a direction perpendicular to the direction of flow. If the canal flows at 4 km/h, the direction

and the time taken by the man to cross the canal are :

- 1) $\tan^{-1} \frac{3}{4}, 24 \text{ min}$
- 2) $\pi - \tan^{-1} \frac{3}{4}, 144 \text{ s}$
- 3) $\tan^{-1} \frac{1}{2}, 100 \text{ s}$
- 4) none of these

202. If $x = e^y + e^{y+e^y+e^{y+\dots-\infty}}$, then (dy/dx) is equal to :

- 1) $1/x$
- 2) $(x/(1+x))$
- 3) $((1-x)/x)$
- 4) none of these

203. The acceleration of a particle moving in a straight line, at time t is $(2t + 1) \text{ m/s}^2$. If 4 m/s is the initial velocity of the particle, then its velocity after 2 s is :

- 1) 4 m/s
- 2) 8 m/s
- 3) 10 m/s
- 4) none of these

204. If $a + b + c = 0$, then determinant

$$\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix}$$
 is equal to :

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

205. A body of weight 40 kg rests on a rough horizontal plane, whose coefficient of friction is 0.25 . The least force which is acting horizontally would move the body of :

- 1) 40 kg wt
- 2) 20 kg wt
- 3) 35 kg wt
- 4) 10 kg wt

206. If $\frac{\log a}{b+c} = \frac{\log b}{c-a} = \frac{\log c}{a-b}$, then $a^a b^b c^c$ is equal to

- 1) $\frac{\log a}{b+c} = \frac{\log b}{c-a} = \frac{\log c}{a-b}$
- 2) 1
- 3) 2
- 4) none of these

207. The co-ordinates of a point on the parabola $y^2 = 8x$ whose focal distance is 4, is :

- 1) (2, ±4)
- 2) (4, 2)
- 3) (4, -2)
- 4) (2, 4)

208. Three letters are written to different persons and addresses on three envelopes are also written. Without looking at the addresses, the probability that the letters go into the right envelope is :

- 1) 2/3
- 2) 1/28
- 3) 1/27
- 4) 1/9

209. The subtangent, ordinate and subnormal to the parabola $y^2 = 4a x$ at a point different from the origin are in :

- 1) GP
- 2) AP
- 3) HP
- 4) none of these

210. If $\vec{a} = 3\hat{i} - \hat{j} + 2\hat{k}$ and $\vec{b} = 2\hat{i} + \hat{j}$

then $(\vec{a} \times \vec{b}) \cdot \vec{a}$ is equal to :

- 1) 3
- 2) 0
- 3) $3\sqrt{14} \int \frac{\sqrt{\tan x}}{\sin x \cos x}$
- 4) none of these

211. Evaluate $\int \sqrt{\cot x} dx$:

- 1) $\sqrt{(\cot x)} + c$
- 2) $2\sqrt{(\cot x)} + c$
- 3) $\sqrt{(\tan x)} + c$
- 4) $2\sqrt{(\tan x)} + c$

212. Two cars start off to race with velocities u, u' and move with uniform acceleration f, f' ; the result being a dead heat. The time taken by cars is :

- 1) $2 \left(\frac{u + u'}{f + f'} \right)$
- 2) $\frac{5(f + f')}{u'f - uf}$

$$4) 2 \left(\frac{u' - u}{f - f'} \right)$$

213. The difference between the greatest and least values of the function $\phi(x) = \int_0^x (t+1)$

dt on [2, 3] is :

- 1) 3 2) 2 3) 7/2 4) 11/2

214. If the circle $x^2 + y^2 = a^2$ intersects the hyperbola $xy = c^2$ in four points P(x₁, y₁), Q(x₂, y₂),

R(x₃, y₃), S(x₄, y₄) then :

- 1) $x_1 + x_2 + x_3 + x_4 = 1$
 2) $y_1 + y_2 + y_3 + y_4 = 0$
 3) $x_1 x_2 x_3 x_4 = c^3$
 4) $y_1 y_2 y_3 y_4 = c^3$

215. The vector moment about the point $\hat{i} + 2\hat{j} + \hat{k}$

3 $3\hat{j} - 4\hat{k}$ acting at the point $-2\hat{i} + 3\hat{j}$ is : of the resultant of the force $\hat{i} - 2\hat{j} + 5\hat{k}$ and

- 1) $5\hat{i} - \hat{j} - 4\hat{k}$
 2) $3\hat{i} - \hat{j} - 4\hat{k}$
 3) $5\hat{i} + \hat{j} - 4\hat{k}$
 4) none of these

216. _____ is equal to :

- 1) $\tan^{-1} x^2 + c$
 2) $\log (1 + x^4) + c$
 3) $(1/2) \tan^{-1} x^2 + c$
 4) none of these

217. If the intercept made on the line $y = mx$ by lines $y = 2$ and $y = 6$ is less than by 5, then the range of the value of m is :

- 1) $\left(-\infty, -\frac{4}{3} \right) \cup \left(\frac{4}{3}, \infty \right)$
 2) $\left(-\frac{3}{4}, \frac{3}{4} \right)$
 3) _____

218. The equation of the tangent to the curve $y = e^{-|x|}$ at the point where the curve cuts the line $x = 1$ is :
- 1) $e(x + y) = 1$
 - 2) $y + ex = 1$
 - 3) $y + x = e$
 - 4) none of these
219. Let $z = 1 - t + i\sqrt{t^2 + t + 2}$, where t is a real parameter. The locus of z in the argand plane is :
- 1) an ellipse
 - 2) a hyperbola
 - 3) a straight line
 - 4) none of these
220. Differential equation for $y = A \cos \alpha x + B \sin \alpha x$ where A and B are arbitrary constants, is :
- 1) $\frac{d^2y}{dx^2} - \alpha^2y = 0$
 - 2) $\frac{d^2y}{dx^2} - \alpha y = 0$
 - 3) $\frac{d^2y}{dx^2} + \alpha y = 0$
 - 4) $\frac{d^2y}{dx^2} + \alpha^2y = 0$
221. A billiard ball collides directly with another ball of same mass having in rest. If the coefficient of restitution is e , then ratio of their velocities will be :
- 1) $2 - e : 2 + e$
 - 2) $1 - e : 1 + e$
 - 3) $1 - e^2 : 1 + e^2$
 - 4) $(e/(1 + e)) : (e/(1 - e))$
222. From the gun cartridge of mass M , a fire arm of mass m with velocity u relative to gun cartridge is fired. The real velocities of fire arms and gun cartridge will be respectively :
- 1) $\frac{Mu}{M + m}, \frac{mu}{M + m}$
 - 2) $\frac{Mu}{M + m}, \frac{mu}{M + m}$
 - 3) $\frac{Mu}{u(M + m)}, \frac{Mu}{u(M + m)}$
 - 4) none of the above

223. Is the equation
 $(ab + ca + bc) \sin \theta = 2(a^2 + b^2 + c^2)$
 possible for real values of a, b, c ?
- 1) possible
 - 2) not possible
 - 3) insufficient data
 - 4) none of these
224. The equation $3 \sin^2 x + 10 \cos x - 6 = 0$ is satisfied, if :
- 1) $x = n \pi \pm \cos^{-1} (1/3)$
 - 2) $x = 2n \pi \pm \cos^{-1} (1/3)$
 - 3) $x = n \pi \pm \cos^{-1} (1/6)$
 - 4) $x = 2n \pi \pm \cos^{-1} (1/6)$
225. A train whose mass is 16 metric tons, moves at the rate of 72 km/h. After applying brakes it stops at a distance of 500 m. What is the force exerted by brakes, obtaining it to be uniform ?
- 1) 800 N
 - 2) 1600 N
 - 3) 3200 N
 - 4) 6400 N
226. Six girls are entering in a dance room with 10 boys to form a circle so that every girl is in between two boys, then the probability of doing so, such that two specified boy remains together, is :
- 1) $4/15$
 - 2) $7/15$
 - 3) $2/15$
 - 4) none of these
227. If $1, \omega, \omega^2, \dots, \omega^{n-1}$ are the n roots of unity, then :
 $(1 - \omega) (1 - \omega^2) \dots (1 - \omega^{n-1})$ equals :
- 1) 0
 - 2) 1
 - 3) n
 - 4) n^2
228. The number of common tangent to the circles $(x + 1)^2 + (y + 4)^2 = 40$ and $(x - 2)^2 + (y - 5)^2 = 10$ are :
- 1) 1
 - 2) 2
 - 3) 3
 - 4) 4
229. If $f(x) = x^x$, then $f(x)$ is decreasing in interval :
- 1) $]0, e[$

- 2) $]0, (1/e)[$
- 3) $]0, 1[$
- 4) none of these

230. The angle between the vectors $2\hat{i} + 3\hat{j} + \hat{k}$ and $2\hat{i} - \hat{j} - \hat{k}$ is :

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

231. A man falls vertically under gravity with a box of mass m on his head then the reaction force is :

- 1) mg
- 2) $2 mg$
- 3) zero
- 4) $1.5 mg$

232. The value of $\int_0^{100} [\sqrt{x}] dx$ is equal to : (where $[.]$ is the greatest integer)

- 1) 400
- 2) 600
- 3) 415
- 4) 615

233. If $\frac{5 + 9 + 13 + \dots n \text{ terms}}{7 + 9 + 11 + \dots (n + 1) \text{ terms}} = \frac{17}{16}$ then n is equal to :

- 1) 7
- 2) 12
- 3) 8
- 4) none of these

234. The value of the determinant

$$\begin{vmatrix} 1 & a & a^2 \\ \cos(n-1)x & \cos nx & \cos(n+1)x \\ \sin(n-1)x & \sin nx & \sin(n+1)x \end{vmatrix} \text{ is zero, if :}$$

- 1) $\sin x = 0$
- 2) $\cos x = 0$
- 3) $a = 0$
- 4) $\cos x = ((1 + a^2)/2a)$

235. If in a triangle ABC, $\sin A, \sin B, \sin C$ are in AP, then :

- 1) the altitudes are in AP
- 2) the altitudes are in HP
- 3) the altitudes are in GP

4) none of the above

236. A variable chord is drawn through the origin to the circle $x^2 + y^2 - 2ax = 0$. The locus of the centre of the circle drawn on this chord as diameter is :

1) $x^2 + y^2 + ax = 0$

2) $x^2 + y^2 + ay = 0$

3) $x^2 + y^2 - ax = 0$

4) $x^2 + y^2 - ay = 0$

237. The straight lines $x + y = 0$, $3x + y - 4 = 0$ and $x + 3y - 4 = 0$ form a triangle which is

:

1) isosceles

2) right angled

3) equilateral

4) none of these $\vec{u} \vec{v} \vec{w}$

remaining three ?

1) $\vec{u} \cdot (\vec{v} \times \vec{w})$

2) $(\vec{v} \times \vec{w}) \cdot \vec{u}$

3) $\vec{v} \cdot (\vec{u} \times \vec{w})$

4) $(\vec{u} \times \vec{v}) \cdot \vec{u}$

239. $\int [f(x) g''(x) - f''(x) g(x)] dx$ is equal to :

1) $f(x) / g'(x)$

2) $f'(x) g(x) - f(x) g'(x)$

3) $f(x) g'(x) - f'(x) g(x)$

4) $f(x) g'(x) + f'(x) g(x)$

240. $\int \frac{x e^x}{(1+x)^2} dx$ is equal to :

1) $\frac{e^x}{x+1} + c$

2) $\frac{x+1}{e^{x(x+1)}} + c$

3) $\frac{-e^x}{(x+1)^2} + c$

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

241. The top of a hill observed from the top and bottom of a building of height h is at angles of

elevation p and q respectively. The height of the hill is :

- 1) $\frac{h \cos q}{\cot q - \cot p}$
- 2) $\frac{h \cot p}{\cot p - \cot q}$
- 3) $\frac{h \tan p}{\cot p - \cot q}$
- 4) none of these

242. The probability that in a random arrangement of the letters of the word 'UNIVERSITY', the two I's do not come together is :

- 1) $\frac{4}{5}$
- 2) $\frac{1}{5}$
- 3) $\frac{1}{10}$
- 4) $\frac{9}{10}$

243. If \vec{a} and \vec{b}

are two vectors such that $\vec{a} \times \vec{b} = \vec{a} \cdot \vec{b}$ = 0, then :

- 1) a is equal to zero
- 2) b is equal to zero
- 3) either a or b is zero
- 4) both a and b are necessarily zero

244. If $(1 + i)(1 - 2i)(1 - 3i) \dots (1 - ni) = \alpha - i\beta$, then $\alpha^2 + \beta^2$ equals :

- 1) $1 \cdot 2 \cdot 3 \dots n$
- 2) $1^2 \cdot 2^2 \cdot 3^2 \dots n^2$
- 3) $1^2 + 2^2 + 3^2 + \dots n^2$
- 4) $2 \cdot 5 \cdot 10 \dots (n^2 + 1)$

245. If $f(x) = ax + b$ and $g(x) = cx + d$, then $f[g(x)] = g[f(x)]$ is equivalent to :

- 1) $f(a) = g(c)$
- 2) $f(b) = g(d)$
- 3) $f(d) = g(b)$
- 4) $f(c) = g(a)$

246. A rough plane is inclined at an angle α to the horizon. A body is just to slide due to its own weight. The angle of friction would be :

- 1) $\tan^{-1} \alpha$
- 2) α
- 3) $\tan \alpha$
- 4) 2α

247. If $f(x) = \frac{a}{x} + x^2$, then $f(x)$ has maximum value at $x = 3$, then :

- 1) $a < -27$

- 2) $a > -27$
- 3) $a > 27$
- 4) $a < 27$

248. If $a + b + c = 0$, $|a| = 3$, $|b| = 5$, $|c| = 7$ then the angle between a and b is equal to :

- 1) $\pi/6$
- 2) $2\pi/3$
- 3) $5\pi/3$
- 4) $\pi/3$

249. A bag contains 4 red, 6 white and 5 black balls. 2 balls are drawn at random. Find the probability of getting one red and one white ball is :

- 1) $2/3$
- 2) $4/35$
- 3) $15/10$
- 4) $8/35$

250. In two events $P(A \cup B) = (5/6)$,
 $P(\bar{A}) = (5/6)$, $P(B) = (2/3)$ then A and B are :

- 1) independent
- 2) mutually exclusive
- 3) mutually exhaustive
- 4) dependent

251. If $P(\text{not } A) = 0.7$, $P(B) = 0.7$ and $P(B/A) = 0.5$, then $P(A/B)$ equals :

- 1) $3/13$
- 2) $3/14$
- 3) $1/12$
- 4) none of these

252.

If $\begin{vmatrix} p & q-y & r-z \\ p-x & q & r-z \\ p-x & q-y & r \end{vmatrix} = 0$, then the value of $\frac{p}{x} + \frac{q}{y} + \frac{r}{z}$ is

- 1) 0
- 2) 1
- 3) 2
- 4) $4 pqr$

253. Let $f : R \rightarrow R$ be a function defined by $f(x) = ((x - m)/(x - n))$, where $m \neq n$, then :

- 1) f is one-one onto
- 2) f is one-one into
- 3) f is many-one onto
- 4) f is many-one into

254. The sum of the series $1 + \frac{1.3}{6} + \frac{1.3.5}{6.8} + \dots \infty$ is :

255. The locus of the pole of normal chords of an ellipse is given by :

1) $\frac{a^6}{x^2} + \frac{b^6}{y^2} = (a^2 - b^2)^2$

2) $\frac{a^3}{x^2} + \frac{b^3}{y^2} = (a^2 - b^2)^2$

3) $\frac{a^6}{x^2} + \frac{b^6}{y^2} = (a^2 + b^2)^2$

4) $\frac{a^3}{x^2} + \frac{b^3}{y^2} = (a^2 + b^2)^2$

256. A body is projected through an angle α from vertical so that its range is half of maximum range. Value of α is :

1) 60°

2) 75°

3) 30°

4) 22.4°

257. The sum of the magnitudes of two forces acting at a point is 18 and magnitudes of their resultant is 12. If the resultant is at 90° with the force of smaller magnitude, then their magnitudes are :

1) 3, 15

2) 4, 14

3) 5, 13

4) 6, 12

258. To be semigroup the elements of a subset of a group must obey the axioms of :

1) associativity and commutativity

2) closure and identity

3) closure and associativity

4) closure and inverse

259. Let A and B be two events such that, $P(A \cup B) = (5/6)$, $P(A \cap B) = (1/3)$ and $P(\bar{A}) = (1/2)$ then :

1) $P(B) \leq P(A)$

2) $P(A) = P(B)$

3) A and B are independent

4) A and B are mutually exclusive

260. If $z = (\lambda + 3) + i\sqrt{5 - \lambda^2}$, then the locus of z is a :

1) circle

- 3) parabola
4) none of these
261. Let $a > 0$, $b > 0$ and $c > 0$. Then both the roots of the equation $ax^2 + bx + c = 0$:
- 1) are real and negative
 - 2) have negative real parts
 - 3) are rational numbers
 - 4) none of the above
262. If $y = \tan^{-1} (1/(1 + x + x^2)) + \tan^{-1} (1/(x^2 + 3x + 3)) + \tan^{-1} (1/(x^2 + 5x + 7)) + \dots$ upto n terms, then $y' (0)$ is equal to :
- 1) $-(1/(1 + n^2))$
 - 2) $-(n^2/(1 + n^2))$
 - 3) $(n/(1 + n^2))$
 - 4) none of these
263. Each side of an equilateral triangle subtends an angle of 60° at the top of a tower h m high located at the centre of the triangle. If a is the length of each side of the triangle, then :
- 1) $3a^2 = 2h^2$
 - 2) $2a^2 = 3h^2$
 - 3) $a^2 = 3h^2$
 - 4) $3a^2 = h^2$
264. Equation of the tangent to the hyperbola $2x^2 - 3y^2 = 6$ which is parallel to the line $y = 3x + 4$ is :
- 1) $y = 3x + 5$
 - 2) $y = 3x - 5$
 - 3) $y = 3x + 5$ and $y = 3x - 5$
 - 4) none of the above
265. Differential coefficient of $\tan^{-1} \frac{2x}{1-x^2}$ with respect to $\sin^{-1} \frac{2x}{1+x^2}$ will be :
- 1) 1
 - 2) -1
 - 3) -1/2
 - 4) x
266. A particle is moving in a straight line with constant acceleration a . If x is the space described in t seconds and x' is the space described during next t' seconds, then a is equal to :
- 1) $\frac{2}{t+t'} \left(\frac{x}{t} + \frac{x'}{t'} \right)$

$$2) \frac{2}{t+t'} \left(\frac{x'}{t'} - \frac{x}{t} \right)$$

$$3) \frac{2}{t-t'} \left(\frac{x'}{t'} + \frac{x}{t} \right)$$

$$4) \frac{2}{t-t'} \left(\frac{x'}{t'} - \frac{x}{t} \right)$$

267. The numbers P, Q and R for which the function $f(x) = Pe^{2x} + Qe^x + Rx$ satisfies the conditions $f(0) = -1$, $f'(\log 2) = 31$ and $\int_0^{\log 4} [f(x) - Rx] dx = \frac{39}{2}$ are given by :

- 1) P = 2, Q = -3, R = 4
- 2) P = -5, Q = 2, R = 3
- 3) P = 5, Q = -2, R = 3
- 4) P = 5, Q = -6, R = 3

268. $\lim_{x \rightarrow 0} \frac{e^{x^2} - \cos x}{x^2}$ is equal to

- 1) 3/2
- 2) 1/2
- 3) 2/3
- 4) none of these

269. $\lim_{x \rightarrow -2} \frac{(x^2 - x - 6)^2}{(x + 2)^2}$ is

- 1) 6
- 2) 25
- 3) 9
- 4) 16

270. If in a triangle ABC, $\angle B = 60^\circ$, then

- 1) $(a - b)^2 = c^2 - ab$
- 2) $(b - c)^2 = a^2 - bc$
- 3) $(c - a)^2 = b^2 - ac$
- 4) $a^2 + b^2 + c^2 = 2b^2 - ac$

271. The coefficient of the term independent of x in the expansion of

$$\left[\sqrt{\frac{x}{3}} + \frac{3}{2x^2} \right]^{10}$$

is
:

- 1) 5/4

272. A set contains $(2n + 1)$ elements. The number of subsets of the set which contain at most n element, is :

- 1) 2^n
- 2) 2^{n+1}
- 3) $2^n - 1$
- 4) 2^{2n}

273. A unit vector perpendicular to the vector $4\hat{i} - \hat{j} + 3\hat{k}$ and $-2\hat{i} + \hat{j} - 2\hat{k}$ is :

- 1) $(1/3)(\hat{i} - 2\hat{j} + 2\hat{k})$
- 2) $(1/3)(-\hat{i} + 2\hat{j} + 2\hat{k})$
- 3) $(1/3)(2\hat{i} + \hat{j} + 2\hat{k})$
- 4) $(1/3)(2\hat{i} - 2\hat{j} + 2\hat{k})$

274. The radius of the incircle of a triangle whose sides are 18, 24 and 30 cms, is :

- 1) 2 cm
- 2) 4 cm
- 3) 6 cm
- 4) 9 cm

275. The area in the first quadrant bounded by $y = 4x^2$, $x = 0$, $y = 1$ and $y = 4$ is :

- 1) $(7/3)$ sq unit
- 2) $(4/5)$ sq unit
- 3) $(3/4)$ sq unit
- 4) none of these

276. A particle is projected vertically upwards at a height h after t_1 seconds and again after t_2 seconds from the start. Then h is equal to :

- 1) $(1/2)g(t_1 - t_2)$
- 2) $(1/2)g(t_1 + t_2)$
- 3) $(1/2)g t_1 t_2$
- 4) none of these

277. If $\sin \theta + \operatorname{cosec} \theta = 2$, then $\sin^2 \theta + \operatorname{cosec}^2 \theta$ is equal to :

- 1) 1
- 2) 4
- 3) 2
- 4) none of these

278. The value of $\int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$, is :

- 1) $\pi/2$ 2) $\pi/4$ 3) $\pi/8$ 4) $\pi/6$

279. The value of expression

$$1 - \frac{\sin^2 y}{1 + \cos y} + \frac{1 + \cos y}{\sin y} - \frac{\sin y}{1 - \cos y}$$
 is equal to :

- 1) 0
2) 1
3) $-\sin y$
4) $\cos y$

280. If $f(x) = \begin{bmatrix} a & -1 & 0 \\ ax & a & -1 \\ ax^2 & ax & a \end{bmatrix}$, then $f(2x) - f(x)$ equals to :

- 1) $a(2a + 3x)$
2) $ax(2x + 3a)$
3) $ax(2a + 3x)$
4) $x(2a + 3x)$

281. If ω is a non-real cube root of unity, then $\frac{1 + 2\omega + 3\omega^2}{2 + 3\omega + \omega^2} + \frac{2 + 3\omega + 3\omega^2}{3 + 3\omega + 2\omega^2}$ is equal to :

- 1) -2ω 2) 2ω 3) ω 4) 0

282. If in a ΔABC , $(a/\cos A) = (b/\cos B)$, then :

- 1) $\sin^2 A + \sin^2 B = \sin^2 C$
2) $2\sin A \cos B = \sin C$
3) $2\sin A \sin B \sin C = 1$
4) none of the above

283. The graph of the function $y = f(x)$ has a unique tangent at the point $(a, 0)$ through which

the graph passes. Then $\lim_{x \rightarrow a} \left[\frac{\log_e \{1 + 6f(x)\}}{3f(x)} \right]$ is :

- 1) 0
2) 1
3) 2
4) none of these

284. $\lim_{n \rightarrow \infty} \left(1 + \sin \frac{a}{n} \right)^n$ is equal to :

$$\lim_{n \rightarrow \infty} \left(1 + \sin \frac{a}{n} \right)^n$$

- 1) e^a
- 2) e
- 3) e^{2a}
- 4) 0

285. If the equation $ax^2 + 2bx - 3c = 0$ has no real roots and $(3c/4) < a + b$, then :

- 1) $c < 0$
- 2) $c > 0$
- 3) $c \geq 0$
- 4) $c = 0$

286. The line $3x - 4y = \lambda$ touches the circle $x^2 + y^2 - 4x - 8y - 5 = 0$ if the value of λ is :

- 1) -35
- 2) 5
- 3) 20
- 4) 31

287. If $\vec{OA} = 3\hat{i} + 2\hat{j} + \hat{k}$, $\vec{OB} = 3\hat{i} + \hat{j} - 2\hat{k}$, $\vec{OC} = 2\hat{i} - 3\hat{j} + \hat{k}$ then $\vec{AB} \cdot \vec{AC}$

Then $\vec{AB} \cdot \vec{AC}$ is equal to :

- 1) 0
- 2) 17
- 3) 15
- 4) none of these

288. The value of $\tan^2(\sec^{-1} 2) + \cot^2(\operatorname{cosec}^{-1} 3)$ is :

- 1) 15
- 2) 13
- 3) 11
- 4) 10

289. The sum of all proper divisor of 9900 is :

- 1) 29351
- 2) 23951
- 3) 33851
- 4) none of these

290. The combined equation of the pair of lines through the point $(1, 0)$ and parallel to the lines represented by $2x^2 - xy - y^2 = 0$ is :

- 1) $2x^2 - xy - y^2 - 4x - y = 0$
- 2) $2x^2 - xy - y^2 - 4x - y + 2 = 0$
- 3) $2x^2 + xy + y^2 - 2x - y = 0$
- 4) none of the above

291. If a, b, c are in AP, then $(a/bc), (1/c), (2/b)$ are in :

- 1) AP

292. A particle is in equilibrium when the forces

$$\vec{F}_1 = -10\hat{k},$$

$$\vec{F}_2 = (u/13) (4\hat{i} - 12\hat{j} + 3\hat{k}),$$

$$\vec{F}_3 = (v/13) (-4\hat{i} - 12\hat{j} + 3\hat{k}) \text{ and}$$

$$\vec{F}_4 = w (\cos \theta \hat{i} + \sin \theta \hat{j}) \text{ act on it, then :}$$

- 1) $v = (65/3) + 65 \cos \theta$
- 2) $u = 65(1 - 3 \cos \theta)$
- 3) $w = 65 \operatorname{cosec} \theta$
- 4) none of the above

293. There are 10 points in a plane out of these 6 are collinear. The number of triangles formed by joining these point is :

- 1) 100
- 2) 120
- 3) 150
- 4) none of these

294. If \vec{x} and \vec{y} are two unit vectors and ϕ is the angle between them, then $(1/2) |\vec{x} \times \vec{y}|$ is equal to :

- 1) 0
- 2) $\pi/2$
- 3) $\sin (\phi/2)$
- 4) $\cos (\phi/2)$

295. If \vec{a} , \vec{b} and \vec{c} are three non-coplanar vectors, then $(\vec{a} + \vec{b} + \vec{c}) \cdot (\vec{a} + \vec{b}) \times (\vec{a} + \vec{c})$ is equal to

- 1) 0
- 2) $[\vec{a} \vec{b} \vec{c}]$
- 3) $2[\vec{a} \vec{b} \vec{c}]$
- 4) $-[\vec{a} \vec{b} \vec{c}]$

296. The coefficient of x^5 in the expansion of $(1 + x^2)^5 (1 + x)^4$ is :

- 1) 30
- 2) 60
- 3) 40
- 4) none of these

297. The function $f(x) = x^3 - 3x$ is :

- 1) increasing on $(-\infty, -1) \cup (1, \infty)$ and decreasing on $(-1, 1)$
- 2) decreasing on $(-\infty, -1) \cup (1, \infty)$ and increasing on $(-1, 1)$

- 3) increasing on $(0, \infty)$ and decreasing on $(-\infty, 0)$
4) decreasing on $(0, \infty)$ and increasing on $(-\infty, 0)$
298. A man in a balloon rising vertically with an acceleration of 4.9 m/s^2 , releases a ball 2 s after the balloon is let go from the ground. The greatest height above the ground reached by the ball, is :
- 1) 19.6 m
2) 14.7 m
3) 9.8 m
4) 24.5 m
299. A bag contain $n + 1$ coins. It is known that one of these coins shows heads on both sides, whereas the other coins are fair. One coin is selected at random and tossed. If the probability that toss results in heads is $(7/12)$, then the value of n is :
- 1) 3
2) 4
3) 5
4) none of these
300. If $\phi(x) = \int_{1/x}^{\sqrt{x}} \sin t^2 dt$, then $\phi'(1)$ is equal to :
- 1) $\sin 1$
2) $2 \sin 1$
3) $(3/2) \sin 1$
4) none of these

Answer Key

1) 1	2) 2	3) 4	4) 2	5) 2	6) 3	7) 2	8) 1	9) 1	10) 2
11) 3	12) 3	13) 2	14) 1	15) 1	16) 2	17) 4	18) 4	19) 4	20) 3
21) 4	22) 1	23) 1	24) 1	25) 2	26) 1	27) 1	28) 4	29) 4	30) 3
31) 3	32) 2	33) 1	34) 1	35) 3	36) 4	37) 2	38) 4	39) 3	40) 4
41) 1	42) 2	43) 3	44) 2	45) 1	46) 1	47) 2	48) 2	49) 2	50) 4
51) 3	52) 3	53) 2	54) 2	55) 1	56) 3	57) 4	58) 2	59) 1	60) 4
61) 4	62) 2	63) 1	64) 1	65) 2	66) 4	67) 3	68) 1	69) 3	70) 1
71) 1	72) 2	73) 4	74) 4	75) 3	76) 1	77) 1	78) 3	79) 1	80) 2
81) 4	82) 3	83) 1	84) 3	85) 1	86) 2	87) 4	88) 1	89) 1	90) 2
91) 3	92) 2	93) 3	94) 2	95) 4	96) 2	97) 1	98) 4	99) 1	100) 2
101) 2	102) 2	103) 1	104) 3	105) 2	106) 2	107) 3	108) 1	109) 3	110) 4
111) 3	112) 1	113) 2	114) 3	115) 1	116) 2	117) 1	118) 1	119) 3	120) 3
121) 1	122) 1	123) 3	124) 2	125) 2	126) 2	127) 2	128) 3	129) 4	130) 1
131) 2	132) 2	133) 3	134) 1	135) 4	136) 3	137) 3	138) 1	139) 4	140) 1
141) 2	142) 2	143) 4	144) 1	145) 3	146) 3	147) 2	148) 1	149) 3	150) 4
151) 2	152) 4	153) 4	154) 4	155) 1	156) 3	157) 1	158) 1	159) 4	160) 3
161) 1	162) 3	163) 3	164) 2	165) 2	166) 4	167) 3	168) 1	169) 1	170) 4
171) 1	172) 2	173) 4	174) 2	175) 2	176) 3	177) 1	178) 1	179) 3	180) 2
181) 2	182) 3	183) 1	184) 3	185) 3	186) 1	187) 4	188) 4	189) 3	190) 1
191) 2	192) 3	193) 2	194) 1	195) 4	196) 3	197) 4	198) 4	199) 2	200) 4
201) 2	202) 3	203) 3	204) 1	205) 4	206) 2	207) 1	208) 1	209) 1	210) 4
211) 4	212) 4	213) 3	214) 2	215) 1	216) 3	217) 2	218) 4	219) 2	220) 4
221) 2	222) 1	223) 2	224) 2	225) 4	226) 3	227) 3	228) 3	229) 2	230) 1
231) 3	232) 4	233) 1	234) 1	235) 2	236) 3	237) 1	238) 4	239) 3	240) 1
241) 2	242) 1	243) 3	244) 4	245) 3	246) 2	247) 1	248) 2	249) 4	250) 2
251) 2	252) 3	253) 2	254) 4	255) 1	256) 2	257) 3	258) 3	259) 3	260) 1
261) 2	262) 2	263) 2	264) 3	265) 1	266) 2	267) 4	268) 1	269) 2	270) 3
271) 1	272) 4	273) 2	274) 3	275) 1	276) 3	277) 3	278) 2	279) 4	280) 3
281) 2	282) 2	283) 3	284) 1	285) 1	286) 1	287) 2	288) 3	289) 2	290) 2
291) 4	292) 1	293) 1	294) 3	295) 4	296) 2	297) 1	298) 2	299) 3	300) 3