Objective Part

1. Computer chips are made of:
(a) Silicon (b) Germanium (c) Carbon (d) Gold

2. Which is not a base unit in SI units?
(a) Kilogram (b) Joule (c) Ampere (d) Kelvin

3. 1 Giga is equal to:
(a) 10^3 (b) 10^6 (c) 10^9 (d) 10^{12}

4. S.I unit of intensity of light is:
(a) Ampere (b) Mole (c) Candela (d) Joule

5. The ratio of 1 nanometer to 1 attometer is:
(a) 10^9 (b) 10^8 (c) 10^{-9} (d) 10^{-8}

6. Which of the following is least multiple?
(a) Pico (b) Femto (c) Nano (d) Atto

7. SI unit of plane angle is:
(a) Radian (b) Degree (c) Sterdian (d) Revolution

8. The SI unit of solid angle is:
(a) Steradian (b) Radian (c) Degree (d) Revolution

9. How many nanometers in a meter?
(a) 10^{19} (b) 10^{-19} (c) 10^9 (d) 10^{-9}

10. Which one of the following is not allowed as standard prefix?
(a) Kilo (b) Nano (c) Mega (d) Micro Micro

11. Kg m-1 s-2 is the unit of:
(a) Force (b) Work (c) Pressure (d) Momentum

12. Physical quantity "pressure" in term of base unit is:
(a) $Kg\ m^{-1}\ s^{-2}$ (b) $Kg\ m^2\ s^{-3}$ (c) $Kg^2\ m^{-2}\ s$ (d) $Kg\ m^1\ s^{-2}$

13. How many seconds are there in one year?
(a) 3.156×10^6 s (b) 3.1536×10^7 s
(c) 3.1536×10^{10} s (d) 3.1536×10^{-7} s

14. 2^o is equal:
(a) 0.035 rad (b) 0.30 rad (c) 0.35 rad (d) 0.0035 rad

15. One radian is equal to:
(a) 77.3° (b) 67.3° (c) 57.3° (d) 47.3°

16. Pascal is the unit of:
(a) Pressure (b) Force (c) Tension (d) Weight

17. Which one of the following is not a unit of energy?
(a) Kilowatt (b) Erg (c) Joule (d) Kilowatt hour

18. One radian is equal to:
(a) 57.3 (b) 67.3 (c) 87.3 (d) 60

19. Zero error of an instrument is a type of:
(a) Systematic error (b) Classified error

20. Least count of meter rod is:

(a) 0.01 cm (b) 0.001 cm (c) 0.1 cm (d) 1 cm

21. Significant figures in 8.70×10^4 kg are:

(a) 2 (b) 3 (c) 4 (d) 5

22. If we round off 64.34546 up to three significant figures, the best answer is:

a. (a) 64.3 (b) 64.4 (c) 64.5 (d) 64.6

23. A precise measurement is the one which has:

(a) Greater precision (b) Less precision

(c) Medium precision (d) More % error

24. For total assessment of uncertainty in the final result obtained by multiplication and division:

(a) Absolute uncertainties are added

(b) Fractional uncertainties are added

(c) % age uncertainties are added

(d) Error are added

25. The time taken by light from moon to earth is:

(a) 1 min 10 sec (b) 1 min 20 sec (c) 1 min 30 sec (d) 1 min 40 sec

26. A measurement taken by vernier callipers with least count as 0.01 cm is recorded as 0.45 cm, it has fractional uncertainty:

(a) 0.01 (b) 0.02 (c) 0.03 (d) 0.45

27. Length of an object is recoded as 25.5 cm by using a meter rod having smallest division in millimetre. The fractional uncertainty is:

(a) 0.400 (b) 2.550 (c) 0.004 (d) 0.100

28. If r = 2.25 ± 0.01 cm then (%) percentage uncertainty in r is:

(a) 0.225% (b) 22.5% (c) 0.2% (d) 0.4%

29. The dimensions of force is:

(a) $[ML^2T^{-2}]$ (b) $[MLT^{-1}]$ (c) $[MLT^{-2}]$ (d) $[ML^2T^{-2}]$

30. Dimensions of coefficient of viscosity are:

(a) $[MLT^{-1}]$ (b) $[ML^1T^1]$ (c) $[ML^1T^2]$ (d) $[M^1L^1T^{21}]$

31. The dimension of angular momentum are:

(a) $[MLT^2]$ (b) $[MLT^1]$ (c) $[ML^2T^1]$ (d) $[ML^2T^2]$

32. The dimension of $\sqrt{\frac{l}{g}}$ is same as that of:

(a) Time (b) Energy (c) Velocity (d) Force

33. The dimension of the relation are equal $\sqrt{\frac{F \times l}{m}}$ to the dimension of:

(a) Force (b) Momentum (c) Acceleration (d) Velocity

34. Light year is the unit of:

(a) Time (b) Distance (c) Energy (d) Torque

35. The dimensions of torque are:

(a) $[MLT^2]$ (b) $[ML^{-1}T^{-2}]$ (c) $[ML^{-1}T^{-1}]$ (d) $[ML^2T^2]$

36. Dimensions of ratio of angular momentum to linear momentum is:

(a) $[M^oLT^o]$ (b) $[M^1LT^1]$ (c) $[M^1L^2T^{-1}]$ (d) $[M^{-1}L^{-1}T^1]$

37. The dimensions of Einstein equation are $E = mc^2$:

(a) $[MLT^{-2}]$ (b) $[ML^{-1}T^{2}]$ (c) $[ML^{2}T^{-2}]$ (d) $[ML^{-2}T^{2}]$

38. Which of the following is correct:

(a) $f = V\lambda$ (b) $f = \frac{V}{\lambda}$ (c) $f = \frac{1}{V\lambda}$ (d) $f = \frac{\lambda}{V}$

39. The dimensions of pressure are:

(a) $[MLT^{2}]$ (b) $[ML^{2}T^{2}]$ (c) $[ML^{-1}T^{2}]$ (d) $[MLT^{-3}]$

40. The resultant of two forces 30 N and 40 N acting parallel to each other is:

(A) 30 N (B) 40 N (C) 70 N (D) 10 N 2015

41. The resultant of two vectors having magnitude 12 N and 8 N cannot be:

(A) 2N (B) 20 N (C) 10 N (D) 16 N

42. If $\vec{B} = 4\hat{i} + 5\hat{k}$, then its magnitude will be:

(A) 9 (B) $\sqrt{41}$ (C) 7 (D) 3

43. A force of 10 N makes an angle 30° with y-axis. Then magnitude of x-component is:

(A) 5N (B) 8.66 N (C) 10N (D) Zero

44. The position vector $\hat{r}$ in xz - plane is:

(A) $v\hat{i} + z\hat{k}$ (B) $x\hat{i} + y\hat{k}$ (C) $x\hat{i} + z\hat{k}$ (D) $x\hat{i}+y\hat{k}+z\hat{k}$

45. Unit vector of a given vector $\vec{A} = 4\hat{i} + 3\hat{j}$ is:

(A) $\frac{4\hat{i}+3\hat{j}}{25}$ (B) 1 (C) $\frac{4\hat{i}+3\hat{j}}{5}$ (D) $\frac{\sqrt{4\hat{i}+3\hat{j}}}{5}$

46. Rectangular components have angle between them is:

(A) 30° (B) 45° (C) 60° (D) 90°

47. Which of the following is the only scalar quantity?

(A) Energy (B) Velocity (C) Force (D) Torque

48. Resultant of two perpendicular vectors of equal magnitude (say $\vec{A}$) will be:

(A) $\vec{A}$ (B) $2\vec{A}$ (C) $\sqrt{2}\vec{A}$ (D) $\vec{A}^2$

49. The magnitude of the resultant of two forces 6 N and 8 N acting at right angle is:

(A) 6N (B) 10N (C) 14 N (D) 16 N

50. The reverse process of vector addition is called:

(A) Subtraction of vectors (B) Resolution of a vector

(C) Negative of a vector (D) Multiplication of a vector

51. The resultant of 120 N and 20 N forces can not

(A) 141 N (B) 100 N (C) 101 N (D) 130 N

52. The angle of A = Ax i - Ay J with x-axis will be in between:

(A) 0° and 90° (B) 90° and 180°

(C) 180° and 270° (D) 270° and 360° 30

53. If two unit vectors perpendicular to each other are added, magnitude of resultant.

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

54. Angle between two vectors $3\hat{i} + 4\hat{j}$ and $4\hat{i} - 3\hat{j}$ is:

(A) 30° (B) 90° (C) 60° (D) 45°

55. The force of 15 N makes an angle of 90° with x- axis, its y- component is:

(A) 15 N (B) Zero N (C) 30 N (D) 45 N

56. If the two components of a vector are equal in magnitude, the vector making angle with x-axis will be:

(A) 30° (B) 45° (C) 60° (D) 90°

57. In which quadrant vector $2\hat{i} - 3\hat{j}$ lies?

(A) 1st (B) 2nd (C) 4th (D) 3rd

58. The sum of two perpendicular forces 8 N and 6 N is:

(A) 2 N (B) 14 N (C) 10 N (D) -2N.

59. If a force of 10 N is acting along x-axis then its component along y-axis is:

(A) Zero (B) 5 N (C) 10 N (D) 15 N

60. If R, is negative and R, is positive and resultant lies in quadrant:

(A) 1st (B) 2nd (C) 3rd (D) 4th

61. The vector product $(\vec{A} \times \vec{A})$ is:

(A) $\vec{F}$ (B) F (C) Zero (D) Null vector

62. The area of the parallelogram formed by A and B as two adjacent sides is equal to:

(A) AB (B) AB cos θ (C) AB sin θ (D) AB tan θ

63. The cross product $\hat{k} \times \hat{j}$ is equal to:

(A) $-\hat{i}$ (B) $-\hat{j}$ (C) $-\hat{k}$ (D) $\hat{i}$

64. If two non-zero vectors $\vec{A}$ and $\vec{B}$ are parallel to each other than:

(A) $\vec{A}.\vec{B} = 0$ (B) $\vec{A}.\vec{B} = AB$ (C) $|\vec{A} \times \vec{B}| = AB$ (D) $(\vec{A} \times \vec{B}) = \vec{A}.\vec{B}$

65. If $\vec{A} \times \vec{B} = 0$, then angle between the vectors is:

(A) 90° (B) 180° (C) 0° (D) None of these

66. AB sin θ $\hat{n}$ x AB sin θ $\hat{n}$ is:

$A^2B^2 \sin^2 \theta$ (B) A^2B^2 (C) $A^2B^2\,\hat{n}$ (D) 0

67. Projection B along A is given as:

(A) $\hat{A}.\vec{A}$ (B) $\vec{B}.\hat{A}$ (C) $\frac{\hat{A}.\vec{B}}{B}$ (D) $\frac{A\cos\theta}{B}$

68. $\hat{i}.(\hat{k} \times \hat{i})$ = ____

(A) 1 (B) 0 (C) $\hat{i}$ (D) $\hat{k}$

69. The magnitude of $\hat{i} \times \hat{j}$ is equal to:

(A) 1 (B) -1 (C) $-\hat{j}$ (D) $+\hat{k}$

70. The dot product $\hat{i}.\hat{i}$ is equal to:

(A) 0 (B) 1 (C) -1 (D) $\hat{j}$

71. $\hat{i}.\hat{i} = \hat{j}.\hat{j} = \hat{k}.\hat{k}$ is equal to:

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

72. The complete requirements for a body to be in equilibrium is:

(A) $\Sigma F = 0$ (B) $\Sigma \tau = 0$ (C) $\Sigma P = 0$ (D) $\Sigma F = 0, \Sigma \tau = 0$

73. The dot product of two vectors A and B zero,if angle between A and B is:

(A) Zero (B) 30° (C) 90° (D) 180°

74. Speed of moon around the earth is:

(A) 1200 m/s (B) 1100 m/s (C) 1000 m/s (D) 900 m/s

75. When a ball is thrown straight up, the acceleration at its highest point is:

(A) Upward (B) Downward (C) Zero (D) Horizontal

76. Unit of acceleration is:

(A) ms^{-1} (B) ms (C) ms^{-2} (D) m^2S

77. If a mass of a body is doubled, then acceration becomes:

(A) double (B) half (C) one fourth (D) Constant

78. A body covers a distance of 10 m in 1 sec with a constant velocity of 10 ms^{-1} Acceleration produced by the body is:

(A) 0 ms (B) 2 ms^2 (C) 5 ms (D) 10 ms

79. If the mass of a body is acceleration becomes: doubled, then acceleration becomes:

(A) One fourth (B) Half (C) Double (D) Constant

80. 10 N and 20 N are acting on a body of mass 2 kg, the minimum acceleration will be:

(A) 10 ms^{-2} (B) 20 ms^{-2} (C) 60 ms^{-2} (D) 5 ms^{-2}

81. The velocity of a body changes with constant rate. Then acceleration is:

(A) Zero (B) Constant (C) Negative (D) Positive

82. Slope of velocity time graph describes a physical quantity called:

(A) Displacement (B) Average velocity
(C) Average acceleration (D) Momentum

83. When the body moves with constant acceleration, the velocity time-graph is:

(A) Parabola (B) Hyperbola (C) Straight line (D) Curve

84. The area under velocity time graph is equal to:

(A) Distance (B) Power (C) Force (D) Work

85. The distance covered by a body with uniform acceleration "a" in time "t" starting from rest is:

(A) $\frac{1}{2}at^2$ (B) vt (C) $\frac{1}{2}vt$ (D) $\frac{1}{2}a^2t$

86. If velocity-time graph is parallel to time axis, then acceleration of moving body will be:

(A) Maximum (B) Positive (C) Zero (D) Negative

87. A bullet shot straight up, returns to its starting point in 10 second. Its initial speed was:

(A) 9.8 ms^{-1} (B) 24.5 ms^{-1} (C) 49 ms^{-1} (D) 98 ms^{-1}

88. Velocity of an object dropped from a building at any instant "t" is given by:

(A) $\frac{1}{2}gt^2$ (B) $v_1t + \frac{1}{2}gt^2$ (C) at (D) gt

89. Distance travelled by free falling object in first second is:

(A) 4.9 m (B) 9.8 m (C) 19.6 m (D) 10 m

90. The mass of an object is quantitative measure of its:

(A) Momentum (B) Acceleration (C) Inertia (D) Energy

91. S.I unit of linear momentum is:

(A) kg m^2 s^{-1} (B) kg m^2 s^{-2} (C) kg $m^{-1}s^{-1}$ (D) kg m s^{-1}

92. S.I unit of impulse is equivalent to that of:

(A) Force (B) Momentum (C) Acceleration (D) Velocity

93. SI unit of impulse is:

(A) $kgms^{-1}$ (B) N.m (C) Ns (D) $N.m^2$

94. A force of 10 N acts on a body of mass 1 kg for 5 sec to a distance of 10 m. The rate of change of momentum is:

(A) 50 N (B) 25 N (C) 20 N (D) 10 N

95. The force due to water flow is:

(A) F = mv (B) $F = \frac{ma}{t}$ (C) $F = \frac{mv}{t}$ (D) $F = \frac{mt}{v}$

96. For a typical rocket, how much mass of rocket is in the form of fuel?

(A) 60% (B) 50% (C) 80% (D) 100%

97. The overcome gravity, fuel consumed by rocket is:

(A) 40000 Kgs (B)30000 Kgs (C) 20000 Kgs (D) 10000 Kgs

98. A typical rocket consumes about 10,000 kgs^{-1} of fuel and ejects the burnt gases at speeds of over:

(A) 2000 ms^{1} (B) 3000 ms (C) 4000 ms^{1} (D) 5000 ms

99. Acceleration of rocket is given by the relation:

(A)$a = \frac{m}{mv}$ (B) $a = \frac{mv}{M}$ (C) $a = \frac{m}{Mv}$ (D) $a = \frac{Mv}{m}$

100. Motion of projectile is:

(A) One dimensional (B) Two dimensional

(C) Three dimensional (D) Four dimensional

101. The horizontal range of a projectile is maximum, when it is projected at an angle of:

(A) 0° (B) 30° (C) 45° (D) 60°

102. OR For maximum range the angle of projection must be:

(A) 30° (B) 45° (C) 60° (D) 90°

103. The horizontal component of velocity of projectile:

(A) Increase (B) Decreases

(C) Remains Same (D) Decreases and then increases

104. The ballistic missiles

(A) Long range (B) Short range (C) Medium range (D) Constant range

105. If maximum height of the projectile is equal to the range then angle of projection of projectile will be:

(A) 30° (B) 60° (C) 45° (D) 76

106. Maximum height of projectile:

(A) $h = \frac{v_1^2 Sin^2\theta}{2g}$ (B) $h = \frac{v_1^2 Sin^2\theta}{g}$ (C) $h = \frac{v_1^2}{2g}$ (D) $h = \frac{v_1^2}{g}$

107. The trajectory of a projectile is:

(A) Circle (B) Parabola (C) Hyperbola (D) Straight line

108. The shape of trajectory of short range projectile is:

(A) Straight line (B) circle (C) Elliptical (D) Parabolic

109. The path followed by a projectile in known as its:

(A) Range (B) Trajectory (C) Cycle (D) Height

110. The maximum horizontal range of a projectile is given by:

(A) $\frac{v_i^2}{g}$ (B) $\frac{v_i^2}{2g}$ (C) $\frac{2v_i}{g}$ (D) $\frac{2v_i^2}{g}$

111. The acceleration of a projectile along x-axis is:

(A) Zero (B) Increases (C) Decreases (D) Equal to "g"

112. Which shows correct relation between H and T of projectile?

(A) $H = \frac{gT^2}{8}$ (B) $H = \frac{8T^2}{g}$ (C) $H = \frac{8g}{T^2}$ (D) $H = \frac{8}{8T^2}$

113. A ball is thrown up at an angle of 60° with horizontal, with a speed of $14ms^{-1}$ the velocity of the ball at the highest point is:

(A) 14 m/s (B) 0m/s (C) 7m/s (D) 16m/s

114. Time of flight of a projectile is:

(A) $\frac{v_1 \sin\theta}{g}$ (B) $\frac{v_1 \sin\theta}{2g}$ (C) $\frac{v_1^2 \sin\theta}{g}$ (D) $\frac{2v_1 \sin\theta}{g}$

115. The horizontal range of projectile is:

(A) $\frac{2v_1 \sin\theta}{g}$ (B) $\frac{v_2 \sin 2\theta}{g}$ (C) $\frac{v_i^2 \mathrm{Sin}2\theta}{g}$ (D) $\frac{v_1 \mathrm{Sin}^2\theta}{g}$

116. S.I unit of work is:

(A) Newton (B) Walt (C) Pascal (D) Joule

117. Work done will be maximum when angle between F and d is:

(A) 180° (B) 90° (C) 60° (D) 0°

118. When the finite force is parallel to the direction of motion of the body, the work done is:

(A) Minimum (B) Maximum (C) Infinity (D) Varies

119. Kilo watt hour is the unit of:

(A) Power (B) Energy (C) Force (D) Torque

120. 3 joules of work is done in 3 seconds, then power is:

(A) 6 watt (B) 3 watt (C) 18 watt (D) 1 watt

121. Which one is a conservative force?

(A) Elastic spring force (B) Frictional force

b. (C) Air resistance (D) Tension in the spring

122. The SI unit of product of pressure and volume is:

(A) Watt (B) Joule (C) Pascal (D) N m

123. Scalar product of force and velocity is:

(A) Work (B) Power (C) Energy (D) Acceleration

124. Power is the dot product of force and:

(A) Acceleration (B) Mass (C) Velocity (D) Displacement

125. Power an electric heater is (approximate power)

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

126. Consumption of energy by a 60 watt electric bulb in 2 seconds is:

(A) 120 J (B) 603 (C) 301 (D) 0.53

127. One watt hour is equal to:

(A) 3.6 MJ (B) 3.6 kJ (C) 36 kJ (D) 36 MJ

128. Kilo Watt-second is the unit of:
(A) Power (B) Energy (C) Momentum (D) Time

129. The escape velocity can be determined relation:
(A) $V_{esc} = gR$ (B) $V_{esc} = 2gR$ (C) $V_{esc} = \sqrt{gR}$ (D) $V_{esc} = \sqrt{2gR}$

130. The value of escape velocity for earth is:
(A) $11.6 \times 10^3 ms^{-1}$ (B) $11 \times 10^3 ms^{-1}$ (C) $11.5 \times 10^3 ms^{-1}$ (D) $12 \times 10^3 ms^{-1}$

131. Energy stored in spring is:
(A) Elastic P.E. (B) Gravitational P.E (C) K.E. (D) Chemical P.E.

132. The ratio of maximum orbital velocity and velocity is:
(A) $1:\sqrt{2}$ (8) 2:1 (C) $\sqrt{2} : 1$ (D) 4 : 1

133. Mass is highly concentrated form of:
(A) Inertia (B) Energy (C) Plasma (D) Charge

134. In work-energy principle work done on a body is equal to:
(A) Kinetic energy (B) Potential energy
(C) Internal energy (D) change in K.E

135. The escape velocity is maximum for:
(A) Moon (B) Mercury (C) Earth (D) Jupiter

136. Energy dissipated usually appears as:
(A) Heat energy (B) Nuclear energy (C) P.E. (D) Chemical energy

137. Choice of zero potential energy level is:
(A) Surface of the Earth (B) At infinity
(C) At infinity Just above the surface of the Earth (D) Arbitrary

138. Conservation of Energy Original source of energy for biomass is:
(A) Earth (B) Moon (C) Sun (D) Star

139. Which one is renewable source of energy?
(A) Coal (B) Uranium (C) Biomass (D) Natural Gas

140. Which one is non-renewable source of energy?
(A) Wind (B) Biomass (C) Coal (D) Sunlight

141. The unit of solar light is:
(A) Watt (B) $kW\ m^{-2}$ (C) $Watt\ m^{-2}$ (D) $J.m^2$

142. A layer of rock holding water that allows water to percolate through it with pressure is called:

1 kWh = :
(A) 3.6μ (B) 3.6mJ (C) 3.6kJ (D) 3.6MJ
(A) $\frac{\pi}{8}$ (B) $\frac{\pi}{6}$ (C) $\frac{\pi}{5}$ (D) $\frac{\pi}{12}$

143. One radian is equal to:
(A) 75.3° (B) 57.3° (C) 35.7° (D) 73.5°

144. The S.I unit of angular displacement
(A) Degree (B) Revolution (C) Radian (D) Rotation **OR** (A) Radian

145. In one revolution, the angular displacement covered is:
(A) 60° (B) 360° (C) 90° (D) 180°

146. If velocity and mass of a moving object are doubled then K.E becomes:

(A) Double (B) 4 times (C) 6 times (D) 8 times

147. If 20 waves pass through medium in one second with speed of 20 ms^{-1} the wavelength is:

(A) 20 m (B) 2m (C) 400 (D) 1 m

148. When a particle is moving along a circular path, its projection along the diameter executes:

(A) Linear motion (B) Vibratory motion (C) Rotatory motion (D) SHM

149. The angular velocity of the minute hand of a clock is:

(A) 2 π rads (B) π $rads^{-1}$ (C) $\frac{\pi}{60}$ rad s^{-1} (D) $\frac{\pi}{180}$ rad s^{-1}

150. The angular displacement per second is called angular:

(A) acceleration (B) speed (C) rotation (D) velocity

151. When a body is whirled in a horizontal circle by means of string, the centripetal force is supplied by:

(A) Mass of a body (B) Velocity of a body
(C) Tension in the string (D) Centripetal acceleration

152. Centripetal force performs:

(A) Maximum work (B) Minimum work
(C) Negative work (D) No work

153. Which one of the following is not directed along the axis of rotation?

(A) Angular acceleration (B) Angular momentum
(C) Centripetal acceleration (D) Angular displacement

154. If linear velocity and radius are both made to half a circle. Then it's of a body moving around centripetal force becomes:

(A) F_c (B) $\frac{Fc}{2}$ (C) $\frac{Fc}{4}$ (D) $2F_c$

155. If a body revolves under centripetal force, its angular acceleration is:

(A) Non zero (B) Variable (C) Increasing (D) Zero

156. The expression for centripetal force is given by:

(A) $\frac{mv^2}{r^2}$ (B) $\frac{m^2v^2}{r}$ (C) $\frac{m^2v^2}{r^2}$ (D) $mr\omega^2$

157. Escape velocity of object depends upon:

(A) Mass of object (B) Size of object
(C) Shape of object (D) Radius of planet

158. Moment of inertia of a solid sphere is:

(A) mr^2 (B) ½ mr^2 (C) 2/5 mr^2 (D) ½ mr^2

159. Moment of inertia is measured in:

(A) kg m^2 (B) kg m^{-2} (C) Rad s^{-1} (D) Joule second

160. Moment of inertia of hoop is:

(A) mr^2 (B) $\frac{1}{2}mr^2$ (C) $\frac{2}{5}mr^2$ (D) $\frac{1}{12}mr^2$

161. Momentum of inertia of rod is:

(A) $I = \frac{1}{2}mL^2$ (B) $I = \frac{2}{5}mL^2$ (C) $I = \frac{1}{12}m^2L$ (D) None of these

162. Moment of inertia for a particle is given by:

(A) m^2r^2 (B) mr^2 (C) m^2r (D) mr^{-2}

163. The S.I unit of angular momentum is given by:

(A) kgm^2s^{-1} (B) kgm^2s^{-2} (C) $kgms^{-2}$ (D) $kgms^{-1}$

164. Angular momentum of a rigid body is given by:J.S

(A) $I^2\omega$ (B) $I\,\omega^2$ (C) $I^2\omega^2$ (D) $I\omega$

165. For angular momentum of system to remain constant, external torque should be:

(A) Small (B) Large (C) Zero (D) None

166. If a body is moving counter clockwise, then angular displacement is:

(A) Minimum (B) Zero (C) Negative (D) Positive

167. The direction of angular momentum $\vec{L} = \vec{r} \times \vec{p}$ is:

(A) Along the direction of $\vec{p}$ (B) Along the direction of $\vec{r}$

(C) Parallel to the plane containing $\vec{r}$ and $\vec{p}$

(D) Perpendicular to the plane containing $\vec{r}$ and $\vec{p}$

168. The diver spins faster when moment of inertia becomes:

(A) Smaller (B) Greater (C) Constant (D) Zero

169. Speed of a hoop at the bottom of inclined plane is:

(A) $\sqrt{GH}$ (B) $\sqrt{2gh}$ (C) $\sqrt{\frac{4}{3}\,gh}$ (D) $\sqrt{4gh}$

170. The rotational K.E of a hoop of radius 'r' is:

(A) $\frac{1}{2}mr^2\,\omega^2$ (B) $\frac{1}{2}mr^2\,\omega^2$ (C) $mr^2\omega^2$ (D) $\frac{1}{2}r^2\,\omega^2$

171. The ratio of moment of inertia of a disc and hoop is:

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

172. OR The relation between the speed and hoop can be written:

(A) $v_{disc} = \sqrt{\frac{3}{4}}\,v_{hoop}$ (B) $v_{disc} = \sqrt{\frac{4}{3}}\,v_{hoop}$

(C) $v_{disc} = v_{hoop}$ (D) $v_{disc} = \frac{1}{2}\,v_{hoop}$

173. The ratio of velocity of disc to velocity of hoop is:

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

174. The rotational kinetic energy of a solid sphere is:

(A) $\frac{2}{5}mr^2\,\omega^2$ (B) $\frac{2}{5}mv^2$ (C) $\frac{1}{2}I\,\omega^2$ (D) $\frac{1}{2}I\,\omega^2$

175. The rotational K.E of a hoop of mass "m" moving down frictionless inclined plane with velocity "v" will be:

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

176. The linear velocity of a disc when it reaches the bottom of an inclined plane of height 'h' is:

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

177. Relation between the speed of disc and hoop at the bottom of an incline is:

(A) $v_{disc} = \sqrt{\frac{3}{4}}\, v_{hoop}$ (B) $v_{disc} = \sqrt{\frac{4}{3}}\, v_{hoop}$

(C) $v_{disc} = \sqrt{\frac{2}{5}}\, v_{hoop}$ (D) $v_{disc} = 2\, v_{hoop}$

178. The rotational K.E of disc is equal to:

(A) $\frac{1}{4} mv^2$ (B) $\frac{1}{2} mv^2$ (C) $\frac{1}{4} I\omega^2$ (D) Iw^2

179. A 20 metre high tank is full of water. A hole appears at its middle. The speed of efflux will be:

(A) 10 ms^{-1} (B) 14 ms^{-1} (C) 11.5 ms^{-1} (D) 9.8 ms^{-1}

180. The moment of inertia for a cylinder is:

(A) mr^2 (B) $\frac{1}{2} mr^2$ (C) $\frac{2}{5} mr^2$ (D) $\frac{1}{12} mr^2$

181. Rotational kinetic energy of the hoop moving down on inclined plane is:

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

182. A hoop is rolled down on an inclined plane having height of 10 m. Its velocity at the bottom will be:

(A) 4.91 m/s (B) 9.89 m/s (C) 28.31m/s (D) 31.31 m/s

183. The moment of inertia of solid disc or cylinder is:

(A) mr^2 (B) $\frac{1}{2} mr^2$ (C) $\frac{1}{4} mr^2$ (D) $\frac{1}{2} m^2r$

184. The value of "g" at the centre of the earth is:

(A) Infinite (B) 2g (C) 3g (D) Zero

185. The formula for speed of satellite orbiting around theEarth is:

(A) $v = \sqrt{2}\, gr$ (B) $v = \sqrt{2gR}$ (C) $v = \sqrt{gR}$ (D) $v = \sqrt{\frac{gR}{M}}$

186. If the radius of earth is doubled then the value of critical velocity becomes.

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

187. If the radius of earth is increased to four times of the present, critical velocity v, becomes.

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

188. The weight of the body at the centre of Earth is:

(A) Maximum (B) Minimum (C) Zero (D) Infinite

189. The expression for the orbital velocity of satellite is given by:

(A) $v = \sqrt{GMr}$ (B) $v = \frac{GM}{r}$ (C) $v = \sqrt{\frac{GM}{r}}$ (D) $v = \sqrt{\frac{r}{GM}}$

190. An orbital speed of a satellite can be determined by the equation:

(A) $\sqrt{2gR}$ (B) $\sqrt{\frac{2GM}{R}}$ (C) $\sqrt{gR}$ (D) $\sqrt{\frac{GM}{R}}$

191. The expression for the time period of low flying satellite put into the orbit is:

(A) $T = \frac{2\pi R}{g}$ (B) $T = \frac{2\pi R}{G}$ (C) $T = \frac{2\pi V}{R}$ (D) $T = \frac{2\pi R}{v}$

192. The period of revolution of a geostationary satellite is:
(A) 1 hour (B) 48 min **(C)** 1 day (D) 1 month **OR** (A)

193. As the speed of object moving through a fluid increases then the drag force experienced by it:
(A) Increases (B) Decreases
(C) Remains constant (D) Becomes: zero

194. Drag force is given by:
(A) Stoke's law (B) Bernoulli's equation
(C) Continuity equation (D) Newton's law

195. If the radius of droplet becomes half, then its terminal velocity will become:
Double (B) Half **(C)** One fourth (D) Remains same

196. The word FLUID means:
(A) To rise (B)To fall **(C)** To flow (D) To oppose

197. A fog droplet falls vertically through air with an acceleration:
(A) Equal to "g" (B) Less than "g" **(C)** Zero (D) Greater than "g"

198. Terminal velocity v_t is related with the radius r of a spherical object as:
(A) $v_t \propto r^2$ (B) $v_t \propto r$ (C) $v_t \propto \frac{1}{r}$ (D) $v_t \propto \frac{1}{r2}$

199. When droplet of water has terminal velocity the acceleration is:
(A) Maximum (B) Minimum **(C)** Zero (D) Constant

200. The S.I units of flow rate are:
(A) m^2s^{-1} (B) m^3s^{-2} **(C)** m^3s^{-1} (D) m^2s^{-2}

201. A hose pipe ejects water at a speed of 0.3 ms^{-1} through a hole of area 10 cm^2, flow rate will be:
(A) $3m^3s^{-1}$ **(B)** $3x10^{-3}m^3s^{-1}$ (C) 30 m^3s^{-1} (D) 0.03 m^3s^{-1}

202. The pressure will be low where the speed of fluid is:
(A) High (B) Low (C) Zero (D) Constant

203. Bunsen burner works on the principle of
(A) Venturi effect (B) Terricilli's effect
(C) Bernoulli's effect (D) None of these

204. The dimensions of potential energy volume are same as that of per unit
(A) Work **(B)** Pressure (C) Speed (D) Density

205. The dimensions of pgh has same as that of
(A) Work (B) Energy **(C)** Pressure (D) Mass

206. The term in Bernoulli's equation has the same unit as:
(A) Work (B) Volume **(C)** Pressure (D) Force

207. The unit of $\frac{1}{2}pV^2$ in Bernoull's equation is same as that of:
(A) Energy (B) Pressure (C) Work (D) Power

208. The term $\frac{1}{2}pv^2$ in Bernoulli's equation represents:
(A) K.E of fluid (B) Pressure energy
(C) k.E per unit volume (D) P.E of fluid

209. Blood has density equal to that of:

(A) Mercury (B) Sodium (C) Honey (D) Water

210. The density of blood is nearly equal to:

(A) Air (B) Water (C) Milk (D) Honey

211. One torr is equal to:

(A) 120 Pascals (B) 100 Pascals (C) 133.3 Pascals (D) 80 Pascals

212. The relation $v_2 = \sqrt{2g(h_1 - h_2)}$ is called:

(A) Torricelli's theorem (B) Ventusi relation

(C) Stoke's law (D) Equation of continuity

213. Speed of efflux is measured by the relation:

(A) $v = \sqrt{gh}$ (B) $v = \sqrt{\frac{gh}{2}}$ (C) $v = \sqrt{2gh}$ (D) $\sqrt{\frac{4}{3}gh}$

214. Torricelli's theorem can be written as:

(A) $V = \sqrt{2g(h_1 - h_2)}$ (B) $V = 2g\,(h_1 - h_2)$

(C) $V = 2g\sqrt{(h_1 - h_2)}$ (D) $V = \sqrt{2g}\,(h_1 - h_2)$

215. The relation between time period and frequency is:

(A) $f = 2\pi T$ (B) $f = \frac{1}{2\pi T}$ (C) $f = \frac{1}{2\pi}$ (D) $fT = 1$

216. The waveform of SHM is:

(A) Sine wave (B) Cosine wave (C) Tangent wave (D) Square wave

217. Phase difference between two points of a wave front is:

(A) Zero (B) $\frac{\pi}{2}$ (C) π (D) $\frac{3\pi}{2}$

218. When one-fourth of the cycle of a vibrating body is completed then the phase change in it is:

(A) $\frac{\pi}{4}$ radian (B) $\frac{\pi}{2}$ radian (C) $\frac{3\pi}{2}$ radian (D) π radian

219. The ratio of angular frequency and linear frequency is:

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

220. When three-fourth of the cycle of a vibrating body is completed then the phase of vibration is:

(A) $\frac{\pi}{4}$ radian (B) $\frac{\pi}{2}$ radian (C) $\frac{3\pi}{2}$ radian (D) π radian

221. Which of the following quantity can be expressed in $kg\,s^{-2}$?

(A) Spring constant (B) Density (C) Momentum (D) Force

222. The expression for frequency of a mass 'm' attached to a spring of spring constant "k" is:

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

223. The time period of an oscillating mass spring system is 10 second. If mass attached to spring is

(A) Same (B) Twice (C) Thrice (D) Four times

224. The velocity of spring-mass vibrating system at mean position is:

(A) Zero (B) $\sqrt{\frac{k}{m}}$ (C) $x_{o}\sqrt{\frac{k}{m}}$ (D) $w\sqrt{\frac{k}{m}}$

225. The frequency of simple pendulum is given by:

(A) $\frac{1}{2\pi}\sqrt{\frac{g}{l}}$ (B) $2\pi\sqrt{\frac{g}{l}}$ (C) $\frac{1}{2\pi}\sqrt{\frac{g}{l}}$ (D) $2\pi\sqrt{\frac{l}{g}}$

226. If amplitude of a simple pendulum is increased by 4 times, the time period will be:

(A) Four times (B) Half (C) Same (D) Two times

227. A simple pendulum is completing 20 vibrations in 5 seconds, its frequency is:

(A) 4 Hz (B) 20 Hz (C) 200 Hz (D) 40 Hz

228. In order to double period of a simple pendulum the length of the pendulum should be increased by:

(A) Four times (B) Three times (C) Two times (D) Eight times

229. When the bob of simple pendulum is at extreme position then its K.E is:

(A) Maximum (B) Minimum (C) Zero (D) Small

230. If length of the simple pendulum is double then its period increases:

(A) 1.41 times (B) 2 times (C) 2.4 times (D) 3 times

231. The frequency of waves produced in microwave oven is:

(A) 1435 HZ (B) 2450 MHz (C) 1860 MHz (D) 2850 Hz

232. The wave produced in microwave oven have a wavelength of:

(A) 12 cm (B) 12 m (C) 8 m (D) 18 cm

233. At resonance, the transfer of energy is:

(A) Zero (B) Minimum (C) Maximum (D) Negative

234. The force responsible for the vibratory motion of simple pendulum is:

(A) mg cos θ (B) mg sin θ (C) mg sec θ (D) mg tan θ

235. Longitudinal waves do not exhibit.

(A) Reflection (B) Refraction (C) Polarization (D) Diffraction

236. Transverse waves are distinguished from longitudinal waves by the:

(A) Interference (B) Diffraction (C) Reflection (D) Polarization

237. Tuning fork is a source of:

(A) Energy (B) Heat (C) Light (D) Sound

238. Distance between two adjacent crests and trough is:

(A) λ (B) $\frac{\lambda}{2}$ (C) $\frac{\lambda}{4}$ (D) 2λ

239. The distance between a node and the next antinode is:

(A) 4λ (B) 2λ (C) $\frac{\lambda}{4}$ (D) $\frac{\lambda}{2}$

240. Wave transport:

(A) Energy (B) Wavelength (C) Power (D) Mass

241. The wavelength of transverse wave travelling with a speed 'v' having frequency 'f' in equal to:

(A) f/v (B) vf (C) v/f (D) f/v^2

242. Longitudinal waves of frequencies less than 20 Hz are known as:

(A) Infra sound (B) Ultra sound (C) Super sound (D) Audible sound

243. The distance between two consecutive crest is called:

(A) Displacement (B) Amplitude (C) Wave front (D) Wavelength

244. The distance between two consective trough is called:

(A) Displacement (B) Amplitude (C) Wave length (D) Wavelength

245. The value of constant γ for the mono-atomic gas is:

(A) 1.67 (B) 1.40 (C) 1.29 (D) 2.45

246. According to Newton, sound travels in air under conditions of:

(A) Adiabatic (B) Isothermal (C) Isobaric (D) Isochonc

247. According to Newton's formula, sound in air at STP is:

(A) 332 ms^{-1} B) 340 ms^{-1} (C) 350 ms^{-1} (D) 280 ms^{-1}

248. Speed of sound in vacuum is:

(A) 280 ms^{-1} (B) 332 ms^{-1} (C) 333 ms^{-1} (D) 0 ms^{-1}

249. Laplace's expression for speed of sound in air is:

(A) $v = \frac{q}{p}$ (B) $v = \frac{p}{q}$ (C) $v = \sqrt{\frac{yP}{P}}$ (D) $v = \sqrt{\frac{P}{rq}}$

250. The speed/velocity of sound is greatest in:

(A) Air (B) Steel (C) Ammonia (D) Water

251. The speed of sound is greater in solids due to Water their high:

(A) Density (B) Pressure (C) Temperature (D) Elasticity

252. The speed of sound in air does not depend upon:

(A) Temperature (B) Pressure (C) Density (D) Medium

253. Sound travel faster in:

(A) CO_2 (B) H_2 (C) O_2 (D) He

254. The error in speed of sound calculated by Newton at STP is about:

(A) 0% (B) 14% (C)15% (D) 16%

255. In which medium the speed of sound is greater?

(A) oxygen (B) air (C) water (D) copper

256. The louder the sound, the greater will be its:

(A) Speed (B) Frequency (C) Amplitude (D) Wavelength

257. Frequency range of hearing of cats is:

(A) 20-20000 Hz (B) 10-10000 Hz (C) 60 -20000 Hz (D) 60-70000 Hz

258. The velocity of sound is maximum at 20°C in:

(A) Lead (B) Copper (C) Glass (D) Iron

259. When sound waves enter in different medium, the quantity that remains unchanged is:

(A) Intensity (B) Speed (C) Frequency (D) Wavelength

260. Velocity of sound is independent of:

(A) Temperature (B) Density (C) Pressure (D) Medium

261. The process by Newton for the followed determination of speed of sound in air is:

(A) Adiabatic (B) Isothermal (C) Isobaric (D) Isochoric

262. Speed of sound in lead at 220°C is:

(A) 1320 m/s (B) 1330 m/s (C) 1340 m/s (D) 1350 m/s

263. The speed of sound approximately equal to:

(A) 332 m/s (B) 350 m/s (C) 340 m/s (D) 335 m/s

264. The speed of sound at a given temperature by doubling pressure speed of sound is:

(A) 0.5v (B) v (C) 2v (D) 3v

265. The path difference for constructive interference should be:

(A) $\frac{\lambda}{2}$ (B) $\frac{5\lambda}{2}$ (C) m λ (D) $\frac{3\lambda}{2}$

266. Constructive interference of two coherent beams is obtained if path difference is:

(A) $\frac{n\lambda}{2}$ (B) $\frac{n\lambda}{4}$ (C) $\frac{n(3\lambda)}{4}$ (D) n λ

267. When two identical waves superimposed, which can change?

(A) Wavelength (B) Frequency (C) Velocity (D) Amplitude

268. Beats can be heard when difference of frequency is not more than:

(A) 8 Hz (B) 10 Hz (C) 4 Hz (D) 6 Hz

269. The basic principle of beats is:

(A) Interference (B) Diffraction (C) Reflection (D) Refraction

270. When two notes of frequencies f_1 and f_2 are sounded together, beats are formed. If $f_1 > f_2$ what will be the beat frequency?

(A) $f_1 + f_2$ (B) $\frac{1}{2}(f_1 + f_2)$ (C) $f_1 - f_2$ (D) $\frac{1}{2}(f_1 - f_2)$

271. The distance between consecutive node and node:

(A) λ (B) $\frac{\lambda}{2}$ (C) 2 λ (D) $\frac{\lambda}{2}$

272. The distance between two consecutive nodes is:

(A) $\frac{\lambda}{2}$ (B) $\frac{\lambda}{4}$ (C) 2 λ (D) λ

273. In stationary waves, the velocity of particle at the node is:

(A) Maximum (B) Infinite (C) Zero (D) Variable

274. In stationary waves the points which always remain at rest are:

(A) nodes (B) antinodes (C) crest (D) trough

275. The distance between two consecutive antinode is:

(A) $\frac{\lambda}{2}$ (B) $\frac{\lambda}{2}$ (C) λ (D) 2 λ

276. If a stretch string vibrate in three loops. Then relation between its length and wavelength of stationary wave is:

(A) $l = \frac{3\lambda}{2}$ (B) $l = 3\lambda$ (C) $l = \frac{2\lambda}{3}$ (D) $\lambda = 3l$

277. The wavelength of fundamental node of vibration of an open end pipe is:

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

278. If the organ pipe is closed at one end, the frequency of fundamental harmonic is:

(A) $f_1 = \frac{v}{2l}$ (B) $f_1 = \frac{v}{4l}$ (C) $f_1 = \frac{4l}{v}$ (D) $f_1 = \frac{2l}{v}$

279. The distance between 1st node and 4th antinode is:

(A) $\frac{7}{4}\lambda$ (B) $\frac{5}{4}\lambda$ (C) $\frac{13}{4}\lambda$ (D) $\frac{11}{4}\lambda$

280. When one end of organ pipe is closed, then the frequency of stationary waves of any harmonic, it is given by:

(A) $f_n = \frac{nv}{2l}$ (B) $f_n = \frac{nl}{4v}$ (C) $f_n = \frac{4v}{nl}$ (D) $f_n = \frac{nv}{4l}$

281. If organ pipe is open at both ends, frequency of fundamental harmonic is given by:

(A) v / 2l (B) v / 4l (C) 4l / v (D) 2l / v 108.

282. When both ends of organ pipe are open then frequency of stationary waves of nth harmonic is given by:

(A) $f_n = \frac{nv}{4l}$ (B) $f_n = \frac{v}{2nl}$ (C) $f_n = \frac{nv}{2l}$ (D) $f_n = \frac{2v}{nl}$

283. When an observer is moving away from stationary source, sending waves with speed the waves received by him at the rate of:

(A) $\frac{v - u_o}{\lambda}$ (B) $\frac{v - u_o}{\lambda}$ (C) $\frac{\lambda}{v - u_o}$ (D) $\frac{\lambda}{v + u_o}$

284. Angle between ray of light and wave front is:

(A) 0° (B) 60° (C) 90° (D) 120°

285. In case of point source the shape of wave front is

(A) Plane (B) Spherical (C) Circular (D) Elliptical

286. The locus of all points in the same wave of vibration is called:

(A) Wave Front (B) Interference (C) Diffraction (D) Polarization

287. The fringe spacing increases if we use:

(A) Red light (B) Blue light (C) Yellow light (D) Green light

288. An oil film on water surface shows colour due to:

(A) Diffraction (B) Interference (C) Polarization (D) Dispersion

289. The blue colour of sky is due to:

(A) Diffraction (B) Reflection (C) Polarization (D) Scattering

290. Sodium in a flame gives:

(A) Green light (B) Blue light (C) White light (D) Yellow light

291. Light entering room air to glass does not change in its:

(A) Frequency (B) Wavelength (C) Velocity (D) Direction

292. In Young's double slit experiment, the fringe spacing is equal to:

(A) $\Delta Y = \frac{L\lambda}{d}$ (B) $\Delta Y = \frac{\lambda}{d}$ (C) $\Delta Y = \frac{\lambda}{Ld}$ (D) $\Delta Y = Ld\lambda$

293. Fringe spacing is equal to:

(A) $\frac{\lambda d}{L}$ (B) $\frac{\lambda L}{d}$ (C) $\frac{L}{\lambda d}$ (D) m λ

(C) Remain same (D) Becomes zero

294. If red light is used as compare to blue light then fringe spacing:

(A) Increases (B) Decreases (C) Remain same (D) Becomes zero

295. Thin film shows colours due to:

(A) Interference (B) Diffraction (C) Refraction (C) Polarization

296. Newton's rings are formed as a result of:

(A) Interference (B) Dispersion (C) Diffraction (D) Polarization

297. When Newton ring are seen through the transmitted light, then central spot is:

(A) Dark (B) Blue (C) Bright (D) Red

298. A glass grating has 5000 lines/cm, then grating element will be:

(A) 2×10^{-6} m (B) 2×10^{-4} m (C) 2×10^{-3} m (D) 2×10^{-7} m

299. The wavelength of X-rays is of the order of:

(A) 10^{-8} m (B) 10^{-5} m **(C)** 10^{-10} m (D) 10^{-4} m

300. Bragg's equation is given as:

(A) $2d\sin\theta = n\frac{\lambda}{2}$ (B) $2d\sin\theta = n\lambda$ **(C)** $d\sin\theta = n\frac{\lambda}{2}$ (D) $2d\sin\theta = 2\lambda$

301. Bragg's equation is given as:

(A) $d = \frac{2\sin\theta}{n\lambda}$ **(B)** $n = \frac{2d\sin\theta}{\lambda}$ (C) $d = \frac{2n\sin\theta}{\lambda}$ (D) $d = \frac{2\lambda\sin\theta}{n}$

302. The process of confining the beam of light to vibrate in one plane is called:

(A) Interference (B) Diffraction

(C) Polarization (D) Total internal reflection

303. Which phenomenon of light proves waves are transverse in nature?

(A) Refraction (B) Reflection (C) Diffraction **(D)** Polarization

304. To distinguish between transverse and longitudinal wave_____is used.

(A) Refraction (B) Interference **(C)** Polarization (D) Diffraction

305. Which one of the following cannot be polarized?

(A) Ultra violet rays (B) Radio waves (C) T.V waves **(D)** Sound waves

306. Intensity of light depend on:

(A) Wavelength (B) Amplitude (C) Velocity **(D)** Frequency

307. Which of the followings cannot produce colours with white light?

(A) Diffraction (B) Interference **(C)** Polarization (D) Dispersion

308. Rayleigh formula for resolving power:

(A) $R = \frac{1.22\lambda}{D}$ (B) $R = \frac{1.22D}{\lambda}$ (C) $R = \frac{D}{1.22\lambda}$ (D) $R = \frac{\lambda}{1.22D}$

309. The units of magnifying power of microscope or telescope are:

(A) Metre (B) m^{-1} **(C)** Dioptre (D) No unit

310. The magnifying power of simple microscope is:

(A) $1 + \frac{d}{p}$ (B) $1 - \frac{d}{f}$ (C) $1 - \frac{d}{p}$ **(D)** $1 + \frac{d}{f}$

311. Magnification of convex lens is:

(A) $1 + \frac{d}{f}$ (B) $1 - \frac{d}{f}$ (C) $1 + \frac{d}{f}$ (D) $1 - \frac{f}{d}$

312. If a convex lens of focal length "f" is cut into two identical halves along the Lens diameter, the focal length of each half is:

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

313. Magnifying power of telescope is:

(A) $\frac{f_e}{f_o}$ (B) $\frac{f_o}{f_e}$ (C) $f_e f_o$ (D) $\frac{1}{f_e f_o}$

314. In Michelson's experiment the angle subtended by a side of the eight sided mirror is:

(A) $\frac{\pi}{8}$ rad (B) $\frac{\pi}{4}$ rad (C) $\frac{\pi}{2}$ rad (D) $\frac{\pi}{6}$ rad

315. The detector in photo-phone is made up of:

(A) Cadmium (B) Germanium (C) Selenium (D) Silicon

316. The first person who attempted to measure the speed of light was:

(A) Michelson (B) Huygen (C) Galilleo (D) Newton

317. If the speed of light in vacuum is c, then its velocity in a medium of refractive index 1.3 is:

(A) 1.3 c (B) $\frac{1.3}{c}$ (C) $\frac{c}{1.3}$ (D) c

318. A layer over the central core of the Jack is called:

(A) Jacket (B) Plastic (C) Cladding (D) Rubber

319. Multimode step index fiber is useful for:

(A) Long distance (B) Short distance
(C) Very long distance (D) Infinite distance

320. In multimode step index fibre, the diameter of core is:

(A) 50μm (B) 5μm (C) 100μm (D) 150μm

321. The diameter of the core of the single mode step index fibre is:

(A) 10μm (B) 50 μm (C) 50μm to 1000 μm (D) 5 μm

322. In multimode step index fiber, the value of refractive index of core is:

(A) 1.33 (B) 1.52 (C) 1.67 (D) 1.48

323. Refractive index of water is:

(A) 1.5 (B) 1.33 (C) 1.0 (D) 1.2
(C) 1 ns per km (D) 1 ns per 100 km

324. For a gas obeying Boyle's law, if the pressure is doubled, the volume becomes:

(A) Double (B) Threefold (C) One half (D) Remains the same

325. The relation for absolute temperature of a gas is given by:

(A) $T = \frac{2}{3K} < \frac{1}{2}mv^2 >$ (B) $T = \frac{2K}{3} < \frac{1}{2}mv^2 >$

(C) $T = \frac{3}{2K} < \frac{1}{2}mv^2 >$ (D) $T = \frac{3K}{2} < \frac{1}{2}mv^2 >$

326. A device based upon the thermodynamics property of matter is called:

(A) Calorimeter (B) Heat engine (C) Thermometer (D) Voltmeter

327. Heat is form of:

(A) Power (B) Momentum (C) Energy (D) Torque

328. The ideal gas law is

(A) PV=NVK (B) P=NkT (C) PV=nRT (D) P=nRT

329. The value of Boltzman's constant is:

(A) 1.38×10^{-23} J/K (B) 1.38×10^{23} J/K
(C) 1.38×10^{-23} J/mol.K (D) 1.38×10^{23} J/mol.K

330. Pressure of a gas is given as:

(A) $\frac{1}{3}\rho <v^2>$ (B) $\frac{2}{3}\rho <v^2>$ (C) $\frac{1}{3}Ne<v^2>$ (D) None

331. S.I unit of pressure of gas is:

(A) Nm^{-2} (B) N.m (C) N^2/m (D) $N^2.m$

332. At constant temperature, if pressure of a given mass of gas is halved, then its volume becomes:

(A) Halve (B) Doubled (C) Four Time (D) Constant

333. At constant temperature and pressure, if volume of given mass of a gas is doubled then density is:

(A) Doubled (B) $\frac{1}{4}$ of original (C) $\frac{1}{2}$ of original (D) Unchanged

334. Boltzman constant, universal Avogadro number is related as:

(A) $K=\frac{R}{N_A}$ (B) $K=\frac{N_A}{K}$ (C) $R=\frac{1}{2}\frac{K}{N_A}$ (D) $R=NK\frac{N_A}{K}$

335. Boltzman constant "k" has same unit as:

(A) Temperature (B) Energy (C) Entropy (D) Pressure

336. If the temperature of a gas is constant then $<\frac{1}{2}mv^2>$ of the molecules of gas will be:

(A) Constant (B) Zero (C) Increase (D) Decrease

337. The mean kinetic energy of gas is at:

(A) 0°C (B) -273°C (C) 0K (D) 100° C

338. Solid ice, liquid water and water vapours consist in thermal equilibrium at a temperature:

(A) 273 K (B) 273.16 K (C) 273°C (D) 100°C

339. Root mean square velocity is related to the absolute temperature of an ideal gas as:

(A) $V_{max}\propto T$ (B) $V_{max}\propto T^2$ (C) $V_{max}\propto\sqrt{T}$ (D) $V_{max}\propto\frac{1}{\sqrt{T}}$

340. Pressure of an ideal gas can be written in terms of its density:

(A) $P=\rho <v^2>$ (B) $P=\frac{1}{3}\rho <v^2>$
(C) $P=\frac{2}{3}\rho <v^2>$ (D) $P=\frac{1}{3}\rho <v^2>$

341. A chimney works best when it is:

(A) Tall (B) Wide (C) Short (D) Narrow

342. Pressure of a gas is equal to:

(A) $\frac{2}{3}\rho <v^2>$ (B) $\frac{3}{2}\rho<v^2>$ (C) $\frac{1}{3}\rho<v^2>$ (D) $\rho <v^2>$

343. The K.E of molecules of an ideal gas at absolute zero will be:

(A) Zero (B) Infinite (C) Very high (D) Below zero

(A) Temperature (B) Pressure (C) Path (D) Final and initial state

344. For an ideal gas, the internal energy is directly proportional to:

(A) Temperature (B) Pressure (C) Volume (D) Mass

345. Pascal is the unit of:

(A) Pressure (B) Force (C) Tension (D) Weight

346. According to first law of thermodynamics the quantity which is conserved:

(A) Energy (B) Force (C) Momentum (D) Power

347. The first law of thermodynamics for an isothermal process is:

(A) $Q = 0$ (B) $W = 0$ (C) $Q = W$ (D) $\Delta U = 0$

348. First law of thermodynamics for an adiabatic process will be written as:

(A) $W = \Delta U$ (B) $W = Q$ (C) $W = Q - \Delta U$ (D) $W = -\Delta U$

349. The process which is carried out at constant temperature is known as:

(A) Adiabatic process (B) Isochoric process
(C) Isothermal process (D) Isobaric process

350. Which remains constant in an adiabatic process?

(A) Volume (B) Pressure (C) Entropy (D) Temperature

351. Entropy remains constant

(A) Isothermal process (B) Adiabatic process
(C) Isochoric Process (D) Isobaric process

352. The change in internal energy is defined as:

(A) Q - W (B) Q – T (C) Q + P (D) Q – P

353. The work done in isochoric process is:

(A) Constant (B) Variable
(C) Zero (D) Depend upon condition

354. In thermodynamics process, the equation $W = -\Delta U$ represents.

(A) Isothermal expansion (B) Variable
(C) Adiabatic expansion (D) Adiabatic compression

355. The difference between C_P and C_V is equal to:

(A) Plank's constant (B) General gas constant
(C) Molar gas constant (D) Boltzmann constant

356. SI unit of molar specific heat is:

(A) $J\ mol^{-1}\ K^{-1}$ (B) $J\ mol\ K^{-1}$ (C) J mol K (D) $J\ mol^{-1}$

357. If one mole of an ideal gas is heated at constant volume then:

(A) $Q_p = C_v \Delta T$ (B) $W = C_V \Delta T$
(C) $Q_V = C_P \Delta T$ (D) $\Delta U = C_V \Delta T$

358. The value of universal gas constant 'R' is:

(A) $1.6 J\ mol^{-1} k^{-1}$ (B) $1/38\ J\ mol^{-1}\ k^{-1}$
(C) $8.314\ J\ mol^{-1}\ k^{-1}$ (D) $6.02\ J\ mol^{-1} k^{-1}$

359. If one mole of an ideal gas is heated at constant pressure then:

(A) $Q_P = C_V \Delta T$ (B) $\Delta U = C_P \Delta T$
(C) $Q_V = C_P \Delta T$ (D) $\Delta U = C_V \Delta T$

360. The efficiency of heat engine whose sink is at 17°C and source at 200°C is:

(A) 38% (B) 65% (C) 80% (D) 90%

361. An ideal heat engine can only be 100% efficient its cold temperature reservoir is at:

(A) 0 K (B) 0°C (C) 100 K (D) 100 °C

362. Carnot cycle consists of:

(A) Two steps (B) Three steps (C) Four steps (D) Five steps

363. The measure of hotness or coldness of a substance is:

(A) Temperature (B) Heat (C) Internal energy (D) Energy

364. If heat engine absorbs 400 J and rejects 200 heat energy, its efficiency will be:

(A) 25% (B) 50% (C) 70% (D) 100%

365. Carnot engine consists of:

(A) Two steps (B) Three steps (C) Four steps (D) Five steps

366. In carnot engine, each process is:

(A) Reversible (B) Perfectly reversible

(C) Irreversible (D) Perfectly irreversible

367. Sadi carnot described an ideal engine in:

(A) 1640 (B) 1740 (C) 1940 (D) 1840

368. Value of triple point of water is given as:

(A) Zero K (B) 100 K (C) 273.16 K (D) 373.16 K

369. Unit of thermodynamics scale of temperature is:

(A) Centigrade (B) Fahrenheit (C) Kelvin (D) Celsius

370. The unit of entropy is:

(A) J K (B) J (C) $\frac{J}{K}$ (D) $\frac{K}{J}$

371. The change in entropy ΔS of a system is given by:

(A) $\Delta S = \frac{\Delta Q}{T}$ (B) $\Delta Q = \frac{\Delta S}{T}$ (C) $\Delta Q = \frac{T}{\Delta S}$ (D) $\Delta S = \Delta Q \times T$

372. Entropy is measure of:

(A) Internal energy of system (B) Order of system

(C) Disorder of system (D) Potential energy of system

373. When temperature of source and sink of a heat engine becomes equal then the entropy change will be:

(A) Zero (B) Minimum (C) Maximum (D) Negative

374. Change in entropy of reversible process is:

(A) Positive (B) Negative (C) Zero (D) Adiabatic

Subjective Portion

Inshallah! It is Challenge you can get 68/68 Marks

Section - I

Short Questions

1. Give the draw backs to use the period of simple pendulum as a time standard.
2. Calculate the distance covered by the light in free space in one year
3. What are supplementary units? Define only one unit.
4. Differentiate between base units and derived units.
5. Define light year and what are the unit and dimensions of light year?
6. Show that 1 rad = 67.3°
7. How many micro seconds in one year?
8. Why do we find it useful to have two units for the amount of substance, the kilogram and the mole?
9. Define random error and systematic error?
10. The period of a pendulum cannot be used as a time standard why?
11. Check the correctness of the relation $v = \left[\frac{F \times l}{m}\right]^{1/2}$ where "v" is the speed transverse wave on a stretched spring of tension F, length "I" and mass "m".
12. Is a zero significant or not? Explain.
13. What is the difference between precision and accuracy?
14. The period of simple pendulum is measured by a stop watch what type of errors are possible in the time period?
15. How you can find uncertainty in a timing experiment?
16. What are the dimensions and unit of gravitational constant G in the formula $F = \frac{GmM}{r^2}$?
17. Show that $S = v_i t + \frac{1}{2} at^2$ is dimensionally correct.
18. Write down the two uses of dimension analysis. **2 Times**
19. Check the correctness of the relation $v = \sqrt{\frac{F \times l}{m}}$ dimensionally?
20. Write the dimension of pressure and density.
21. Show that the famous "Einstein Equation" E=me is dimensionally consistent. Calculate equivalence energy of one
22. Decide which is correct $f = v\lambda$ or $f = \frac{V}{\lambda}$
23. Define the terms i) Null vector ii) Subtraction of vector.
24. What is the unit vector in the direction of vector $\vec{A} = 2\,\hat{i} - \hat{j} + 2\,\hat{k}$?
25. Define component of a vector? What are rectangular components?
26. If all the components of the vectors, $\vec{A}_1$ and $\vec{A}_2$ were reversed, how would this alter $\vec{A}_1 \times \vec{A}_2$?
27. Define: (1) Unit vector (ii) Position vector ii) components of a vector.

28. If one of the rectangular components of a vector is not zero, can its magnitude be zero? Explain.
29. Can the magnitude of a vector have a negative value?
30. If $\vec{A} + \vec{B} = 0$, what can you say about the components of the two vectors?
31. Under what circumstances would a vector have components that are equal in magnitude?
32. Is it possible to add a vector quantity to a scalar quantity?
33. Can you add zero to a null vector?
34. Write down the five steps for addition of by rectangular component method.
35. Name three conditions that could make $\vec{A} \cdot \vec{B} = 0$:
36. Find the angle between $\vec{A} = 2\hat{i} - 2\hat{j}$ and $\vec{B} = 2\hat{i} + 2\hat{j}$
37. What is the vector product, give its two characteristics?
38. State first and second conditions of equilibrium in terms of linear and angular acceleration.
39. A picture is suspended from a wall by two strings. Show by diagram the configuration of the strings for which the tension in strings will be minimum.
40. What is the difference between uniform and variable velocity? Give S.I. units of velocity and acceleration.
41. Can the velocity of an object reverse the direction when acceleration is constant? If so, give an example.
42. How acceleration and distance can be calculated from velocity time graph?
43. Explain the circumstances in which the velocity 'v' and acceleration 'a' of a car are:
44. (a) Parallel (b) Perpendicular to one another (c) Anti-parallel
45. State Newton's Second and Third Law of Motion.
46. State Newton's second law of motion and define the unit of force.
47. What will be the velocity of the particle if its momentum and kinetic energy are equal in magnitudes?
48. Is law of conservation of momentum is valid in an Elastic and Inelastic Collision?
49. Find the change in change in momentum for an object for a given time and state law of motion in terms of momentum.
50. Show that rate of change in momentum for an object is equal to applied force.
51. Define impulse and show how it is related to linear momentum?
52. Find the velocities of two elastically colliding 35 bodies when $m_1 = m_2$ after collision.
53. Differentiate between elastic and inelastic collision. Explain how would a bouncing ball behave in each case?
54. Briefly describe the force due to water flow.
55. When rocket re-enters the atmosphere, its nose becomes very hot, why?
56. What is ballistic flight? Explain.
57. Is the range of projectile same for both angles of projectile of 30° and 60°? If your answer is yes then prove it?
58. Water is projected from two rubber pipes at the same speed v from one at 30° and from other at 60°. Why are the ranges equal? What is trajectory? Explain briefly.
59. Explain what is meant by projectile motion. Derive expression for:
    a. The time of flight b. The range of projectile
60. Show that range of projectile is maximum when the projectile is thrown at an angle of 45° with horizontal.

61. Define range of projectile. In which situations its value is maximum and minimum.
62. At what point or points in the path does a projectile have its minimum speed, its maximum speed?
63. Why fog droplets appear to be suspended in air?
64. Explain the difference between laminar flow and turbulent flow.
65. State Bernoulli's relation for a liquid in motion and describe some of its applications.
66. A person is standing near a fast moving train. Is there any danger that he will fall towards it?
67. Explain, how the swing is produced in a fast moving cricket ball?
68. Explain viscosity. What do you understand by the term viscosity? Explain.
69. Explain the working of a carburetor of a motor car using Bernoulli's principle.
70. Write values of systolic and diastolic blood pressure for a normal healthy man.
71. Derive venturi relation.
72. State Torricelli's theorem and write its relation.
73. Write values of systolic and diastolic blood pressure for a normal healthy man.
74. How can you measure blood pressure?
75. Define viscosity and drag force.
76. What is meant when we say fluid is non-viscous and incompressible?
77. State Stoke's law. Give its mathematical form.

Section - II

Short Questions

1. Calculate the work done in kilojoules in lifting a mass of 10 kg (at a steady velocity) through a vertical height of 10m.
2. In which case is more work done? When a 50kg bag of books is lifted through 50cm, or when a 50kg crate is pushed through 2m across the floor with a force of 50N?
3. An object has 1J of potential energy. Explain what does it mean?
4. What sort of energy is in the following: i)Compressed spring ii)Water in a high dam iii)A moving car
5. A girl drops a cup from a certain height, which breaks into pieces. What energy changes are involved?
6. When a rocket re-enters the atmosphere, its nose cone becomes very hot. Where does this heat energy come from?
7. State the direction of the following vectors in simple situations, angular momentum and angular velocity.
8. Why mud flies off the tyre of a moving bicycle, in what direction does it fly?
9. Why does a diver change his body positions before and after diving in the pool?
10. Name two characteristics of simple harmonic motion.
11. Does frequency depends on amplitude for harmonic oscillators?
12. Can we realize an ideal simple pendulum?
13. Does the acceleration of a simple harmonic oscillator remain constant during its motion? Is the acceleration ever zero? Explain.
14. What is meant by phase angle? Does it define angle between maximum displacement and the driving force?
15. Under what conditions does the addition of two simple harmonic motions produce a resultant, which is also simple harmonic?
16. Describe some common phenomena in which resonance plays an important role.
17. What features do longitudinal waves have in common with transverse waves?

18. Is it possible for two identical waves travelling in the same direction along a string to give rise to a stationary wave?
19. Why does sound travel faster in solids than in gases?
20. How are beats useful in tuning musical instruments?
21. Explain why sound travels faster in warm air than in cold air?
22. A wave is produced along a stretched string but some of its particles permanently show zero displacement. What type of wave is it?
23. An object has one joule potential energy. What does it mean? Explain.
24. Under what conditions work done will be positive and negative.
25. Define kilowatt hour. Show that $\mathbf{1kWh = 3.6 \times 10^6\ J}$.
26. Differentiate between conservative and non-conservative forces. Give examples.
27. Define work energy principle. Also write down its equations.
28. A stone is dropped from a height of 10m vertically down ward. What energy changes are involved?
29. State law of conservation of energy.
30. Write down two sources of energy which are renewable.
31. How energy can be obtained from waste products?
32. A 70kg man runs up flight of stairs in 9.8sec. The vertical height of the stairs in 5m. Calculate his power in KW.
33. What is Salter's duck? Explain it.
34. What is the difference between tangential velocity and angular velocity?
35. Define positive and negative angular acceleration. Give examples for each.
36. What is difference between angular acceleration and centripetal acceleration?
37. Prove that $v = r\omega$.
38. Banked tracks are needed for turns on highway. Why?
39. Define centripetal force and centripetal acceleration.
40. Define moment of inertia, how it is related to torque.
41. What will be the effect on moment of inertia of a cylinder of about its axis if its diameter is doubled?
42. Show that the angular momentum L0=m v r.
43. State the direction of the follow's vectors in simple situations, angular momentum and angular velocity.
44. Define angular momentum and give its dimensions.
45. What is meant by angular momentum? State law of conservation of angular momentum.
46. Why does the coasting rotating system slow down as some material object is added to the system during rotations?
47. Why is the axis of rotation of Earth remains fixed in one direction with respect to the universe around it?
48. A disc and hoop start moving down from the top of inclined plane at the same time. Which one will be the moving faster on reaching the ground?
49. A disc is rolling down on an inclined plane. Find the rotation for the speed of disc at its bottom.
50. State the practical use of rotational K.E by fly wheels.
51. What are the differences between real and apparent weight?
52. A lift is ascending with the acceleration "a". Derives the expression for apparent weight. Time body of mass "m" in it.
53. How artificial gravity is created in an artificial satellite?
54. Write down at least four uses of Geostationary satellites.
55. What is meant by INTELSAT? Explain.
56. Find total kinetic energy of rolling sphere of mass "m" and radius "r" on horizontal smooth surface.

57. What is difference between spin angular momentum and orbital angular momentum.
58. Derive the relation between radian, degree and revolution.
59. Prove that $S = r\theta$.
60. A disc and a hoop start moving down from the top of an inclined plane at the same time, which one will be moving faster on reaching the bottom?
61. Show that $= r\alpha$.
62. Define simple harmonic motion. Express it mathematically.
63. Define the terms used in SHM: i) Time period ii) Amplitude
64. What happens to the period of a simple pendulum of its length is doubled? What happens if the suspended mass is doubled?
65. State hook's law writes it in mathematical form.
66. What is the effect of amplitude on frequency and period of simple pendulum?
67. What happens to the period of the simple pendulum if the length is halved and mass of bob is doubled?
68. In an oscillating mass spring system if mass is doubled, how its time period will change?
69. Describe the condition under which a vibrating body resonates with other body.
70. The amplitude of simple pendulum should be small, why? Explain.
71. Define restoring force and simple harmonic motion.
72. What is difference between longitudinal and transverse wave?
73. Define mechanical waves and electromagnetic waves. Given examples of each.
74. Explain why sound travel faster in warm air than in cold air?
75. What is the effect of density on speed of sound? Explain briefly.
76. What is path difference? What should be the path difference for constructive and destructive interference?
77. What is the difference between interference and beats?
78. Explain the term red shift and blue shift in Doppler's effect.
79. What is the affect on phase of a wave when it is reflected from a boundary?
80. What do you mean by "Sonar Technique"?
81. How can Doppler effect be used to monitor blood flow through major arteries?
82. How Doppler's effect is applied to a radar system?
83. Taking an example of periodic wave, prove that $= f\lambda$.

Section - III

Short Questions

1. Under what conditions two or more sources of light behave as coherent sources?
2. Can visible light produce interference fringes? Explain.
3. Explain whether the Young's experiment is an experiment for studying interference or diffraction effects of light.
4. An oil film spreading over a wet footpath shows colors. Explain how does it happen?
5. Could you obtain Newton's rings with transmitted light? If yes, would the pattern be different from that obtained with reflected light?
6. How would you manage to get more orders of spectra using a diffraction grating?
7. Why the polaroid sunglasses are better than ordinary sunglasses?
8. How would you distinguish between un-polarized and plane-polarized lights?
9. Why would it be advantageous to use blue light with a compound microscope?
10. If a person was looking through a telescope at the full moon, how would the appearance of the moon be changed by covering half of the objective lens?

11. How the light signal is transmitted through the optical fibre?
12. How the power is lost in optical fibre through dispersion?
13. Why is the average velocity of the molecules in a gas zero but the average of the square of velocities is not zero?
14. Why does the pressure of a gas in a car tyre increase when it is driven through some distance?
15. Specific heat of a gas at constant pressure is greater than specific heat at constant volume. Why?
16. Is it possible to convert internal energy into mechanical energy? Explain with an example.
17. Is it possible to construct a heat engine that will not expel heat into the atmosphere?
18. Can the mechanical energy be converted completely into heat energy? If so give an example.
19. Does entropy of a system increase or decrease due to friction?
20. Define wave front and a ray of light.
21. Define wave-front and diffraction of light.
22. What is meant by wave front? Give its types.
23. State Huygen's principle?
24. Write the conditions for detectable interference.
25. Prove that $\Delta y = \frac{\lambda L}{d}$
26. What is Michelson's interferometer? Also write its working principle.
27. Define coherent source of light. Give an example.
28. On what factor, the distance between adjacent bright fringes in Young's double slits experiment depends?
29. If white light is incident on a film of irregular thickness at all possible angles, when will be the pattern of interference fringes? Explain your answer.
30. Give two applications of Michelson's interferometer.
31. Write down selective absorption method to obtain plane polarized light from ordinary light.
32. What are Newton's rings?
33. In Newton's ring, why are the fringes circular?
34. What is contribution of Michelson to measure the length of standard meter using interferometer?
35. What is the difference between interference and diffraction?
36. What is meant by the diffraction of light?
37. A typical diffraction grating has 5000 times per centimeter. What will be the grating element of this diffraction grating in meters?
38. What is diffraction grating and grating element?
39. Write down two methods by which we can obtain plane-polarized beam of light from un-polarized light.
40. Why diffraction grating cannot be used for X-rays diffraction?
41. Write the names of any four processes to obtain plane polarized beam of light from polarized light.
42. What is the usual way to obtain plane wave front a point source?
43. Write two uses of X-rays diffraction by crystal.
44. Why X-rays cannot be diffracted by ordinary glass grating?
45. Differentiate between Constructive and Destructive Interference.
46. What is meant by polarized light? Explain.
47. What is fringe spacing? And how the fringe spacing is increased?
48. Explain the difference between angular magnification and resolving power of an optical instrument.
49. What is difference between magnifying power and resolving power of optical instrument?
50. Define Snell's Law and write its mathematical form.

51. What us optical resolution and resolving power?
52. What is simple microscope? Write down the equation for its magnifying power.
53. Describe with the help of ray diagrams, how a single-biconvex lens can be used as a magnifying glass?
54. Sketch the ray diagram of a compound microscope.
55. Write down the main parts of spectrometer and two used of spectrometer.
56. What is Collimator? Why it is named so?
57. Write the advantages use of light as transmission carrier wave over radio wave carriers.
58. Draw sketch showing the different light paths through a single mode and a multi-mode fibre.
59. Define critical angle and total internal reflection.
60. What is difference between multimode step index and multimode graded index fibre?
61. Write down the three major components on which a fibre otpic communication system consists.
62. An astronomical telescope of long focal length and large aperture is considered to be a good telescope. Why?
63. Define Refractive index of a medium. Write its two mathematical forms.
64. Write down the main postulates of kinetic theory of gases.
65. Can the mechanical energy be converted completely into heat energy? If so give an example.
66. Derive Boyle's law from the expression for pressure of gas.
67. Define Charles law how it is derived from kinetic theory of gases.
68. Why absolute value of internal energy cannot be measured?
69. Prove that $W = P\Delta V$.
70. Is it possible to construct a heat engine of hundred percentage efficiency? Explain.
71. What is reversible and irreversible process?
72. What is adiabatic process? Under what conditions these processes occur?
73. Under what circumstances the efficiency of a carnot engine will be 100%? Is it possible?
74. State second law of thermodynamics.
75. A real heat engine is less efficient than carnot engine. Why?
76. State Carnot Theorem.
77. What is entropy? Give its mathematical relation.
78. State second law of thermodynamics in terms of entropy.
79. Define thermodynamics scale of temperature.
80. Why adiabate is steeper than isotherm?
81. Explain bicycle pump as an example of first law of thermodynamics.
82. Define molar specific heat of a gas at constant volume and molar specific heat at constant pressure.
83. Solid line represents adiabatic and dotted line isothermal process. In which process more work is done?
84. Can the efficiency of a Carnot Engine 100%? Explain.

Long Questions

QUESTION NO. 1

1. Suppose in a rectangular coordinate system, a vector A has its tail at the point $P(-2,-3)$ and its tip at $Q(3,9)$. Determine the distance between these two points.
2. Show that the three vectors $\hat{\imath}+\hat{\jmath}+\hat{k}, 2\hat{\imath}-3\hat{\jmath}+\hat{k}$ and $4\hat{\imath}+\hat{\jmath}-5\hat{k}$ are mutually perpendicular.
3. The line of action of force, $F=\hat{\imath}-2\hat{\jmath}$ Passes through a point whose position vector is $(-\hat{\imath}+\hat{k})$ Find i) the moment of F about the origin. Ii) the moment of F about the point of

which the position vector is $\hat{\imath} + \hat{k}$.

4. The magnitude of dot and cross products of two vectors are $6\sqrt{3}$ and 6 respectively. Find the angle between the vectors.
5. Define torque. Calculate torque due to force acting on a rigid body.
6. Define scalar product with examples. Write down its any four characteristics.
7. Define vectors product of two vectors. Also write the characteristics of vector product of two vectors.
8. Derive the expression for the magnitude and direction of the resultant of two vectors, added by rectangular component method.
9. A boy places a fire cracker of negligible mass in an empty can of 40 g mass. He plugs the end with a wooden block of mass 200 g. After igniting the firecracker, he throws the can straight up. It explodes at the top of its path. If the block shoots out with a speed of $3.0\ ms^{-1}$, how fast will the can be going?
10. An electron ($m = 9.1 \times 10^{-31}$ kg) travelling at $2.0 \times 10^{7}\ ms^{-1}$ undergoes a head on collision with a hydrogen atom ($m = 1.67 \times 10^{-27}$ kg) which is initially at rest. Assuming the collision to be perfectly elastic and a motion to be along a straight line, find the velocity of hydrogen atom.
11. A truck weighing 2500 kg and moving with a velocity of $21\ ms^{-1}$ collides with stationary car weighing 100 kg. The truck and the car move together after the impact. Calculate their common velocity.
12. Two blocks of masses 2.0 kg and 0.50 kg are attached at the two ends of a compressed spring. The elastic potential energy stored in the spring is 10 J. Find the velocities of the blocks if the spring delivers its energy to the blocks when released.
13. A bomber dropped a bomb at a height of 490 m when its velocity along the horizontal was $300 kmh^{-1}$. i) How long was it in air? ii) At what distance from the point vertically below the bomber at the instant the bomb was dropped, did it strike the ground?
14. A SLBM (submarine launched ballistic missile) is fired from a distance of 3000 km. If the Earth is considered flat and the angle of launched is 45^0 with horizontal, find the velocity with which the missile is fired and the time taken by SLBM to hit the target.
15. Define projectile motion. Derive relation for the following terms: i) Time of flight ii) Range of flight
16. Define elastic and inelastic collision. Explain elastic collision in one dimension to show the relative velocities before and after collision are same. A man pushes a lawn mower with a 40 N force directed at an angle of 20° downward from the horizontal. Find the work done by the man as he cuts a strip of grass 20 m long.

QUESTION NO. 2

1. Ten bricks, each 6.0 cm thick and mass 1.5 kg, lie flat on a table. How much work is required to stack them one on the top of another?
2. A 1000 kg automobile at the top of an incline 10 meter high and 100 m long is released and rolls down the hill. What is its speed at the bottom of the incline if the average retarding force due to friction is 480 N ?
3. A diver weighing 750 N dives from a board 10 m above the surface of a pool of water. Use the conservation of mechanical energy to find his speed at a point 5.0 m above the water surface,

neglecting friction.

4. Explain the inter conversion of potential energy and kinetic energy.
5. Define absolute gravitational P.E. derive expression for the absolute value of gravitational P.E of a body at a distance "r" from the center of the earth.
6. When two nodes of frequencies f_1 and f_2 are sounded together, beats are formed. If $f_1 > f_2$, what will be the frequency of beats? I) $f_1 + f_2$ ii) $1/2(f_1 + f_2)$ iii) $f_1 - f_2$ iv) $1/2(f_1 - f_2)$
7. A stationary wave is established in a string which is 120 cm long and fixed at both ends. The string vibrates in four segments; at a frequency of 120 Hz. Determine its wavelength and the fundamental frequency?
8. The frequency of the note emitted by a stretched string is 300 Hz. What will be the frequency of this note when: a) the length of the wave is reduced by one third without changing the tension. b) the tension is increased by one-third without changing the length of the wire.
9. Organ pipe has a length of 50 cm. Find the frequency of its fundamental note and the next harmonic when it is: a) open at both ends b) closed at one end.
10. Discuss effect of temperature on speed of sound. Also prove that $v_t = v_0 + 0.61t$.
11. Write down newton's formula for speed sound in air explain the Laplace correction by deriving the relation for speed of sound in air.
12. Define Doppler's effect. Derive apparent frequency if:a) observer moves towards the source b) observer moves away from the source
13. Explain interference. Find the conditions for i) constructive interference ii) destructive interference
14. What is drawback of Newton's formula for the speed of sound and how this was corrected by Laplace? Derive the Laplace's expression for the speed of sound and also find the value of speed of sound by using this expression.

QUESTION NO. 3

1. A disc and a hoop start moving down from the top of an inclined plane at the same time. Which one will be moving faster on reaching the bottom?
2. A tiny laser beam is directed from the Earth to the Moon. If the beam is to have a diameter of 2.50 m at the Moon, how small must divergence angle be for the beam? The distance of Moon from the Earth is 3.8×10^8 m.
3. Calculate the angular momentum of a star of mass 2.0×10^{30} kg and radius 7.0×10^5 km. If it makes one complete rotation about its axis once in 20 days. What is its kinetic energy? 4. Explain artificial gravity. Derive $f = \frac{1}{2\pi}\sqrt{\frac{g}{R}}$.
4. Define artificial satellite. Explain that how real and apparent weight in an elevator for all the cases is related?
5. Define rotational K.E. Also derive formula for rotational K.E of a disc and hoop coming down an inclined plane.
6. Define rotational K.E. show that a disc will be moving faster than a hoop on reaching the

bottom of an inclined plane, when thrown at the same time.

7. Calculate the angular momentum of a star of mass 2.0×10^{30} kg and radius 7.0×10^{5} km. if it makes one complete rotation about its axis one in 20 days, what is its kinetic energy?
8. What are geostationary satellites? Derive the relation for radius of geostationary orbit.
9. Certain globular protein particle has a density of $1246 kgm^{-3}$. It falls through pure water with a terminal speed of $3.0 cmh^{-1}$. Find the radius of the particle.
10. Water is flowing smoothly through a closed pipe system. At one point the speed of water is $3.0\ ms^{-1}$, while at another point 3.0 m higher, the speed is $4.0\ ms^{-1}$. If the pressure is 80kPa at the lower point, what is pressure at the upper point?
11. The radius of the aorta is about 1.0 cm and the blood flowing through it has a speed of about $30 cms^{-1}$. Calculate the average speed of the blood in the capillaries using the fact that although each capillary has a diameter of about 8×10^{-4} cm, there are literally millions of them so that their total cross section is about $2000\ cm^2$.
12. Define stoke's law and show that the terminal velocity is directly proportional to square of radius of the object.
13. State and prove the Bernoulli's equation in dynamic fluid that relates pressure to fluid speed and height.
14. State and derive equation of continuity $A_1V_1 = A_2V_2$

QUESTION NO. 4

1. Explain the relation between total energy, potential energy and kinetic energy for a body oscillating with SHM.
2. A load of 15.0 g elongates a spring by 2.00 cm. If body of mass 294 g is attached to the spring and is set into vibration with an amplitude of 10.0 cm, what will be its: i)period ii)spring constant iii)maximum speed of its vibration.
3. A block of mass 4.0 kg is dropped from a height of 0.80 m on to a spring of spring constant $k = 1960 Nm^{-1}$. Find the maximum distance through which the spring will be compressed.
4. A car of mass 1300 kg is constructed using a frame supported by four springs. Each spring has a spring constant $20{,}000 Nm^{-1}$. If two people riding in the car have a combined mass of 160 kg, find the frequency of vibration of the car, when if is driven over a pot hole in the road. Assume the weight is evenly distributed.
5. Discuss the motion of horizontal mass spring system and also derive formula for time period, displacement and velocity.
6. A Carnot engine utilizes an ideal gas. The source temperature is 227°C and the sink temperature is 127°C. Find the efficiency of the engine and also find the heat input from the source and heat rejected to the sink when 10000 J of work is done.
7. A reversible engine works between two temperatures whose difference is 100°C. If it absorbs 746 J of heat from the source and rejects 546 J to the sink. Calculate the temperature of the source and the sink.

8. A heat engine performs 100 J of work and at the same time rejects 400 J of heat energy to the cold reservoirs. What is the efficiency of the engine?
9. A Carnot engine whose low temperature reservoir is at 7°C has an efficiency of 50%. It is desired to increase the efficiency to 70%. By how many degrees the temperature of the source be increased?
10. A steam engine has a boiler that operates at 450 K. The heat changes water to steam, which drives the piston. The exhaust temperature of the outside air is about 300 K. What is maximum efficiency of this steam engine?
11. Define pressure of a gas. Prove that $\boldsymbol{P} = \frac{2}{3}\boldsymbol{N_0} < \frac{1}{2}\boldsymbol{mv^2} >$.
12. Define first law of thermodynamics. Explain isothermal and adiabatic process.
13. What is Carnot heat engine? Show that efficiency of a Carnot heat engine depends on the temperature of the hot and cold reservoirs.
14. Define molar specific heat and prove that $C_p - C_v = R$
15. Define and explain entropy with an example. Does entropy decrease for reversible process? Why absolute value of entropy cannot be determined?

QUESTION NO. 5

1. Calculate the wavelength of light, which illuminates two slits 0.5 mm apart and produce an interference pattern on a screen placed 200 cm away from the slits. The first bright fringe is observed at a distance of 2.40 mm from the central bright image.
2. A monochromatic light of $\lambda = 588$ nm is allowed to fall on the half silvered glass plate G_1, in the Michelson interferometer. If mirror M_1 is moved through 0.233 mm, how many fringes will be observed to shift?
3. Blue light of wavelength 480 nm illuminates a diffraction grating. The second order image is formed at an angle of 30° from the central image. How many lines in a centimeter of the grating have been ruled?
4. 4. X-rays of wavelength 0.150 nm are observed to undergo a first order reflection at a Bragg angle of 13.3^0 from a quartz (SiO 2) crystal. What is the interplanar spacing of the reflecting planes in the crystal?
5. Explain Young's Double slit experiment to study the phenomenon of interference of light.
6. Explain Young's double slit experiment. Derive the relation for position of mth bright and dark fringe from the center of the screen.
7. Describe the diffraction of X-rays by crystal and derive Bragg's equation.
8. A converging lens of focal length 5.0 cm is used as a magnifying glass. If the near point of the observer is 25 cm and the lens is held close to the eye, calculate: a)the distance of the object from the lens. b)the angular magnification. What is the angular magnification when the final image is formed at infinity?
9. A telescope objective has focal length 96 cm and diameter 12 cm. Calculate the focal length and minimum diameter of a simple eye piece lens for use with the telescope, if the linear magnification required is 24 times and all the light transmitted by the objective from a distant point on the telescope axis is to fall on the eye piece.
10. A point object is placed on the axis of and 3.6 cm from a thin convex lens of focal length 3.0 cm. A second thin convex lens of focal length 16.0 cm is placed coaxial with the first and

26.0 cm from it on the side away from the object. Find the position of the final image produced by the two lenses.

11. A compound microscope has lenses of focal length 1.0 cm and 3.0 cm. An object is placed 1.2 cm from the object lens. If a virtual image is formed 25 cm from the eye. Calculate the separation of the lenses and the magnification of the instrument.
12. Sodium light of wavelength 589 nm is used to view an object under a microscope. If the aperture of the objective is 0.90 cm, a) find the limiting angle of resolution. b) using visible light of any wavelength. What is the maximum limit of resolution for this microscope?
13. Discuss Michelson's experiment for the determination of speed of light.
14. What is compound microscope? Give its construction, working and derive the expression for the angular expression.
15. What is astronomical telescope? Sketch its ray diagram, write its working and find its angular magnification.