MODEL PAPER - 5

PHYSICS

81. Law of force between charges was discovered by *(Physical world)*
1) Coulomb 2) Chadwick 3) Galileo 4) Lord Kelvin

82. The velocity of a body is given by the equation $v = \frac{b}{t} + ct^2 + dt^3$. The dimensional formula of b is *(Units and Mesurement)*
1) $[M^0LT^0]$ 2) $[ML^0T^0]$ 3) $[M^0L^0T]$ 4) $[MLT^{-1}]$

83. The x and y coordinates of a particle at any time t are given by $x = 7t + 4t^2$ and $y = 5t$, where x and y are in metre and t in seconds. The acceerlation of particle at t = 5s is *(Motion in a Straight Line)*
1) Zero 2) $8m/s^2$ 3) $20\ m/s^2$ 4) $40\ m/s^2$

84. At a certain height a body at rest explodes into two equal fragments with one fragment receiving a horizontal velocity of $10\ ms^{-1}$. The time interval after the explosion for which the velocity vectors of the two fragments become perpendicular to each other is $(g = 10ms^{-2})$ *(Motion in a Plane)*
1) 1s 2) 2s 3) 1.5s 4) 1.75s

85. A ball A is projected from the ground such that its horizontal range is maximum. Another ball B is dropped from a height equal to thrice the maximum range of A. The ratio of the time of flight of A to the time of fall of B is *(Motion in a Plane)*
1) $\sqrt{3}:1$ 2) $1:\sqrt{3}$ 3) $2:\sqrt{3}$ 4) $\sqrt{3}:2$

86. A bomb of mass 6kg initially at rest explodes in to three identical fragements. One of the fragments moves with a velocity of $10:\sqrt{3}\,\hat{i}$ m/s, another fragment moves with a velocity if $10\hat{j}$ m/s, then the third fragment moves with a velocity of magnitude *(Law of Motion)*
1) 30 m/s 2) 20 m/s 3) 15 m/s 4) 5 m/s

87. A nucleous of mass number "A" initially at rest is hit directly by an a particle with a velocity "v". Assuming that the collision is elastic, the velocity of the nucleus after the collision is *(Law of Motion)*
1) $\frac{4v}{A+4}$ 2) $\frac{8v}{A-4}$ 3) $\frac{4v}{A-4}$ 4) $\frac{8v}{A+4}$

88. The kinetic energy of a man is half that of a boy whose mass is half that of the man. When the man speeds up by $5ms^{-1}$, his kinetic energy is 100% more than that of the boy. The initial velocity of the man is *(Work, Energy, Power)*
1) $(\sqrt{2}+1)$ m/s 2) 5 m/s 3) $2(\sqrt{2}-1)$ m/s 4) 2 m/s

89. An open knife edge of mass M is dropped from a height 'h' on a wooden floor. If the blade penetrates a distance 's' into the wood, the average resistance offered by the wood to the blade is *(Work, Energy, Power)*
1) Mg 2) $Mg\left(1+\frac{h}{s}\right)$ 3) $Mg\left(1-\frac{h}{s}\right)$ 4) $Mg\left(1+\frac{h}{s}\right)^2$

90. A simple pendululm is oscillating with an angular amplitude 60^0. If m is mass of bob and T_1, T_2 are tensions in the string when the bob is at extreme position, mean position respectively then *(System of Particles and RM)*
A) $T_1 = \frac{mg}{2}$ B) $T_2 = 2mg$ C) $T_1 = 0$ D) $T_2 = 3\ mg$
1) A and B are true 2) A and D are true 3) B and C are true 4) C and D are true

91. A simple pendulum consists of a light string from which a spherical bob of mass M is suspended. the distance between the point of suspension and the center of bob is L. At the lowest position the bob is given tangential velocity of $\sqrt{5gL}$. The K.E. of the bob when the string becomes horizontal is *(System of Particles and RM)*
1) Zero 2) $\frac{MgL}{2}$ 3) $\frac{3MgL}{2}$ 4) $\frac{5MgL}{2}$

92. A small mass lying at the top of a smooth convex hemisphere is just pushed horizontally. The angle with the vertical where it looses contact with surface is *(System of Particles and RM)*
1) $\tan^{-1}\left(\frac{2}{3}\right)$ 2) $\sin^{-1}\left(\frac{2}{3}\right)$ 3) $\cos^{-1}\left(\frac{2}{3}\right)$ 4) $\cot^{-1}\left(\frac{2}{3}\right)$

93. A particle hanging from spring stretches by 1 cm at earth's surface. At a point 800 km above earth's surface the same spring stretches by the same partical (Radius of earth R = 6400 km) *(Oscillation)*
1) 1 cm 2) 0.79 cm 3) 1.2 cm 4) 1.4 cm

94. A simple pendulum has a time period T_1 when on the earth's surface and T_2 when taken to a height R above the earth's surface R is the radius of the earth. The value of T_2/T_1 is *(Gravitation)*
1) 1 2) $\sqrt{2}$ 3) 4 4) 2

95. Density of a material is ρ and its bulk modulus is k. What is the increasing in density when it is subjected to a pressure of 'P'. *(Mechanical Properties of Solids)*

1) $\frac{P\rho}{K}$ 2) ρK 3) $\frac{\rho}{KP}$ 4) ρK

96. A body with a volume V neither sinks nor floats in a liquid. The vessel containing the liquid falls with an acceleration g/2. Then the volume of solid inside the liquid in the falling condition is *(Mechanical Properties of Fluids)*

1) V 2) V/2 3) zero 4) 3V/4

97. Intensity of radiation is 100 units when the distance between source & absorber is 'd' units, If the distance is doubled then intensity will be *(Thermal Properties of Matter)*

1) 200 units 2) 400 units 3) 25 units 4) 100 units

98. In an adiabatic change, the pressure P and temperature T of a monoatomic gas are related as $P \propto T^C$ where C equals *(Thermodynamics)*

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

99. During an adiabatic change the density becomes $\frac{1}{16}$ th of the initial value, then $\frac{P_1}{P_2}$ = ($\gamma = 1.5$) *(Thermodynamics)*

1) 16 2) 4 3) 32 4) 64

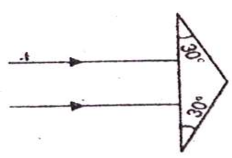
100. Each molecule of a gas has f degrees of freedom. The ratio $\frac{C_P}{C_V} = \gamma$ for the gas is *(Kinetic Theory of gases)*

1) $1 + \frac{f}{2}$ 2) $1+\frac{1}{f}$ 3) $1+\frac{2}{f}$ 4) $1+\frac{(f-1)}{3}$

101. An observer moves towards a stationery source of sound with a velocity one-fifth of velocity of sound. The percentage increase in apparent frequency is *(Waves)*

1) 5% 2) 20 % 3) Zero 4) 0.5%

102. Two parallel light rays are incident at one surface of a prism of refractive index 1.5 as shown in figure. The angle between the emergent rays is nearly *(Ray Optics and Optical Instruments)*



1) 19^0 2) 37^0 3) 45^0 4) 49^0

103. On one face of a prism of refractive index μ and refracting angle A, a ray of light is incident at an angle i. After refraction from the other refracting surface, the ray travels at grazing emergence. *(Ray Optics and Optical Instruments)*

1) $\mu = \sqrt{1+\left(\frac{\sin A + \cos i}{\sin A}\right)}$ 2) $\mu = \sqrt{1+\left(\frac{\sin i + \cos A}{\sin A}\right)^2}$

3) $\mu = \sqrt{1-\left(\frac{\sin i + \cos A}{\sin A}\right)^2}$ 4) $\mu = \sqrt{1+\left(\frac{\sin i + \cos A}{\sin A}\right)^2}$

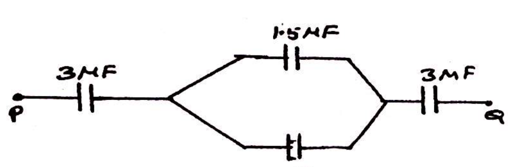
104. The distance between the two slits in a Young's double slit experiment is d and the distance of the screen from the plane of the slits is b, P is a point on the screen directly infront of one of the slits. The path difference between the waves arriving at P from the two slits is *(Wave Optics)*

1) $\frac{d^2}{b}$ 2) $\frac{d^2}{2b}$ 3) $\frac{2d^2}{b}$ 4) $\frac{d^2}{4b}$

105. A proton (mass = M) and a deutron (mass = 2M) are sent into an electric field. The ratio of accelerations of the proton and deutron is : *(Electric Charges and Fields)*

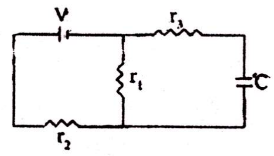
1) 1 : 1 2) 1 : 2 3) 2 : 1 4) 4 : 1

106. The equivalent capacitance of the network given below is 1 μ F. The value of 'C' is *(Electrostatic Potential and Capacitance)*



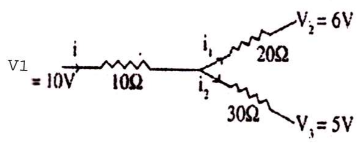
1) 3 μ F 2) 1.5 μ F 3) 2.5 μ F 4) 1 μ F

107. In the given circuit, the steady state voltage drop across the capacitor C is *(Current Electricity)*



1) $\frac{Vr_1}{r_2 + r_3}$ 2) $\frac{Vr_2}{r_1 + r_3}$ 3) $\frac{Vr_1}{r_1 + r_2}$ 4) $\frac{Vr_2}{r_1 + r_2}$

108. The current 'i' in the given branch of circuit is *(Current Electricity)*



1) 0.1 A 2) 0.2 A 3) 0.5 A 4) 0.4 A

109. If a particle of charge 10^{-12} C moving along the x - axis with a velocity 10^5 m/s. experienaces a force of 10^{-10} N in y - direction due to magnetic field, then the minimum magnetic field is. *(Moving Charges and Magnetism)*
1) 6.25 x 10^3 tesla in Z direction 2) 10^{-15} tesla in Z direction
2) 6.25 x 10^{-3} tesla in Z direction 4) 10^{-3} tesla in -ve Z direction

110. A proton of energy ' E' is moving along a circular path in a uniform magnetic field. If an alpha particle describes the same circular path, its energy should be *(Moving Charges and Magnetism)*
1) 4E 2) 2E 3) E 4) E/2

111. Two poles of same strength attract each other with a force of magnitude F when placed at the corners of an equilateral triangle. If a north pole of the same strength is placed at the third vertex, It experiences a force of magnitude *(Magnetism and Matter)*
1) F $\sqrt{3}$ 2) F 3) F $\sqrt{2}$ 4) 2F

112. There are two batteries 'A' and 'B having same emf. A has no internal resistance and B has some internal resistance. An inductance is connected first to 'A' and the energy in the uniform magnetic field setup inside is 'U'. It is now discounnected from 'A' and reconnected to 'B'. The energy stored in the uniform magnetic field will be *(Electromagnetic Induction)*
1) U 2) > U 3) < U 4) Zero

113. An alternating voltage of E= 200 $\sqrt{2}$ sin(100t) V is connected to a conduensor of 1 μF through an A. C ammeter. The reading of the ammeter will be. *(Alternating Current)*
1) 10 m A 2) 40 m A 3) 80 m A 4) 20 m A

114. Light with energy flux of 18 w/ cm^2 falls on a non reflecting surface of area 20 cm^2 at normal incidence the momentum delivered in 30 minutes is *(Electromagnetic Waves)*
1) 1.2 x 10^{-6} kgms^{-1} 2) 2.16 x 10^{-3} kgms^{-1} 3) 1.8 x 10^{-3} kg ms^{-1} 4) 3.2 x 10^{-3} khms^{-1}

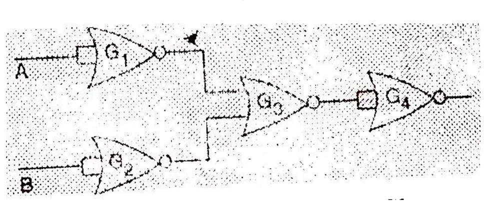
115. Phototelectrons are ejected fron the surface of a metal having work function 4.5 e V. Then the impulse tranmitted to the surface of the metal when the electron flies off due to collision of light quanta of energy 4.9 e V. *(Dual Nature)*
1) 3.39 x 10^{-25} Kg ms^{-1} 2) 1.47 x 10^{-25} Kg ms^{-1}
2) 3.43 x 10^{-25} Kg ms^{-1} 4) 4.62 x 10^{-25} Kg ms^{-1}

116. The energy required to excite an electron from n = 2 to n=3 energy state is 47.2 e V. The charge number of the nucleus, around which the electron revolving will be *(Atoms)*
1) 5 2) 10 3) 15 4) 20

117. If the activity of ^{108}Ag is 3 micro curie, the number of atoms present in it are (λ = 0.005 sec^{-1}) *(Nuclei)*
1) 2.2 x 10^7 2) 2.2 x 10^6 3) 2.2 x 10^5 4) 2.2 x 10^4

118. In a transistor circuit, when the base current is increased by 50 micro - amperes keeping the collector voltage fixed at 2 volts, the collector current increases by 1 mA. The current gain of the transistor is *(Semiconductors)*
1) 20 2) 40 3) 60 4) 80

119. The combination of the gates shown below produces *(Semiconductors)*



1) AND gate 2) XOR gate 3) NOR gate 4) NAND gate

120. A TV tower has a height of 100m. The population density around the TV if the population covered is 60.288 lac, is *(Communication System)*
1) 5 x 10^3 km^{-2} 2) 1.5 x 10^3 km^{-2} 3) 7.5 x 10^3 km^{-2} 4) 7 x 10^4 km^{-2}