MODEL PAPER - 3
PHYSICS

81. What is the working principle of steam engine? *(Physical world)*
1) Digital logic 2) Super conductivity 3) Laws of thermodynamics 4) Nuclear fission

82. The resistance of a metal is given by $R = \frac{V}{I}$, where V is potential difference and I is the current. In a circuit the potential difference across resistance is V = (8 ± 0.5)V and current in resistance, I = (2 ± 0.2) A. What is the value of resistance with its percentage error? *(Units and Mesurement)*
1) $4\Omega \pm 16.25\%$ 2) $4\Omega \pm 0.7\%$ 3) $4\Omega \pm 70\%$ 4) $4\Omega \pm 7\%$

83. Water drops fall from the roof of a building 20m high at regular time intervals. If the first drop strikes the floor when the sixth drop begins to fall, the heigths of the second and fourth drops from the ground at that instant are (g = 10 ms^{-2}) *(Motion in a Straight Line)*
1) 12.8 m and 3.2m 2) 12.8m and 7.2m 3) 19.2m and 0.8m 4) 7.2m and 16.8m

84. A bomb at rest at the summit of a cliff breaks into two equal fragments. One of the fragments attains a horizontal velocity of $20\sqrt{3}$ ms^{-1}. The horizontal distance between the two fragments when their displacement vectors is inclined at 60^0 relative to each other is (g = 10 ms^{-2}) *(Motion in a Plane)*
1) $40\sqrt{3}$ 2) $80\sqrt{3}$ 3) $120\sqrt{3}$ 4) $480\sqrt{3}$

85. A hose pipe lying on the ground shoots a stream of water upward at an angle 60^0 to the vertical at a speed of 50 ms^{-1}. The water strikes a wall 10m away at a height of (g = 10ms^{-2}) *(Motion in a Plane)*
1) 5.51m 2) 2.68m 3) 4.51m 4) 6.03m

86. An object initially at rest explodes, disintegrating into 3 parts of equal mass. Parts 1 and 2 have the same initial speed 'v', the velocity vectors being perpendicular to each other. Part 3 will have an initial speed of *(Law of Motion)*
1) $\sqrt{2}\,v$ 2) v / 2 3) $v/\sqrt{2}$ 4) $\sqrt{2v}$

87. A hammer of mas M strikes a nail of mass m with a velocity of "u" m/s and drives it "a" meter into a fixed block of wood. The average resistance of wood to the penetraiton of nail is *(Law of Motion)*
1) $\left(\frac{M}{m+M}\right)\frac{u^2}{2a}$ 2) $\left(\frac{M^2}{(m+M)^2}\right)\frac{u^2}{2a}$ 3) $\left(\frac{M^2}{(m+M)}\right)\frac{u^2}{2a}$ 4) $\left(\frac{M+m}{m}\right)\frac{u^2}{2a}$

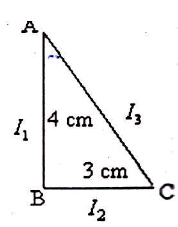
88. A dam is situated at a height of 300 m above sea level. It supplies water to a power house which is at heigth of 60m above sea level. 1000 kg of water passes through the turbine per second. If the efficiency of the system is 80% the electrical power output is (g =10 ms^{-2}) *(Work, Energy, Power)*
1) 4 MW 2) 2.5 MW 3) 3 MW 4) 6 MW

89. A particle moves in a straight line with retardation propoortional to its displacement x Its loss of kinetic energy for any displacement x is proportional to *(Work, Energy, Power)*
1) x^2 2) e^x 3) x 4) $\log_e x$

90. The bob of a simple pendulum is given a velocity in horizontal direction when the bob is at lowest position, so that the bob describes vertical circle of radius equal to length of pendulum and tension in the string is 10N when the bob is at an angle 60^0 from lowest position of vertical circle. The tension in the string when the bob reaches highest position is (The mass of bob is 100 gram. g = 10ms^{-2}) *(System of Particles and RM)*
1) 9 N 2) 7 N 3) 5.5 N 4) 3.5 N

91. A bodyis moving in a vertical circle of radius 'r'. If the ratio of maximum to minimum speeds is $\sqrt{3}:1$, the ratio of maximum to minimum tensions in the string is *(System of Particles and RM)*
1) 3 : 1 2) 5 : 1 3) 7 : 1 4) 9 : 1

92. ABC is a right angled triangular plate of uniform thickness. The sides are such that AB > BC as shown in figure. I_1, I_2, I_3 are moments of inertia about AB, BC and AC respectively. Then which of the following relations is correct? *(System of Particles and RM)*



1) $I_1 = I_2 = I_3$ 2) $I_2 > I_1 > I_3$ 3) $I_3 > I_2 > I_1$ 4) $I_3 > I_1 > I_2$

93. An oscillating mass spring system has a mechanical energy 1 Joule, when it has an amplitude 0.1m and maximum speed of 1 ms^{-1}. Then the force constant of the spring is *(Oscillation)*
1) 100 Nm^{-1} 2) 200 Nm^{-1} 3) 300 Nm^{-1} 4) 50 Nm^{-1}

94. The self graviational potential energy of a spherical shell of mass M and radius R is *(Gravitation)*
1) $\frac{-GM^2}{R}$ 2) $\frac{-GM^2}{2R}$ 3) $-\frac{3}{5}\frac{GM^2}{R}$ 4) $\frac{-GM^2}{4R}$

95. Two wires of different materials each 2m long and of diameter 2mm are joined in series to form a composite wire. If their young's moduli are 2 x 10^{11} N/m^2 and 7 x 10^{11} N/m^2 the force required to produce a total elongation 0.9 mm is *(Mechanical Properties of Solids)*

1) 110 N 2) 220 N 3) 330 N 4) 440 N

96. A stream line body with relative density ρ_1 falls into air from a height h_1 on the surface of a liquid of relative density ρ_2 where $\rho_2 > \rho_1$. The time of immersion of the body into the liquid will be *(Mechanical Properties of Fluids)*

1) $\sqrt{2h_1/g}$ 2) $\sqrt{2h_1/g}\,x\,\frac{\rho_2}{\rho_1}$ 3) $\sqrt{\frac{2h_1}{g}}\,x\,\frac{\rho_1}{\rho_2}$ 4) $\sqrt{\frac{2h_1}{g}}\,x\,\frac{\rho_1}{(\rho_2-\rho_1)}$

97. A planet having average surface temperature T_0 is at an average distance d from the sun. Assuming that the planet receives radiant energy only from its surface and neglecting all other atmospheric effects we conclude *(Thermal Properties of Matter)*

1) $T_0 \propto d^2$ 2) $T_0 \propto d^{-2}$ 3) $T_0 \propto d^{1/2}$ 4) $T_0 \propto d^{-1/2}$

98. A gas is compressed isothermally and adiabatically. The corresponding change in volume are found to be 51 c.c and 34 c.c. The value of γ for the gas is *(Thermodynamics)*

1) 1.67 2) 1.4 3) 1.33 4) 1.5

99. From which height a block of ice must be dropped in order that it melts completely. Assume that all the energy is retained by the ice (g = 10 ms^{-2}, L = 80 cal gm^{-1} and J = 4.2 joules/cal.) *(Thermodynamics)*

1) 1000 km 2) 100 km 3) 33.6 km 4) 1 km

100. If the velocity of sound in air is V_s and root mean square velocity is V_{rms}, then *(Kinetic Theory of gases)*

1) $V_{rms} = V_s$ 2) $V_{rms} < V_s$ 3) $V_{rms} = \frac{V_s}{2}$ 4) $V_s = V_{rms}\sqrt{\frac{\gamma}{3}}$

101. A train running at 108 km/hr towards east whistles at a frequency of 800 Hz. The frequencies heard by a passenger sitting in the train and a person standing near the track whom the train has just passed (speed of sound = 330 m/s) *(Waves)*

1) 800 Hz, 733 Hz 2) 740 Hz, 800 Hz 3) 800 Hz, 880 Hz 4) 800 Hz, 750 Hz

102. A man cannot see clearly the objets beyond adistances of 20 cm from his eyes. To see distanobjects clearly the kind of lenses and its focal length must be *(Ray Optics and Optical Instruments)*

1) 100 cm convex 2) 100 cm concave 3) 20 cm convex 4) 20 cm concave

103. The power of lens, a short sighted person uses is 2 dioptre. The maximum distance of an object which he can see without spectacle is *(Ray Optics and Optical Instruments)*

1) 25 cm 2) 50 cm 3) 100 cm 4) 10 cm

104. In young's double slit experiment, the distance between the slit is 'd' and the screen is at a distance 'D' from the slits. If maximum brightness is formed opposite to a slit on the screen, the order of that band is (λ = wavelength of the light) *(Wave Optics)*

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

105. Charges 20,30, -40 and 50 μ C are at the corners of a square of 10 cm. The field at the point of intersection of the diagonals is *(Electric Charges and Fields)*

1) $360\sqrt{10}x10^5\frac{N}{C}$ 2) $360x10^5\frac{N}{C}$ 3) $360x10^6\frac{N}{C}$ 4) $36\sqrt{10}x10^5\frac{N}{C}$

106. Two identical parallel plate capacitors are joined in series to 100 V battery. Now a dielectric with K=4 is introduced between the plates of second capacitor. The potential difference on capacitors. *(Electrostatic Potential and Capacitance)*

1) 60 V, 40 V 2) 70V, 30V 3) 75V, 25V 4) 80V, 20V

107. A resistance is made by connecting two wires (series) of same material of radii 2 mm and 5 mm and length 8 cm and 5 cm. A potential difference of 22V is applied to them. The potential difference on the longer wire is *(Current Electricity)*

1) 15V 2) 18 V 3) 16V 4) 20V

108. The combined resistance of two conductors in series is 1Ω. If the conductance of one conductor is 1.1 siemen, the conductance of the other conductor in siemen is *(Current Electricity)*

1) 10 2) 11 3) 1 4) 1.1

109. An a - particle describes a circular path of radius r in a magnetic field B. The radius of the circular path described by the proton of same energy in the same magnetic field is *(Moving Charges and Magnetism)*

1) r/2 2) r 3) $\sqrt{2}$ r 4) 2r

110. An electron is shot in steady electric and magnetic field such that its velocity is V. Electric field E and magnetic field B are mutually perpendicular. The magnitude of E is 1 volt /cm and that of B is 2 tesla. Now it happens that the lorentz (magnetic) force cancels with the electro static force on the electron, then the velocity of the electron is *(Moving Charges and Magnetism)*

1) 50 ms^{-1} 2) 2 cms^{-1} 3) 0.5 cms^{-1} 4) 200 ms^{-1}

111. A bar magnet with poles 25 cm apart and pole strength 14.4 A-m rests with its centre on a frictionless pivot. If it is held in equilibrium at 60^0 to a uniform magnetic fild in induction 0.25 T by applying a force F at right angles to its axis 10 cm from the pivot, The value of F in Newton is (nearly) ***(Magnetism and Matter)***

1) 3.9N 2) 7.8N 3) 15.6 N 4) 31.2 N

112. The coefficient of mutual inductance of two coils is 5H. The current through the primary coil is reduced to zero value from 3 A in 1 millisecond. The induced e.m.f in the secondary coil will be ***(Electromagnetic Induction)***

1) 30KV 2) 1.67 KV 3) 15 KV 4) 600 V

113. Voltage and current in an A.C circuit are given by $V = 5\sin\left(100\pi t - \frac{\pi}{6}\right)$ and $I = 4\sin\left(100\pi t + \frac{\pi}{6}\right)$ ***(Alternating Current)***

1) Voltage leads the current by 30^0 2) Current leads the voltage by 60^0
3) Voltage leads the current by 60^0 4) Current and voltage are in phase

114. Light with energy flux of 18 w/cm^2 falls on a non-reflecting surface at normal at normal incidence. If the surface has an area of 20 cm^2, the average force exerted on the surface during a 30 minute time span is ***(Electromagnetic Waves)***

1) 1.2×10^{-6} N 2) 2.4×10^{-6} N 3) 2.16×10^{-3} N 4) 1.5×10^{-6} N

115. If U.V light of wavelengths 800 A^0 and 700 A^0 can liberate electrons with kinetic energies of 1.8 eV and 4 eV respectively from hydrogen atom in ground state. Then the value of Planek's constant is ***(Dual Nature)***

1) 6.57×10^{-34} Js 2) 6.63×10^{-34} Js 3) 6.66×10^{-34} Js 4) 6.77×10^{-34} Js

116. The number of revolutions done by an electron 'e' in one second in the first orbit of hydrogen atom is ***(Atoms)***

1) 6.57×10^{15} 2) 6.57×10^{13} 3) 1000 4) 6.57×10^{14}

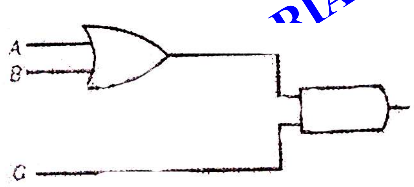
117. The half life period of of Pb^{210} is 22 years. If 2g of Pb^{210} is taken, Then after 11 years the amount of Pb^{210} will be present is ***(Nuclei)***

1) 0.1414 g 2) 1.414 g 3) 2.828 g 4) 0.707 g

118. A common emitter transistor amplifier has a current gain of 50. If the load resistance is $4K\Omega$, and input resistance is 500 Ω, The voltage gain of amplifier is ***(Semiconductors)***

1) 100 2) 200 3) 300 4) 400

119. To get an output 1 from the circuit shown in the figure, the input must be ***(Semiconductors)***



1) A=0, B=1, C=0 2) A=1, B=0, C=0 3) A=1, B=0, C=1 4) A=1, B=1, C=0

120. The number of AM broad casting stations that can be accomodated in a 100 KHz band width if the highest frequency modulating a carrier is 5KHz are ***(Communication System)***

1) 5 2) 7 3) 20 4) 10