MODEL PAPER - 4

PHYSICS

81. The scientific principle involved in radio and television is *(Physical world)*
1) Superconductivity 2) Electromagnetic induction 3) Propagation of e.m. wave 4) Emission of γ-rays

82. If L is the inductance, C is the capacitance and R is the resistance, then $R\sqrt{\frac{C}{L}}$ has the dimension *(Units and Mesurement)*
1) $MLT^{-2}I^{-2}$ 2) ML^2T^2I 3) $ML^{-1}T^{-2}I^{-1}$ 4) $M^0L^0T^0I^0$

83. The position x of a particle varies with time t as $x = at^2 - bt^3$. The acceleration of the particle will be zero at time t equal to *(Motion in a Straight Line)*
1) $\frac{a}{b}$ 2) $\frac{2a}{3b}$ 3) $\frac{a}{3b}$ 4) zero

84. At a certain height a shell at rest explodes into two equal fragments. One of the fragments receives a horizontal velocity u. The time interval after which, the velocity vectors will be inclined at 120^0 to each other is *(Motion in a Plane)*
1) $\frac{u}{\sqrt{3g}}$ 2) $\frac{\sqrt{3}\mu}{g}$ 3) $\frac{2\mu}{\sqrt{3g}}$ 4) $\frac{\mu}{2\sqrt{3g}}$

85. A projectile has the maximum range of 150m. If it is pushed up on a smooth inclined plane of angle 60^0 with the same speed, the distance travelled by it along the inclined plane will be *(Motion in a Plane)*
1) $30\sqrt{3}$ 2) $40\sqrt{3}$ 3) $50\sqrt{3}$ 4) $60\sqrt{3}$

86. A wooden plank of mass M and length L is resting on a smooth horizontal floor. A body of mass m starts moving from one end of the plank to the other end with a uniform velocity 'v' relative to the plank. The recoil velocityof the plank is *(Law of Motion)*
1) $\frac{mv}{M}$ 2) $\frac{Mv}{m}$ 3) $\frac{Mv}{M+m}$ 4) $\frac{mv}{M+m}$

87. A shell is fired from the ground at an angle q with horizontal velocity 'v'. At its highest point it breaks into two equal fragments. If one fragment comes back through its initial line of motion with same speed, then speed of second fragment will be *(Law of Motion)*
1) $3v\cos\theta$ 2) $3v\cos\theta/2$ 3) $2v\cos\theta$ 4) $\sqrt{3}\,v\cos\theta/2$

88. A shell of mass 'm' moving horizontally explodes in to two equal pieces at the instant its momentum is '3p'. One of the fragments attains a linear momentum of '4p' in upward direction.The kinetic energy gained by the system immediately after explasion is *(Work, Energy, Power)*
1) $\frac{25p^2}{m}$ 2) $\frac{16p^2}{m}$ 3) $\frac{41p^2}{m}$ 4) $\frac{73p^2}{2m}$

89. A car of mass 1000 kg moves on a horizontal surface. If the road friction amounts to 10% of weight of the car and air resistance amounts to 2% of the weight, the power required to run the car at a uniform speed of 36 KMPH is *(Work, Energy, Power)*
1) 112 kW 2) 56 kW 3) 12 kW 4) 6 kW

90. The length of a ballistic pendulum is 1 m and mass of its block is 1.9 kg. A bullet of mass 0.1kg strickes the block of ballistic pendulum in horizontal direction with a velocity 100 ms^{-1} and got embeded in the block. After collision the combined mass (block & bullet) swings away from lowest point. The tension in the string when it makes an angle 60^0 with vertical is ($g = 10\ ms^{-2}$) *(System of Particles and RM)*
1) 20 N 2) 30 N 3) 40 N 4) 50 N

91. A simple pendulum with a bob of mass 'm' swings with angular amplitude of 60^0. When its angular displacement 30^0, the tension in the string would be *(System of Particles and RM)*
1) $3\sqrt{3}\,mg$ 2) $\frac{mg}{2}\left(3\sqrt{3}-2\right)$ 3) $\frac{1}{2}mg\left(\frac{3}{\sqrt{3}+2}\right)$ 4) $\frac{1}{2}mg\left(3-\sqrt{2}\right)$

92. The length of a simple pendulum is 'L'. Its bob from rest position is projected horizontally with a velcoity $\sqrt{\frac{7gL}{2}}$. The maximum angular displacement of bob such that the string does not slack is *(System of Particles and RM)*
1) 30^0 2) 60^0 3) 120^0 4) 150^0

93. The period of the vertical oscillation of a load of mass 4kg suspended form a spring is 0.4 sec. When an additional load of mass 5kg is applied the period of oscillational is *(Oscillation)*
1) 0.9 sec 2) 0.8 sec 3) 0.7 sec 4) 0.6 sec

94. A geostationary satellite orbits around the earth in a circular orbit of radius 36,000 km. Then, the time period of a spy satellite orbiting a few hundred km above the earth's surface (Re = 6400 km) will approximately be ***(Gravitation)***
1) h/2 2) 1 h 3) 2 h 4) 4 h

95. Bulk modulus of rubber is 9.8 x 10^8 N/m^2. To what depth a rubber ball be taken in a lake so that its volume is decreased by 0.1% ***(Mechanical Properties of Solids)***
1) 50 m 2) 100 m 3) 150 m 4) 200 m

96. A denotes the area of free surface of a liquid and h the depth of an orifice of area of cross-section a, below the liquid surface. The velocity of the liquid flowing through the orifice is ***(Mechanical Properties of Fluids)***
1) $\sqrt{2gh}$ 2) $\sqrt{2gh}\sqrt{\left(\frac{A^2}{A^2-a^2}\right)}$ 3) $\sqrt{2gh}\sqrt{\left(\frac{A}{A-a}\right)}$ 4) $\sqrt{2gh}\sqrt{\left(\frac{A^2-a^2}{A^2}\right)}$

97. Two identical bodies have temperature 277^{0}C and 67^{0}C. If the surrounding temperature is 27^{0}C, the ratio of loss of heat of two bodies during the same interval of time is (approx) ***(Thermal Properties of Matter)***
1) 4 : 1 2) 8 : 1 3) 12 : 1 4) 16 : 1

98. A fixed amount of dry air at temperature of 27^{0}C is compressed to 1/9 of original volume. Its final temperature is (γ_1 = 1.5) ***(Thermodynamics)***
1) 627^{0}C 2) 600^{0}C 3) 158^{0}C 4) 527^{0}C

99. In an adiabatic expansion, the temperature of 5 moles of gas γ = 1.5 falls from 87^{0}C to 27^{0}C, then the work done is ***(Thermodynamics)***
1) 2400 cal 2) 4980 cal 3) 1200 cal 4) 3000 cal

100. A mixture of n_1 moles of monatomic gas and n_2 moles of diatomic gas has $\frac{C_p}{C_v} = \gamma = 1.5$. ***(Kinetic Theory of gases)***
1) $n_1 = n_2$ 2) $2n_1 = n_2$ 3) $n_1 = 2n_2$ 4) $2n_1 = 3n_2$

101. An engine giving off whistle is moving towards a stationery observer with 50 m/s speed. What will be the ratio of the frequencies of the whistle heard when engine is approaching and receding from the observer? (speed of sound = 350 m/s) ***(Waves)***
1) 2 : 1 2) 4 : 5 3) 4 : 3 4) 3 : 4

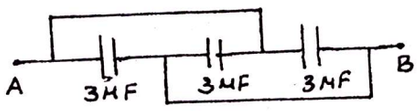
102. A person can see clearly objects lying between 25 cm to 2m from his eye. His vision can be corrected by using spectacles of power ***(Ray Optics and Optical Instruments)***
1) +0.25 D 2) + 0.5 D 3) - 0.25 D 4) -0.5 D

103. The power of a lens used to remove the myopic defect of eye is 0.66 D. The far point of this eye is (nearly) ***(Ray Optics and Optical Instruments)***
1) 25 cm 2) 150 cm 3) 100 cm 4) 75 cm

104. White light is used to illuminate two slits. The separation between slits is b and screen is at a distance 'd' from slits 'Q' point on the screen directly infront of one of slits, certain wave lengths are missing. The missing wave lengths are ***(Wave Optics)***
1) $\lambda = \frac{4b^2}{d}$ 2) $\lambda = \frac{2b^2}{d}$ 3) $\lambda = \frac{b^2}{3d}$ 4) $\lambda = 2b^2 / 3d$

105. Strength of the electric field in which an electron will experience a force equal to its weight is ***(Electric Charges and Fields)***
1) 5.625 x 10^{-11} N/C 2) 2 x 10^{-12} N/C 3) 4 x 10^{-12} N/C 4) 4 x 10^{-11} N/C

106. The equivalent capacity between the points 'A' and 'B' in the following figure will be ***(Electrostatic Potential and Capacitance)***



1) 9 μ F 2) 1 μ F 3) 4.5 μ F 4) 6 μ F

107. Aluminium (α = 4 x 10^{-3} K^{-1}) resistance of 60Ω and carbon (α = -0.5 x 10^{-3} K^{-1}) resistance 40Ω are connected in parallel. The combination is heated. The effective resistance is ***(Current Electricity)***
1) Greater than 24 Ω 2) less than 24 Ω 3) Greater than 40 Ω 4) Greater than 100 Ω

108. A copper tube is of internal radius 4 mm and outer radius 5 mm. Its resistance is R_1. The tube is filled with suitable copper wire. The resistance of the arrangement is R_2. Then R_2/R_1 is ***(Current Electricity)***
1)25/9 2) 1/2 3) 4 4) 9/25

109. Electrons accelerated by a potential difference V enter a uniform magnetic field of flux density B at right angles to the field. They describe a circular path of radius 'r'. If now V is doubled and B is also doubled, the radius of the new circular path is ***(Moving Charges and Magnetism)***
1) 4r 2) 2r 3) $2\sqrt{2r}$ 4) r / $\sqrt{2}$

110. An electron of charge 'e' and mass 'm ' describes a circular path of radius 'r' when it is projected with a velocity 'v' perpendicular to a uniform magnetic field, then its frequency is ***(Moving Charges and Magnetism)***

1) $\frac{1}{2\pi}\sqrt{\frac{Be}{m}}$ 2) $\frac{1}{2\pi}\frac{Be}{m}$ 3) $\frac{1}{2\pi}\frac{m}{Be}$ 4) $\frac{1}{2\pi}\frac{me}{2}$

111. A bar magnet of magnetic moment 3.0 amp. m^2 is placed in a uniform magnetic induction field 2 x 10^{-5} T. If each pole of the magnet experience a force of 6 x 10^{-4} N, The length of the magnet is ***(Magnetism and Matter)***
1) 0.5 m 2) 0.3 m 3) 0.2 m 4) 0.1 m

112. A small square loop of wire of side ' I' is placed inside a large square loop of side 'L' (L>>I). If the loops are coplanar and their centres coincide, the mutual induction of the system is directly proportional to : ***(Electromagnetic Induction)***

1) $\frac{L}{\ell}$ 2) $\frac{\ell}{L}$ 3) $\frac{L^2}{\ell}$ 4) $\frac{\ell^2}{L}$

113. The inductance of a coil is 0.70 henry. An A.C. source of 120volt is connected in parallel with it. If the frequency of A.C is 60 Hz, Then the current which is flowing in inductance will be ***(Alternating Current)***
1) 4.55A 2) 0.33 A 3) 0.455A 4) 3.55A

114. Light with energy flux 18 w cm^{-2} is incident on a mirror of size 2 cm x 2cm normally. The force experienced by it and momentum delivered in one minute are ***(Electromagnetic Waves)***
1) 0.48 μ N; 28.8 μ kgms^{-1} 2) 48 μ N; 2.88 μ kgms^{-1}
3) 28.8 μ N; 4.8 μ kgms^{-1} 4) 0.24 μ N; 28.8 μ kgms^{-1}

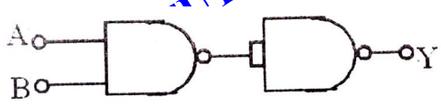
115. Light rays of waterlengths 600 ^{0}A and of photon intensity 39.6 watts/m^2 is incident on a metal surface. If only one percent of photons incident on the surface emit photo electrons, Then the number of electrons emitted per second per unit area from the surface will be [Planck constant = 6.64 x 10^{-34} J - S; velocity of light = 3 x 10^8 ms^{-1}] ***(Dual Nature)***
1) 12 x 10^{18} 2) 10 x 10^{18} 3) 12 x 10^{17} 4) 12 x 10^{15}

116. In the Bohr model of hydrogen atom, the ratio of the k inetic energy and total energy of electron in the n^{th} quantum state will be ***(Atoms)***
1) 1 2) -1 3) 2 4) -12

117. A radio active isotope having a half life of 3 days was received after 9 days. It was found that there was only 4 gms of the isotope in the container. The initial weight of the isotopes when packed was. ***(Nuclei)***
1) 8 gms 2) 64 gms 3) 48 gms 4) 32 gms

118. The current gain (β) of a transistor in common emitter mode is 40. To change the collector current by160 m A, The necessary change in the base current is (at constant V_{CE}) ***(Semiconductors)***
1) 0.25 μ A 2) 4 μ A 3) 4 m A 4) 40 m A

119. The arrangement shown in figure performs the logic function of ***(Semiconductors)***



1) AND gate 2) NAND gate 3) OR gate 4) XOR gate

120. A TV transmission tower at a particular station has a height of 160 m. Radius of earth is 6400km ***(Communication System)***

i) The range it covers is 45255 m
ii) The population that it covers is 77.42 lakhs. When population density is 1200 km^{-2}
iii) The height of antenna should be increased by 480 m to double the coverage range

1) i and ii are true 2) ii and iii are true 3) i and iii are true 4) i, ii and iii are true