



**PHYSICS, PAPER-II**

<b>TIME ALLOWED:</b>	<b>(PART-I) 30 MINUTES</b>	<b>MAXIMUM MARKS:20</b>
	<b>(PART-II) 2 HOURS &amp; 30 MINUTES</b>	<b>MAXIMUM MARKS:80</b>

- NOTE:** (i) First attempt PART-I (MCQ) on separate Answer Sheet which shall be taken back after 30 minutes.  
 (ii) Overwriting/cutting of the options/answers will not be given credit.  
 (iii) Use of Scientific Calculator is allowed.

**PART – I (MCQ)**  
**(COMPULSORY)**

- Q.1. Select the best option/answer and fill in the appropriate box on the Answer Sheet. (20)**
- (i) A Watt – sec is a unit of:  
 (a) Force (b) Energy (c) Power (d) None of these
- (ii) The direction of any magnetic induction effect is such as to oppose the cause of the effect. This is:  
 (a) Coulumb's Law (b) Ampere's Law (c) Lenz's Law (d) None of these
- (iii) A magnetic field cannot:  
 (a) accelerate a charge (b) Exert a force on a charge  
 (c) change the kinetic energy of a charge (d) None of these
- (iv) The inverse of resistivity is called Conductivity. Its unit is:  
 (a) Ohm<sup>-1</sup> (b) ohm-metre (c) (ohm-meter)<sup>-1</sup> (d) None of these
- (v) An LRC Circuit has  $R=4\Omega$ ,  $X_C=3$  and  $X_L=6$ , the impedance of the circuit is:  
 (a)  $5\Omega$  (b)  $7\Omega$  (c)  $13\Omega$  (d) None of these
- (vi) A "step-down" transformer is used to:  
 (a) increase the power (b) decrease the voltage (c) Increase the voltage (d) None of these
- (vii) Electrical potential is the potential energy per unit:  
 (a) Charge (b) Voltage (c) Force (d) None of these
- (viii) The force on a charge moving with the velocity in a magnetic field B is given by:  
 (a)  $F = (q/v \times B)$  (b)  $F = (qv \times B)$  (c)  $F = (qv + B)$  (d) None of these
- (ix) A changing current "i" in any circuit induces an emf "e" in that circuit, which is equal to:  
 (a)  $e = di/dt$  (b)  $E = i d\Phi/dt$  (c)  $e = -L di/dt$  (d) None of these
- (x) Inductive reactance of an inductor is:  
 (a)  $X_L = \omega^2 L$  (b)  $X_L = \omega/L$  (c)  $e = -L di/dt$  (d) None of these
- (xi) The resonant frequency of an LC-Circuit is:  
 (a)  $f = 2\pi LC$  (b)  $f = 1 / 2\pi\sqrt{LC}$  (c)  $f = 1/2LC$  (d) None of these
- (xii) The deliberate addition of an impurity element in a semi-conductor is called:  
 (a) doping (b) annealing (c) mixing (d) None of these
- (xiii) The conversion of AC into DC is called:  
 (a) amplification (b) rectification (c) modulation (d) None of these
- (xiv) The Laser light is:  
 (a) monochromatic (b) coloured (c) chromatic (d) None of these
- (xv) The Laser light may be obtained from:  
 (a) quartz crystal (b) NaCl crystal (c) ruby crystal (d) None of these
- (xvi) The emission of photoelectrons in photoelectric effect is dependent on:  
 (a) threshold frequency (b) intensity of light (c) Nature of metal (d) None of these
- (xvii) Which one of the following is NOT needed in Nuclear Fission reactor:  
 (a) fuel (b) accelerator (c) moderator (d) None of these
- (xviii) The half life of a radioactive isotope is 140 days. How many days would it take to loose 3/4 of its initial activities:  
 (a) 105 days (b) 280 days (c) 35 days (d) None of these
- (xix) Most of the energy produced in Sun is due to:  
 (a) Nuclear fusion (b) Chemical reaction (c) Nuclear Fission (d) None of these
- (xx) A U-235 nucleus will split when it captures:  
 (a) an  $\alpha$ -particle (b) e.m. radiation (c) neutron (d) None of these

<b>NOTE:</b>	<p>(i) <b>PART-II</b> is to be attempted on the separate <b>Answer Book</b>. (ii) Attempt <b>ONLY FOUR</b> questions from <b>PART-II</b>. All questions carry <b>EQUAL</b> marks. (iii) Extra attempt of any question or any part of the attempted question will not be considered. (iv) Use of Scientific calculator is allowed.</p>
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- Q.2.** (a) State and prove Gauss's Law in electrostatics and express the law in differential forms. **(14)**  
(b) Find the electric intensity at a point outside a volume distribution of charge confined into a spherical region of radius R. **(06)**
- Q.3.** (a) State and explain Ampere's Law. Derive an expression for the value of 'B' inside a solenoid. **(14)**  
(b) A thin 10 cms long solenoid has a total of 400 turns of wire and carries a current of 0.20 amp. Calculate the field inside near the centre.  $\left( \text{Given } \mu_0 = 12.57 \times 10^{-7} \text{ T - m/A} \right)$  **(06)**
- Q.4.** (a) How a Semi Conductor diode is used as a half wave and full wave rectifier? **(08)**  
(b) What are the transistors? Give Construction and Symbol of PNP and NPN transistor. **(07)**  
(c) The resistivity of a metal increases with increase in temperature while that of a semi conductor decreases. Explain. **(05)**
- Q.5.** (a) Discuss briefly the wave nature of matter and obtain an expression of de Broglie's wavelength for matter waves. **(14)**  
(b) Calculate the de Broglie's wavelength of a 0.20kg ball moving with a speed of 15 m/s. **(06)**
- Q.6.** (a) Derive Einstein's photoelectric effect on the basis of quantum theory and derive Einstein's photoelectric equations. **(14)**  
(b) Calculate the work function of Na in electron-volts, given that the threshold wavelength is 6800 Å and  $h = 6.625 \times 10^{-34}$  J-S **(06)**
- Q.7.** (a) Define the terms decay constant, half life and average life as applied to a radioactive substance. Find the relation between them. **(11)**  
(b) The half life of Radium is 1590 years. In how many years will one gm of pure element (a) loose one centigram and (b) be reduced to one centigram. **(07)**  
(c) When a nucleus emits a  $\gamma$  – ray photon, what happens to its atomic number and its actual mass. **(02)**
- Q.8.** Write notes on **ANY TWO** of the following: **(20)**  
(a) Self and Mutual Inductance  
(b) Pauli's Exclusion Principle  
(c) Compton Scattering

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