



FEDERAL PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION FOR
RECRUITMENT TO POSTS IN BPS-17 UNDER
THE FEDERAL GOVERNMENT, 2010

Roll Number

PHYSICS, PAPER-II

TIME ALLOWED:	(PART-I) 30 MINUTES	MAXIMUM MARKS:20
	(PART-II) 2 HOURS & 30 MINUTES	MAXIMUM MARKS:80

- 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⁻¹ (b) ohm-metre (c) (ohm-meter)⁻¹ (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) 5Ω (b) 7Ω (c) 13Ω (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 α -particle (b) e.m. radiation (c) neutron (d) None of these

NOTE:	<p>(i) PART-II is to be attempted on the separate Answer Book. (ii) Attempt ONLY FOUR questions from PART-II. All questions carry EQUAL 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 γ – 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
