

PUNJAB PUBLIC SERVICE COMMISSION
COMBINED COMPETITIVE EXAMINATION FOR
RECRUITMENT TO THE POSTS OF
PROVINCIAL MANAGEMENT SERVICE-2019

SUBJECT: PHYSICS (PAPER-I)

TIME ALLOWED: THREE HOURS

MAXIMUM MARKS: 100

NOTE: Attempt Five Questions in All. Attempt in Urdu or English.

- Q No. 1:** (a) Prove that a positively charged particle projected at right angles to a uniform magnetic field $\mathbf{B}$, describes a circle. **(10 Marks)**
(b) Discuss motion of satellites and derive mathematical expressions for speed and time period. **(10 Marks)**
- Q No. 2:** How does the Michelson Morley experiment prove that the velocity of light is the same when measured along two perpendicular directions in a frame of reference which is supposed to be moving relative to the ether? **(20 Marks)**
- Q No. 3:** (a) Describe travelling waves and discuss sinusoidal waves also. **(10 Marks)**
(b) What are the stationary waves? Analyze standing waves mathematically. **(10 Marks)**
- Q No. 4:** (a) Derive electromagnetic wave equation. **(10 Marks)**
(b) Explain grating spectrometer and its resolution. **(10 Marks)**
- Q No. 5:** (a) How can you produce and measure low temperatures? Explain in detail. **(10 Marks)**
(b) Describe in detail third law of thermodynamics. **(10 Marks)**
- Q No. 6:** State and derive Gauss's and Stoke's theorems. **(20 Marks)**
- Q No. 7:** (a) State and explain Law of Conservation of Linear Momentum. **(10 Marks)**
(b) Explain gyroscope and its precession. **(10 Marks)**
- Q No. 8: Write short note on the following: (4x5=20 Marks)**
(i) Kepler's laws of planetary motion (ii) Surface tension
(iii) Newton's Rings (iv) Fermi-Dirac statistics

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SUBJECT: PHYSICS (PAPER-II)

TIME ALLOWED: THREE HOURS

MAXIMUM MARKS: 100

NOTE: Attempt Five Questions in All. Selecting ONE from Section-I and TWO each from Section-II and III. Calculator is allowed (Not Programmable). Attempt in Urdu or English.

SECTION-I

- Q No. 1:**
- a) Define Compton Effect. Derive an expression for Compton Shift in wavelength.
 - b) If the wavelength of incident X-rays is $1.5 \text{ \AA}$, calculate the frequency of X-rays scattered at an angle of 60° in Compton Scattering.
Where $h = 6.63 \times 10^{-34} \text{ J.s}$, $m = 9.11 \times 10^{-31} \text{ Kg}$, $c = 3 \times 10^8 \text{ m/s}$
(12+8=20 Marks)

- Q No. 2:**
- a) State Maxwell's equation in words and through appropriate differential and integral forms.
 - b) Use Ampere's law to show that the magnitude of the magnetic field inside an infinitely long solenoid, with " n " turns of wire per unit length and current " I " passing through it, is given by

$$B = \mu_0 n I$$

- c) Calculate the voltage of a battery connected to a parallel plate capacitor with a plate area of 2.0 cm^2 and a plate separation of 2.0 mm if the charge stored on the plates is 4.0 pC .

(8+8+4=20 Marks)

SECTION-II

- Q No. 3:**
- a) What is the Law of Radioactivity. Derive an expression for mean life of radioactive element by using this law.
 - b) How much percent radioactive atoms of a radioactive substance will left after three mean lives.

(12 + 8=20 Marks)

- Q No. 4:**
- a) Write a note on working of an operational amplifier.
 - b) Discuss the operation of J-K flip flops.

(10+10=20 Marks)

- Q No. 5:**
- a) What is diode? Explain the working of full wave rectifier.
 - b) Define transistor (BJT). Explain cutoff, saturation, and active region.

(10+10=20 Marks)

SECTION-III

- Q No. 6:**
- a) Write a brief note on nuclear models.
 - b) Define nuclear fission and fusion. What is role of moderation in nuclear reactor?
 - c) Indium-115 has a half-life equal to 4.5 hours. If the sample were Originally 12 mg how much would remain after 13.5 hours?

(12+4+4=20 Marks)

- Q No. 7:** Write a note on the following:

- a) Zeeman Effect
- b) Pair production
- c) Heisenberg's Uncertainty Principle
- d) Quantum Numbers

(4X5=20 Marks)

- Q No. 8:**
- a) Write a note on Mass spectrometer.
 - b) Differentiate between Poisson and Laplace's Equation
 - c) Monochromatic light of wavelength $\lambda = 400 \text{ nm}$ strikes a plate of Cesium. Cesium has a work function of 2.14 eV. What is the energy of the electrons ejected?

(10+6+4=20 Marks)