



**FEDERAL PUBLIC SERVICE COMMISSION
SPECIAL COMPETITIVE EXAMINATION-2023 FOR
RECRUITMENT TO POSTS IN BS-17 UNDER THE FEDERAL
GOVERNMENT**

Roll Number

PHYSICS, PAPER-I

TIME ALLOWED: THREE HOURS	(PART-I MCQs) MAXIMUM MARKS: 20
PART-I (MCQs) : MAXIMUM 30 MINUTES	(PART-II) MAXIMUM MARKS: 80
NOTE: (i) First attempt PART-I (MCQs) on separate OMR Answer Sheet which shall be taken back after 30 minutes.	
(ii) Overwriting/cutting of the options/answers will not be given credit.	
(iii) There is no negative marking. All MCQs must be attempted.	

PART-I (MCQs)(COMPULSORY)

Q.1. (i) Select the best option/answer and fill in the appropriate Box on the OMR Answer Sheet.(20x1=20)
(ii) Answers given anywhere else, other than OMR Answer Sheet, will not be considered.

- 1. Two physical quantities having same dimensions are:**
(A) Force and energy (B) Work and torque (C) Pressure and power (D) Impulse and momentum
- 2. Melting point of Ice _____ when the pressure is increased:**
(A) Remains unchanged (B) Increases (C) Rises first and then lowers (D) Decreases
- 3. Special theory of Relativity treats problems involving:**
(A) Inertial frame of reference (B) Non-inertial frame of reference
(C) Uniform velocity frame of reference (D) Accelerated frame of reference
- 4. The mass of a body on moon is 40kg, what is its weight on earth.**
(A) 240 N (B) 392 N (C) 240 N (D) 400 N
- 5. In which region of earth the weight of a body is slightly greater?**
(A) At Polar region (B) At equator (C) Tropic of Cancer or Tropic of Capricorn (D) None of these
- 6. What is the change in phase if a wave is reflected from a denser medium?**
(A) 3π (B) 0 (C) π (D) 2π
- 7. Which of the following does not exhibit polarization?**
(A) Longitudinal waves in a gas (B) Transverse waves in a gas
(C) Mechanical waves (D) Electromagnetic waves
- 8. The intensity of a wave is proportional to the square of its**
(A) Amplitude (B) Time (C) Frequency (D) None of these
- 9. The dimension of coefficient of viscosity η**
(A) $M^1L^{-1}T^{-1}$ (B) $M^{-1}L^1T^{-1}$ (C) $M^{-1}L^1T^1$ (D) $M^{-1}L^{-1}T^1$
- 10. Surface tension _____**
(A) Acts in the plane of the interface normal to any line in the surface
(B) Is also known as capillarity (C) Is a function of the curvature of the interface
(D) Decreases with fall in temperature.
- 11. From Kepler's law of orbit, we can infer that the sun is located _____ of the planet's orbit.**
(A) At the center (B) At one of the foci (C) At both foci (D) Anywhere along the semi-minor axis
- 12. What does Kepler's law of period co-relate?**
(A) Time period and semi-minor axis (B) Time period and eccentricity
(C) Time period and semi-major axis (D) Time period and area swept by the planet
- 13. What is the value of the current in a wire of 10cm long at the right angle to a uniform magnetic field of 0.5 Weber/m² when the force acting on the wire is 5N?**
(A) 1A (B) 10A (C) 100A (D) 1000A
- 14. Magnetic force acting on a unit positive charge moving perpendicular to the magnetic field with a unit velocity is called**
(A) Magnetic flux (B) Magnetic field intensity (C) Magnetic induction (D) Self-inductance
- 15. The volume of a parallelepiped bounded by Vectors A,B and C can be obtained from the relation**
(A) $(A \times B) \cdot C$ (B) $(A \cdot B) \times C$ (C) $(A \times B) \times C$ (D) None of these
- 16. If l, m, n are the direction cosines of a position vector a^{\rightarrow} , then which of the following is true?**
(A) $l^2+m^2+n^2=0$ (B) $lmn=1$ (C) $l^2+m^2+n^2=1$ (D) $l^2 m^2+n^2=1$
- 17. Transverse component of the central force acting on a particle to keep it moving along circular path is:**
(A) mv^2/r (B) mv^2/r (C) Zero (D) Constant
- 18. If the velocity of the particle becomes doubled then its K.E:**
(A) Becomes double (B) Reduces to half (C) Becomes four times (D) None of these
- 19. When a constant torque is acting on a rotating system, which of the following is constant?**
(A) Angular velocity (B) Angular acceleration (C) Angular momentum (D) None of these
- 20. Fermi-Dirac statistics cannot be applied to _____**
(A) Electrons (B) Photons (C) Fermions (D) Protons

PHYSICS, PAPER-I

PART-II

TIME ALLOWED: THREE HOURS	PART-I (MCQS)	MAXIMUM MARKS = 20
PART-I(MCQS): MAXIMUM 30 MINUTES	PART-II	MAXIMUM MARKS = 80

NOTE: (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) All the parts (if any) of each Question must be attempted at one place instead of at different places.
(iv) Write Q. No. in the Answer Book in accordance with Q. No. in the Q.Paper.
(v) No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
(vi) Extra attempt of any question or any part of the question will not be considered.

- Q. 2.** (a) Derive Michelson Morley Experiment. Discuss its role in the recent verification of the Gravitational waves. **(05,05)**
(b) The planet Mercury travels around the Sun with a mean orbital radius of 5.8×10^{10} m. The mass of the Sun is 1.99×10^{30} kg. Use Newton's version of Kepler's third law to determine how long it takes Mercury to orbit the Sun. Give your answer in Earth days. **(10) (20)**
- Q. 3.** (a) Establish Stokes's theorem using the three dimensional approach. **(10)**
(b) Sketch a function $\mathbf{V} = -y\mathbf{x}^{\wedge} + x\mathbf{y}^{\wedge}$ and evaluate $\text{curl } \mathbf{V}$. **(05,05) (20)**
- Q. 4.** (a) Distinguish between Linear and Angular Momentum. Prove that the Angular momentum is constant in the absence of external torque. **(05,05)**
(b) Assume that a car tyre rotates 10 times a second. The tyre has a diameter of 10 inches. Find the angular velocity in radians per second. **(10) (20)**
- Q. 5.** (a) Give a comprehensive note on three dimensional grating and its role in crystallography mentioning the laws involved. **(10)**
(b) Justify the dual nature of light with supportive experiments. **(05,05) (20)**
- Q. 6.** (a) One type of transparent glass has refractive index 1.5. What is the speed of light through this glass? **(10)**
(b) Show that the entropy remains constant in a reversible process but increases in an irreversible one. **(05,05) (20)**
- Q. 7.** (a) State and explain Faraday's Law of electromagnetic induction. **(10)**
(b) Discuss elementary particles and their properties. **(10) (20)**
- Q. 8.** Write comprehensive notes on any TWO of the following: **(10 marks each) (20)**
(a) Einstein's equivalence of mass and energy.
(b) Merger of the four Maxwell's equations into a single Electromagnetic Wave Equation.
(c) Special theory of Relativity.
