FEDERAL PUBLIC SERVICE COMMISSION

COMPETITIVE EXAMINATION-2026 FOR RECRUITMENT TO POSTS IN BS-17 UNDER THE FEDERAL GOVERNMENT

PHYSICS, PAPER-I

Roll Number

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. **If A=6i-8j, then 4A has magnitude:**
   (A) 10 (B) 40 (C) 20 (D) -28
2. **Which of the following is not a vector quantity?**
   (A) Momentum (B) Force (C) Work (D) Displacement
3. **Let A=2i+6j-2k and B=i+4k, then A.B is equal to:**
   (A) -6 (B) 6 (C) 0 (D) None of these
4. **When the velocity of a body is constant, its acceleration is:**
   (A) Non-zero (B) Maximum (C) Minimum (D) zero
5. **What does a wave transmit from one place to another?**
   (A) Energy (B) Mass (C) Wavelength (D) Amplitude
6. **The rate of change of momentum of a particle is equal to:**
   (A) Energy (B) Force (C) Acceleration (D) Speed
7. **The waves in which particles of the medium vibrate in the direction of the wave motion are called:**
   (A) Stationary (B) Longitudinal (C) Transverse (D) Mechanical
8. **What is the SI unit of angular acceleration?**
   (A) ms^{-1} (B) $rad\ s^{-1}$ (C) rad (D) None of these
9. **Which of the following statements is correct for particles obeying Fermi–Dirac statistics?**
   (A) Any number of particles can occupy the same quantum state,
   (B) The occupation probability becomes infinite at low energy
   (C) Each quantum state can be occupied by at most one particle (D) The chemical potential is always zero
10. **An isothermal process is carried out at constant:**
    (A) Volume (B) Temperature (C) Pressure (D) Energy
11. **What is the total work done in moving a body along a closed path in gravitational field?**
    (A) Zero (B) Maximum (C) Minimum (D) None of these
12. **Shock absorbers in cars are example of oscillations:**
    (A) Damped (B) Forced (C) Undamped (D) Simple
13. **Bernoulli's Principle is based on the conservation of:**
    (A) Mass (B) Momentum (C) Energy (D) Force
14. **When the pressure of the system remains constant, it is called _____ process.**
    (A) Isochoric (B) Isobaric (C) Isothermal (D) Adiabatic
15. **What happens to the volume of most gases when their temperature is increased at constant pressure?**
    (A) Decreases (B) Increases (C) Remains the same (D) No change
16. **Entropy is defined by dS = _____.**
    (A) dQ/T (B) TdQ (C) dU/dW (D) dQ/U
17. **In the absence of net external force, _____ remains constant.**
    (A) Mass (B) Momentum (C) Work (D) None of these
18. **A motor lifts a weight of 3000 N through a height of 20 m in 30 seconds. Calculate the power developed by the motor.**
    (A) 200W (B) 18000W (C) 2000W (D) 1500W
19. **Divergence and Curl of a vector field are:**
    (A) Scalar and Scalar (B) Scalar and vector (C) Vector and Scalar (D) Vector and Vector
20. **The gradient of a vector is:**
    (A) Curl (B) Scalar (C) Divergence (D) None of these

PART-II

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.
(vii) **Use of Calculator is allowed.**

Q.2. **(a)** What is the difference between Divergence, Gradient, and Curl. Give one example of each. **(10)**

(b) A particle moves in the *xy* plane, starting from the origin at $t = 0$ with an initial velocity having an *x* component of 20 m/s and a *y* component of -15 m/s. The particle experiences an acceleration in the *x* direction, given by $a_x = 4\ m/s^2$. Determine the total velocity vector at any time. **(10)** **(20)**

Q.3. **(a)** What is law of conservation of angular momentum? Give at least one example. **(8)**

(b) A 6 kg block initially at rest is pulled to the right along a horizontal surface by a constant horizontal force of 12N. Find the speed of the block after it has moved 3m if the surfaces in contact have a coefficient of kinetic friction of 0.15. **(10)**

(c) Can a normal force do work? If not, why not? If so, give an example. **(2)** **(20)**

Q.4. **(a)** What is Kepler's third law? Prove that the square of the period is proportional to the cube of the semimajor axis. **(12)**

(b) Consider a satellite of mass *m* moving in a circular orbit around the Earth at a constant speed *v* and at an altitude *h* above the Earth's surface. Determine the speed of satellite in terms of *G* (Universal Gravitational Constant), *h*, *R* (the radius of the Earth), and *M* (the mass of the Earth). **(8)** **(20)**

Q.5. **(a)** What is Bernoulli's Theorem? Show that **(10)**

$$P + \frac{1}{2}\rho v^2 + \rho g h = constant$$

Where P is pressure of the fluid, ρ is density of the fluid, v is velocity of the fluid, g is acceleration due to gravity, and *h* is height above a reference level.

(b) In a car lift used in a service station, compressed air exerts a force on a small piston that has a circular cross section of radius 5 cm. This pressure is transmitted by a liquid to a piston that has a radius of 15 cm. What force must the compressed air exert to lift a car weighing 1000 N? **(10)** **(20)**

Q.6. **(a)** What is Young's double-slit experiment? Derive the mathematical formula for constructive and destructive interference of light. **(12)**

(b) A 200g block connected to a light spring for which the force constant is 5 N/m is free to oscillate on a frictionless, horizontal surface. The block is displaced 5cm from equilibrium and released from rest. Find the period of its motion. **(8)** **(20)**

Q.7. **(a)** What is diffraction of light? Explain diffraction of X-rays by crystals. **(10)**

(b) Monochromatic light from a helium–neon laser ($\lambda = 632$ nm) is incident normally on a diffraction grating containing 4000 grooves per centimeter. Find the angles at which the second-order maximum is observed. **(10)** **(20)**

Q.8. **(a)** What is first-law of thermodynamics? Show that work done on the gas during isothermal expansion of an ideal gas is $W = nRT \ln\left(\frac{V_i}{V_f}\right)$, where *R* is universal gas constant, *T* is temperature, *n* is number of moles. V_i and V_f is the initial and final volume, respectively. **(12)**

(b) A 1 mole sample of an ideal gas is kept at 0°C during an expansion from 3 L to 10 L. How much work is done on the gas during the expansion? **(8)** **(20)**

****