

KHYBER PAKHTOON KHWA, PUBLIC SERVICE COMMISSION, PESHAWAR

SUBJECT:- COMPETITIVE EXAMINATION FOR THE POSTS OF PROVINCIAL MANAGEMENT 20
SERVICE(BPS-17)

PHYSICS PAPER-I

Time Allowed: 03 hours

Max. Marks:100

Note: Attempt any five complete questions.

- Q.1.(a). Describing the scalar and vector fields, explain the divergence of a vector field and show that the divergence of a vector field is equal to. $\nabla \cdot \mathbf{V}$ (6,8)
- (b) If \mathbf{A} is a vector such that $\mathbf{A} = xy\mathbf{i} + 3x^2yz\mathbf{j} + xy^2\mathbf{k}$, where $\mathbf{i}, \mathbf{j}, \mathbf{k}$ are unit vectors, then calculate (i) $\text{div} \cdot \mathbf{A}$. (ii) curl of \mathbf{A} , at the point (1,0,4) (6)
- Q.2.(a) What is the difference between center of gravity and center of mass of a body? State and explain the laws of conservation of linear momentum and angular momentum (4,12)
- (b) Under what condition both, the angular momentum and angular velocity, can have the same direction? (4)
- Q.3.(a) What is Lorentz transformation? Explain the Einstein's mass-energy equation $E=mc^2$, and give examples of conversion of mass into energy and vice versa. (5,12)
- (b) If the rate of emission of radiation from a body is 2×10^{30} J/s, then calculate the corresponding change in mass of the body. Also, state whether the mass will increase or decrease. (3)
- Q.4.(a) Describe the general characteristics of fluid flow and explain the streamline motion. (9)
- (b) State and explain the law of conservation of mass in a fluid (7)
- (c) If droplets of a liquid are suspended then what shape will they acquire and why? (4)
- Q.5.(a) Describing the simple harmonic motion, explain the damping and its effect on the oscillatory motion of a body. (5,5)
- (b) What are traveling waves? Considering a stretched string, explain the transport of energy due to a traveling wave. (3,7)
- Q.6.(a) Give an account of the total internal reflection and discuss its significance. (5,2)
- (b) What is the difference between interference and diffraction of light? (3)
- (c) Describing the main properties of laser light, explain the basic processes involved in the emission of laser light (5,5)
- Q.7.(a) State and explain the second law of thermodynamics and give a statistical view of entropy. (6,5)
- (b) Give an account of methods of heat transfer and explain thermal expansion. What are the situations where thermal expansion is not desirable? (6,3)
- Q.8.(a) Describing precessional motion, explain the working of a gyroscope. (4,6)
- (b) State and explain Kepler's third law regarding period of revolution of a planet. How do we apply Kepler's laws to satellites? (6,4)

wavelength of scattered photon.

- b) Why Compton Effect cannot be observed with visible light?

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Q7:

- a) What do you understand by the wave function Ψ of a moving particle? Give the physical significance of wave function.

2,2

- b) Derive the Schrodinger wave equation.

10

- c) Obtain an expression for the energy levels of the one dimensional harmonic oscillator.

6

Q8:

- a) What is meant by the Binding Energy of a nucleus? Discuss the variation of binding energy per nucleon as a function of mass number.

3,7

- b) Calculate the binding energy of deuteron ${}_1\text{H}^2$ when the mass of ${}_1\text{H}^2$ is 2.01412 u, mass of neutron is 1.008665 u and mass of proton is 1.007825 u.

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- c) Differentiate between natural and artificial radioactivity.

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