



National Officers Academy
Mock Exams for CSS-2022
January 2022 (Mock-7)
PHYSICS, PAPER-I

TIME ALLOWED: THREE HOURS
PART-I(MCQS): MAXIMUM 30 MINUTES

PART-I (MCQS)
PART-II

MAXIMUM MARKS = 20
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. Write Q. No. in the Answer Book in accordance with Q. No. in the Q. Paper.
- iv. **Use of Calculator is allowed.**

SUBJECTIVE PART — PART-II

- Q. No. 2.** (a) State Postulates of theory of relativity for inertial frame.
(b) Derive the God's equation:
$$E=mc^2$$

(c) Find the curl of vector $v=-yx^{\wedge} +xy^{\wedge}$

- Q. No. 3.** (a) How population inversion is obtained in LASER. Give some uses of LASER.
(b) What are advantages of LASER over ordinary light?
(c) Calculate the largest wavelength of the Paschen series.

- Q. No. 4.** (a) What is the cross product of two vectors? Why cross product is called a pseudo vector?
(b) What is divergence of a vector field? What is its significance?
(c) Consider the vectors:

$$A = -3i + 3j + 2k,$$
$$B = -2i - 4j + 2k,$$
$$C = 2i + 3j + 1k$$

Find $A \cdot (B \times C)$

- Q. No. 5.** Write a note on any four of the following:
(a) Polarization of light (b) Zeeman Effect (c) Kinetic energy of gases
(d) Newton's Rings (e) Viscosity and Stokes' law

- Q. No. 6.** (a) What is zeroth law of thermodynamics, why is it called zeroth?
(b) Discuss entropy in detail.
(c) Calculate the change in entropy when 10kg of water is heated from 90°C to 100°C. Specific heat of water is 4180 J per mole per Kelvin.

- Q. No. 7.** (a) What is Doppler's shift? Explain in detail Doppler's effect of sound.
(b) What is speed of sound in air?
(c) Dogs can hear frequencies up to 45 KHz, what is the wavelength of sound with this frequency travelling in air at 0°C.

- Q. No. 8.** Write a note on the following:
(a) Young's Double Slit Experiment
(b) Bernoulli's Theorem of Fluids

Best of Luck for CSS-2022