



**National Officers Academy**  
**Final Mock Exams for CSS-2021**  
**January 2021**  
**PHYSICS, PAPER I**

<b>TIME ALLOWED: THREE HOURS</b>	<b>PART-I (MCQS)</b>	<b>MAXIMUM MARKS = 20</b>
<b>PART-I(MCQS): MAXIMUM 30 MINUTES</b>	<b>PART-II</b>	<b>MAXIMUM MARKS = 80</b>
<b>NOTE:</b> <ul style="list-style-type: none"><li>i. <b>Part-II</b> is to be attempted on the separate <b>Answer Book</b>.</li><li>ii. Attempt <b>ONLY FOUR</b> questions from <b>PART-II</b>. <b>ALL</b> questions carry <b>EQUAL</b> marks.</li><li>iii. All the parts (if any) of each Question must be attempted at one place instead of at different places.</li><li>iv. Write Q. No. in the Answer Book in accordance with Q. No. in the Q. Paper.</li><li>v. No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.</li><li>vi. Extra attempt of any question or any part of the question will not be considered.</li></ul>		

**SUBJECTIVE PART II**

- Q. No. 2.** (a) What do you mean by angular momentum? Discuss in detail law of conservation of angular momentum.  
(b) Prove  $A \times (B \times C) = B(A \cdot C) - C(A \cdot B)$  in vector triple product.  
(c) Differentiate gradient, divergence & curl shortly.
- Q. No. 3.** (a) Drive the relation of time dilation in theory of relativity.  
(b) Discuss Kepler's law of periods.  
(c) The period of a pendulum is measured to be 3 second at Earth. What is period by observer moving at a with speed  $0.9c$ ?
- Q. No. 4.** (a) What is unique about light from a laser source & why should you never look directly into laser beam?  
(b) Explain Helium-Neon Laser, in detail.  
(c) For He-Ne laser at 2m & 4m distances from laser. The output beam spot diameters are 2mm & 3mm. Calculate angle of divergence.
- Q. No. 5.** (a) What is surface tension? How is it measured?  
(b) Differentiate Laminar & turbulent flow establish equation of continuity.  
(c) A garden hose has an inside diameter of 2cm & water flows through it at 3m/s. What nozzle diameter is required for the water to emerge at 10m/s?
- Q. No. 6.** (a) Discuss some characteristics of Dot product.  
(b) What is polar vector & pseudo vector?  
(c) Show the vectors  
 $A = i + j + 2k$  &  $B = 2i + 2j + 4k$  are parallel to each other.
- Q. No. 7.** (a) Define entropy. State 2<sup>nd</sup> law of thermodynamics in terms of entropy.  
(b) Distinguish among Isothermal, Isobaric, Isochoric and Adiabatic processes.  
(c) Does entropy increase or decrease during the natural process? Also what do you mean by triple product of water.
- Q. No.8.** (a) Describe Young's double Slit experiment; also find the condition for constructive & destructive interference.  
(b) Write a note on any ONE of the following:  
(1) Diffraction Grating  
(2) Newton's Rings

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*Best of Luck for CSS-2021*