

**Instructions: You have a total of 120 minutes to complete this test.  
Answer each of the following questions completely.**

Your answers to this test must follow the following format in an email to me:  
a f e d c d e c ... (etc) with a single space between each letter answer to the question.

**Send your answers to [lyonphysics@gmail.com](mailto:lyonphysics@gmail.com).**

**The email must be time stamped before 3:05 PM May 16, 2021.**

**Note:**

**you may want to put an extra spaces between the answer string for each problem.**

**Constants:**

$$e^- = -1.602 \times 10^{-19} \text{ C} , \quad k = 8.99 \times 10^9 \frac{\text{Nm}^2}{\text{C}^2} . \quad \epsilon_0 = \frac{1}{4\pi k} = 8.85 \times 10^{-12} \frac{\text{C}^2}{\text{Nm}^2}$$
$$\mu_0 = 4\pi \times 10^{-7} \frac{\text{Tm}}{\text{A}} , \quad c = 3 \times 10^8 \frac{\text{m}}{\text{s}} \quad 1\mu = 1 \times 10^{-6} \quad 1\text{nm} = 1 \times 10^{-9} \text{m}$$

Due to rounding off, choose the answer which is **closest**.

**Your submission of your answers signifies your pledge to the Lyon Honor Code.**

**Students are instructed that they may not discuss the content of final examinations prior to the conclusion of the examination period as such discussions may involve violations of the Honor Code. You are therefore instructed not to discuss any aspect of this exam until after Monday May 17, 2021.**