Physics 112
Quiz #22
November 17, 2000

Name: _____

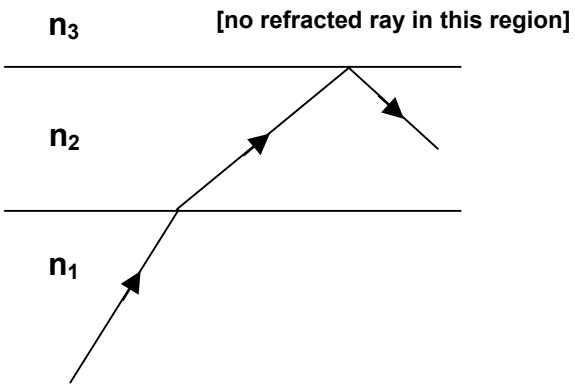
IF YOU WANT A QUESTION GRADED OUT OF THREE POINTS (–1 [MINUS ONE] FOR WRONG ANSWER!!) WRITE "3" IN SPACE PROVIDED ON EACH QUESTION.

$c = 3 \times 10^8$ m/s

1. The electric field in a gamma-ray beam reverses direction approximately 10^{20} times each second. In a beam of infrared light, this reversal occurs approximately 10^{12} times per second. Then the distance between peaks in the magnetic field pattern (i.e., points where the magnetic field has maximum intensity) in the ***infrared*** beam is:
   A. more than a million times longer than in the gamma-ray beam.
   B. about a thousand times longer than in the gamma-ray beam.
   C. about the same as in the gamma-ray beam.
   D. about a thousand times shorter than in the gamma-ray beam.
   E. more than a million times shorter than in the gamma-ray beam.

   Grade out of 3? Write "3" here: _____

2. The diagram shows part of the path traveled by a particular light ray as it strikes a piece of three-layer material. The different layers have different indices of refraction (n_1, n_2, and n_3) as indicated. Note that no ray is observed in the n_3 region.



   What is the correct ranking (largest to smallest) of the three indices of refraction?

   largest _____smallest

3. Which of these will produce an electromagnetic wave?
   A. A proton at rest.
   B. An electron moving with constant velocity.
   C. A positively charged particle moving at a constant rate of half the speed of light.
   D. An electron that is accelerating.
   E. None of the above.

4. A 5 T magnetic field points everywhere in the y direction. An electric field of magnitude 5 N/C points everywhere in the x direction. A proton is moving ***along the x axis toward positive x*** at 5 m/s, and an electron sits motionless at the origin. Choose your answers from these options:

   (a) electric force on the proton (due to the 5 N/C electric field)
   (b) electric force on the electron (due to the 5 N/C electric field)
   (c) magnetic force on the proton (due to the 5 T magnetic field)
   (d) magnetic force on the electron (due to the 5 T magnetic field)

   (ii) Which force has the ***largest*** magnitude? *Answer:* _____

   (iii) Which force has the ***smallest*** magnitude? *Answer:* _____