Polytechnic Tutoring Center

Final Review – PH 1223 Fall 2021

Disclaimer: This mock exam is only for practice. It was made by tutors in the Polytechnic Tutoring Center and is not representative of the actual exam given by the Academic Department.

1. Four point charges are located on the corners of a square, which has sides of length 30 cm. Three of the charges have values of 11 μC and one has a value of -11 μC. What is the magnitude of the electric field at the point in the center of the square?

   a) 4.40 x 10^6 N/C b) 7.99 x 10^6 N/C c) 5.59 x 10^6 N/C
   d) 3.10 x 10^6 N/C e) 6.79 x 10^6 N/C

2. If the maximum possible force on a 40 cm long straight wire is 0.09 N when it is placed in a uniform magnetic field of 75 mT, how much current is flowing through the wire?

   a) 1.71 A b) 1.22 A c) 2.00 A d) 2.40 A e) 3.00 A

3. A laser beam in the air enters a swimming pool filled with water at an incident angle of 35°. What is the angle between the beam that is reflected at the water surface and the beam that is transmitted into the water? Use 1.33 for the index of refraction of water.

   a) 142° b) 136° c) 111° d) 128° e) 119°

4. A 2 cm tall object is placed 70 cm in front of a concave mirror. If the radius of curvature of the mirror is 50 cm, how tall will the image be? The negative sign in the answers means that the image is inverted.

   a) -1.11 cm b) -0.769 cm c) -0.909 cm
   d) -1.43 cm e) -0.334 cm

5. A lensmaker made a plano-convex lens with one flat surface and one surface with radius of curvature of 45 cm. If the focal length of the lens is 75 cm, what is the index of refraction of the glass that the lensmaker used?

   a) 1.47 b) 1.67 c) 1.40 d) 1.60 e) 1.53

6. A monochromatic beam of light with wavelength 589 nm is incident to a plate with two narrow slits which are 0.04 mm apart. The light travels to a screen where the interference fringes are observed to be 3.4 cm apart. How far is the plate from the screen?

a) 1.63 m b) 2.31 m c) 5.11 m d) 3.67 m e) 4.35 m

7. A monochromatic beam of light with wavelength 700 nm is incident to a plate with a single slit of width 50 μm. The light pattern is observed on a screen that is 3 m away. On the screen, how far is it from the second minimum on one side of the central peak to the second minimum on the other side?

   a) 13.2 cm b) 15.6 cm c) 12.1 cm d) 14.4 cm e) 16.8 cm

8. A spectrometer with a grating is used to observe the hydrogen spectral line that has wavelength 656 nm. If the grating has 600 lines per mm, at what angle will the line be observed in second order?

   a) 41.7° b) 51.9° c) 31.4° d) 35.7° e) 29.5°

9. Unpolarized light is incident to a stack of 2 polarizing plates. The transmission axis of the second plate is rotated at the angle θ with respect to the first plate. If 12% of the light intensity gets through the stack, what is the value of the angle θ?

   a) 60.7° b) 46.1° c) 31.9° d) 11.5° e) 46.1°

10. How far apart are two green light sources (l = 550 nm for each of them) if an observer can just barely resolve them at a distance of 1.5 km away? Assume the observer's eyes have a pupil diameter of 4 mm.

    a) 15.1 cm b) 35.2 cm c) 21.8 cm d) 30.2 cm e) 25.2 cm