Quiz 8 Version D

1) A light beam in the z-direction is polarized along the x-direction. i) What is the minimum number of polarizers needed to transform this light beam into one that is polarized along the y-direction? ii) What is the maximum intensity achievable for the light beam once polarized in y-direction with this many polarizers?

a) This can not be done.
b) 1 polarizer achieving ½ the original intensity.
c) 2 polarizers achieving ¼ the original intensity.
d) 3 polarizers achieving 1/3 the original intensity.
e) 4 polarizers achieving ¼ the original intensity.

2) Polarized light passes through a sequence of two polarizers whose axis of polarization form a 30 degree angle. The second polarizer has the same polarization as the incoming light before it hits the first polarizer.
What fraction of the incident intensity emerges from the set of polarizers?
a) 9/16 b) 1/3 c) ¼ d) 1/8 e) ½

3) If a radio transmitter has a vertical antenna, should the receiver's antenna be vertical or horizontal to obtain the best receptio?

A) vertical B) horizontal C) doesn't matter

4) The average intensity of noonday sunlight is about 1kW/m^2 .
What is the radiation force on a solar collector measuring 60cm by 2.5m
if it is oriented at right angles to the incident light and absorbs all the light?

a) 5 micro N b) 50 micro N c) 0.5 milli Newton d) 5 milli Newton e) 0.05 Newton

5) X rays of wavelength 0.14nm are aimed at an unknown crystal in a diffractometer.
A first order peak is observed at a Bragg angle of 38.2 degrees.
What is the spacing of the Bragg planes in the crystall?
a) 0.1 nm b) 0.2 nm c) 0.3 nm d) 0.4 nm e) 0.5 nm

6) A laser beam shines vertically upward. What laser power is necessary
for this beam to support a flat piece of aluminum foil with mass 30.0 micro gram
and diameter equal to that of the beam? Assume the foil reflects all the light.

a) 40W b) 41W c) 42W d) 43W e) 44W

7) A double slit interference experiment is done in a water tank, often called a "ripple tank" because of the water waves looking like ripples o the water surface. The slits are 3.5cm apart, and a viewing screen is 0.8m from the slits. The wave speed is 0.12m/s, and the frequency 12Hz. How far from the center of the screen will the first maximum be found?

A) 2cm B) 5cm C) 10cm D) 20cm E) 40cm

8) Blue light of a given wavelength passes through a single slit of width d and forms a diffraction pattern on a screen. If the blue light is replaced by red light with twice the wavelength, the original diffraction pattern can be reproduced if the slit width is changed to:

A) d/4
B) d/2
C) no change needed
D) 2d
E) 4d

9) You are shining light with a wavelength of 430nm on a 5-slit apparatus with slit spacing of 1 micron. At what angle from the center do you find the 3rd dark fringe?
a) 5 degrees b) 10degrees c) 15 degrees d) 20 degrees e) 25 or more degrees

10) White light shines on a 250 nm thick layer of diamond (n=2.42) straight down. Which of the following wavelengths of light is most strongly reflected?
a) 450nm b) 480nm c) 520nm d) 550nm e) 600nm