Quiz 6
Section 313

Name ______________________

Don’t open this cover sheet until told to do so.

You have 40 minutes to answer the 10 questions.

You may have one page of notes (both sides)
An unpolarized beam of light is incident on a pane of glass ($n = 1.56$) such that the reflected component coming off the glass is completely polarized. What is the angle of incidence in this case?

a. 32.7°
b. 41.0°
c. 49.0°
d. 57.3°

An earth observer sees a spaceship at an altitude of 980 m moving downward toward the earth at a speed of 0.800 c. What is the spaceship's altitude as measured by an observer in the spaceship?

a. 1 630 m
b. 1 270 m
c. 893 m
d. 588 m
Light of wavelength 540 nm is incident on a slit of width 0.150 mm, and a diffraction pattern is produced on a screen that is 2.00 m from the slit. What is the width of the central bright fringe? \(1 \text{ nm} = 10^{-9} \text{ m}\)

a. 0.720 cm  
b. 1.44 cm  
c. 1.76 cm  
d. 2.16 cm

A diffraction grating with 10 000 lines/cm will exhibit the first order maximum for light of wavelength 510 nm at what angle? \(1 \text{ nm} = 10^{-9} \text{ m}\)

a. 0.51°  
b. 0.62°  
c. 15.3°  
d. 31°
In an x-ray tube, high-speed electrons are slammed into a lead target, giving off x-rays. If the electrons are accelerated from rest through a potential difference of 50 000 volts, what speed do they have when they strike the target? \((q_e = 1.6 \times 10^{-19} \text{ C}, m_e = 9.11 \times 10^{-31} \text{ kg}, \text{ and } c = 3.00 \times 10^8 \text{ m/s})\)

a. 0.17 \(c\)  
b. 0.41 \(c\)  
c. 0.83 \(c\)  
d. 0.91 \(c\)

The intensity of unpolarized light passing through a single sheet of polarizing material changes by a factor of:

a. 1.  
b. 0.5.  
c. \(\cos \theta\)  
d. \(\cos^2 \theta\)
If astronauts could travel at $v = 0.95c$, we on Earth would say it takes \( \frac{4.2}{0.95} = 4.4 \) years to reach Alpha Centauri, 4.2 lightyears away. The astronauts disagree. How much time passes on the astronaut’s clocks?

a. 1.4 years  
b. 1.9 years  
c. 2.4 years  
d. 3.0 years

A boxcar without a front or a back is moving toward the right. Two flashes of light move through the boxcar, one moving from back to front toward the right, the other moving from front to back toward the left. A passenger in the boxcar records how long it takes each flash of light to pass from one end of the boxcar to the other end. According to the passenger, which took longer?

a. the flash going from back to front  
b. the flash going from front to back  
c. They both took the same time.  
d. It depends on whether the passenger is sitting at the front or the back of the boxcar.
Einstein's theory of relativity is based in part on which one of the following postulates?

a. Mass and energy are equivalent.
b. Space and time are absolutes.
c. Energy is conserved only in elastic collisions.
d. Speed of light in a vacuum is same for all observers regardless of source velocity.

What is the minimum thickness of a glycerin film \((n = 1.47)\) on which light of wavelength 600 nm shines that results in constructive interference of the reflected light? Assume the film is surrounded from and back by air.

a. 75 nm
b. 102 nm
c. 150 nm
d. 204 nm