

## Light Worksheet 1

1. Compare and contrast the particle model of light and the wave model of light making reference to reflection and refraction.
2. Light of wavelength 600 nm passes through a double slit apparatus, where the slits are  $68 \mu\text{m}$  apart. The distance from the central maximum to the 5<sup>th</sup> bright band in interference pattern appears 60 mm apart on a screen a fixed distance away.
  - a. How far away is the screen from the double slit?
  - b. If the wave length increases, describe what would happen to the interference pattern.
3. Periodic waves pass from a deep to a shallow section of a ripple tank with an angle of incidence of  $50^\circ$  and an angle of refraction of  $35^\circ$ . In the deep section,  $v = 30 \text{ cm/s}$  and  $f = 6.0 \text{ Hz}$ . What is the wavelength of the waves in the shallow section?
4. According to the \_\_\_\_\_ theory of light, objects send out light beams or particles that ricochet off other objects and enter the eyes.
5. A group of students who are discussing the nature of light make the following statements:
  - Newton's particle model of light predicts rectilinear propagation, reflection, and refraction.
  - Newton's particle model of light predicts that the speed of light will decrease as light goes from water into air.
  - The particle model cannot account for diffraction and interference phenomena, whereas the wave model can.Which of the above statements is/are CORRECT?
6. Which scientist calculated the speed of light by measuring the position of Jupiter's moon Io at different times during the year?
7. Refraction of light and its speed in different substances was a major discrepancy between the wave theory and particle theory of light. What else did Newton also have a hard time explaining with his particle theory of light?
8. In Young's double slit experiment, if all other variables remain constant, as the distance between the two point sources is decreased the distance between the bright spots on the screen will \_\_\_\_\_.
9. Light is an electromagnetic wave, therefore, it
  - A) can travel through a vacuum.
  - B) does not diffract.
  - C) travels slower in less dense mediums.
  - D) travels at the same speed in all materials.

10. A beam of electromagnetic radiation is passed through two slits  $6.0 \times 10^{-5}$  m apart. At a point 2.0 m from the two slits, the distance between adjacent nodal lines on either side of the prime antinodal line is  $1.5 \times 10^{-2}$  m. What is the wavelength of the radiation?
11. Einstein explained the photoelectric effect by assuming that
- A) the charge of an electron increases with speed.
  - B) atoms do not radiate energy from stationary states.
  - C) the mass of an electron increases with speed.
  - D) light consists of quanta of energy.
12. On the basis of the particle model of light, which of the following is the most suitable speed-time graph to describe the predicted behavior of a “particle” of light when passing from GLASS to AIR?

