

Chapter 22 Problem Set

Advanced Physics II

1. The Apollo XI mission placed a mirror on the moon. A laser was shot at it from Earth's equator when the moon was directly overhead. The beam returned to that spot in 2.51 s. From gravitation equations you learned in SI Physics the distance between the centers of the Earth and moon is $3.84 \times 10^8 \text{ m}$. How fast is light?
2. Why does the ceiling in the room have millions of little holes?
3. How do Mr. L's glasses work (near sighted)?
4. Mr. L is driving home on a hot dry day and he sees water on the road ahead. When he gets to the place where he thought it was it is gone? Where did it go?
5. Why do astronomers looking at distant galaxies say they are looking back in time?

6. Michelson carefully measured the speed of sound using an eight-sided mirror very close to his eye and a light bulb on the other side. He set the mirror spinning so the light struck one of the eight sides, was reflected to a flat mirror 35.0 km away, returned, striking the mirror that was just ahead of the original one-of-eight and entering Michelson's eye. If light travels at 3.00×10^8 m/s, what is the minimum speed the mirror needs to rotate?

7. A light beam strikes a mirror lying flat on a table 1.25 m from a mirror connected to the first perpendicularly. What angle does the light beam leave the second mirror?

8. Mr. L is at Farm & Fleet clothes shopping. The fitting room has a mirror in front of him 2.0 ft and one behind him 2.0 ft. They are tilted slightly so that he can see a second Mr. L looking at him. How deep is that image?

9. Mr. L is preparing to create an ice sculpture. A ray of light enters a square block of clear ice at an angle of incidence of 40.0° . What is the angle between the reflected ray and the refracted ray?

10. Mr. L needs to clean a mess from one of his demos. In a 25.0 cm tall beaker he has mixed a 50/50 solution of water and linseed oil for cleaning that completely fills the beaker. If the oil and the water separate, what is the angle of refraction in the water of a ray that strikes the oil 30.4° at the north edge? How far from the north edge of the beaker will the light strike the bottom of the beaker?