

**Concept-Development
Practice Page** **27-1**

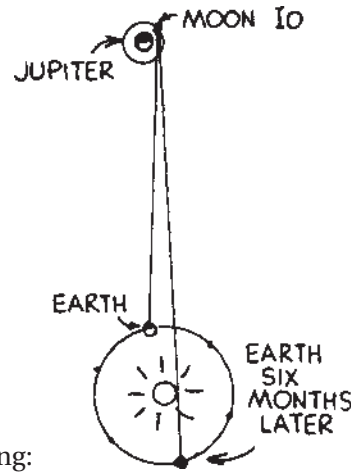
Light

1. The Danish astronomer Olaus Roemer made careful measurements of the period of a moon about the planet Jupiter. How this data enabled a calculation of the speed of light is described in your textbook on pages 534 and 535.

a. What is the diameter, in kilometers, of Earth's orbit around the sun?

b. How much time is required for light to travel across the diameter of the orbit?

c. How do these two quantities determine the speed of light?



2. Study Figure 27.4 on page 536 in your textbook and answer the following:

a. Which have longer *wavelengths*, radio waves or light waves?

b. Which have longer *wavelengths*, light waves or gamma rays?

c. Which have higher *frequencies*, ultraviolet or infrared waves?

d. Which have higher *frequencies*, ultraviolet waves or gamma rays?



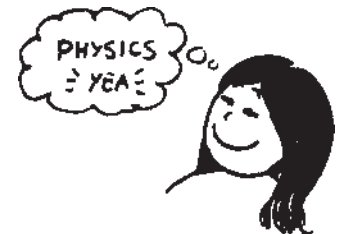
3. Carefully study Section 27.4 in your textbook and answer the following:

a. Exactly what do vibrating electrons emit?

b. When ultraviolet light shines on glass, what does it do to electrons in the glass structure?

c. When energetic electrons in the glass structure vibrate against neighboring atoms, what happens to the energy of vibration?

d. What happens to the energy of a vibrating electron that does not collide with neighboring atoms?



- e. Which range of light frequencies, visible or ultraviolet, is absorbed in glass?

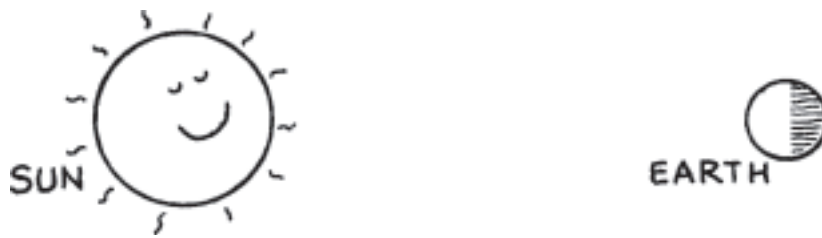
- f. Which range of light frequencies, visible or ultraviolet, is transmitted through glass?

- g. How is the speed of light in glass affected by the succession of time delays that accompany the absorption and re-emission of light from atom to atom in the glass?

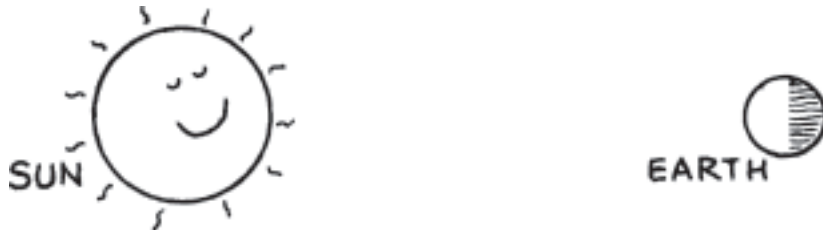
- h. How does the speed of light compare in water, glass, and diamond?

4. The sun normally shines on both Earth and the moon. Both cast shadows. Sometimes the moon's shadow falls on Earth and, at other times, Earth's shadow falls on the moon.

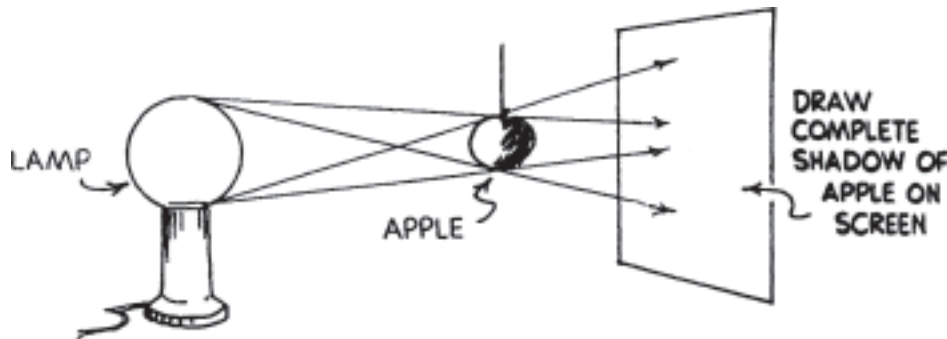
- a. The sketch shows the sun and Earth. Draw the moon at a position for a solar eclipse.



- b. This sketch also shows the sun and Earth. Draw the moon at a position for a lunar eclipse.



5. The diagram shows the limits of light rays when a large lamp makes a shadow of a small object on a screen. Shade the umbra darker than the penumbra. In what part of the shadow could an ant see part of the lamp?



CONCEPTUAL PHYSICS