

Clicker Questions

Discovering the Essential Universe, Fifth Edition by Neil F. Comins
Chapter 3

3-1. True or False: Different colors of light are waves with different amplitudes.

- a.) True
- b.) False

3-2. True or False: Different colors of light are waves with different wavelengths.

- a.) True
- b.) False

3-3. During a thunderstorm, the fact that you can see the lightning before you hear the thunderclap tells you what?

- a.) That light travels faster than sound.
- b.) That sound travels faster than light.
- c.) That light travels instantaneously from one place to another.
- d.) That light travels at a finite speed.

3-4. What is light?

- a.) A wave.
- b.) A particle.
- c.) It displays properties of both a particle and a wave.
- d.) It doesn't display properties of either a particle or a wave.

3-5. Which of the following forms of electromagnetic radiation cannot reach Earth's surface due to the atmosphere?

- a.) Visible
- b.) Radio
- c.) Infrared
- d.) X rays

3-6. Which form of electromagnetic radiation is the most damaging to living tissue?

- a.) UV-B
- b.) X rays
- c.) Gamma rays
- d.) UV-C

3-7. True or False: There is a limit to the magnification for a given telescope.

- a.) True
- b.) False

3-8. Why did CCDs replace film for use in astronomical photographs?

- a.) CCDs respond to more of the light falling on them than film does.
- b.) CCDs have a better resolution than film does.
- c.) CCDs respond more uniformly to light of different colors.
- d.) All of the above.

3-9. True or False: A refracting telescope needs only one lens to form an image in the human eye.

- a) True
- b) False

3-10. The secondary mirror used in reflecting telescopes blocks some of the light entering the telescope from reflecting off the primary mirror. What effect does this have on the image produced?

- a.) The image will have a hole in the center.
- b.) The image will be dimmer than if no light was blocked.
- c.) The image will be distorted due to lost information but this effect can be corrected.
- d.) The image cannot be magnified as much due to the lost light.

3-11. True or False: Refracting telescopes have more limitations than reflecting telescopes.

- a) True
- b) False

3-12. What causes stars to appear to “twinkle”?

- a.) Rapidly changing air density in the atmosphere.
- b.) Rapidly changing brightness of the stars.
- c.) The Earth’s magnetic field interacting with the light.
- d.) The limitations of the human eye.

3-13. Which type of telescope suffers from chromatic aberration?

- a) Cassegrain
- b) refractor
- c) Coudé
- d) Newtonian

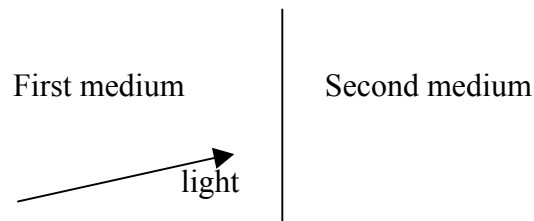
3-14. Which type of electromagnetic radiation has had an increasingly large “window” through our atmosphere over the past half century?

- a) gamma rays
- b) infrared radiation
- c) visible light
- d) ultraviolet

3-15. The Hubble space telescope has which of the following advantages over land-based telescopes? Choose one.

- a) the light entering it is not distorted by the Earth's atmosphere
- b) Hubble has the largest diameter of any telescope ever built
- c) there are no mirrors in Hubble to distort the light
- d) Hubble sees huge angular regions of the sky compared to any ground-based telescope

- 3-16. A telescope with which of the following diameters has the highest resolution?
- 4 cm
 - 8 cm
 - 12 cm
 - all of the above have the same resolution.
- 3-17. How long does it take light to travel 3×10^8 m?
- 1 year
 - 8 minutes
 - 1 minute
 - 1 second
- 3-18. The frequency of light is
- the number of wave crests passing a point per second. *
 - another name for the speed of light.
 - the number of oscillations per second of the electric and magnetic fields.
 - a measure of the brightness of the light.
- 3-19. A light source has a frequency of 2×10^{13} Hz. What region of the electromagnetic spectrum is it in?
- Gamma ray
 - Ultraviolet
 - Visible
 - Infrared
 - Microwave
- 3-20. A light source has a frequency of 2×10^5 Hz. What is its wavelength?
- 0.67×10^{-3} m
 - 1.5×10^3 m
 - 6×10^{13} m
 - 0.16×10^{-13} m
- 3-21. When light is incident on a surface (see diagram), refraction occurs when
- it “bounces off” at an angle (measured from the normal) equal to the incident angle.
 - it enters the second medium and changes direction.
 - it enters the second medium and changes frequency.
 - it “bounces off” and changes frequency.



- 3-22. The primary purpose of building larger optical telescopes on the Earth's surface is to
- increase the light-gathering power.
 - increase the magnification.
 - improve the resolution.
 - allow a wider range of wavelengths to be viewed.
- 3-23. The focal length of the objective of a refractor telescope is 80 cm, and the focal length of the eyepiece is 8 cm. What is the magnification of the telescope?
- 80×
 - 10×
 - 8×
 - 2×
- 3-24. Chromatic aberration occurs when light
- passes through glass.
 - reflects off glass.
 - reflects off a mirror.
 - enters a telescope just before it reflects or refracts.
- 3-25. The two kinds of electromagnetic radiation that can easily be observed through the Earth's atmosphere are
- visible (optical) and ultraviolet.
 - visible (optical) and infrared.
 - ultraviolet and infrared.
 - visible (optical) and radio.
- 3-26. An emission spectrum is best described by which of the following?
- All colors
 - Only a few, separate colors
 - No colors at all
 - All colors, except a few missing ones
- 3-27. A star's surface temperature is most accurately determined from:
- the number of planets orbiting it.
 - its color.
 - its distance from Earth.
 - its rotation rate.
- 3-28. The nucleus of an atom contains which of the following?
- protons and electrons
 - neutrons and electrons
 - just protons
 - protons and neutrons
- 3-29. We can determine the chemical composition of an object most accurately from

which of the following?

- a) Its size
- b) How fast it is moving
- c) Its spectrum
- d) The peak of its blackbody radiation

3-30. Isotopes of an atom have different numbers of:

- a) protons
- b) electrons
- c) neutrons
- d) photons

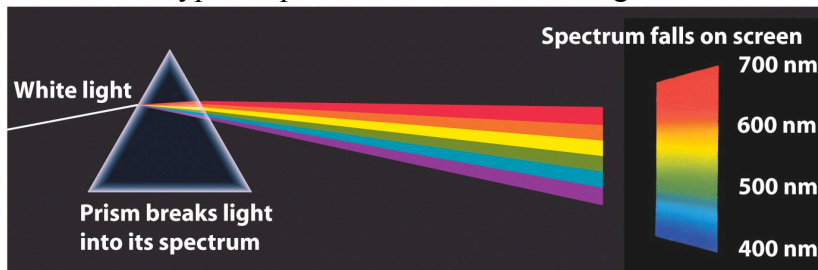
3-31. A star with which color has the hottest surface?

- a) blue
- b) red
- c) orange
- d) yellow

3-32. Which of the following objects emits an emission spectrum in which light is present only at certain wavelengths?

- a) The filament of a light bulb
- b) The surface of a star
- c) Light from a low-density nebula heated by a nearby star
- d) None of the above

3-33. What type of spectrum is shown in the figure?



- a) Emission
- b) Absorption
- c) Reflection
- d) Continuous

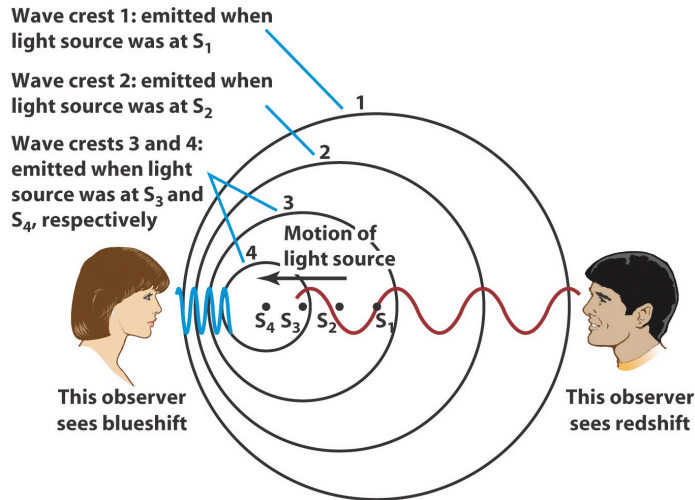
3-34. A blackbody

- a) is a body that is black in color.
- b) absorbs all the light incident on it.
- c) reflects all the light incident on it.
- d) is a body at very low temperature.

3-35. The star Betelgeuse has a surface temperature of approximately 3500 K. At what wavelength does it emit most radiation?

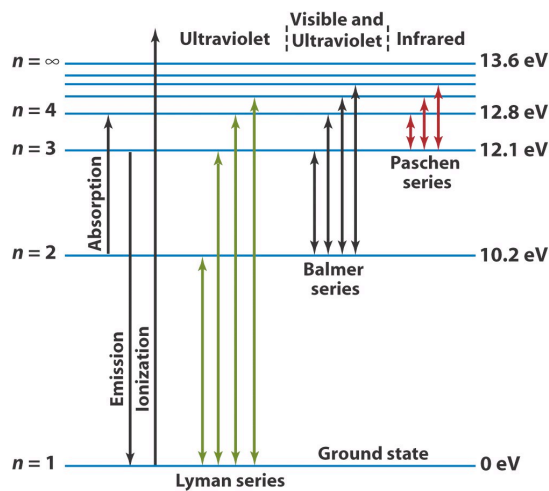
- a) 10.1 m
- b) 1.2×10^6 m
- c) 8.3×10^{-7} m
- d) 9.8×10^{-2} m

- 3-36. A source of light moves toward you. According to the Doppler effect the
- a) frequency of the light will increase.
 - b) frequency of the light will decrease.
 - c) wavelength of the light will increase.
 - d) the velocity of the light will increase.



- 3-37. Which set of lines in the diagram correspond to electron transitions that emit light in the visible range?

- a) Lyman series
- b) Balmer series
- c) Paschen series
- d) None of them



3-38. Light has a particle nature, and these particles are called photons. Which region of the electromagnetic spectrum has the highest energy photons?

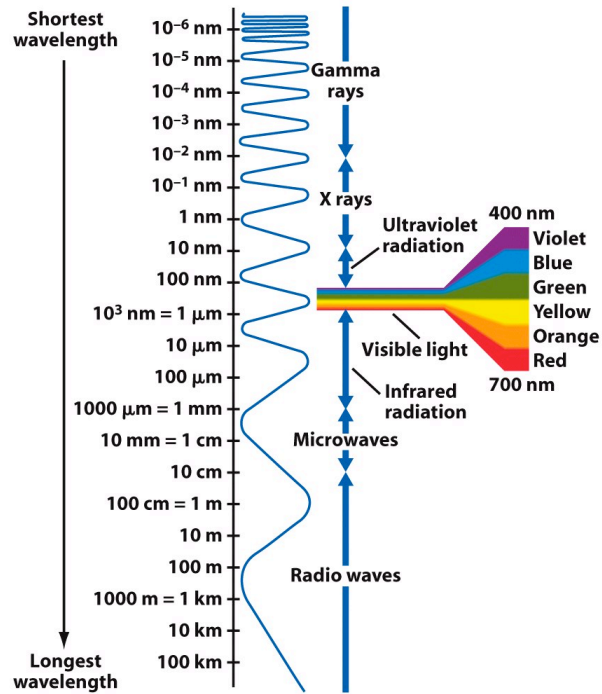


Figure 5-7
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- a) gamma ray
- b) X-ray
- c) ultraviolet
- d) visible
- e) infrared