

Optics Unit Study Guide

Vocabulary: You should be able to define each of these terms:

Crest, trough, rest position, amplitude, wavelength, frequency, Hertz, wave, medium, visible light, absorb, reflect, electromagnetic spectrum, radio waves, microwaves, radar waves, infrared waves, ultraviolet waves, x-rays, gamma rays, ray model of light, wave model of light, ray diagram, photon, transparent, translucent, opaque, incident ray, reflected ray, normal, angle of incidence, reflection, angle of reflection, refraction, angle of refraction, plane mirror, convex mirror, concave mirror, image, concave lens, convex lens, iris, pupil, sclera, retina, optic nerve, lens, cornea, dilate, rods, cones, near sighted, far sighted, astigmatism, fiber optics, telescope, microscope, camera, focus, total internal reflection.

Questions: You should be able to answer each of these questions fully:

1. What do waves transport?
2. What is the matter that waves travel through called?
3. Draw and label a diagram of a wave with each of the following terms: amplitude, crest, trough, wavelength, rest position.
4. Calculate a frequency given the number of waves in an amount of time. (ex: What is the frequency of the waves if 10 wave crests pass under a boat in 5 seconds)
5. Calculate the number of waves which will pass in an amount of time if you know the frequency (ex: How many waves will hit a dock in a minute if the waves have frequency of 0.5 Hz)
6. Explain the relationship between wavelength and frequency.
7. Explain the relationship between amount of energy transported and the amplitude and frequency of waves.
8. Calculate the distance from crest to trough if you know the amplitude.(ex: The amplitude of a wave is 7 meters, what is the distance from crest to trough?)
9. What is the wavelength of various colours of light (ex: What colour of light has wavelength of 600 nanometers?)
10. Explain what happens when white light goes through a prism, use the terms refract, and wavelength.
11. Explain what happens when white light hits a red shirt, use the terms absorb and reflect.
12. Explain what happens when white light hits a black shirt, use the terms absorb and reflect.
13. Explain what happens when white light hits a white shirt, use the terms absorb and reflect.
14. What colour is produced when all the colours of light are mixed together?
15. How are the electromagnetic spectrum and visible light related?
16. List the eight parts of the electromagnetic spectrum in order of wavelength.
17. Give a common use of each of the eight parts of the electromagnetic spectrum.
18. List the two main ways of thinking about light.
19. Make a ray diagram of light hitting a transparent material.
20. Make a ray diagram of light hitting a translucent material.
21. Make a ray diagram of light hitting an opaque material.
22. Give one example of a transparent, a translucent and an opaque material.
23. Make a ray diagram of a shadow being created; be sure to label the shadow.
24. Create/label a ray diagram of light hitting a plane mirror showing the incident ray, reflected ray, normal, angle of incidence, and angle of reflection.
25. State the law of reflection.
26. Given the angle of incidence calculate the angle of reflection, or given the angle of reflection calculated the angle of incidence. (ex: The angle of incidence of a ray of light is 20 degrees, what will the angle of reflection be after it reflects off a plane mirror?)
27. Explain when a light ray would be refracted towards the normal.

28. Explain when a light ray would be refracted away from the normal.
29. Create/label a diagram of light moving from one medium into another, showing the incident ray, refracted ray, normal and angle of refraction, you will be told in which medium light travels faster.
30. Give one common use of a plane, a convex and a concave mirror.
31. Draw a plane mirror, a convex mirror, and a concave mirror each with an arrow showing the direction light is coming from.
32. Give the type of image formed by a plane mirror (Is it upright? Is it larger or smaller than the object?)
33. Give the type of image formed by a convex mirror (Is it upright? Is it larger or smaller than the object?)
34. Create a diagram showing the focal point of a concave mirror.
35. List the three types of image which can be formed by a concave mirror, explain where the object must be placed to create each type of image.
36. Draw a concave and a convex lens.
37. Give the type of image formed by a concave lens (Is it upright? Is it larger or smaller than the object?)
38. List the three types of image which can be formed by a convex lens, explain where the object must be placed to create each type of image.
39. Draw and label a side view of the human eye including the cornea, retina, lens, and optic nerve.
40. Draw and label a front on view of the human eye including the iris, pupil and sclera.
41. Explain the function of the iris; how does it change the eye depending on the brightness of light?
42. Explain why humans have blind spots.
43. List the two parts of the eye which refract light.
44. Explain how the lenses in our eyes changes when we try to focus on close objects.
45. Explain how the lenses in our changes when we try to focus on far away objects.
46. Where in the eye are rod and cone cells found?
47. What type of vision are rod cells used for?
48. What type of vision are cone cells used for?
49. What kind of lens is used to correct vision of near-sighted people?
50. What kind of lens is used to correct vision of far-sighted people?
51. What are 3 examples of devices humans have created to extend vision?
52. Explain how fiber optic cable transmits light, use the term total internal reflection.