

Name: _____
Hour: _____ Date: _____

Physics: *Light, Mirrors, and Color HW*

Set 1: Electromagnetic Waves

1. A particular neutron star emits X-rays with a frequency of 3.4×10^{16} Hz. Determine the wavelength of these X-rays.
2. What is the frequency of an electromagnetic wave if it has a wavelength of 0.78 km?
3. The portion of the visible spectrum brightest to the human eye (i.e., yellow-green) has a frequency of around 5.5×10^{14} Hz. Determine the wavelength of this light, in nanometers.
4. What is the frequency of infrared radiation that has a wavelength of 920 nm?
5. What is the wavelength of the radio waves for the AM station that broadcasts at 680 AM (i.e., 680 kHz)?
6. A certain shortwave radio transmission is broadcast at 18.2 MHz. What is the wavelength of these waves?

ANSWERS: 1. 8.8×10^{-9} m 3. 550 nm 5. 440 m
 2. 3.8×10^5 Hz 4. 3.3×10^{14} Hz 6. 16.5 m

Set 3: Concave Mirrors

14. A concave makeup mirror has a focal length of magnitude 31 cm. Calculate the image distance and magnification of a Q-tip placed 95 cm in front of the mirror. Decide real/virtual and inverted/upright.
15. An object placed 10.3 cm from a concave mirror produces a real image 12.2 cm from the mirror. Find the focal length of the mirror and the magnification of the image.
16. A concave shaving mirror is designed so that a person 17.5 cm in front of it sees an upright image at a distance of 26.5 cm behind the mirror. Find the radius of curvature of the mirror and the magnification of the image. Is the image real or virtual?

Set 4: Convex Mirrors

17. A bottle is 41 cm in front of a convex mirror that has a focal length of magnitude 32 cm. What are the image distance and magnification? Decide real/virtual and inverted/upright.
18. A convex mirror with a radius of curvature of magnitude 58 cm is placed above the aisles in a supermarket. Determine the image distance and magnification of a customer who is 4.8 m away from the mirror. Decide real/virtual and inverted/upright.

ANSWERS:

14. $q = +46$ cm, $M = -0.48$, R, I
15. $f = +5.58$ cm, $M = -1.18$
16. $R = +103$ cm, $M = +1.51$, V

17. $q = -18$ cm, $M = +0.44$, V, U
18. $q = -0.27$ m, $M = +0.057$, V, U

19. A spherical, glass, holiday ornament is 7.80 cm in diameter. If a child's face is 8.30 cm away from the ornament, where will the image form? Find the magnification. Decide real/virtual and inverted/upright.
20. The image of a thimble appears to be 21.5 cm behind the surface of a convex mirror and is 1.12 cm tall. If the mirror's focal length has magnitude 36.0 cm, how far in front of the mirror is the thimble? What is the magnification of the image? Decide real/virtual and inverted/upright. How tall is the thimble?
21. A convex mirror with focal length of magnitude 34 cm forms an image of a coffee mug at a distance of 21 cm behind the mirror. If the height of the image is 6.8 cm, where is the object located, and how tall is it? What is the magnification of the image? Decide real/virtual and inverted/upright.
22. A car's sideview mirror is a convex mirror with focal length of magnitude 0.24 m. The mirror yields a 0.079 m tall image of a truck 0.23 m behind the mirror. Where is the truck located, and what is its height? What is the magnification of the image? Decide real/virtual and inverted/upright.

ANSWERS: 19. $q = -1.58$ cm, $M = +0.190$, V, U
20. $p = +53.4$ cm, $M = +0.403$, V, U, $h = +2.78$ cm

21. $p = +55$ cm, $h = +18$ cm, $M = +0.38$, V, U
22. $p = +5.5$ m, $h = +1.89$ m, $M = +0.042$, V, U