**Waves and Optics Worksheet**

**1.** Which of the following waves require a medium and which can propagate in a vacuum?

Sound wave Vacuum Medium

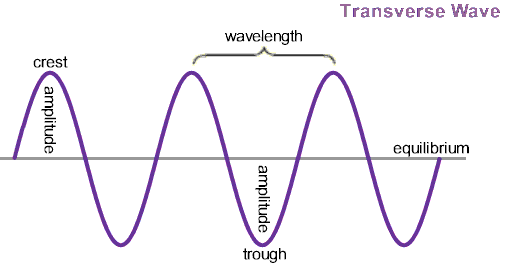
X-Ray Vacuum Medium

Light wave Vacuum Medium

Shock wave of an explosion Vacuum Medium

**2.** Label the following wave diagram with the appropriate parts:

Crest, trough, amplitude, wavelength



**3.** Suppose you record a song and play it back on your phone. If the amplitude of the sound wave is very large, the song will be very:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ?

**4.** Draw two waves. The first wave has a very high frequency. The second wave has a very low frequency. Which one has the highest energy?

**5.** Order the following types of radiation from the electromagnetic spectrum from largest wave length to smallest wavelength: Gamma Ray, Infrared, Microwave, Radio, Ultraviolet, Visible, X-ray

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**6**. For each type of radiation, give a technological application or give an interesting fact.

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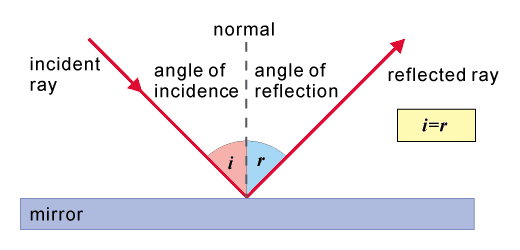
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**7.** On the following diagram, label the following:

Incident ray, reflected ray, angle of reflection, angle of incidence, normal.



**8.** The angle of incidence is always *[greater, smaller or equal]* to the angle of reflection



**9.** Explain how refraction works (i.e. your straw looks broken in a glass of water)

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**10.** Explain the difference between a converging and diverging lens:

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**11.** Sound waves are longitudinal waves, as opposed to transverse waves like the EM spectrum. Explain the difference between longitudinal and transverse waves:

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**12.** The speed of sound is the greatest in *[space, air, water]?*