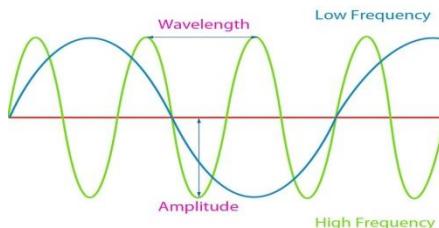


## Catching the Perfect SAR Waves – Understanding the Problem ANSWER KEY

1. What is a wave?

**A wave is a continuous oscillation of energy in space time.**

2. Draw wave with a low frequency and one with a high frequency.



3. List the seven electromagnetic radiation waves in order from low frequency to high frequency.

**Radio, Microwave, Infrared, Visible, Ultraviolet, X-ray, Gamma Ray**

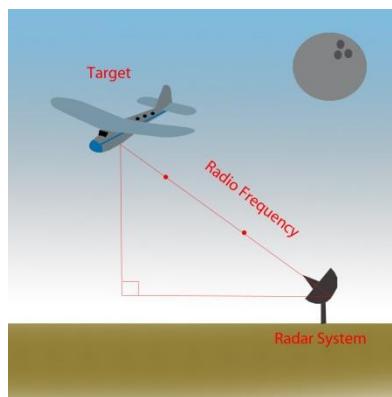
4. For each wave listed above, approximate the size of each wavelength in terms of an object.

**Buildings, Humans, Honey Bee, Pinpoint, Protozoans, Molecules, Atoms**

5. What does the acronym RADAR stand for?

**Radio Detection and Ranging**

6. Draw a diagram of how a radar system works. Use the keywords transmitter, receiver, antenna, target, and radar display to label your drawing.



**A Radar System is composed of an antenna, a transmitter, a receiver, and a display. The transmitter produces an RF pulse of energy that is propagated by the antenna. A receiver captures, amplifies, and demodulates the backscatters. The radar image is displayed on the indicator.**

7. What is the difference between Synthetic Aperture Radar and Inverse Synthetic Aperture Radar?

**In the synthetic aperture radar model, the radar is mounted onto a flying platform and sends radio waves to ground targets. For inverse synthetic aperture, the radar is stationary and sends radio waves to moving targets.**

8. Fill in the missing word: Essentially, radar systems are \_\_\_\_\_ calculating devices.

**Distance**

9. The Pythagorean Theorem is only applied to what type of angles?

### **Triangles with one 90 degree angle – Right Triangles**

10. Give the formula for the Pythagorean Theorem, the representation of each variable, and what we can use it for.

$$a^2 + b^2 = c^2$$

**a, b are the short legs and c is the hypotenuse of a right triangle**

11. In your own words, restate the problem in slide number 11 (Rise to the Challenge).

**We are NASA aviation engineers asked to construct, calibrate, and evaluate the latest Radar system design within four days.**

12. List the engineering technologies that electrical engineers use to design SAR systems.

**Electrical engineers use electronics, electromagnetics, and image processing technologies to design SAR systems.**

13. Given that SAR technology provides structural information to geologists and target information for military operations, what other functions may SAR technology provide? Consider a gulf coast oil spill.

**SAR technology provides information on oil spill boundaries on water to environmentalists.**