1.) Choose the correct statement from those listed below.
   a. Transverse waves are created by displacing a slinky in the same direction as the wave travels.
   b. When a person with a slinky makes a higher harmonic transverse wave of same amplitude of the original wave, it takes more energy.
   c. When a piece of paper is placed on one ring of a slinky and you make a series of longitudinal waves with the slinky, the paper moves a distance A from its equilibrium position then moves back to its equilibrium position and stops.
   d. The more energy you put into transverse waves of a particular wavelength, the smaller the amplitude of the resultant waves.
   e. Constructive interference occurs when two waves that are out of phase with one another superpose

2.) If you increase the frequency of a light wave by a factor of 5, its wavelength will _______

   a. decrease by a factor of 5
   b. increase by a factor of 5
   c. remain the same
   d. increase by a factor of 25
   e. you cannot tell because the speed is not given

3.) Which shows the correct direction for the rays of light as they refract or reflect off the optical elements. The incoming rays are all parallel.

   a. A biconvex lens
   b. A concave mirror
   c. A convex mirror
   d. A biconcave lens
   e. None of the above optical elements are effecting the light rays as they should.

4. If you have far-sighted eyes, ________________

   a. your eye is distended.
   b. your lens images far-away objects inside your eye in front of the retina.
   c. your retina is too far from the lens.
   d. your lens images far-away objects on the retina, but near objects are imaged in front of the retina.
   e. your lens images near objects behind the retina outside your eye.
5.) Wave A and Wave B interfere with one another. When Wave A and B have their left sides aligned, which resultant wave form is correct? Or choose e.

![Wave A and Wave B](image)

- [a] Wave A
- [b] Wave B
- [c] None
- [d] None
- [e] None of the above waveforms shows the interference correctly.

6.) If a spring is oscillating at a frequency of 7 oscillations per second, what is its period?
   a. 1/49 second  
   b. 1/7 second  
   c. 1 second  
   d. 7 second  
   e. 49 second

7.) If a longitudinal wave has a frequency of 350 Hz and a wavelength of 0.5 m, calculate the wave's speed.
   a. 700 m/s  
   b. 350 m/s  
   c. 250.5 m/s  
   d. 175 m/s  
   e. a longitudinal wave has no speed

8.) A concave mirror creates an image of a person __________ when you very close to the mirror (inside the focal length).
   a. which is rightside up and on the same side of the mirror as the person
   b. which is upside down and may be larger or smaller than the person
   c. which is rightside up and smaller than the person
   d. which is upside down and is always larger than the person
   e. which is rightside up and larger than the person
9.) Which of the following statements about the quantum mechanical picture of the atom is TRUE?

a. The planetary model of the atom is replaced with an electron orbiting the nucleus at some specifically known radius.
b. The light given off by an electron as it jumps from a higher energy level to another can be any wavelength (any energy).
c. The uncertainty principle tells us that when observing a macroscopic system (like a car's position measured with a laser) that our very measurement can change the characteristics of the system.
d. Lasers were developed based upon spontaneous emission (a key result of Einstein's work).
e. The electron's orbit is replaced with an electron cloud which represents the probability distribution describing the likelihood of finding an electron at any distance from the nucleus.

10.) Choose the best picture for the direction light reflects off the fish in the fish bowl and exits the water.

a. Fish A  b. Fish B  c. Fish C  d. Fish D

e. None of the above representations of light rays emanating from a fish are correct.