

See General Rules, Eye Protection & other Policies on www.soinc.org as they apply to every event.

1. **DESCRIPTION:** In this event competitors must demonstrate knowledge and process skills needed to solve problems and answer questions regarding all types of waves and wave motion.

A TEAM OF UP TO: 2

APPROXIMATE TIME: 50 minutes

2. **EVENT PARAMETERS:**

- a. Competitors may bring reference materials, writing utensils, **protractors, rulers**, and any type of calculators.
- b. All reference materials must be secured in a 3-ring binder, so that regardless of orientation nothing can fall out.

3. **THE COMPETITION:**

- a. The competition must consist of both hands-on tasks and questions related to waves. 25-50% of the score must be from the practical portion (hands-on tasks), and 50-75% must be from the theoretical portion (written questions). No single question may count for more than 10% of the score.
- b. The event supervisor may provide some mathematical relationships, but the competitors are expected to demonstrate an understanding of the concepts outlined below. The competition must consist of at least one task/question from each of the following areas (at indicated regional (R), state (S), and national (N) levels):
 - i. General wave characteristics (R,S,N), e.g. wavelength, amplitude, frequency, period.
 - ii. Wave types (R,S,N), e.g. transverse, longitudinal, surface, torsional waves.
 - iii. Wave phenomenon (R,S,N), e.g. sound & light – reflection, standing waves, constructive and destructive interference, refraction, effect of media, diffraction, doppler effect
 - iv. Electromagnetic waves (R,S,N), e.g. electromagnetic spectrum, relationship between frequency and wavelength; wave energy; standard wavelength bands, their uses and dangers; and how waves are used in communication.
 - v. Spectroscopy (R,S,N), e.g. primary colors of light – reflection, refraction, use with filters, absorption spectra and emission spectra and their use in astronomy, primary colors of pigments.
 - vi. Earthquake/seismic waves (S,N), e.g. p-waves, s-waves, Rayleigh waves, Love waves, surface waves
 - vii. Boundary effects (N), e.g. breaking ocean waves, tsunamis.

4. **SAMPLE STATIONS:**

- a. Regional level
 - i. Label the parts of a wave, determine frequency, period or wavelength of a wave.
 - ii. Determine the angle of refraction of a prism.
 - iii. Measure and label the angles of incidence and **reflection** and the normal of a mirror.
 - iv. Listen to a recording and determine in which direction (toward or away) a truck is moving.
 - v. Given papers with colored circles and a flashlight hidden inside a black box, determine the color of the filter over the flashlight.
 - vi. Using a recording of two trucks determine which one is moving faster.
- b. State level - given p-wave and s-wave diagrams determine the distance to the epicenter.
- c. National level - label and describe the action of a breaking wave.

5. **SCORING:**

- a. Points must be awarded for the accuracy and quality of the responses. High score wins.
- b. Ties must be broken using pre-selected questions.

Recommended Resources: All reference and training resources including the **Chem/Phy Sci CD** are available on the Official Science Olympiad Store or Website at <http://www.soinc.org>