



# ASTRONOMY

See General Rules, Eye Protection & other Policies on [www.soinc.org](http://www.soinc.org) as they apply to every event.

1. **DESCRIPTION:** Teams will demonstrate an understanding of stellar evolution and **Type II** Supernova Events.

**A TEAM OF UP TO:** 2

**APPROXIMATE TIME:** 50 minutes

2. **EVENT PARAMETERS:**

- a. Each team may bring one of the following sources of information:
  - i. two computers/tablets of any kind;
  - ii. one computer/tablet and one three-ring binder; or,
  - iii. two three-ring binders
- b. If three-ring binders are used, they may be of any size containing information in any form and from any source, attached using the available rings. The information may be removed during the event.
- c. Each team may bring two calculators of any type **dedicated to computation** to use during the event.
- d. No Internet access is allowed during any part of this event.

3. **THE COMPETITION:**

Using information which may include Hertzsprung-Russell diagrams, spectra, light curves, motions, cosmological distance equations and relationships, stellar magnitudes and classification, multi-wavelength images (X-ray, UV, optical, IR, radio), charts, graphs, and DS9/JS9 imaging analysis software, teams will complete activities and answer questions related to:

- a. Stellar evolution, including stellar classification, spectral features and chemical composition, luminosity, blackbody radiation, color index and H-R diagram transitions, **HII regions, red supergiants, Cepheids, semiregular variables, luminous blue variables, hypergiants, Wolf-Rayet stars**, neutron stars, **magnetars, pulsars, stellar mass black holes, eclipsing binaries, X-ray & gamma-ray binary systems, Type II supernovas.**
- b. Use Kepler's laws of rotation and circular motion to answer questions relating to the orbital motions of binary systems; use parallax, spectroscopic parallax, and the distance modulus **to calculate distances to Type I and Type II Cepheids, and Hubble's law to calculate distances to galaxies.**
- c. Identify and answer questions relating to the content areas outlined above for the following objects: **RCW 103, IC 443, Alpha Orionis, HR 5171 A, SN W49B, ASASSN-15lh, AG Carinae, S Doradus, SN 1987A, Geminga, NGC 6357, NGC 7822, M82 X-2, PSR B0355+54, DEM L241, Circinus X-1.**

4. **SCORING:**

- a. The high score wins. All questions will have been assigned a predetermined number of points.
- b. Selected questions will be used to break ties.

**Recommended Resources:** The Science Olympiad Store ([store.soinc.org](http://store.soinc.org)) carries the Astronomy CD, Bio/Earth Science CD and Audubon Night Sky Guide; other resources are on the event page at [soinc.org](http://soinc.org)

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