

ASTRONOMY

DESCRIPTION: Students will demonstrate an understanding of the basic concepts of mathematics and astrophysics relating to stellar evolution and galaxies.

A TEAM OF UP TO: 2

APPROXIMATE TIME: 50 minutes

THE COMPETITION: Students will provide a scientific calculator. All resources are permitted, including laptop computers and programmable calculators.

Using information which may include Hertzsprung-Russell diagrams, spectra, light curves, Kepler's laws, the distance modulus, rotation, circular motion, the period-luminosity relationship, stellar magnitudes and classification, multi-wavelength images (X-ray, UV, optical, IR, radio), charts, graphs and animations, participants will be asked to complete activities which include the following:

1. Use all available information to determine answers relating to galaxies, including galaxy types (spiral, barred spiral, elliptical, lenticular, dwarf, irregular, peculiar, interacting, and AGN's - Seyferts and Quasars), clusters and superclusters of galaxies, and galactic structure (disk, spiral arms, nucleus, halo).
2. Use all available information to determine answers relating to stellar evolution within galaxies, including Population I and Population II stars, blue stragglers, planetary nebulae, globular clusters, red giants, red supergiants, Type Ia supernovae, Type II supernovae, white dwarfs, neutron stars, pulsars, and black holes.
3. Use all available information to determine answers relating to the motions and evolution of globular clusters, binaries, Cepheid and RR Lyrae variable stars, and galaxies - including rotation and Hubble's Law.
4. Students should be knowledgeable about standard candlesticks and use them to calculate distances to stellar objects and galaxies, including spectroscopic parallax, globular clusters, Cepheid variables, RR Lyrae variables, type Ia supernovae, planetary nebulae, and the Tully - Fisher Relationship.
5. Students will be asked to identify, know the location, be knowledgeable about, and/or answer questions relating to the four content areas outlined above for the following Objects: MWG, LMC, M83, Cen A, HCG 62, HCG 87, Coma Cluster, ARP 188, Stephan's Quintet, Tycho's SNR, Cas A, M13, Tuc 47, M31, M57, IC 418, NGC 3132, Abell 39, G1

SCORING: All questions will have been assigned a predetermined number of points. The highest score wins. Selected questions having differentiated weights will be used to break ties.

Reference Materials "*Astronomy Today*", Eric J Chaisson;

http://www.tufts.edu/as/wright_center/cosmic_evolution/index.html

<http://chandra.harvard.edu/photo/index.html>

<http://oposite.stsci.edu/pubinfo/pictures.html>

<http://antwrp.gsfc.nasa.gov/apod/astropix.html>

<http://www.scds.org/mcssic/galaxy.html>

<http://skyservcr.sdss.org/en/>



National Science Education Standards: Science as Inquiry, Content Standard A: Use Technology and Mathematics to Improve Investigations and Communications; Formulate and Revise Scientific Explanation and Models using Logic and Evidence; Earth and Space Science, Content Standard D: The Origin and Evolution of the Universe (Grades 9-12).