ASTRONOMY 294Z: The History of the Universe
Professor Barbara Ryden

PRACTICE MINI-EXAM

Short Answer Problems

1) Who lived first: Kepler or Copernicus?

2) If the density of the universe were greater than the critical density, would the universe be positively curved, negatively curved, or flat?

3) Which is more massive, an electron or a neutrino?

4) A newly formed zircon crystal contains 1000 uranium-238 atoms. How many uranium-238 atoms will be left after two half-lives?

5) A galaxy has a radial velocity of 14,000 kilometers per second. Using Hubble's Law, what is its distance from us?

6) Arrange the following objects in order of increasing mass: Jupiter, Sun, brown dwarf, Earth.

7) Which has the longer wavelength, visible light or X-rays?

8) If a star is at a distance of 2 parsecs, what is its parallax angle, in arcseconds?

Mathematical Problems

9) The stars Arcturus and Vega have the same flux as seen from the Earth. Arcturus is at a distance of 11.3 parsecs from the Earth; Vega is at a distance of 7.76 parsecs from the Earth. What is the ratio of the luminosity of Arcturus to the luminosity of Vega?

10) The star Proxima Centauri has a mass $0.12M_{\rm sun}$, where $M_{\rm sun}$ is the Sun's mass. Also, Proxima Centauri has a luminosity $0.00014L_{\rm sun}$, where $L_{\rm sun}$ is the Sun's luminosity. If the Sun's lifespan is $t_{\rm sun} = 10$ billion years, what is the lifespan of Proxima Centauri?

Essay Question

11) Our crotchety old pal "Flat Earth Fred" refuses to believe that exoplanets (planets around stars other than the Sun) exist, since astronomers haven't been able to take pictures of them. Write an explanation, in simple terms that a non-specialist like Fred can understand, of *either* the radial velocity method *or* the transit method for finding planets.