Sample Questions for Exam #2
one question for each of the four thematic categories
answers on last page

HUBBLE’S LAW
1. Suppose Hubble’s Constant (i.e., the slope of the line in Hubble’s Law shown below) were measured to be twice as large as it is now believed to be. As a result, we would conclude that the age of the Universe in a Big Bang model would be
   A. halved.
   B. the same.
   C. doubled.
   D. squared.
   E. none of the above.

QUANTUM MECHANICS & MATTER
2. The “Uncertainty Principle”
   A. implies that we cannot know a particle’s energy precisely at a specific time.
   B. suggests that empty space (i.e., a vacuum) contains energy.
   C. implies that an atomic particle can pass through barriers.
   D. is a theory verified by experiment.
   E. all of the above

SPECTRA
3. Based on the blackbody spectra below, which star(s) would appear brightest in the infrared at a wavelength of 10 μm?
   A. D
   B. B
   C. C
   D. A
   E. they all appear about the same brightness
4. Based on the spectra below, which objects reach their peak brightness at wavelengths outside the range of human vision?

LOW MASS STARS & WHITE DWARFS
5. Compared to the Sun, a low mass (3.5 \( M_{\text{Sun}} \)) star like Arcturus (K2 giant)
   A. is red because it is hotter and larger.
   B. has a higher luminosity (~10^2 \( L_{\text{Sun}} \)) because it is hotter.
   C. has a higher luminosity (~10^2 \( L_{\text{Sun}} \)) because it is larger.
   D. is also on the main sequence star.
   E. will become a supernova at the end of its life.

HIGH MASS STARS, NEUTRON STAR, & BLACK HOLES
6. The mass of a black hole
   A. cannot be measured since it is not visible.
   B. lies mostly outside the event horizon.
   C. must be <1.4 \( M_{\text{Sun}} \).
   D. can be determined from Doppler shifts in the spectrum of a companion star.
   E. has equal amounts of matter and antimatter.
ANSWERS
1. A
2. E
3. D
4. all but B
5. C
6. D