

Extra credit #2 -- Zakamska, AS.171.618 (Observational Astronomy)

1 point per problem

Order of magnitude physics (real problems given to graduate students at oral exams):

1. Can you derive the density of a rock from first principles / fundamental constants of nature?
2. If all the air on Earth suddenly liquefied, how deep would the liquid air layer be?

Astrophysics:

3. If there were no Galactic extinction and if the supermassive black hole in the center of the Milky Way was an Eddington-limited quasar, would it be brighter or fainter than the Sun and by how much?
4. By what factor would the standard Galactic extinction decrease the brightness of this quasar?
5. You have discovered a white dwarf with a radius 10,000 km and temperature 10,000 K. Calculate the inner and the outer radii of the "habitable zone" around this star (where liquid water can exist on a surface of a planet) in astronomical units.
6. You conducted an all-sky survey and found a bunch of objects with similar spectra, whose nature you don't understand. You plotted them in the Galactic coordinates and saw the following distribution. What is the typical distance to your mystery objects? Why? What is the typical age of your mystery objects? Why?

