

# Physics 121

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## Astronomy of Stars & Galaxies

### Sample Exam 3 Questions

May 2006

1. What powers the sun?
2. How is light important in astronomy?
3. How are neutrinos important in astronomy?
4. Summarize the life cycle of a massive star using a Hertzsprung-Russell diagram.
5. Why are supernovae important?
6. From where do the light and heavy chemical elements come?
7. What are black holes?
8. Illustrate Einstein's theory of general relativity with the parable of two travelers.
9. Use a sketch to provide an overview of the structure of the Milky Way galaxy.
10. Where are we in the Milky Way? Which direction is the galactic center, and when can we see it?
11. How do astronomers map the Milky Way spiral arms? Why don't they wind-up and self-destruct?
12. Describe how Hubble measured the distance to the Andromeda galaxy.
13. Describe how to use the Tully-Fisher relation to measure very large distances.
14. Describe three types of evidence for the existence of dark matter.
15. How does dark matter relate to lighted matter?
16. Describe how Hubble inferred the expansion of the universe.
17. Use the raisin-bread model to illustrate the Hubble expansion and correct common misconceptions of the expanding universe.
18. Use pennies-glued-to-the-balloon model to illustrate the Hubble expansion and correct common misconceptions of the expanding universe.
19. Describe Olber's paradox, and its modern resolution.
20. Describe four evidences for the Big Bang.
21. Describe in sequence five key events in the universe from 10 microseconds to 1 billion years.
22. Describe cosmological nucleosynthesis.
23. Describe three important features of the Cosmic Microwave Background.
24. Describe the discovery of the CMB.
25. Sketch the CMB power spectrum. What do the peaks represent?
26. How does the location of the largest peak of the CMB power spectrum reveal the large-scale curvature of the universe?
27. In cosmology, what is inflation?
28. What three problems does inflation solve? How does it solve them?
29. How might the quantum vacuum accelerate the expansion of the universe?
30. Describe five ages of the universe, from the Big Bang to beyond a googol ( $10^{100}$ ) years.