

**Astronomy 1124**  
Study guide for Exam 4  
**Galaxies & the Universe**

**Format of Exam 4**

30 multiple choice questions	2 pts ea = 60 pts
10 matching questions	2 pts ea = 20 pts
15 true / false questions	2 pts ea = 30 pts
<u>5 short answer questions</u>	<u>3 pts ea = 15 pts</u>
60 Total	125 pts

**Preparation**

1. Review class notes. This includes committing concepts to memory.
2. The material you are responsible for knowing is what was discussed **in class and in the assigned readings**. It is your responsibility to know and understand completely the terms, abbreviations, and concepts described in class or in the **textbook chapters 19-24**.
3. Memorize definitions to vocabulary listed here and in the textbook.
4. Review **homework** and **lab assignments**; what were the main concepts reinforced in these?
5. Answer the review questions below and at the end of the chapters in the textbook.
6. Review (and understand!) the figures in your textbook.

**Review questions**

1. What are the dimensions of the Milky Way galaxy? How do we know where the Sun is located?
2. What is at the center of the Milky Way Galaxy? How do stars orbit in the bulge? in the disc? in the halo?
3. What are the three major types of galaxies? How are they different?
4. What are the two main stellar populations in galaxies? Where and how do stars form in our galaxy?
5. How do we find the distance to a (1) nearby star? (2) a Cepheid variable star? (3) a star cluster? (4) a nearby galaxy? (5) a distant galaxy?
6. What is the Hubble Classification scheme of galaxies? Which types have active star formation?
7. What is Hubble's Law? Why is it important?
8. How does the Hubble constant tell us the age of the universe?
9. How are galaxy redshifts used to support the Big Bang? What is the difference between a **cosmological** redshift and the **Doppler** redshift?
10. How do we know supermassive black holes exist in galaxies?
11. What are quasars, radio galaxies, and active galactic nuclei? What is their power source?
12. What does a rotation curve for a spiral galaxy tell us about its distribution of matter? How does it support the idea of 'dark matter'?
13. What is dark matter? What evidence do we have for its existence?
14. What is dark energy? What evidence do we have for its existence?
15. How much of the universe does normal matter, dark matter, and dark energy comprise?
16. How is the 'shape' of the universe determined? What are the possible shapes?
17. What determines the shape of the universe? What does each shape infer about the fate of the universe?
18. Explain the evidence used to support the Big Bang theory of the universe.

## Vocabulary

Andromeda galaxy  
Big Bang  
Cepheid variable stars  
Cosmology  
Cosmological redshift  
critical density  
dark energy  
dark matter  
Doppler effect  
Edwin Hubble  
Elliptical galaxy

Galactic disk  
Galactic bulge  
Galactic halo  
Galaxy rotation curve  
Hubble's Law  
Hubble constant  
Irregular galaxy  
Local Group  
Main sequence fitting  
Milky Way Galaxy  
Nebulae

Open/closed universe  
Period-luminosity relation  
Quasar  
Radio galaxy  
red shift  
singularity  
Spiral galaxy  
Supermassive black hole  
standard candle  
Type I supernovae