Third Exam - Spring 07

Name _____Key_____

Slides: (20 points, 1 point each)

1. Andromeda — Sa-sb with companions
2. Radio Galaxy — Radio Jets
3. Spiral — Sb, Sc,
4. Cluster of Galaxies — Virgo cluster
5. Elliptical — E0-E1-E2
6. Infrared Sky
7. Large Scale Structure — Galaxy superclusters
8. SBc or SBd — Barred spiral
9. Star orbiting black hole at Galactic Center
10. Large Magellanic Cloud — Irregular galaxy
11. Antennae Galaxy — Galaxy collisions
12. Hubble Deep Field — Thousands of Galaxies
    Gravitational Lensing
13. Quasar
14. Radio Sky
15. Sombrero — S0
16. Lagrangian Pts — Binary Star stable Points
17. Herschell Model of Milky Way
18. Spiral — Sb, Sc
19. Microwave Sky — WMAP Image — Background Radiation
20. Tadpole Galaxy — Collision of Galaxies

average
+
me

Short Answer: (20 points, 2 points each)

1. Which are the largest galaxies in the Universe?

   Giant Ellipticals

2. What is the group of galaxies containing over a thousand galaxies called?

   Rich Cluster

3. What does quasar stand for?

   Quasi Stellar Radio Source

4. Which region of the galaxy contains globular clusters?

   Halo

5. What is the current temperature of the background radiation?

   3° K   *2.72 K*

6. What type of stars did Shapley use to determine the distance to globular clusters?

   RR Lyraes

7. What is the suspected classification of the Milky Way galaxy?

   Sa, Sb, Sc or Sbb, SBa, Sbc

8. What is it called when a small galaxy collides with a large galaxy?

   Galactic Cannibalism

9. What is the name for a binary star system in which both stars fill their Roche lobes?

   Contact binary

10. What is the name for a galaxy which is currently showing a large amount of star formation?

   starburst

Multiple Choice: (10 points, 1 points each)

1. Who first determined the shape of the Milky Way Galaxy and that we weren't at the center?

a) Einstein
b) Hubble
c) Herschell
d) Kapteyn
e) None of the above

2. Who first determined the distance to the Andromeda Galaxy

a) Einstein
b) Hubble
c) Herschell
d) Kapteyn
e) none of the above

3. Which galaxy type has the most gas and dust?

a) Ellipticals
b) Spirals
c) Barred Spirals
d) Irregulars
e) None of the above
f) Both a and d

4. Which galaxies formed first?

a) Spirals
b) Ellipticals
c) Barred Spirals
d) Irregulars
e) All formed at the same time

5. How many years does it take the Sun to orbit the Milky Way?
a) 20
b) 250,000
c) 2,000,000,000
d) 250,000,000
e) We don't have a clue

6. Which type of galaxy has almost all population II stars?

a) Ellipticals
b) Irregulars
c) Spirals
d) Barred Spirals
e) All of the above

7. Which of the following is **not** a method for determining distances?

a) Cepheid variable stars
b) Galactic Parallax
c) Brightest Stars in a Galaxy
d) Supernova Type I
e) All are methods for determining distances

8. Collisions between galaxies can:

a) Turn ellipticals into spirals
b) Cause all the stars in both galaxies to collapse into supermassive black holes
c) Cause bursts of star formation
d) Cause large numbers of stars to collide and explode
e) All of the above
f) None of the above

9. What is it called when distant light is bent by nearer objects?

a) Space-Time Distortions
b) Large-Scale Warping
c) Einsteinian Field Equations
d) Relativistic Bending
e) None of the above

10. What allows astronomers to map the positions of the Milky Way's spiral arms?

a) Ultraviolet emission from high mass stars
b) The spin-flip transmission of a hydrogen atom
c) The distribution of dust in the galaxy
d) Bouncing radio waves off distant galaxies
e) None of the above

Define or explain the following: (20 points, 2 points each)

Hubble Law: The further a galaxy is away from us the faster it is moving away

LaGrangian Points: Points of gravitational equilibrium in a 3 body system

Large and Small Magellanic Clouds: Companion galaxies of the Milky Way

Z Value: $\dfrac{\Delta \lambda}{\lambda}$

Light Element Abundances: The amount of H, He, Li, Be in the universe matches the prediction of the Big Bang Theory

Giant Ellipticals: Largest galaxies in the universe usually found at the center of rich clusters

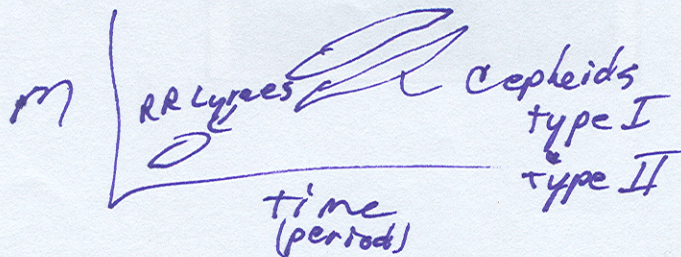Harlow Shapley: First one to determine the center of the Milky Way using Globular Clusters

Center of the Milky Way: In Sagittarius where a super massive black hole resides

Forming Spiral Arms: Two Methods 1.) Star formation 2.) Density Wave

Period-Luminosity Relation:

M | RR Lyrees   Cepheids type I   type II
  |_____
        time (period)

Problems: (Do 3 of 4, 30 points, 10 points each)

1) A cluster of galaxies is receding at a velocity of 63000 km/sec and is at a distance of 840 Mpc, what Hubble constant does this imply?

$$H = \frac{v}{D} = \frac{63,000}{840} = 75 \text{ km/sec/Mpc}$$

What is the age of the universe assuming a constant rate of expansion implied by the above Hubble constant?
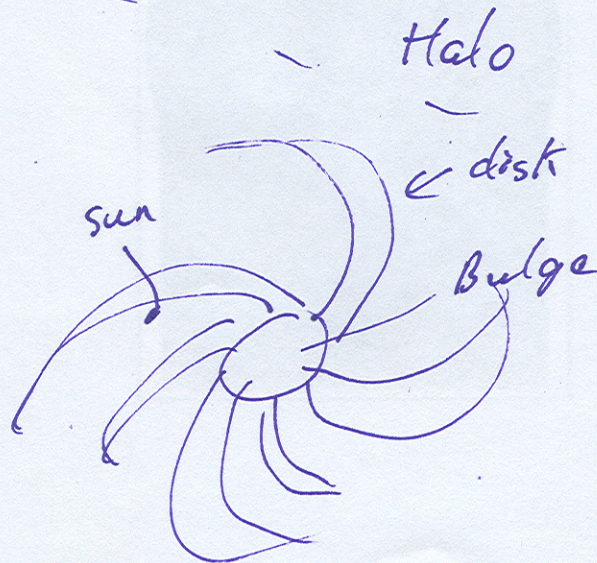
$$t = \frac{1000}{75} = 13.3 \text{ Gyrs}$$

2) Draw a picture of the Milky Way both from the side and the top, label the bulge, disk, halo and location of the Sun?
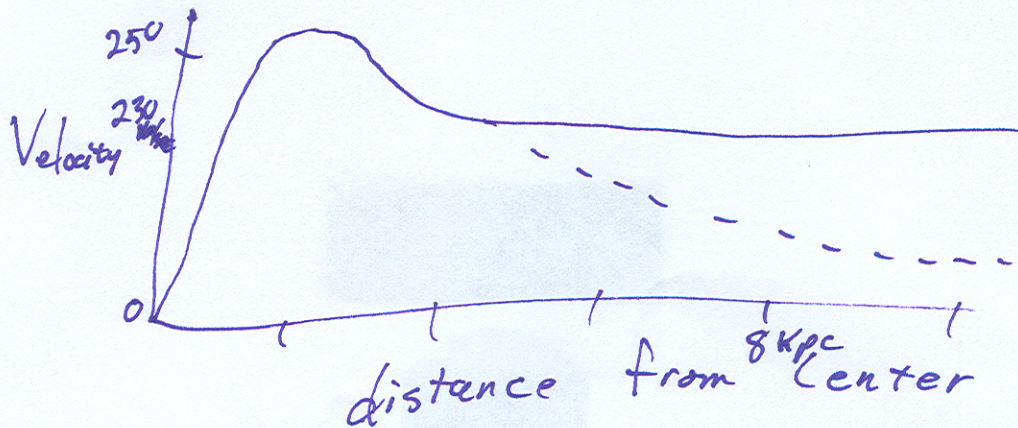
side view,

Disk Sun Bulge Center of Galaxy

top view

Halo

← disk

Bulge

sun

3) Draw the rotation curve of the Milky Way and explain why it shows that dark matter must exist in the galaxy.

$$250$$

$$230$$

Velocity

0

distance from center

8 Kpc

If dark matter didn't exist the curve would follow the dashed line instead of the solid line

4) List the different properties of elliptical and spiral galaxies.

Elliptical

red
older stars
little gas + dust
pop. II
random orbits
metal poor

Spiral

blue
younger stars
lots of gas & dust
pop. I
organized orbits
metal rich