

## ASTR1: Exam 4 Review (PartV)

### CH15 Summary: Our Galaxy

- Know primary features (i.e. bulge, disk, spiral arms, halo)
- Where are the following located in our galaxy (sun, globular clusters, massive black hole)
- What is the size of the milky way (Lyrs)?
- What is the orbital period of the sun around the galactic center?
- What is the interstellar medium
- Describe how stars orbit in the bulge, disk & halo
- How do **high** mass stars contribute to gas recycling in our galaxy?
- How do **low** mass stars contribute to gas recycling in our galaxy?
- How do multiple supernovae contribute to gas recycling?
- Where do stars tend to form in our galaxy?
- What do halo stars tell us about the history of our galaxy?
- Describe briefly how our galaxy formed?
- What is protogalactic cloud?
- What is in the galactic center and how massive is it?

### CH16 Summary: A Universe of Galaxies

- What are the three types of galaxies?
- What is the significance of blue vs red color?
- How are galaxies grouped?
- Describe each method we use to measure distance
  - Radar ranging
  - Parallax
  - Main-sequence fitting
  - Cepheid variables
  - Distant standards
  - Hubble's law
- How does distance tell us the age of the universe?
- What 2 conditions in the protogalactic cloud contributes to why galaxies differ?
- What happens when two spiral galaxies collide?
- What can explain why elliptical galaxies tend to be found closer together?
- What is a quasar?
- How do we estimate the mass of the super massive black hole in our galactic center?
- Why do we think the growth of the central black holes is related to galaxy evolution?

### CH17 Summary: The Birth of the Universe

- In the early universe why could energy radiation turn particles to matter and antimatter?
- What are the 4 forces & what causes them to unify?
- What evidence supports the big bang (2 things)
- What 3 things does inflation explain?
- What is the geometry of space? (Curved/flat)
- What is Olbers' paradox
- Why is the night sky dark?

### CH18 Summary: Stellar Graveyard

- What is dark matter/ dark energy?
- What percent is matter? Dark matter? Dark energy?
- How does rotation give evidence for dark matter?
- What is the evidence of dark matter in clusters of galaxies?
- What are the 2 options we have for the existence of dark matter?
- What are WIMPs?
- What caused protogalactic clouds to contract early in time?
- What are the 2 main structures in the universe?
- How do we know the universe is accelerating expansion?
- What force is causing this expansion?
- What is critical density?
- Why do we infer that the total mass-energy is about 70%?
- What is the fate of the universe?