Astronomy 103 Final Review

Spring 2009
What aspect of Sagittarius A* shows evidence of a massive black hole in the center of our Galaxy?

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B. It has ejected a cloud of low-density dust.
C. It is emitting far infrared radiation.
D. Rapidly moving stars are near it.
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“Standard candles,” which are essential tools for measuring distances to remote galaxies, are

A. stars and other objects of known intrinsic brightness whose apparent brightness can then be used to find the distance.

B. standard laboratory light sources with which the brightness of a galaxy can be compared.

C. heat sources of standard intensity used to calibrate infrared observations of galaxies.

D. laboratory light sources with accurately measured spectra for calibrating stellar and galactic spectra.
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The Hubble law says that if galaxy B has twice the redshift of galaxy A, then galaxy B is

A. half as distant as galaxy A.
B. twice as distant as galaxy A.
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The large scale structure of the universe shows us that

A. Visible matter formed along dark matter filaments
B. Superclusters are ultimately the result of density fluctuations in the early universe
C. Voids in the universe get larger with time
D. All of the above
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The era of recombination (380,000 years after the Big Bang) is when

A. Pop III stars began to form
B. The first atoms formed
C. Neutrinos could freely travel into space
D. The universe began its inflation phase
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The rotation curve for spiral galaxies remains remarkably constant at large distances from the central bulge. What is the significance?

A. These galaxies contain significant amounts of “dark matter” that cannot be detected using electromagnetic radiation at any wavelength.
B. The stars in these galaxies, like planets orbiting the Sun in our own solar system, move primarily under the gravitational pull of a large mass at the center of the system.
C. The stars in these galaxies influence each other gravitationally in such a way that the galaxy rotates like a solid disk.
D. Most of the mass of these galaxies is located in the disk; relatively little mass is located in the central bulge.
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A barred spiral galaxy is a(n)

A. spiral galaxy which, because of the gravitational influence of a neighboring galaxy, is unable to continue, or is “barred” from, rotating in a normal manner.
B. spiral galaxy that has lost all its interstellar gas and dust and now just shows a central bulge crossed by a straight, featureless disk.
C. galaxy with a straight bar of stars passing through its nucleus and spiral arms extending from the ends of the bar.
D. edge-on galaxy with a very dense dust lane in its plane that blocks light from the spiral arms and disk.
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A. They have broad emission lines.
B. They are less common in the early universe than they are today.
C. They are at enormous distances from Earth.
D. They often give off strong radio radiation.
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The tidal streams appearing to come off of the Large and Small Magellenic Clouds show that

A. The LMC and SMC used to be part of the Milky Way
B. The gravity from the Milky Way is disrupting the LMC and SMC as they orbit the galaxy
C. The LMC and SMC are still forming from material surrounding the Milky Way
D. The tidal streams aren’t directly correlated to the LMC and SMC
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Radio galaxies are probably quasars

A. seen face-on to the accretion disk.
B. seen at an angle around 45° to the accretion disk.
C. that have run out of fuel in their accretion disk
D. that are just starting up.
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Supermassive black hole with accretion disk and jets

Receding jet

Approaching jet

Torus

This observer sees a blazar

This observer sees a radio-loud quasar

This observer sees a radio galaxy
The light from more distant galaxies is more redshifted because

A. the photons slow down due to traveling through an expanding universe.
B. more distant galaxies are traveling away faster through space.
C. there is more absorbing matter between us and more distant galaxies.
D. there was a stronger gravitational redshift when the universe was younger and denser.
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What is the significance of the cosmic microwave background radiation discovered by Penzias and Wilson in 1964?

A. It was the first radio transmission believed to indicate the presence of extraterrestrial life in the universe.
B. It indicated the difference between Type I and Type II Cepheid variable stars.
C. It showed a connection between millisecond pulsars and X-ray bursters.
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If the universe is closed, then parallel lines

A. will remain parallel no matter how far they extend.
B. will diverge away from each other as they extend into space.
C. will eventually come together and intersect as they extend into space.
D. are undefined.
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Most of the light from a spiral galaxy comes from the central bulge, so most of the mass of the galaxy resides in the central bulge. How then would we expect the rotation speed to behave in the galaxy's disk?

A. The rotation speed should decrease smoothly with increasing distance from the center because of Kepler's law.
B. The rotation speed should increase smoothly with increasing distance from the center.
C. The rotation speed should decrease rapidly to zero just outside the central bulge because the disk has such a low mass compared to the bulge.
D. The rotation speed should remain essentially constant with increasing distance from the center because the bulge is an extended mass, not a point mass.
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A. Age
B. Density
C. Composition
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The key piece of evidence showing that the expansion of the universe is accelerating is that the

A. most distant Type Ia supernovae are fainter than they would be if the expansion were not accelerating.
B. most distant quasars are fainter than they would be if the expansion were not accelerating.
C. cosmological redshift of light from the most distant quasars is greater than it would be if the expansion were not accelerating.
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The inflation period of the universe that occurred $10^{-35}$ s after the Big Bang can explain what phenomena?

A. The homogeneity of the Cosmic Microwave Background
B. The existence of dark matter in galaxy clusters
C. The flat geometry of the universe
D. Both A and C
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Cosmology is the study of

A. distant quasars
B. galaxy clusters
C. the nature of the universe
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B. Violent interactions between galaxies that strip out gas and dust
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D. Large ellipticals that dominate the cluster center
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A. Redshift, Cepheid variables, Type Ia supernovae
B. Cepheid variables, Type Ia supernovae, redshift
C. Type Ia supernovae, redshift, Cepheid variables
D. All methods work at all distances
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Completely mapping the Milky Way is difficult because

A. Neutral hydrogen doesn’t correlate with the structure of the Milky Way
B. Dust and gas block our view through the galaxy
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The Hubble Sequence organizes galaxies according to:

A. Their evolutionary stage, with galaxies moving through the Hubble Sequence as they age
B. Their mass
C. The apparent shape of the galaxy as viewed from Earth
D. Their overall luminosity
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Studying the positions of superclusters throughout the universe shows that

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B. Groups of clusters are gravitationally bound to one another to create structures like the Great Attractor
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