HW11

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1. The Blue Galaxy

(5 point(s))

Because of the expansion of space, we see all distant galaxies moving away from us, with more distant galaxies moving faster. An observer in one of these distant galaxies would see

- 1. all galaxies moving away from the observer, with more distant galaxies moving faster.
- 2. all galaxies on one side of the observer moving toward the observer, and all galaxies on the other side moving away from the observer, with more distant galaxies moving faster.
- 3. all galaxies moving away from the observer, with closer galaxies moving faster.
- 4. all galaxies moving toward the observer, with more distant galaxies moving faster.

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2. Problems

(5 point(s))

In the verification of the Hubble law for the expansion of the universe and the determination of the constant H0, the greatest difficulty has been

- 1. measurement of recession velocities of distant galaxies by Doppler shift.
- 2. accurate determination of distances to very distant galaxies.
- 3. allowance for the fact that the high gravitational fields of the supermassive black holes within distant galaxies can redshift light (gravitational redshift).
- 4. identification of distant objects as galaxies, rather than very bright stars.

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3. Expanding Universe

(5 point(s))

The expansion of the universe takes place

- 1. between all objects, even between the atoms in our bodies, although the expansion of a person is too small to be measured reliably.

2. only between objects separated by a vacuum; as a result, our bodies do not expand but the Earth-Moon system does.

3. only over distances about the size of a galaxy or larger; consequently, our galaxy expands but the solar system does not.

4. primarily in the huge voids between clusters of galaxies: "small" objects like galaxies or the Earth do not expand.

5. only Brooklyn expands.

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4. Problems with constants

(5 point(s))

One astronomer (astronomer A) claims that the Hubble constant is 84 km/s/Mpc, while another (astronomer B) claims that it is 63 km/s/Mpc. If, based on the Hubble constant, astronomer A claims that a particular galaxy is 3 billion light years away, then astronomer B would claim that it is

1. 4.00 billion light years away.

2. 2.25 billion light years away.

3. 3.75 billion light years away.

4. 2.00 billion light years away.

5. 3.00 billion light years away.

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5. How far?

(5 point(s))

An astronomer studying the spectrum of a distant galaxy finds that its recessional velocity is 14,000 km/s. What is the distance to the galaxy? Take Hubble's constant to be 71 km/s/Mpc.

1. 98 Mpc

2. 980,000 Mpc

3. 1,970 Mpc

4. 197 Mpc

5. 71 Mpc

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6. My favorite rock band?

(5 point(s))

What is the Local Group?

1. a group of about 100 stars within 100 light years of the Sun, which appear to have been formed in a star cluster at about the same time from similar material

2. the planets Mars, Earth, and Venus, which are similar in physical properties and in orbital positions around the Sun

3. a group of galaxies clustered around the Andromeda Galaxy M31, apparently gravitationally bound to it but separate from the Milky Way

4. a cluster of about 40 galaxies of which the Milky Way is a member

5. a punk rock band from Chicago that likes to shave their heads.

Save Answer

7. How do my galaxies grow?

(5 point(s))

Galaxies are distributed through the universe in

1. clusters, which are grouped into linked superclusters around huge voids (like soap bubbles).

2. isolated clusters containing anywhere from a few dozen galaxies to thousands of galaxies.

3. isolated superclusters, each of which contain dozens of clusters of galaxies.

4. a random scattering of small clusters of galaxies similar to the Local Group.

5. only near the center.

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8. Hmmm.. Starbursts

(5 point(s))

What is believed to be the origin of starburst galaxies?

1. The galaxies are slower-rotators than other galaxies, and the slower-speed collisions between interstellar clouds produce more star formation.

2. A recent collision with another galaxy has triggered a wave of star formation.

3. A recent series of supernovae has compressed the interstellar medium and started a new wave of star formation.

4. The galaxies are newly formed and are undergoing their initial, rapid star formation

5. Galaxies from the early Universe that did all their star formation at once.

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9. Galaxy Motion

(5 point(s))

Which of the following statements is most likely to be true when discussing galactic motions and interactions?

1. Galaxies are so widely separated that they never interact or collide.

2. Galaxies are so closely packed in the universe that they are always interacting with one another.

3. The universe is composed of one giant galaxy of which all observed stars are members; thus, the question of interaction between galaxies is irrelevant.

4. Galaxies interact only within their supermassive black holes radii.

5. Galaxies occasionally collide with one another, particularly within clusters of galaxies.

Save Answer

10. Dark matter

(5 point(s))

Which of the following has NOT provided a means by which astronomers can infer the presence of dark matter in the universe?

1. observation of the bending of light from remote galaxies as it passes through intervening clusters of galaxies, producing gravitational lensing

2. measurement of the orbital speeds of stars in the outer regions of galaxies

3. measurement of the orbital speeds of stars near possible supermassive black holes at

the centers of galaxies

4. measurement of the line-of-sight speeds of individual galaxies in clusters of galaxies

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11. Rotation speeds

(5 point(s))

The rotation curve of a galaxy is a graph showing the galaxy's speed of rotation at different distances from the center. The observed rotation curve in the OUTER PARTS of a typical large spiral galaxy

1. decreases suddenly to zero at the outer edge of the visible galaxy.

2. decreases smoothly with increasing distance from the center, following a Keplerian curve.

3. is quite flat (roughly the same speed at all distances).

4. increases drastically with increasing distance from the center, as shown by the spiral arms.

5. are full of black holes.

Save Answer

12. Where are you?

(5 point(s))

As much as 90% of the matter in the universe may be unseen "dark matter." Where is this dark matter?

1. It seems to be rather uniformly distributed throughout the universe.

2. It is concentrated in the centers of galaxies, and may, in fact, be related to black holes at galactic centers.

3. It is concentrated in the planes of galaxies, but extending far beyond the visible galactic plane.

4. It is only made of socks.

5. It appears to be concentrated in spherical haloes around galaxies, but extending several times the radius of visible matter.

Save Answer

13. Quasar

(5 point(s))

A quasar is

- 1. the central core of an active galaxy.
- 2. the remnant cores of exploding stars or supernovae.
- 3. a very active, very bright, very distant star.
- 4. a nearby star, ejected with great violence out of a galaxy.
- 5. very intense star-building activity in certain distant dust and gas clouds.
- 6. the focused image of a distant galaxy by the gravitational lens effect of a closer galaxy.

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14. Dual Overhead Cam

(5 point(s))

The "central engine" of an active galaxy appears to be

- 1. stars falling into a supermassive black hole, their remnants being thrown out in all directions.
- 2. supernova explosions in an extremely dense star cluster at the center of the galaxy.
- 3. the violent merger of two galaxies, in which the collision throws out jets of matter along the rotation axis of the larger galaxy.
- 4. a supermassive black hole at the center of an accretion disk, with jets of material being ejected perpendicular to the disk.
- 5. There is no central "engine" in these sources. Their high gravity has focused radiation from many sources beyond them by gravitational lensing, and thus they appear to be very bright.

Save Answer

15. The Morning Zoo

(5 point(s))

If double radio sources, quasars, and blazars are considered to be the same basic object, why do they appear to us to have very different and distinct properties?

1. because the relativistic particles in the double jets are different in each case: electrons in double radio sources, protons in quasars, and quarks in blazars

2. because they are at different distances from us, and we see more detail and different properties on those that are closer to us

3. because we are viewing them at different angles to the line of the double jets emitted from their cores

4. because they are of different ages

Save Answer

16. That crazy Olber.

(5 point(s))

In stating his paradox, Olber expected the night sky to be bright and not dark as we see it because he thought that

1. the space between the stars would be filled with gas (such as the Orion Nebula), which would emit light.

2. airglow and auroral light excited by solar particles, by his calculations, would produce significant illumination in our atmosphere.

3. his neighbours were spying on him.

4. the Earth's atmosphere should refract (bend) the sunlight around the Earth to illuminate the night sky.

5. every line of sight should eventually intersect a star in an infinite universe randomly scattered with stars.

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17. Redshift

(5 point(s))

What causes cosmological redshift of photons that reach us from distant galaxies?

1. The photons have moved from high gravitational field regions toward lower fields, thereby becoming reddened.

2. The photons were emitted from the galaxies much earlier in time when the overall temperature of matter was much lower. Hence, the observed photons are redder, the farther away from Earth that they were produced.

3. The photons have traveled across space that has been expanding and their wavelengths have expanded with it, becoming redder

4. The photons were emitted by objects that were moving rapidly away from us, and thereby have been reddened by the Doppler effect.

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18. Lost?

(5 point(s))

Where are we?

1. near the edge of an expanding universe, as shown by the Great Wall of Galaxies

2. somewhere in an expanding universe, but not in any special part of it

3. at the exact center of an expanding universe, as shown by the universal expansion away from us in all directions

4. off-center in an expanding universe, as shown by the fact that the microwave background radiation is at a different temperature in one direction than in the opposite direction

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19. The Edge

(5 point(s))

Why does the observable universe have an "edge"?

1. because there are so many galaxies in the universe that every line of sight eventually hits a galaxy, stopping us from seeing any farther

2. because the density of neutrinos at the "edge" is so large that photons cannot pass through, preventing us from seeing beyond this point

3. because absorbing matter prevents us from seeing out past a certain distance

4. because we cannot see any farther than the distance that light has traveled over the lifetime of the universe

5. It doesn't have an edge.

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20. Hot, Hot, Hot

(5 point(s))

I thought that the Big Bang was hot! If the cosmic microwave background radiation is the radiation left over from the Big Bang, why then is it only 3 K?

1. The Big Bang itself was hot, but the temperature decreased as the universe expanded, and the temperature now is 3 K.

2. It is not from the Big Bang itself—it is from cold, intergalactic hydrogen clouds that are left over from the Big Bang.

3. The Big Bang itself was hot, but by the time the universe became transparent the temperature had already decreased to 3 K.

4. The Big Bang was not hot—its temperature was the same as we observe it now from the cosmic background radiation.

5. I have no idea what you're talking about.

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