HW10

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1. Centered

(9 point(s))

The unknown factor that misled Herschel into concluding that the stars of the Milky Way were distributed with the Sun at the center of the galaxy was

1. hot hydrogen gas in the galaxy, whose emission hid the more distant stars.

2. the fact that most of the "stars" that he measured were in fact distant galaxies distributed uniformly around the Sun.

3. gravitational bending of light by the mass of the galaxy, which distorted the relative positions of the stars.

4. the presence of significant interstellar dust, which obscured the more distant stars and thereby localized his observations.

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2. Where?

(9 point(s))

Where is the solar system located in our galaxy?

1. It is not in a galaxy, but in intergalactic space.

2. in the galactic halo

3. in the galactic disk

4. in the galactic nucleus

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3. Star Formation

(9 point(s))

Where in the Milky Way would you expect most star formation to be taking place?

1. globular clusters

- 2. the halo
- 3. the disk and spiral arms
- 4. the bulge

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4. To find the spiral arms...

(9 point(s))

When we measure the narrow line emissions of hydrogen at 21-cm radio wavelength along a particular line of sight through the disk of our galaxy, we can tell the distances to different hydrogen clouds because

- 1. clouds at different distances have different Doppler shifts because of the rotation of the galaxy.
- 2. the further away the gas cloud, the greater the delay in the arrival time of the 21-cm emission.
- 3. clouds that are further away have smaller angular sizes.
- 4. the emission is weaker from clouds that are further away.

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5. To arms!

(9 point(s))

Which of the following components of a galaxy best outline the spiral arms of a galaxy?

- 1. young O and B stars, dust, and gas
- 2. globular clusters
- 3. predominantly solar-type stars
- 4. white dwarf stars
- 5. spiral arms are structures where more stars are located, making them stand-out

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6. Map it out..

(9 point(s))

What is the distribution of molecular clouds in our galaxy and other similar galaxies?

1. They occur primarily in the spiral arms.

2. They are distributed uniformly throughout the disk.

3. They are concentrated close to the galactic center.

4. They are distributed throughout the halo, with greater density toward the center.

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7. Rotation

(9 point(s))

Which of the following statements correctly describes the rotation of our galaxy?

1. Objects in the disk have random orbits with no net rotation of the disk about the center of the galaxy, and the halo rotates differentially (objects further from the center take longer to complete an orbit than objects closer to the center).

2. The disk rotates differentially (objects further from the center take longer to complete an orbit than objects closer to the center), and the halo rotates differentially (objects further from the center take longer to complete an orbit than objects closer to the center).

3. The disk rotates like a solid object (objects at all distances take the same time to complete an orbit), and the halo objects have random orbits with no net rotation of the halo about the center of the galaxy.

4. The disk rotates differentially (objects further from the center take longer to complete an orbit than objects closer to the center), and the halo objects have random orbits with no net rotation of the halo about the center of the galaxy.

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8. The Unseen

(9 point(s))

The possible presence of a very large amount of unseen ("dark") matter in the halo of our galaxy is deduced from

1. the unexpected absence of luminous matter (stars, etc.) beyond a certain distance.

2. the rotation curve of our galaxy, which indicates higher than expected orbital speeds in the outer regions of the galaxy.

3. the rotation curve of our galaxy, which shows that orbital speeds in the outer parts of the galaxy decrease in a way that follows Kepler's law.

4. the unexpected high amount of interstellar absorption in certain directions.

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9. Winding me up

(9 point(s))

Astronomers have found the existence of spiral arms in galaxies difficult to account for because

1. the inner part of a galaxy rotates in a shorter time than the outer parts, so the arms should have wound up so tightly that they would have disappeared over the lifetime of the galaxy.

2. the arms should have been destroyed by collisions with other galaxies over the galaxy's lifetime.

3. the outer regions of a galaxy including the spiral arms have no significant rotation, so the arms should have fallen into the center of the galaxy.

4. the outer parts of a galaxy rotate faster than the inner parts, so the arms should have straightened out into spokes like those of a bicycle wheel.

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10. Super baby

(9 point(s))

What evidence now exists for a supermassive black hole at the center of our galaxy?

1. a very dark void in an otherwise bright region of space near the galactic center, indicating the presence of a black hole

2. observations of intense inflow of matter toward the center of the galaxy, as seen by light, Doppler-shifted toward the red, emitted by this matter

3. very bright and very energetic X-ray emissions from the galactic center

4. very rapid motion of stars (especially S-2) close to the nucleus of the galaxy, requiring a very massive body to hold them in orbit

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11. Mass at the center of the Galaxy.

(10 point(s))

The star S2 orbits Sagittarius A* with a period of 15.2 years and a semimajor axis of 950 AU

What does Kepler's Third Law (as modified by Newton) suggest as the total amount of mass inside the orbital radius of S2? What does this mean? Hint: see Sections 4.7 and 19.9.

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