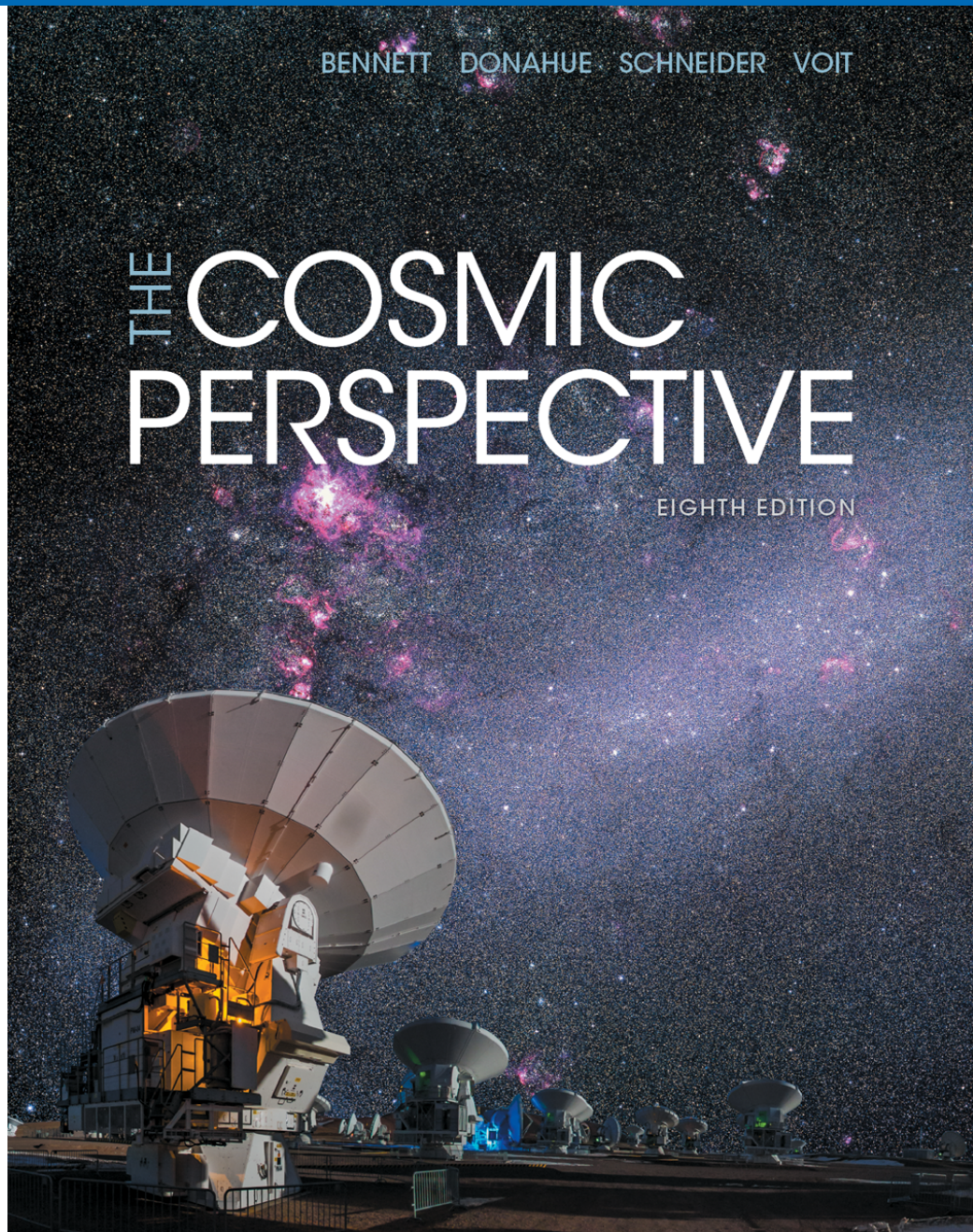
Reading Quiz Clickers

Chapter 13: Other Planetary Systems: The New Science of Distant Worlds



13.1 Detecting Planets Around Other Stars

- Why is it so challenging to learn about extrasolar planets?
- How can a star's motion reveal the presence of planets?
- How can changes in a star's brightness reveal the presence of planets?

Seeing a planet around another star is difficult in part because the reflected light from a planet is at least _____ times fainter than the star.

a) 1000
b) 100,000
c) 1 million
d) 100 million
e) 1 billion

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Which of the following techniques has been used to find the most extrasolar planets, prior to the *Kepler* mission?

a) the astrometric technique
b) the Doppler technique
c) transits and eclipses
d) direct detection

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Which of the following cannot be determined with the Doppler technique?

a) the mass of the planet
b) the orbital period of the planet
c) the size of the planet
d) the size of the planet's orbit

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The astrometric technique for discovering extrasolar planets is the observation of changes in the _____.

a) star's spectrum due to the gravitational effects of an orbiting planet
b) star's brightness as a planet passes in front of the star
c) position of the star due to the gravitational effects of an orbiting planet
d) star's spectrum due to the presence of the spectral signature of the planet in the same observation

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What is the difference between a transit and an eclipse?

a) A transit is when a planet passes in front of a star, and an eclipse is when a planet passes behind a star.
b) An eclipse is when a planet passes in front of a star, and a transit is when a planet passes behind a star.
c) There is no difference. These two terms refer to the same event.
d) A transit is when a star's position changes due to a planet, and an eclipse is when a star's brightness changes due to a planet.

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Which technique(s) of extrasolar planet detection can tell us about the composition of a planet's atmosphere?

a) direct detection
b) transits and eclipses
c) the Doppler technique
d) all of the above
e) A and B

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Which technique of extrasolar planet detection can tell us about the orbital period of a planet?

a) direct detection
b) transits and eclipses
c) the Doppler technique
d) astrometry
e) all of the above

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e) all of the above

How does the *Kepler* mission search for Earth-like planets?

a) It searches for the dip in a star's brightness when an Earth-like planet transits (passes in front of) the star.
b) It searches for the perturbations in the star's motion caused by Earth-like planets using the Doppler technique.
c) It measures the spectra of extrasolar planets to look for the signature of nitrogen-oxygen atmospheres.
d) It measures the perturbations in a star's brightness caused by gravitational microlensing from Earth-like planets.

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13.2 The Nature of Planets Around Other Stars

- What properties of extrasolar planets can we measure?
- How do extrasolar planets compare with planets in our solar system?

The orbits of most extrasolar planets are _____.

a) larger than the orbit of Jupiter
b) more eccentric than the orbit of Mars
c) more inclined than the orbit of Pluto
d) nearly circular

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What is a *hot Jupiter*?

a) a gas giant with a larger than usual source of internal energy
b) a gas giant whose atmosphere is heated to high temperatures due to its small distance from its star
c) a gas giant with a large orbital eccentricity
d) a gas giant with large amounts of radioactive material
e) a gas giant that has an extremely high interior temperature

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13.3 The Formation of Other Solar Systems

- Do we need to modify our theory of solar system formation?
- Are planetary systems like ours common?

How can we explain the presence of gas giants so close to their stars?

a) The nebular theory has been modified to allow for the formation of gas giant planets close to a star.
b) The hot Jupiters are close to cool stars, and so are not actually very hot and have the same history as gas giants in our solar system.
c) These gas giants formed far from the star and migrated inward due to gas drag in the nebula.
d) These gas giants formed far from the star and migrated inward due to the effects of waves in the nebula.
e) These gas giants formed from a star, and then were captured by another star in a much closer orbit.

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Why do many extrasolar planets have large orbital eccentricities?

a) Their eccentricities are increased by close gravitational encounters with other planets while they migrate.
b) Their eccentricities are increased by orbital resonances with other planets.
c) The effect of waves in the nebula on the planet increases the planet's eccentricity.
d) all of the above
e) A and B

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e) A and B

Why are most extrasolar planetary systems so different than ours?

a) There is a large diversity of planetary systems predicted by the nebular theory, and we would not expect any two to be similar.
b) It is easier to detect planets that are massive and close to their stars, and harder to detect systems like our own.
c) The Sun's nebula was affected by a nearby supernova making it the exception, rather than the rule.
d) Our planetary system has been affected to an unusual degree by giant impacts, causing it to be different than the extrasolar planetary systems that we now see are more typical.

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13.4 The Future of Extrasolar Planetary Science

- How will future observations improve our understanding?

How will astrometry be improved to allow detection of extrasolar planets with future telescopes?

a) by using a very large space-based telescope with a deployable reflective mirror
b) by using interferometry (combining the signals of two or more space telescopes) to obtain better angular resolution
c) by using radio telescopes positioned around the world to create a telescope with an effective size as large as the planet
d) by placing a large telescope on the surface of the Moon

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