CH 05 EXPLORATION

ⓘ This is a preview of the published version of the quiz

Started: Jul 22 at 3:54pm

Quiz Instructions

Adapted from Palen, Kay, Smith, Blumenthal "Understanding Our Universe" 2nd ed. (2014)

Question 1

1 pts

(Q001) Visit https://astro.unl.edu/naap/esp/animations/radialVelocitySimulator.html (https://astro.unl.edu/naap/esp/animations/radialVelocitySimulator.html) . **You must have Flash correctly configured in your browser to run the simulation. Please see earlier class announcements for tips to get it running.** This applet has a number of different panels that allow you to experiment with the variables that are important for measuring radial velocities. First, in the window labeled "Visualization Controls," check the box to show multiple views. Compare the views shown in panels 1–3 with the colored arrows in the last panel to see where an observer would stand to see the view shown. Start the animation (in the "Animation Controls" panel), and allow it to run while you watch the planet orbit its star from each of the views shown. Stop the animation, and in the "Presets" panel, select "Option A" and then click "set."

Is Earth's view of this system most nearly like the "side view" or most nearly like the "orbit view"?

Please keep the simulation website open to answer the remainder of the questions.

- ◯ Side view
- ◯ Orbit view

Question 2

1 pts

(Q002) Is the orbit of this planet circular or elongated?

- ◯ Circular
- ◯ Elongated

Question 3

1 pts

(Q003) Study the radial velocity graph in the upper right panel. The blue curve shows the radial velocity of the star over a full period. What is the maximum radial velocity in m/s of the star? Hint: moving your mouse over the blue curve will display the radial velocity at the point on the curve that your mouse is hovering over.

Question 4

1 pts

(Q004) The horizontal axis of the graph shows the "phase," or fraction of the period. A phase of 0.5 is halfway through a period. The vertical red line indicates the phase shown in views in the upper left panel. Start the animation to see how the red line sweeps across the graph as the planet orbits the star. The period of this planet is 365 days. How many days pass between the minimum radial velocity and the maximum radial velocity? Your answer should have 4 significant digits.

Question 5

1 pts

(Q005) When the planet moves away from Earth, the star moves toward Earth. The sign of the radial velocity tells the direction of the motion (toward or away). Is the radial velocity of the star positive or negative when the phase is 0.5? Is the radial velocity of the planet positive or negative when the phase is 0.5?

- Star's radial velocity is positive, planet's radial velocity is positive
- Star's radial velocity is positive, planet's radial velocity is negative
- Star's radial velocity is negative, planet's radial velocity is positive
- Star's radial velocity is negative, planet's radial velocity is negative

Question 6

1 pts

(Q006) In the "Presets" window, select "Option B" and then click "set." What has changed about the orbit of the planet as shown in the views in the upper left panel?

- Nothing has changed.
- The semimajor axis is shorter.
- The eccentricity is larger.
- The exact location of the center of mass is unchanged.

Question 7

1 pts

(Q007) When is the planet moving fastest—when it is close to the star or when it is far from the star?

- Close to the star
- Far from the star

Question 8

1 pts

(Q008) When is the star moving fastest—when the planet is close to it or when it is far away?

- Planet is close to it
- Planet is far away from it

Question 9

1 pts

(Q009) How would an astronomer determine, from a radial velocity graph of the star’s motion, whether the orbit of the planet was in a circular or elongated orbit?

- [ ] She would use the maximum value of the star's radial velocity over a single period.
- [ ] She would use the sign (positive or negative) of the star's radial velocity at different times over a single period.
- [ ] She would use the slope of the radial velocity vs. phase graph just before and just after the phase with maximum radial velocity.
- [ ] She would compare the absolute value of the minimum radial velocity and the maximum radial velocity.

Question 10

1 pts

(Q010) Study the Earth view panel at the top of the window. Would this planet be a good candidate for an observation from our solar system using the transit method? Why or why not?

- Yes, because the orbit is elliptical.
- Yes, because Earth is in the same plane as the planet's orbit.
- No, because Earth's orbit is nearly circular.
- No, because the radial velocity is too slow.

Question 11

1 pts

(Q011) In the "System Orientation" panel, change the inclination to 0.0. Now is Earth’s view of this system most nearly like the "side view" or most nearly like the "orbit view"?

- Side view
- Orbit view

Question 12

1 pts

(Q012) Now, with inclination 0.0°, how does the radial velocity of the star change as the planet orbits?

- It increases and decreases depending on the phase.
- It does not change.

- It only increases with phase.
- It only decreases with phase.

Question 13

1 pts

(Q013) Click the box that says "show simulated measurements," and change the "noise" to 1.0 m/s. The gray dots are simulated data, and the blue line is the theoretical curve. Use the slider bar to change the inclination. What happens to the radial velocity as the inclination increases? (Hint: Pay attention to the vertical axis as you move the slider, not just the blue line.)

- As inclination increases from 0 to 180 degrees, the radial velocity depends more and more clearly on phase and the maximum radial velocity increases.
- As inclination increases from 0 to 90 degrees, the radial velocity depends more and more clearly on phase and the maximum radial velocity increases.
- As inclination increases from 90 to 180 degrees, the radial velocity depends more and more clearly on phase and the maximum radial velocity increases.
- As inclination increases from 0 to 90 degrees, the radial velocity shows no dependence on phase and the maximum radial velocity increases.

Question 14

1 pts

(Q014) Uncheck "show theoretical curve" in the upper right box. What can you say about the data for 0, 5, and 10 degrees of inclination? Check all that apply.

- [ ] The data show no pattern at 0 degrees inclination, a weak but noticeable pattern at 5 degrees, and a more pronounced pattern at 10 degrees.
- [ ] Data at 10 degrees suggest a circular orbit.

- [ ] The observed data at 0 degrees is consistent with measurement noise.
- [ ] At 5 degrees, the minimum radial velocity we are sensitive to is 100 m/s.

No new data to save. Last checked at 4:03pm

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