

Vastness of Space Answer Key

1. What are two techniques that scientists can use to detect planets?

Two techniques that scientists can use to detect planets are the Doppler technique (wobble method) and the transit method. In the Doppler technique, planets are detected when a star is seen to wobble. The transit method looks for star dimming that would indicate a planet moving in front of it.

2. How does the Kepler telescope detect planets?

The Kepler telescope uses the transit method. It looks for dimming of the stars. If the light from the star dims, it may be because of a planet crossing in front of it.

3. Both techniques that Dr. Fischer described involve using the stars to detect the planets. Why do you think that scientists look at stars rather than trying to look directly for planets? (Hint: Think about looking up in the night sky. What are you able to see?)

Scientists look at stars because they are visible. Planets are dark, and space is dark. Scientists can look at something bright (a star) and see it moving or changing in brightness. Those changes might be due to planets orbiting the star. If scientists tried to look directly for planets, it would be very difficult to find any outside of our solar system.

4. Do you think it is probable that scientists will find a habitable planet in your lifetime?
Student answers will vary.

5. Explain your answer.

Student answers will vary. Students should provide a full explanation of their claim. Some reasons that students may give for “yes” and “no” answers are provided below. This is not a comprehensive list, and any reasonable explanations should be accepted.

Explanations stating that finding planets is probable may cite:

There are billions of stars. The likelihood is high that many of those stars have orbiting planets. Scientists are finding many planets, and some of the newly found planets seem to have characteristics that would be favorable to life.

Explanations stating that finding planets is improbable may cite:

Scientists have not yet found a planet that can support life, other than Earth. Not every planet is suitable for life. Having life on any planet is an unusual occurrence.

6. How certain are you about your claim based on your explanation?

Student answers will vary.

7. Explain what influenced your certainty rating.

Student answers will vary. Students may be uncertain that habitable planets will be found ever, or in their lifetimes. They may cite the evidence that although scientists have been

looking for habitable planets for many years, they still have not been able to find one. They may state that as technology improves, scientists will be able to find more planets and find the smaller ones that harbor life. They may state that life forms on other planets might be significantly different than what exists on Earth, so scientists may be looking for too limited a set factors to find habitable planets.

8. Why do scientists think that a celestial body needs to be large to be able to support life?

A celestial body should be large enough to hold on to an atmosphere. If there is an atmosphere on a planet, that means that water can stay liquid on the surface (if the temperature is right). The possibility of liquid water means the possibility of life, since scientists think that water is necessary for life.

9. What is the first thing that scientists need to look for to find life outside of Earth? Why?

Scientists should look for evidence of water. All living things that we know about require liquid water to survive. This means that scientists should be looking for planets that fall into the habitable range— not too close to their stars and not too far away from their stars for liquid water to exist. Students may give other answers, such as it must be a rocky planet or that it needs to have an energy source. These are reasonable, if students' reasoning supports their answers.

10. Which types of living things do you think scientists are more likely to find on other planets? I think that scientists are more likely to find that living things on other planets are like the ones _____.

deep in Earth's oceans.

in Earth's volcanic vents.

deep underneath Earth's surface.

11. Explain your answer.

Student responses should include the following or something similar. There is such a large variety of life on Earth, and not all of it is on the surface. I think it is unlikely that we will find another planet that is exactly like Earth, but it is likely that some planet that gets discovered will have some environment like an environment on Earth. I think that it is more likely that the environments on other planets will be more similar to the harshest environments on Earth than to the relatively un-harsh surface.

Life on really cold planets could look like the organisms that live deep in Earth's Antarctic ice. Maybe life on really hot planets looks similar to the life in Earth's boiling hot springs and volcanic vents, or maybe it could be similar to the life found deep underneath Earth's surface, buried in solid rock.

If life can exist in such harsh environments on Earth, it stands to reason that life may exist on similarly harsh conditions on another planet.