

Exploring the Universe - Exit Slip # 1 - Answer Key

1) Venus is the second closest planet to the Sun, and Mars is the fourth closest. On which planet do you think you would be older? Explain. (2 marks)

I would be older on Venus because it takes Venus less time to orbit the sun.

2) To make a ball move at high speed in a small circle requires a strong **pull**.

3) To make the same ball move at a low speed in a larger circle requires only a **weak pull**. (1 mark).

4) To make a planet move at a high speed in a small orbit requires a strong **gravitational force** (1 mark).

5) To make the same planet move at a low speed in a large orbit requires only a weak **gravitational force**. (1 mark).

6) What is the main theory about how planets were formed? (Hint: think of the activity with the water drops). (2 marks).

Small masses collided and formed larger masses that eventually became planets.

7) What happens to the eccentricity of an ellipse as you increase the distance between foci? (1 mark)

The ellipse becomes less like a circle and more like an elongated oval.

8) What is the result when the foci are so close together that they become the same point (the distance between them is zero)? (1 mark)

The ellipse becomes a circle.

9) The eccentricity of Mars' orbit is a very low 0.0935. If eccentricity is mathematically defined as the ratio of one-half the distance between the foci and one-half the length of the major axis, what is the distance between the foci of Mars' orbit? (Hint: Use the average Mars-Sun distance of 1.5 AU (225,000,000 km in the denominator.) (2 marks).

$$\text{Eccentricity} = \frac{\text{One - half the distance between } F_1 \text{ and } F_2}{\text{One - half the length of the major axis}}$$

$$0.0935 = \text{one-half the distance between foci} / 225,000,000 \text{ km}$$

$$\text{Distance between foci} = 0.0935 \times 225,000,000 \text{ km} \times 2 = 42,075,000 \text{ km}$$

10) Do the orbits of most planets have low, medium or high eccentricity? (1 mark).

Most planets have low eccentricity.

11) Briefly describe the orbits of asteroids and comets (1 mark).

The orbits of asteroids and comets have high eccentricity.

12) Why is it winter in the northern hemisphere even though the Earth is at perihelion (closest to the sun in its elliptical orbit)? (1 mark).

It is winter in the northern hemisphere because the Earth is tilted away from the Sun.

13) What are the two foci in Earth's elliptical orbit? (1 mark).

The two foci in Earth's elliptical orbit are the Sun and an imaginary point in space.

14) If **Cherry** is four times as far away from the Sun as **Anna**, then the force of gravity on **Anna** is only $\frac{1}{16}$ of the gravity on Cherry. (1 mark).