Quiz #2 Answers

1. Why do we see planets undergo apparent retrograde motion in the night sky? Consider using a diagram to help facilitate your description.

Apparent retrograde motion is caused by the fact that we are viewing the planets from a moving Earth and the planets are orbiting at different speeds. Consider Mars. Mars is further from the Sun and hence it orbits more slowly. At certain times the Earth passes Mars on it's orbit. When that happens, the location of Mars projected on the background stars appears to go the reverse of what it normally does. Figure 2.33 on page 51 of the book illustrates this.

Some things to note about people's answers. Many people used the term rotation when they should be using revolution. The motion of a planet around its axis is typically called rotation. The motion in orbit, say around the Sun, is called revolution.

Another significant misunderstanding was that apparent retrograde motion does not require elliptical orbits. It would happen even if all the planets had perfectly circular orbits.

2. List two of the things that Galileo saw with his telescope that help support the Copernican Revolution. For each one, describe how it went against the geocentric doctrine of the time.

You could have picked any two of the following:

1. He saw craters and mountains on the Moon as well as sunspots. Both of these demonstrated that the heavens were not perfect.

2. He saw Venus go through phases in a way that could only happen if it orbited the Sun. This was evidence of a planet orbiting the Sun, not the Earth.

3. He saw four moons orbiting Jupiter. Again evidence that things could orbit bodies other than the Earth, making it less likely the Earth was the center of everything.

4. He saw that the Milky Way was made of stars. This argued for stars being much more numerous and much further away than people had expected. That in turn explained why we couldn't see stellar parallax. Note that Galileo did not observe stellar parallax himself.

Extra Credit: The dwarf planet Sedna has a semimajor axis of 526 AU. Using Kepler's third law, what it the orbital period of this object?

For this we use Kepler's third law: $p^2=a^3$. Given a in AU, the p value is in years. We rearrange this to be $p=a^{3/2}=a^{1.5}$, $526^{1.5}=12064$ years.