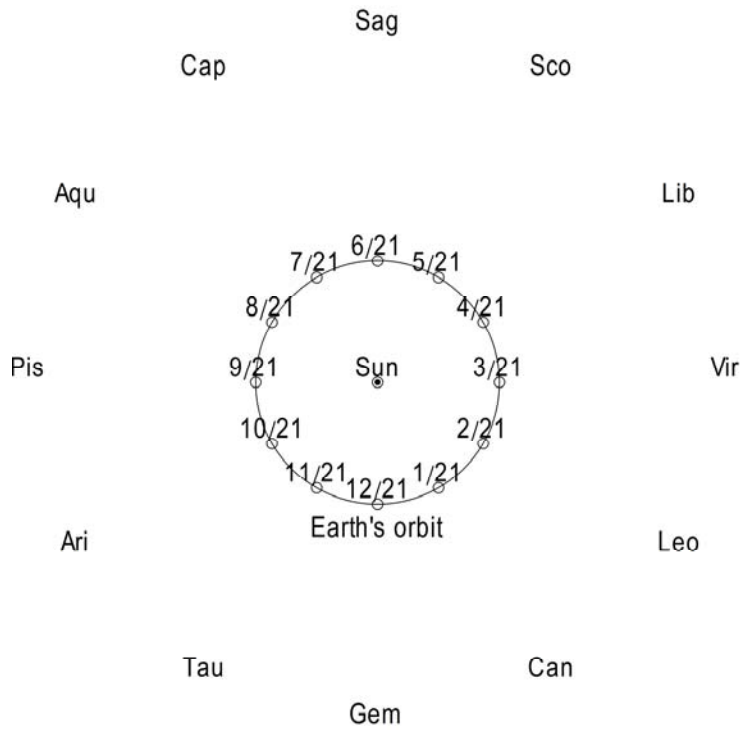


You may use one sheet of notes. You may not use books or additional notes.

Do the easy questions first. Then go back to the harder ones.

Name	
PID	
1	/ 5
2	/ 4
3	/ 8
4	/ 6
Total	/ 23

Planet	Period (yr)	Semi-major axis (AU)	Eccentricity
Mercury	0.241	0.387	0.206
Venus	0.615	0.723	0.007
Earth	1.000	1.000	0.017
Mars	1.881	1.523	0.093
Jupiter	11.86	5.202	0.049
Saturn	29.46	9.539	0.056



1. Galileo disproved Ptolemy's geocentric model by observing the phases of Venus. He wrote, "(1) Know therefore that about 3 months ago I began to observe Venus with the instrument, and I saw her in a round shape and very small. Day by day she increased in size and maintained that round shape until finally, attaining a great distance from the Sun, the roundness of her eastern part began to diminish, and (2) in a few days she was reduced to a semicircle. She maintained this shape for many days, all the while, however, growing in size. (3) At present, she is becoming sickle-shaped."
 - a. (2 pt.) What did Galileo observe that contradicted Ptolemy's model?
 - b. (1 pt.) Why did Ptolemy not disprove his own model in the same way?
 - c. (2 pt.) Draw a diagram that shows Venus at the time (2) of his observations. You must include the sun and earth. For simplicity, you may let earth be stationary. Explain your placement of Venus in your diagram.
2. Copernicus wrote *On the Revolutions of the Heavenly Spheres*.
 - a. (2 pt.) What did he propose in this book?
 - b. (2 pt.) What did he mean by "revolutions"? What did he mean by "heavenly spheres"?
3. The drawing on the front page shows the constellations of the Zodiac. Suppose the date is 3/21 and sunrise and sunset occur at 6am and 6pm.
 - a. (2 pt.) Which constellation is rising at sunset? You must explain how you found the answer, either in words or with a drawing, to receive any credit.
 - b. (3 pt.) Which constellation(s) can you not see at any time during the night? Explain how you found your answer.
 - c. (2 pt.) Explain why the earth spins more than 360° from noon on one day to noon on the next day. Hint: Consider how much earth must spin in 90 days, and show that it is more than $90 \times 360^\circ$. (1 pt.) How many degrees does the earth spin between successive noons?
4. Astronomers discovered a new comet, and they found that it passes closest to the sun at a distance of 0.5AU and the second focus of its orbit is 20AU from the sun.
 - a. (3 pts.) Find the length of the major axis.
 - b. (3 pts.) Is it likely to return in your lifetime? (You are 20 years old.) Explain how you found your answer.