

29:52 Exploration of the Solar System

Homework Assignment # 8

Quiz must be completed on ICON by 8 AM, Monday, April 5

1. If the Earth had a ring, formed in the same way as Saturn's, how far above the *surface* of the Earth would the outer edge of the ring be?
 - (a) 6378 km
 - (b) 384,000 km
 - (c) 8930 km
 - (d) 1.49×10^8 km
 - (e) 74.2 km
2. We recently (in 2009) saw Saturn's ring "disappear" (Saturn ring plane crossing). Approximately when (in what year) will this happen again?
 - (a) 2013
 - (b) 2023
 - (c) 2018
 - (d) 2057
 - (e) 2110
3. Right now, Saturn is at opposition (this happened March 21). How long does it take for a radio signal transmitted from the Earth to reach the Cassini spacecraft, and the response to be received on Earth (i.e. two-way travel time)? This is equivalent to asking how long the delay would be if you used your cell phone to talk to a friend at Saturn.
 - (a) 2 hours and 16 minutes
 - (b) 13.2 seconds
 - (c) 7 minutes 5 seconds
 - (d) 27 minutes and 37 seconds
 - (e) 7.3 milliseconds
4. Look at Figure 7.2 of your book for this one. Look at the blue curve, and ignore the temperature information. Assume that the average thermal speed equals the speed at which the curve reaches a maximum (it is actually a little higher than that). Which of the following planets would be *unable* to retain a gas whose molecules had the distribution of speeds shown in that graph?
 - (a) Earth
 - (b) Venus
 - (c) Jupiter
 - (d) Saturn
 - (e) Mercury

5. Why are oxygen compounds like carbon monoxide and carbon dioxide extremely low in abundance in the atmospheres of Jupiter and Saturn?
 - (a) there is no oxygen in the atmospheres of Jupiter and Saturn
 - (b) the temperatures in the atmospheres of Jupiter and Saturn are too high for the formation of molecules
 - (c) almost all of the oxygen is bound in molecules containing hydrogen
 - (d) there are no molecules (compounds) in the atmospheres of Jupiter and Saturn

6. Why are Saturn's rings conspicuous at times and very difficult to see at other times?
 - (a) Every 14 - 15 years the Earth passes through the plane of the rings
 - (b) the particles in the rings sublimate and refreeze (reform) depending on the season on Saturn
 - (c) the rings of Saturn only form when the planet is near perihelion
 - (d) the ring is difficult to see when the planet is close to the Sun

7. The Earth has a dense N₂ and O₂ atmosphere (N₂ and O₂ means diatomic nitrogen and oxygen molecules). Why doesn't it have significant molecular hydrogen, H₂, in the atmosphere?
 - (a) The temperature of molecular hydrogen will always be much lower than molecular nitrogen and oxygen, so its average molecular speed is correspondingly much lower than nitrogen and oxygen.
 - (b) Molecular hydrogen has a much smaller mass than molecular nitrogen and oxygen, so its average molecular speed is much higher.
 - (c) Hydrogen is a very rare element in the solar system, so there was not much around when the Earth formed its atmosphere.
 - (d) Hydrogen molecules have a strong electric charge, and are swept away into space by the electric field of the solar wind.

8. What percentage of all planetary mass in the solar system is in Jupiter? By planetary mass, I mean the mass in the major planets.
 - (a) 38 %
 - (b) 92 %
 - (c) 99.5 %
 - (d) 71 %

9. Imagine that the obliquity of the ecliptic for Saturn was 0 degrees instead of 26.7 degrees, and that it was exactly in the plane of the ecliptic. Which of the following statements correctly describes what would be the appearance of

Saturn's rings?

- (a) The rings would always be seen edge-on, and thus barely visible.
- (b) The rings would always be seen at their maximum opening angle of about 25 degrees.
- (c) The rings would vary from being fully opened to edge on over the course of a Saturnian year.
- (d) The rings would always appear inclined at an angle of 23.6 degrees.