

Astronomy 105G  
Lab Review Session 3

In collaboration with your Lab Group members, please answer each of the following questions in writing, and be prepared for one group member to turn the answers in on behalf of the entire group.

1. (M3.02) Suppose that you go back in time 4.5 billion years and move the proto-Earth out to where Jupiter now is. How would its subsequent growth be different than what actually happened to Earth? Make sure that you discuss how the growing planet's composition and mass evolve and clarify how these are different from what happened on the real Earth.
2. (M3.03) As the jovians grew in *mass*, did their *density* grow or shrink? Explain how volume can grow faster than mass.
3. (M3.04) Suppose that I'm on the equator and I fire two long-range shells. One is aimed East (in the direction of Earth's rotation) and one is aimed West. Will one of these shells travel farther than the other? Relatedly, can airplanes that fly East travel faster if we neglect the influence of the winds?
4. (M3.04) Suppose I'm on the equator and I fire a long-range shell aimed due north. Will it land at a spot due north of me? Now suppose that I move to Las Cruces and fire the same cannon due south. Will it land on a spot that lies east or west of due south?
5. (M3.04) Jupiter's Great Red Spot is its most famous "storm", but it has smaller ones in its northern hemisphere. Sketch how the Coriolis effect causes high-pressure, northern hemisphere storms to rotate. In what direction do they rotate?
6. (M2.18) Jupiter's phases. Jupiter is about five times as far from the Sun as Earth is. Let's explore how this impacts Jupiter's phases.
  - Sketch the Earth-Sun-Jupiter system when Jupiter is "at opposition"; that is, when it is on the opposite side of the Earth from the Sun. What phase is Jupiter in?
  - When Jupiter is at opposition, at what time of the day does it rise?
  - Indicate where in its orbit Jupiter is when it is in its waxing gibbous phase. Is there more than one correct answer?
  - Where is Jupiter when it is in its New phase? What about its crescent phase?
7. (M2.11) In lecture, we discussed how the Earth's Moon is responsible for gradually slowing down the Earth's rotation through its ability to "pull" on the Earth's tidal bulge. The ability of one planetary body to impact another in this way depends on how massive the two bodies are and how far apart they are. Which body is strongly affected by tidal forces in the following examples:
  - a binary star system where the stars are very close together
  - Jupiter and its four most massive moons (Io, Europa, Ganymede, and Callisto)
  - Mars and its two moons (Phobos and Deimos)
  - Pluto and Charon (both are less massive than Earth's Moon but they orbit fairly close together)