

ASTR 121: Homework 9

Due Thursday, November 12th, 2009

For problems of a mathematical nature, show all work for full credit (including multiple choice responses).

1. (10 pts) Mercury's magnetic field
 - (a) causes aurorae, just like Earth's.
 - (b) has a strength of 1% compared with the Earth's magnetic field.
 - (c) prevents meteors from hitting it, causing Mercury's relatively crater-free surface.
 - (d) is not strong enough to deflect solar winds.

2. (10 pts) Mars and the Moon are similar in all of the following ways except:
 - (a) varied crust thickness
 - (b) presence of regolith
 - (c) atmosphere
 - (d) plate tectonics

3. (10 pts) Moonquakes
 - (a) have drastically changed the surface of the Moon overtime.
 - (b) are caused by plate tectonics, just as on Earth.
 - (c) occur between the boundary of the lithosphere and the asthenosphere.
 - (d) occur as a result of tidal forces acting on the Moon from the Sun.

4. (10 pts) The sun rises in the west on Venus because
 - (a) Venus experiences retrograde rotation.
 - (b) it takes Venus longer to spin on its axis than to complete one revolution around the Sun.
 - (c) Venus revolves around the Sun in the opposite direction as the other planets.
 - (d) Venus experiences retrograde motion.

5. (10 pts) An abundance of *maria* exist on the surface of the Moon facing Earth. Which of the following is a correct explanation?
- (a) Debris only ever hits that side of the Moon; the debris that hits the Moon comes from the Earth.
 - (b) Many active volcanoes once existed there, providing an abundance of basalt and heavier elements.
 - (c) There is not an abundance because maria are evenly spread out across the surface of the Moon.
 - (d) The Moon's crust on the side facing the Earth is thinner, making it easier for meteors to crack the crust and cause lava flow.
6. (20 pts) **True or False:**
- i The tidal bulge of Earth's oceans caused by the Moon lies exactly on the line from the Earth's center to the Moon's center.
 - ii Because it takes Phobos less than a Martian day to orbit Mars, it will spiral out of orbit.
 - iii Active volcanoes are still found on both Venus and Mars because, like Earth, both planets have plate tectonics.
 - iv Regolith is only found on the Moon.
 - v Mercury spins on its axis three times for every two times it orbits the Sun. Therefore, its rotation is unaffected by the Sun's tidal forces.
7. (15 pts) Calculate the tidal force for two 1-kg masses of water on opposite sides of the Earth as a result of the Moon. Assume these two masses of water and the Moon all lie in a straight line. Note: $M_{moon} = 7.35 \times 10^{22}$ kg, and the Earth's diameter is $d = 1.28 \times 10^7$ m. The distance from the Earth to the Moon $r = 3.84 \times 10^8$ m.
8. (15 pts) Every year around August, a hoax goes around that Mars will be the closest to Earth it's ever been, and will appear to be as big as the full Moon in the sky (0.5°). Using the small angle formula, compute how far from Earth Mars would have to be to appear this big; compare this to the distance from Earth to the Moon and comment on why this is impossible.