PTYS/ASTR 206 – Section 3 – Homework 3 – Assigned 2/26/09

NAME:_____

(PRINT CLEARLY)

- Homework is due in class on Thursday March 5th.
- Late homeworks can be turned in class on Tuesday March 10th for 50% credit.
- Homeworks turned in later than this receive 0%.
- Students are encouraged to discuss approaches to solving homework problems with each other; however, all work submitted must be the student's own**. Do not turn in identical homeworks!** See the syllabus for more information.

Hint: Each of these questions should be quick to answer. If you find yourself engaged in a long chain of complicated reasoning or more than a few lines of math then something is probably wrong! Make sure to start this early and talk to the TA or myself with any questions.

Question 1: Planetary interiors

Give two reasons why we know the core of the Earth is at least partly liquid?

When rocks rise up through the Earth's mantle why do they partly melt?

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Volcanoes with very viscous lavas have very explosive eruptions. Give three reasons why some lavas are more viscous than others.

You might already have heard about the Mount St. Helens eruption during 1980 in Washington State. Do a little web research on this eruption, what kind of volcano is this? The mountain itself was badly damaged in the eruption – what will happen to this volcano in the future?

Question 2: Atmospheres of terrestrial planets

The surface pressure of the martian atmosphere is about 0.006 times that of the Earth and the scale height of Earth's atmosphere is about 8km. Is the top of Mount Everest at lower or higher pressure than the surface of Mars (elevation of Mount Everest is 8.8km)?

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Both Earth and Titan have mostly nitrogen atmospheres at roughly the same pressure. Temperature on Titan is 90K and on the Earth 300K. How dense is Titan's atmosphere compared to the Earth?

How do we know there is ice in Mercury's polar regions? Why is it stable there despite Mercury being such a hot planet?

Question 3: Atmospheric Circulation

What latitudes contain most of the deserts on the Earth? What causes this?

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Which way do winds at Earth's equator blow? (Sketch a picture). Where does this air come from and why do these winds blow in this direction?

How does the greenhouse effect work? Why does adding more CO_2 to the atmosphere change the climate? Why did Venus's greenhouse effect run away while the Earth's is kept in check?

Question 4: The Moon

Most people now believe that the Moon formed in a giant collision between the Earth and a passing Mars-sized planet. Give two pieces of evidence to support this.

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An old formation theory involved the Moon and Earth splitting apart from a rapidly spinning parent body. Why doesn't this work?

What are the dark low-land plains on the Moon composed of? Why do they have much fewer impact craters than the bright lunar highlands? Why are these dark plains concentrated on the side of the Moon that faces the Earth?

Question 5: Venus

Most volcanoes on Venus produce lava that is not at all viscous. Suggest a reason why the viscosity of the Venusian lavas is so low.

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Venus is 0.72 AU from the Sun. Assume Venus had no atmosphere and that its bare surface reflected 50% of the sunlight that hit it. How much solar power would it absorb on each square meter? If the temperature was stable then this absorption would be balanced by emitted energy. What would be the temperature in this case?

[Hint: you solved a problem almost just like this in the last homework]

What is the actual surface temperature on Venus? How big of an effect is the atmosphere having?