Astronomy 150 – Midterm

Nov 3, 2011 - Autumn 2011

TA's Name & Section (2 pts):

Answer all questions in the space provided. If you have any questions, raise your hand. 100 points possible. NO CALCULATORS OR ANY ELECTRONIC DEVICES.

1 (2 pts) The fact that most of the evidence of surface water on Mars is found on the heavily cratered southern hemisphere implies that...

- (a) Liquid water is related to volcanic activity
- (b) Liquid water is more likely at high altitude
- (c) Liquid water was present in the distant past
- (d) Liquid water was absorbed by lava flows

2 (2 pts) What do I mean if I say that a material is very volatile?

- (a) it can radioactively decay in a short amount of time
- (b) it is hard to predict at what temperature the material will evaporate
- (c) it takes very little heat to cause the material to change state
- (d) it takes a lot of heat to cause the material to evaporate
- (e) it has a very erratic behavior

3 (2 pts) Removing all life from the Earth would mean which of the following gasses would no longer be abundant in the atmosphere?

- (a) Argon
- (b) Carbon Dioxide
- (c) Methane
- (d) Nitrogen
- (e) Oxygen



4 (8 pts) Match the crater density distributions (left) to the surfaces listed below.

- 1 Tharsis region of Mars
- 2 Surface of Venus
- 3 Lunar highlands
- 4 Mercury Mare

The table below shows data for four planets that have been orbiting a star identical to our sun for billions of years.

Planet	$\begin{array}{l} \text{Mass} \\ [\text{Earth} = 1] \end{array}$	$\begin{array}{l} \text{Size} \\ [\text{Earth} = 1] \end{array}$	$\frac{\rm Density}{\rm [g/cm^3]}$	Moment of Inertia factor [K]	Average Distance from star [AU]	Surface Pressure [atm]
Persephone	1/8	1/2	5.0	0.35	1.5	0.001
OSIRIS	1	1	5.0	0.30	0.7	30.0
Bellerophon	2	$1\frac{1}{4}$	4.0	0.32	1.0	5.0
HERA	1/100	1/5	3.0	0.40	0.3	0.0

5 (2 pts) Which of the planets takes the longest time to orbit the star?

6 (4 pts) What is the most likely composition of the planet PERSEPHONE?

7 (10 pts) How does the gravity on planet PERSEPHONE compare to the gravity on planet HERA? [Show your work.]

8 (6 pts) Describe two reasons why the planet HERA does not have an atmosphere today.

9 (6 pts) What is the most likely composition of the atmosphere of OSIRIS? And what is the most likely temperature on the surface?

10 (8 pts) Explain why it is likely that – of the four planets shown – the planet Bellerophon would have the largest number of *ghost craters*.

(8 pts) Explain why rocks rich in carbon (such as limestone) are very common on the surface of the Earth and not found at all on the surface of Venus.

(8 pts) Explain why, when we explore the surfaces of other worlds, we are always searching for samples that used to be deep underground.

This page has two **False** statements. For each of these statements, explain what is wrong with the argument. Please be specific! (Do not just negate the original statement.)

13 (8 pts) The giant impact theory of lunar origin is not valid since there is no evidence that the Moon was ever extensively heated.

14 (8 pts) The impact of a 10 km asteroid onto the Earth sent out shockwaves that were so powerful, that they caused the mass extinction 65 million years ago.

For each of the following surfaces, tell me: (1) The most likely rock type found on the surface, (2) The most probable age of the surface (I want a number with units), (3) How the age of the surface was determined, and (4) What processes are modifying the surface TODAY.



15 (8 pts) Mercury - Mare Surface
Sample Type:

Surface Age: _____

How surface age determined:

Processes modifying surface today:



16 (8 pts) Mars - Hellas Impact Basin

Sample Type: _____

Surface Age: _____

How surface age determined:

Processes modifying surface today: