

The Earth, Venus –February 7

- Test 1
 - Log on to LONCAPA
www.loncapa.msu.edu
- Using LONCAPA
- Test1
- Processes that shape earth
 - Losing gases in atmosphere
 - Gaining gases in atmosphere
- Venus
- Goldilocks Paradox

Using LONCAPA

Main Menu

- ROLES Switch to another user role
- DOCS View documents included in this course
- NAV Navigate the table of contents for this course
- GRDS Show Problem Completions
- VBKM Use or edit my bookmark collection
- CLDR Course announcements and my calendar
- COM Send and receive messages
- CHAT Enter the chatroom for the course
- SRCH Search the contents of this course
- PREF Set my user preferences
- EXIT Exit LON-CAPA

Points Display

This may take a few moments to display.

Folder	Points Scored / Total
Test1	0 / 39
	Total Points: 0
	Max Possible To Date: 39
	Total Points In Course: 39

Navigate Course Contents

ISP 2

Select Action [x] Go [Sort by: [v]] Delete

Syllabus

Test1

- ans.problem Answer available
- question_002.problem Answer available
- question_003.problem Answer available
- question_005.problem Answer available
- question_006.problem Answer available

Main Menu **Navigate Contents**

ISP 205, sec 1 - Visions of the Universe - Spring 2

Go to the previous resource in the course sequence

CESTR Edit this resource

EVAL Provide my evaluation of this resource

FDRC Provide feed course discu

Which is Newton's Second Law?

Incorrect: $F^2=R^3$, where P is in years and R is in AU.

Correct: $F=ma$

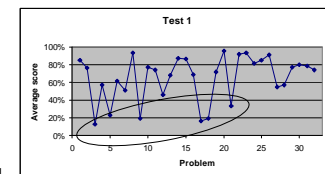
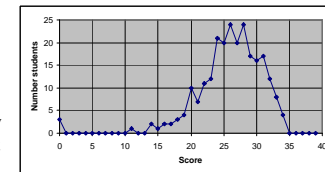
Incorrect: $F=4\pi(GM)R^3$

Incorrect: $F=GMm/R^2$

Computer's answer now shown above Times: 0/99

Test 1

- Average 26/39=66%
- Provisionally, 4.0 is above 87% (34pts).
- Scores on 6 problems were very low; discussion in class was not enough.
 - Add 6pts, and average becomes 82% (4.0 above 28).
- You can replace your score on these questions if you do them correctly on Test 2.
- These questions will be on next homework.
- 12.8eV photon, two lights, Mars, comet, Orion, giant hand



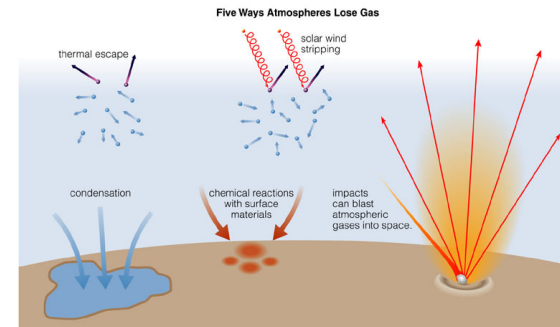
Loss of gases

- Planets formed from the same material but now have very different atmospheres.
 - Earth has little helium; Jupiter has a lot of helium
 - Mercury has little atmosphere
- Think of gas molecules as baseballs moving and colliding. How do baseballs escape from the earth's gravity?
 - Average kinetic energy of gas molecule
 - Important: Hotter means more kinetic energy. $KE = 3k/2$ Temperature
 - Not important: $3k/2$
 - $KE = \frac{1}{2} \text{ mass speed}^2$
- Q: Oxygen molecules ($m=32$) in the air move at an average speed of 300m/s. Helium ($m=4$) moves at an average speed of
 - a. 40 m/s
 - b. 300 m/s
 - c. 850 m/s
 - d. 2400 m/s
- Baseball can escape if Kinetic Energy > Potential Energy
 - $\text{speed}^2 > 2GM_{\text{Earth}}/R_{\text{Earth}}$
 - Escape speed from earth is 11,000 m/s. How can helium escape?

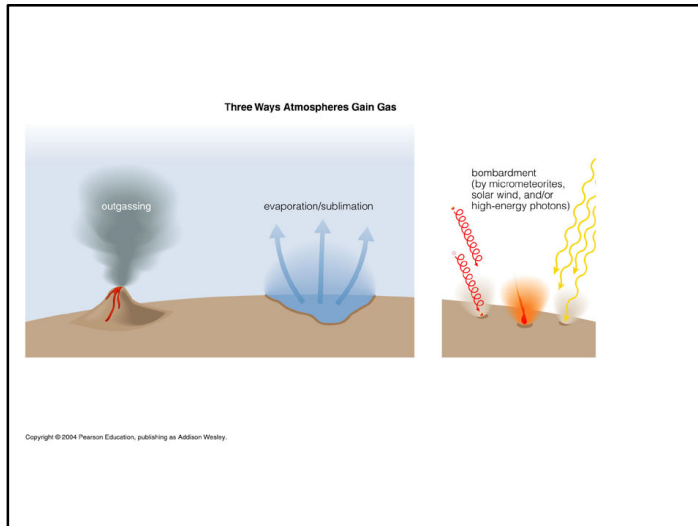
- How can helium escape from earth? By chance, a helium atom gets much more speed than the average and escapes.
 - Average 850 m/s
 - Very rare 12,000 m/s
 - On earth, each molecule get a new try every billionth of a second.
- Q: S1: It is easier to lose a lighter gas. S2: It is easier to lose gas from a hotter planet. S3: It is easier to lose gas from a more massive planet.
 - a. T T T
 - b. F T T
 - c. T F T
 - d. T T F
 - e. Two are false

Geological Activity elsewhere in the Solar System

- Buckling and twisting of crust
 - Mountain building
 - Volcanoes
- Caused by hot interiors
- Presently occurring on
 - Earth
 - Venus
 - Mars
 - Several moons of the giant planets
- Formerly occurred on Moon, Mercury (lava flows)



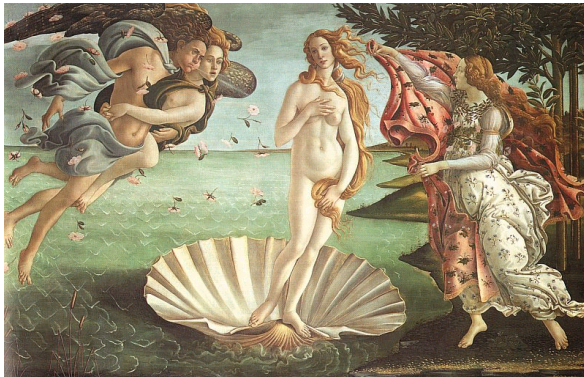
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Venus is too hot for life. What went wrong?

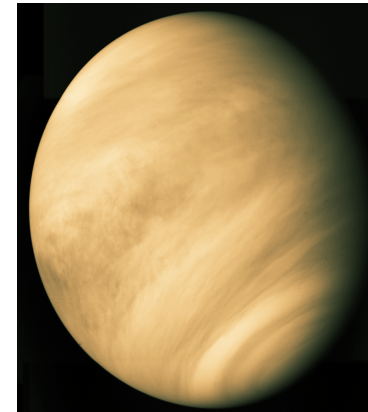
- Description of Venus
- Atmosphere of Venus
- What went wrong?

Venus (according to Botticelli)



Astronomer's Venus

	Venus	Earth
Diameter	0.95	1
Mass	0.81	1
Semi-major axis	0.72	1
Density	0.96	1
Rotation (days)	-243	1
Orbit period (days)	224	365



Venera 7 (1970)
 Venera 10,11 (1975)
 Venera 11,12 (1978)
 Venera 13,14 (1981)

**Venera Landers
 (USSR)**

Venera 13, 14 soil
 samples: basalts

The view from Venera 14

**Radar Map
 of Venus**

Made by Magellan orbiter
 in 1991-93.

Blue = lower
 Brown/red = higher.

The surface of Venus [7.4]

- Impact craters
 - ➔ age dating of surface
 - only 15% as many craters as lunar maria.
- ➔ Oldest terrain only 800 million yrs old
 - compare to 3.8 billion yrs on Earth
- Constant resurfacing by volcanic action.
 - but appears to have ceased ~ 500 million yrs ago

Magellan Radar Imaging.

[Rotating Venus](#)

Volcanic Activity on Venus
 Radar Imaging: 100 m resolution

Sif Mons, a shield volcano 500 km diameter x 3 km high.

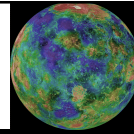
(a) Terrestrial volcano
 (b) Lunar impact crater

Lava flow "Pancake" volcanoes, due to very thick lava. Corona: a collapsed dome over a magma chamber.

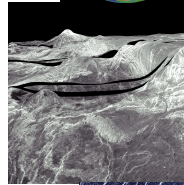
Interior Structure

- Similar to Earth
- Iron core 3000 km in radius
- Molten mantle
- Crust

Magellan Radar
Images



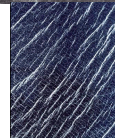
Lakshmi Planum
Hilly area on Ishtar



Tectonics

- No plates as on earth
- But much shearing, compression and stretching of crust by convection currents in mantle.
- Has pushed up “continents”
 - Aphrodite and Ishtar
- Rift valleys and cracks

Ridges & cracks



The Atmosphere of Venus

- Surface Pressure = 92 x Earth's
- Surface Temperature = 482° C
 - melting point of lead: 327°
- Sulfuric acid cloud layer at 30-60 km

	Venus	Earth
CO ₂	96%	0.03%
N ₂	3.5	78.1
Ar	0.006	0.93
O ₂	0.003	21.0

