Planetary Geology: Earth and the Other Terrestrial Worlds
9.1 Connecting Planetary Interiors and Surfaces

- What are terrestrial planets like on the inside?
- What causes geological activity?
- Why do some planetary interiors create magnetic fields?
Which of the following layers of a planet is not characterized by its density?

a) core
b) mantle
c) lithosphere
d) crust
e) none of the above
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a) core  
b) mantle  
**c) lithosphere**  
d) crust  
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As a planet cools, what happens to its lithosphere?

a) Nothing, except getting colder too.
b) It gets thicker.
c) It gets thinner.
d) It rises to the surface of the planet.
e) It sinks to the center of the planet.
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Which of the following does *not* transport heat out of a planet's interior?

a) conduction
b) convection
c) differentiation
d) radiation
e) none of the above (all are processes that transport heat out of the interior)
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Where in Earth is conduction the most important heat transport process?

a) in the core  
b) in the mantle  
c) in the lithosphere  
d) in the crust
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b) in the mantle  
**c) in the lithosphere**  
d) in the crust
What role does a planet's size play in its geological activity?

a) Larger planets are more geologically active because they take longer to cool off.

b) Larger planets are more geologically active because they have thicker lithospheres.

c) Larger planets are less geologically active because they have thicker lithospheres.

d) Larger planets are less geologically active because they have larger surface areas to radiate heat away.

e) Larger planets are less geologically active because there is a greater distance between the core and the surface.
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Which of the following is *not* needed for a planet to have a global magnetic field?

a) an electrically conducting fluid in the interior  
b) convection in the conducting fluid  
c) moderately rapid rotation  
d) a thick electrically conducting lithosphere
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9.2 Shaping Planetary Surfaces

- What processes shape planetary surfaces?
- How do impact craters reveal a surface's geological age?
- Why do the terrestrial planets have different geological histories?
Which planetary properties control erosion?

a) size  
b) rotation rate  
c) distance from the Sun  
d) all of the above
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Which of the following geological processes is most evident on the surface of a small planet?

a) impact cratering
b) erosion
c) volcanism
d) tectonics
e) size does not affect the geological processes
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The geological age of a planet's surface can be determined from the relative amount of

a) impact craters.
b) erosion features.
c) volcanic features.
d) tectonic features.
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9.3 Geology of the Moon and Mercury

• What geological processes shaped our Moon?
• What geological processes shaped Mercury?
Why are the lunar maria smooth?

a) They formed after the heavy bombardment and therefore have fewer craters.

b) The lava that formed the maria lacked gases and was therefore thin and runny.

c) Bombardment of the Moon by meteoroids smoothed over any original rough features in the maria.

d) The maria are liquid.

e) A and B
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e) A and B
Why does Mercury have large cliffs?

a) They were produced by plate tectonics, much like cliffs on Earth.
b) They were produced when the interior cooled and the entire planet shrank.
c) They were produced by the stress of a large upwelling on one side of the planet that produced a bulge with canyons and cliffs.
d) The cliffs are the rims of large impact basins.
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9.4 Geology of Mars

- What geological processes have shaped Mars?
- What geological evidence tells us that water once flowed on Mars?
Who popularized the idea that there was a network of canals on Mars which carried water from the polar ice caps?

a) Giovanni Schiaparelli
b) Percival Lowell
c) William Herschel
d) H. G. Wells
e) Orson Wells
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Which of the following is not a similarity between Mars and Earth today?

a) The lengths of their days are similar.
b) They both have polar ice caps.
c) They both have rivers.
d) They have similar amounts of land.
e) They have similar axis tilts.
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Which of the following geological processes is currently active on Mars?

a) volcanism
b) impact cratering
c) tectonics
d) all of the above
e) none of the above
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a) volcanism
b) impact cratering
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d) all of the above
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Which of the following is *not* evidence that has been found for liquid water on Mars's surface in the past?

a) the presence of iron-bearing spheres called "blueberries" that form in water  
b) layered deposits similar to sedimentary rocks  
c) ancient riverbeds  
d) none of the above (all are evidence of past water)  
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9.5 Geology of Venus

• What geological processes have shaped Venus?
• Does Venus have plate tectonics?
The distribution of craters on the surface of Venus suggests that

a) its surface is ancient and has not been altered by volcanism, erosion or tectonics since the time of the heavy bombardment.
b) parts of the surface are ancient, while others have been resurfaced within the last 100 million years.
c) the entire planet was resurfaced about 750 million years ago.
d) there has been ongoing regional resurfacing leading to a distribution of surface ages between about 100 million years and 750 million years.
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What feature of Venusian geology is largely unexplained?

a) It lacks substantial erosion.
b) It has few impact craters.
c) It lacks plate tectonics.
d) None of the above; we understand each of these features.
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9.6 The Unique Geology of Earth

• How is Earth's surface shaped by plate tectonics?
• Was Earth's geology destined from birth?
Which of the following is *not* evidence of plate tectonics on Earth?

a) There are fossils of similar species on widely separated continents.
b) Seafloor crust is much younger than continental crust.
c) Mid-ocean ridges are sites of mantle material eruption and seafloor spreading.
d) Tidal forces from the Moon and Sun are strong enough to cause continental drift.
e) none of the above (all are evidence of plate tectonics)
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Plumes of hot mantle material are responsible for

a) the formation of the Hawaiian Islands.
b) the geysers of Yellowstone National Park.
c) the Appalachian mountains.
d) all of the above.
e) A and B
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Why does Earth have the youngest surface of all the terrestrial planets today?

a) It is the largest terrestrial planet so its interior has not cooled too much.

b) It is not so close to the Sun that it has lost its water and developed a thick lithosphere.

c) It rotates rapidly.

d) all of the above

e) B and C
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c) It rotates rapidly.
d) all of the above
e) B and C