Ast 110: Survey of Astronomy
Concept Test 5, Thursday February 24th

ANSWERS

1. Why is the Moon's surface more heavily cratered than the Earth's?
   c) most craters on Earth have been hidden through geologic processes such as volcanism, plate tectonics, and erosion

2. Why is it not surprising that Mercury has no atmosphere?
   b) Mercury's gravitational field is too weak to hold on to a substantial atmosphere

3. The terrestrial (inner) planets are characterized by
   d) rocky composition

4. Why are planets hot when they form?
   Planets form by planetesimals colliding with each other. The gravitational energy of these objects is converted to kinetic energy as they fall toward each other and then to thermal energy (heat) when they hit each other.

5. How does the CO$_2$ cycle regulate the temperature on Earth?
   Explain the runaway greenhouse effect.
   CO$_2$ traps infrared radiation and keeps the Earth warm. It is emitted by volcanos and absorbed by the oceans. If the Earth were to cool down, the oceans would absorb less CO$_2$ (or even freeze and absorb no CO$_2$) but the volcanos would continue to erupt and the CO$_2$ content of the atmosphere would increase, warming the Earth back up. If the Earth gets too warm, the oceans can dissolve more CO$_2$ and take it out of the atmosphere, reducing the greenhouse effect and cooling the Earth back down.

   A runaway greenhouse effect occurs when CO$_2$ is pumped into the atmosphere faster than the oceans can dissolve it. In this case, the Earth continues to warm without self-correction. As the temperature rises to the point where oceans produce lots of water vapor (steam), this traps more infrared radiation and increases the greenhouse effect – it has “run away” – and there is no reversal possible. This is similar to the situation on Venus.
6. Which of the following characterizes Jovian planets?
   d) a composition of mostly hydrogen and helium

7. Some Jovian planet moons (e.g. Io, Triton) are geologically very active. Why? (circle all appropriate answers)
   a) their composition is primarily water ice, sulphur, or other substances that melt at low temperatures
   b) their interiors are heated through tidal stretching due to the Jovian planet's strong gravity