I Getting Set on The Net

SES302 Home on the Web
To start with, you want to make sure you can get to the EAS 302 Home Page:
http://www.geo.cornell.edu/eas/education/course/descr/EAS302/
EAS302home.html
Lecture Notes, Labs, and other items will be posted there.
Adobe Acrobat
You will need the Adobe Acrobat Reader Version 6.0 or higher to access many of the items. There are versions available for most operating systems.

II The Solar System
The properties of the solar system are an important constraint on its formation and the formation of the Earth. This exercise will familiarize you with some of these properties. Some answers you may find in your assigned reading; many answers may be found on the following web sites:

NASA's Planetary Fact Sheets
http://nssdc.gsfc.nasa.gov/planetary/planetfact.html
USGS Solar System Browser
http://astrogeology.usgs.gov/Projects/BrowseTheSolarSystem/
Tour of the Solar System at the Univ. of Arizona
http://seds.lpl.arizona.edu/nineplanets/nineplanets/
Tour of the Planets (Cal Tech)
http://pds.jpl.nasa.gov/planets/
JPL Mars Page
http://marsprogram.jpl.nasa.gov/
ESA Mars Express Program
http://www.esa.int/export/SPECIALS/Mars_Express/index.html

II.1 The Sun
The Sun consists of _____ % H and _____ % He by mass.
The temperature in the Sun's core is __________ K
The temperature of the Sun's surface is __________ K

II.2 The Planets:
The group of planets known as the terrestrial planets consists of
These are located at a distance of ________ AU to ________ AU
They consist primarily of _____________________________
The Giant & Icy Planets
The giant planets are ____________________________________________
Jupiter consist primarily of _______________________________________
Uranus and Neptune consist primarily of __________________________

Mercury
Mercury's mass is ______% of that of the Earth, and its orbital radius is ______ % of the Earth's. The density of Mercury is _______________

Venus
Venus's mass is ______% of that of the Earth, and its orbital radius is ______% of the Earth's. The density of Venus is _______________
Venus's surface temperature is ______ K.
Venus has a more massive atmosphere than the Earth. The atmospheric pressure at the surface is ________ bars. Venus's atmosphere consists primarily of the two gases ______ and ________.

Mars
The mass of Mars is only ______ % that of the Earth. Its orbital radius is ____ AU (AU is an abbreviation for “astronomical units”; one astronomical unit is the distance between the Sun and the Earth, i.e., the Earth's orbital radius is 1 AU).
The density of Mars is________________.
The surface temperature of Mars is about ______ K. The atmospheric pressure at the surface is ________ bars. It's atmosphere consists primarily of ________ and ________.

Thinking about the terrestrial planets
What factors do you think account for density variations among the terrestrial planets? In particular, why does Mercury have nearly the same density as the Earth while Mars' is much lower?
_________________________________________________________________ 
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

The effective surface temperature of a planet is a measure of the amount of energy it radiates into space. For small planets, this should equal the amount of energy the planet receives from the Sun. The solar energy flux should decrease with the square root of distance. But the effective surface temperature decreases from Earth (256 K) to Venus (227 K) to Mars (217). Why do you think the effective surface temperature of Venus is so low?
_________________________________________________________________ 
_________________________________________________________________ 
_________________________________________________________________
The actual surface temperatures of Venus, Earth, and Mars are 732 K, 288 K, and 223 K respectively? Why do you suppose actual surface temperatures differ from effective ones, particularly for Venus?

______________________________________________________________________________

Previous Mars missions over the last couple of decades have provided some observations suggesting Mars had abundant water. This hypothesis is being tested by NASA’s Mars Exploration Rover program and ESA’s Mars Express program. These spacecraft arrived at Mars two years ago. Mars Express and the rovers Spirit and Opportunity have all provided key evidence of what on Mars. Chose one of these 3 and explain in detail the evidence of water it has found.

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

Opportunity landed in the Meridiani Planum just two years ago (1/24/04). It landed there because of spectral evidence of the mineral hematite on or near the surface. Hematite is, after all, just rust. So what’s the big deal, why the search for hematite? What is Opportunity doing there – what are the mission objectives?

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________
Saturn and Titan

NASA’s Cassini Spacecraft, which was launched in 1997, reached Saturn in June 2004. In December 2004, it released ESA’s (European Space Agency) Huygens probe which landed on the surface of Titan on January 14. Why send a spacecraft to Saturn, and what, in particular, is the fascination with Titan? What are the objectives of this mission? The Cassini-Huygens Web sites of NASA (http://saturn.jpl.nasa.gov/home/index.cfm) and ESA (http://www.esa.int/SPECIALS/Cassini-Huygens/index.html) should be useful in finding the answers.

Asteroids

The asteroid belt is located from _____ AU to _____ AU. The largest asteroid is ______________ which has a diameter of ________.

The Home Planet

The Earth’s mean radius is ___________ km. The equatorial radius of the Earth is ___________ km greater than the polar radius. The reason for this equatorial “bulge” is _________________________________________________________________.

The radius of the Earth’s core is ______________.

How does the Earth’s atmosphere differ in composition from that of Mars and Venus?

III. Supernovae and Star Formation

For this exercise, visit Hubble Space Telescope’s Greatest Hits at http://www.stsci.edu/pubinfo/BestOfHST95.html
and http://hubblesite.org/gallery/

III.1 Supernovae
What are supernovae?

III.2 The Cygnus Loop
What is the Cygnus Loop, how was it formed?
III.3 SN1987A
In what Galaxy was SN1987A located? ____________________________
How do astronomers explain the ring structure seen in the 1994 HST photo?

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

III.4 Orion Nebula
What are proplyds? ____________________________________________
One proplyd seen by the Hubble Space Telescope has a diameter of
___________________ billion miles or ________ times the dimension of our
Solar System.

III.5 Dust Ring around HR4796A
Examine the image of the disk ring surrounding HR4796A at
release, the region out 2.8 billion miles from the star is clear of dust. What could have
caused this?

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

\IV. What’s the Latest from Space?
Answers to these questions may be found on, or by following, these links:
NASA’s Planet Quest page at http://planetquest.jpl.nasa.gov/, the NASA Universe page
Page at http://exoplanets.org/
Explain the method that has been used to detect most planets of ‘main-sequence’ stars (other than the Sun).

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

How massive (relative to the Earth) would a planet with a semi-major axis of 1 AU have to be to be detected by Space Interferometry Mission if the star were within 10 parsecs of the Earth? When is the SIM mission scheduled to launch?

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

How massive, relative to the Earth, is the smallest planet detected so far?

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

Recently, the Hubble Space Telescope made the first direct measurements of the atmosphere of an extra-terrestrial planet. How massive is this planet? What is its density and what kind of planet is it? How close is it to its star? What gas was detected in its atmosphere?

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
Additional Sources of Information:
White, W. M., *Geochemistry*, Chapter 10
Brown, G. C. and A. E. Mussett, *The Inaccessible Earth*, Chapters 4 and 5