Planet #3: Earth

Our home planet, Earth, is an typical planet in the Solar System in many ways, but totally unique in many others. What are its properties, and how do we learn about them?

1. What is Earth's...

a) Orbital period of revolution about the Sun?

b) Rotation period about its axis?

2. Hydrogen and helium comprise about 99% of the Sun and of the Solar System in general (right). Why isn't there much on Earth?

Top Five Elements by Mass Abundance	
Sun	Earth
H (71%)	O (47%)
He (27%)	Si (28%)
O (0.08%)	Al (8%)
C (0.04%)	Fe (5%)
N (0.01%)	Ca (4%)

http://hyperphysics.phy-astr.gsu.edu/hbase/tables/suncomp.html

3. Draw a picture of the Earth at right, and label all the different "layers" of the planet from its exterior on inward.

4. What is the composition of each region?

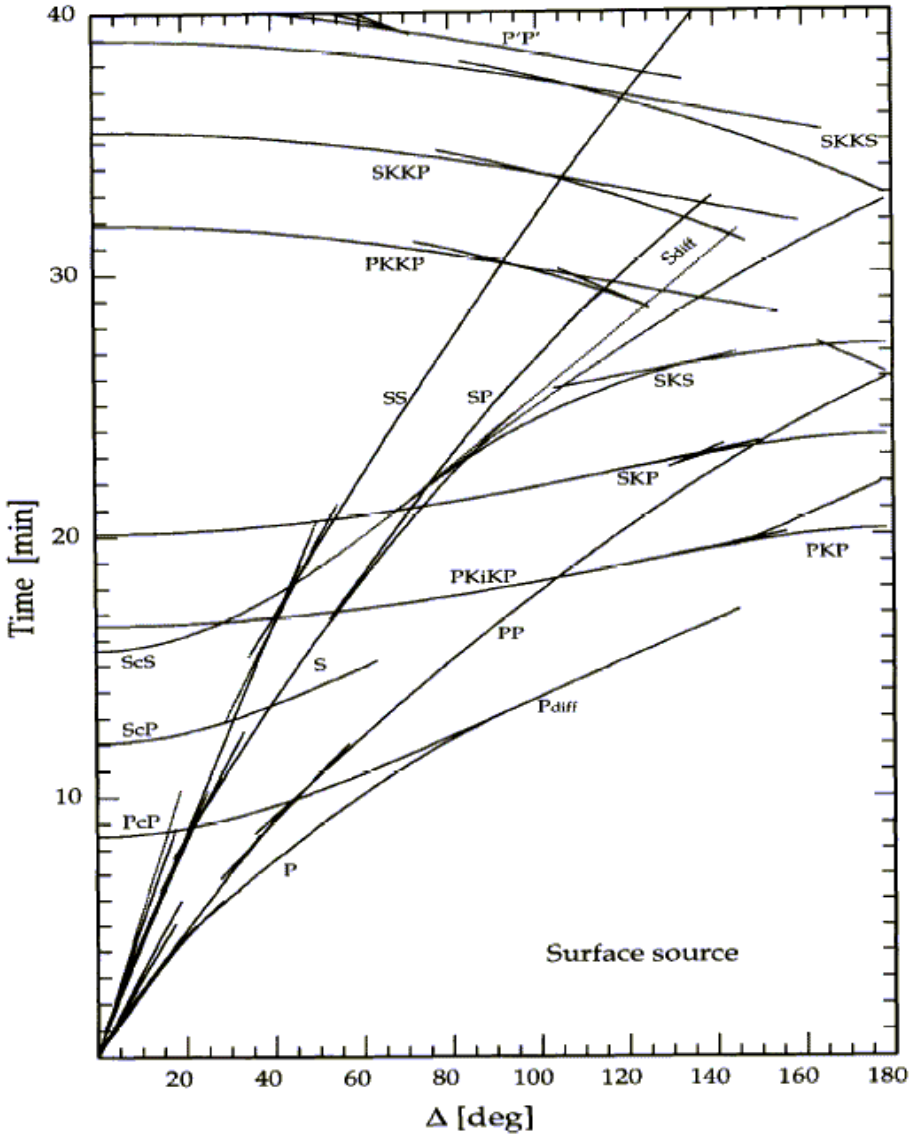
5. Explain your answer for #3. Why is the composition of the interior of the Earth so different from the exterior? Why is Earth made of discrete "layers"?

6. As you may have noticed, rock is quite opaque. So how do we know anything about the interior of the Earth if we can't actually see what's down there?

7. In the 1800s, Lord Kelvin calculated that Earth would cool to a uniform temperature if it were much older than a few tens of thousands of years, yet we know that that in fact Earth's interior is extremely hot, hot enough in the center to melt iron. How has the interior of the planet managed to stay hot for billions of years?

Original worksheet by D. Perley

8. The plot below (published in 1995 by K.L.N. Kennett of the American Geophysical Union) indicates the travel time for various types of earthquake waves from the source (defined as an angle of zero) to reception points at other places on Earth, separated by an angle Δ.



Some of the most important wave types are:

- P – Pressure wave
- S – Shear wave
- PP – Pressure wave reflected once by Earth's surface
- SS – Shear wave reflected once by Earth's surface
- PcP – Pressure wave reflected once by the outer core
- ScS – Shear wave reflected once by the outer core
- PKP – Pressure wave that travels through the outer core
- PKIKP – Pressure wave that travels through the outer and inner cores

On the board, draw examples of each of these ways and explain as best you can why they plot the way they do on this diagram. What do you think some of the other wave symbols represent?