ELT HOMEWORK

Chapter 8. The Earth

1. What are the 8 most abundant elements on Earth?

   The 8 most abundant elements on Earth are Iron, Oxygen, Silicon, Magnesium, Nickel, Sulfur, Aluminum, and Calcium.

2. Explain why these elements are abundant in terms of (1) stellar evolution, and (2) the origin of the terrestrial planets?

   These elements are abundant on Earth due to stellar evolution and the origin of terrestrial planets. Elements such as Oxygen, Silicon, Sulfur, and Calcium came from stellar evolution and during supernova explosions. These elements were then compounded together as planets such as ours formed.

3. What were the sources of heat for the melting of the early Earth?

   The sources of heat for the melting of the early Earth was the decay of radioactive elements such as Uranium.

4. What is the composition of the Earth's core? How do we know this?

   The composition of the Earth's core is Iron and other dense elements such as Nickle, Gold, and Platinum. We know this due to the layers of the Earth. As the Earth's temperature rose, Iron melted first, the other elements with it.

5. What is the composition of the Earth's mantle and crust?

   The composition of the Earth's mantle is a thick layer of rock and elements such as Olivine and Pyroxene due to these elements having high freezing points.

6. Why does the core composition indicate that the early Earth was molten or largely molten?

   The core composition indicates that the early Earth was molten because denser elements such as Iron, Nickel, Gold, and Platinum are in the core because they melted and sank down towards the center.

7. Explain why the Moho (the boundary between the crust and mantle) is located at a greater depth under high mountain ranges than under the deep ocean basins?

   The Moho is located at a greater depth under high mountain ranges because the pressure of these mountains pushes the crust deeper into the mantle than the pressure of the water in the ocean.

8. What is creep, and why is it important?

   Creep is the phenomenon that allows solids to behave like liquids. When steady pressure is applied to a solid over time, its atoms can slide over one another like the atoms of a liquid.

9. Where do convection currents form within the Earth?

   Convection currents form within the mantle of the Earth.

10. What is the lithosphere, and what are the effects of convection on the lithosphere?

    The lithosphere is the cold and rigid layer of rock above the zone of weakness. The continents sit in the lithosphere similar to logs in a frozen lake. The continents may be on thinner pieces of the lithosphere which are called plates. Convection causes these plates to move which in turn causes the continents to move.

Chapter 9. The Changing Face of an Active Habitable Planet

1. What are the differences between ocean crust and continental crust?

   The oceanic crust is composed of basalt whereas continental crust is made of sedimentary rock. The oceanic crust is also less dense than the continental crust which allows for it to slide above the continental when they are pushed together.

2. Why is the lithosphere brittle and not plastic like the layer underlying it?

   The lithosphere is brittle and not plastic like the layer underlying it because it is colder than the layer beneath it. It is made up of rigid rocks making it brittle compared to the molten rock beneath.

3. What are the major pieces of evidence for continental drift?

   The major pieces of evidence for continental drift are that the continents seem as though they fit together very well. North Africa and North America fit together well and so do Europe and Greenland. Another major piece of evidence is the distributions of fossils of both plants and animals. There are fossils of animals that are found on separate continents which suggests at one point the continents may have been connected. Lastly, there are also rocks found in separate continents with matching types and ages.

4. What is the origin of the Mid-Ocean Ridge system?

   The Mid-Ocean Ridge system was created due to sea floor spreading. It is a rift with undersea volcanism and earthquakes. This is where two plates separate which allows for molten rock to escape.

5. Where are the youngest and oldest rocks on the ocean floor?

The youngest rocks on the ocean floor are at or near the rift. The oldest rocks are at the continental margins.

6. How old is the oldest ocean floor in the present oceans? Where did the older ocean crust go?

   The oldest ocean floor in the present oceans is 180 million years old. The older ocean crust was broken when the continents began to separate.

7. Explain seafloor spreading and the magnetic stripes on the ocean floor.

   As molten rock escapes the ridges, the seafloor begins to spread. As this happens, the basalt becomes magnetized in the direction of the Earth's magnetic field. As the Earth's magnetic field reverses, the rocks retain a record of them. These patterns match the ones of the history of Earth's magnetic reversals.

8. What are the major types of plate boundaries?

   The major types of plate boundaries are, separating or diverging plates, sliding plates, or colliding plates which include: ocean against ocean, ocean against continent, continent against continent.

9. What are hotspots and how is their origin related to plate tectonics?

   Hotspots are areas where an upwelling column of hot material from the Earth's mantle rises to the surface. Their origin is related to plate tectonics because each time an eruption happens the plate it is beneath moves as well. The plate would move and create another volcanic island in the process.

10. How were the Hawaiian Islands formed?

    The Hawaiian Islands sit on top of a hotspot. It has been erupting on and off for 70 million years. Throughout this time, as eruptions occurred, lava was

deposited onto the Pacific Plate. Then as the plate moved it carried the lava with it creating another volcanic island. Then as the plate kept moving the islands became spread out.

11. What is a subduction zone, and what are its features?

    A subduction zone is the region where two ocean plates are pushed together and one of them is forced beneath the other. Its features include an ocean trench, volcanic island arcs, and zones of deep earthquakes.

12. What was Pangea and when did it break apart?

    Pangea was a super continent. All of the present-day continents were assembled into one mass. It broke apart 180 million years ago.