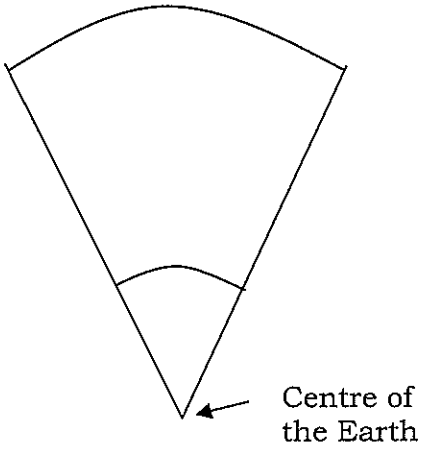
ACTIVITY 1: STRUCTURE OF THE EARTH

Using your text as a guide, and armed with a 20 metre tape measure and a piece of chalk, draw a scale diagram on a concrete or bitumen path near your science room to represent a segment of the Earth to show the layers. Use a scale of 1m = 1000 km.



Questions: Using your text book answer these questions in your notebook.

1. What is the mantle and how thick is it?
2. Where do you think that the Earth's crust would be about 35 km thick?
3. Where do you think that the Earth's crust would be about 6 km thick?
4. Is the inner core solid or liquid?

ACTIVITY 2: A MODEL OF THE EARTH

Aim: To draw a scale model of the Earth that shows the relative size of each of its layers.

Materials required:

- ruler
- calculator
- compass
- sheet of paper

Method:

1. Rule a horizontal line 15.75 cm at the bottom of one side of your page. This line represents the radius of the Earth.

2. Use a calculator to divide this distance into 60 units i.e. $\frac{15.75}{60}$ =

3. From the left end of the line measure 13.33 units i.e. $\frac{15.75}{60}$ x 13.33 =

   Mark this point on the line. This represents the distance from the centre of the Earth to the outer boundary of the Inner Core.

4. Next measure a further 19 units i.e. $\frac{15.75}{60}$ x 19 =

   Mark this point as the limit of the Outer Core.

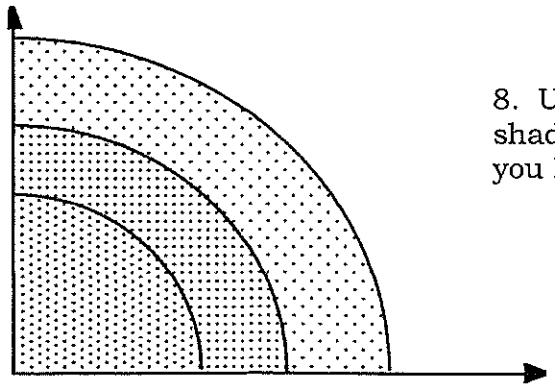
5. Measure a further 27.33 units i.e. $\frac{15.75}{60}$ x 27.33 =

   to represent the distance form the Outer Core to the boundary of the Mantle. Mark this point on your line.

6. The last 0.33 unit represents the thickness of the Crust, i.e. $\frac{15.75}{60}$ x 0.33 =

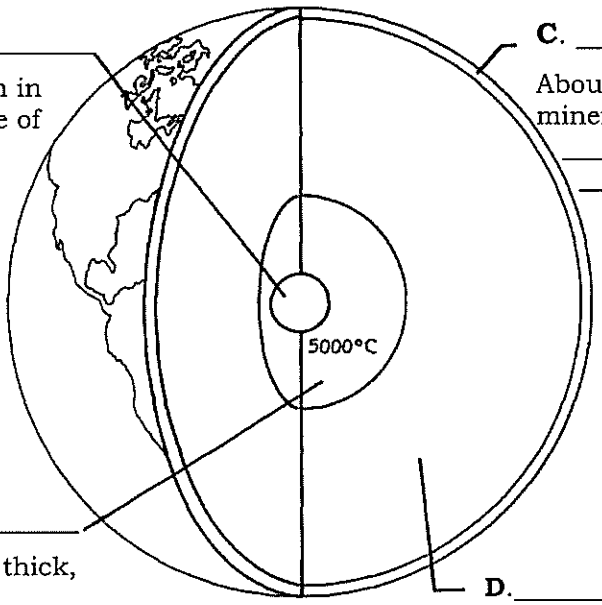
   Measure and mark this distance onto the line.

7. From the left end of the Earth's radius draw a vertical line towards the top of your page.
   Using your compass draw quarter circles to this vertical line using the distances you have marked as radii. Your diagram should look something like this:



8. Use different colours to shade the layers of the Earth you have now drawn.

WORKSHEET: THE EARTHS INTERIOR



A. _____

About 2800 km in diameter, made of solid nickel

B. _____

About 2100 km thick, made of liquid _____ and nickel

C. _____

About 10 – 70 km thick, made of minerals and _____, _____ and _____ rocks

D. _____

About 2800 to 3200 km thick. Made of dense rocks.

1. Label the layers of the Earth on lines A—D.
2. Which layers can only be studied by indirect means?_____

   _____
3. Which layer contains the highest mountains and the deepest oceans?_____
4. What is the composition of:

   a. the outermost layer of the Earth?_____

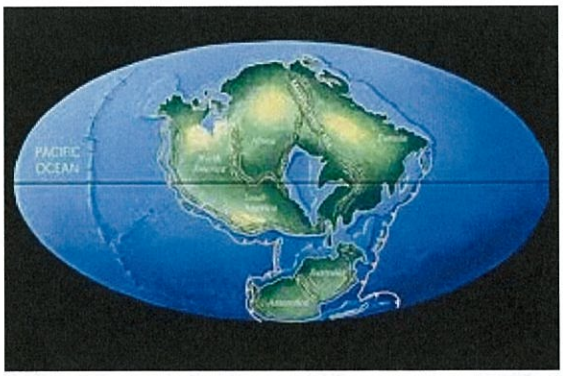
   b. the innermost layer?_____
5. What happens to the temperature of the rocks as the layers go deeper into the Earth?

   _____
6. a. In which layer does erosion take place?_____

   b. Why?_____
7. a. In what areas is the outermost layer of the Earth the thinnest?_____

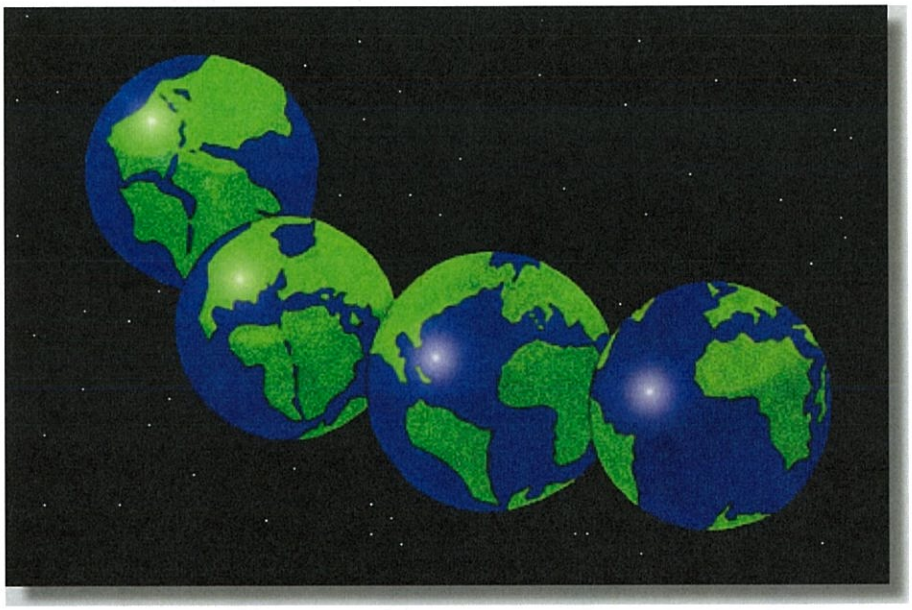
   b. Where is it the thickest?_____
8. Which layer has the greatest mass?_____

ACTIVITY 4: CRUSTAL MOVEMENTS



If you look at a map of the World you will probably notice that the coastlines on the two sides of the Atlantic Ocean look as if they fit together.

Scientists now believe that long ago all the continents were joined together in one huge landmass called Pangaea, surrounded by ocean.
They think that this land mass broke apart and pieces moved over millions of years to where they are today. These land masses continue to move, even as you read this page.



Obtain a copy of the World shown on the next page, cut out the land masses and try to reassemble them into the shape that was Pangaea on a new page in your notebook.
Glue them into place, then answer the questions which follow:

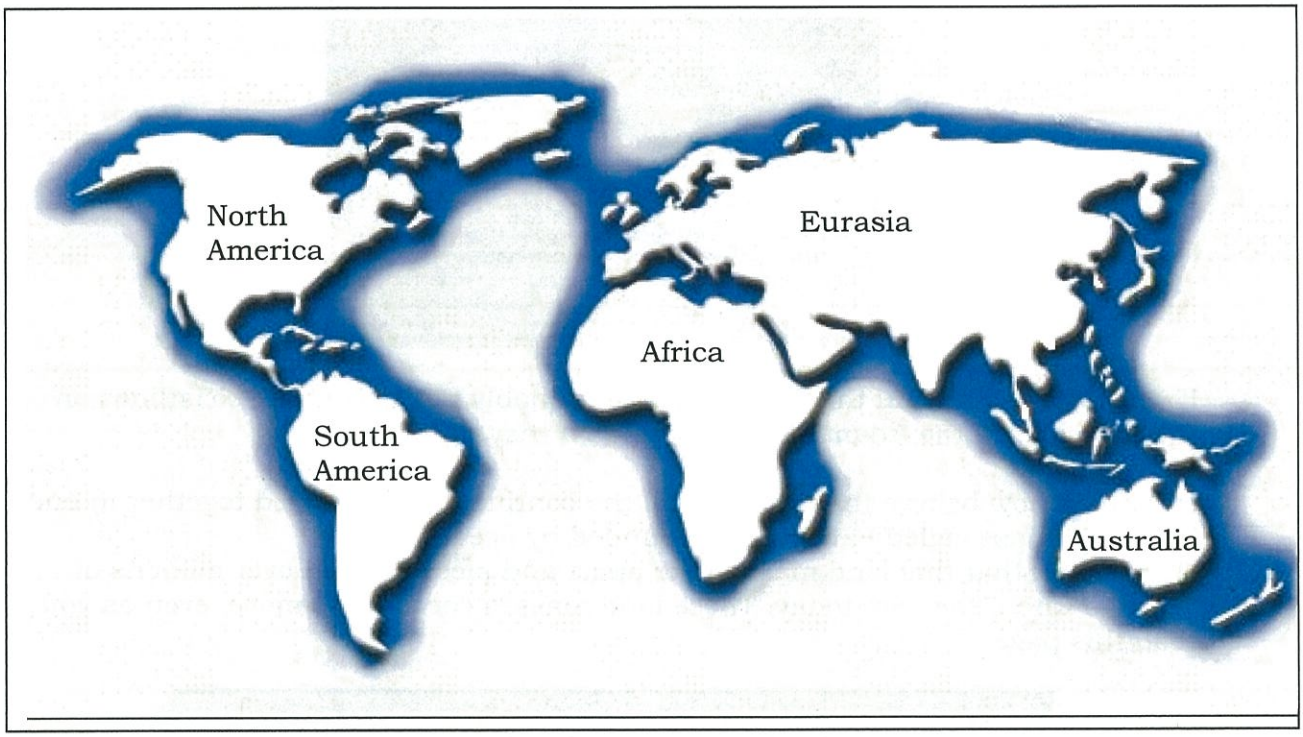
Questions:

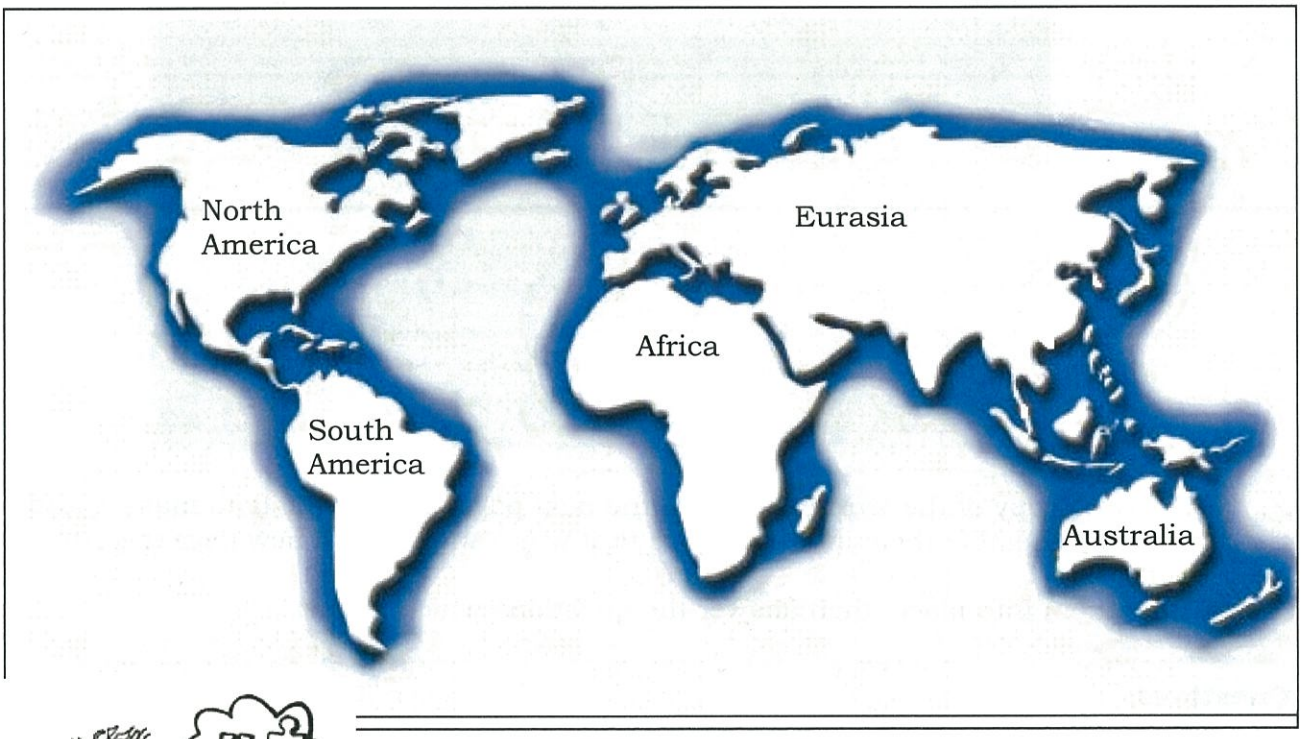
1. What evidence might you put forward to support the Pangaea model?
2. Besides shape, what other evidence might scientists put forward to support this model?

Useful sites:

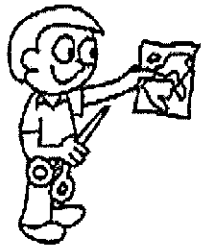
http://geomaps.wr.usgs.gov/parks/pltec/index.html
http://geomaps.wr.usgs.gov/parks/pltec/pangea.html for an animation of the break-up of Pangea
http://geomaps.wr.usgs.gov/parks/pltec/vigilim.html for a diagram of tectonic processes
http://pubs.usgs.gov/gip/dynamic/dynamic.html

WORLD MAPS


North America
Eurasia
Africa
South America
Australia


North America
Eurasia
Africa
South America
Australia


SOUTH AMERICA
AFRICA



Pangea Cutouts

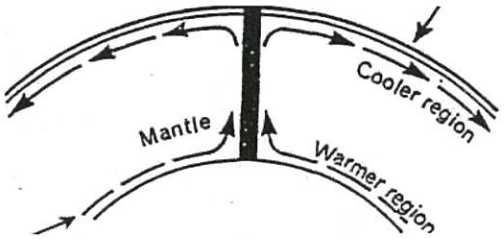
ACTIVITY 6: CONVECTION CURRENTS

In order to understand why the continents drift we need to realize that a large source of energy would be required to power the movement of land-masses weighing billions of tonnes. Finding the source of the energy that moves the crustal plates is a problem.

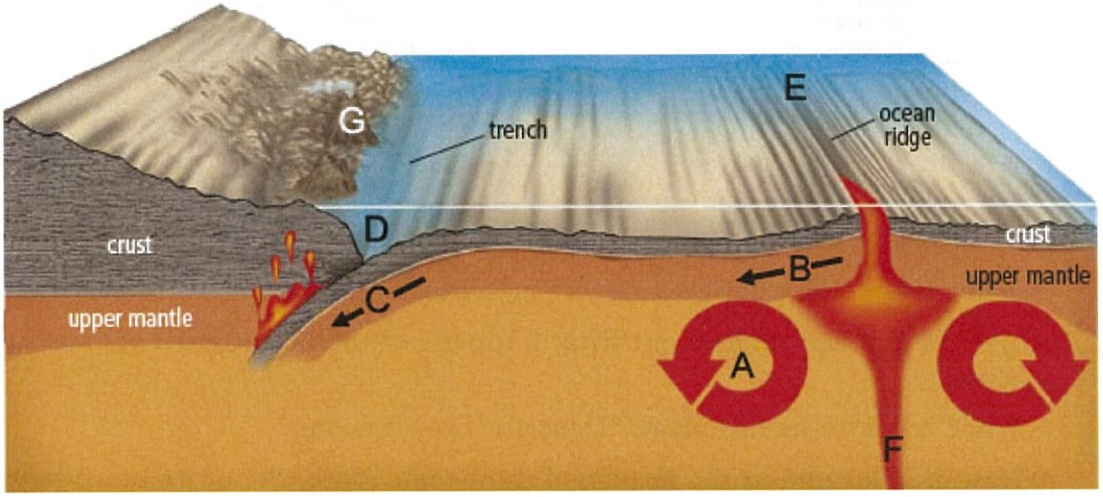
Let's explore a possible solution provided by an examination of the Mid-Atlantic Ridge.

Mid-ocean ridges are areas of crust where new material is being added to the Earth's surface from rocks deep in the mantle. This material is forced to the Earth's surface by convection currents. Convection currents are caused in the Earth's mantle by the heat that comes from the core of the Earth and this process scientists believe is the source of energy that moves the crustal plates.

The plate is pushed by the material spreading from the mid-ocean ridge.



Convection current in mantle



The diagrams above show how the plates may have been made to move. Plates that separate from each other allow lava from the mantle to rise to the ocean floor. As the lava cools, new crust forms at the mid-ocean ridge to fill the gap left by the separating plates.

Draw either of the above diagrams in your notes and below the diagram answer the following questions

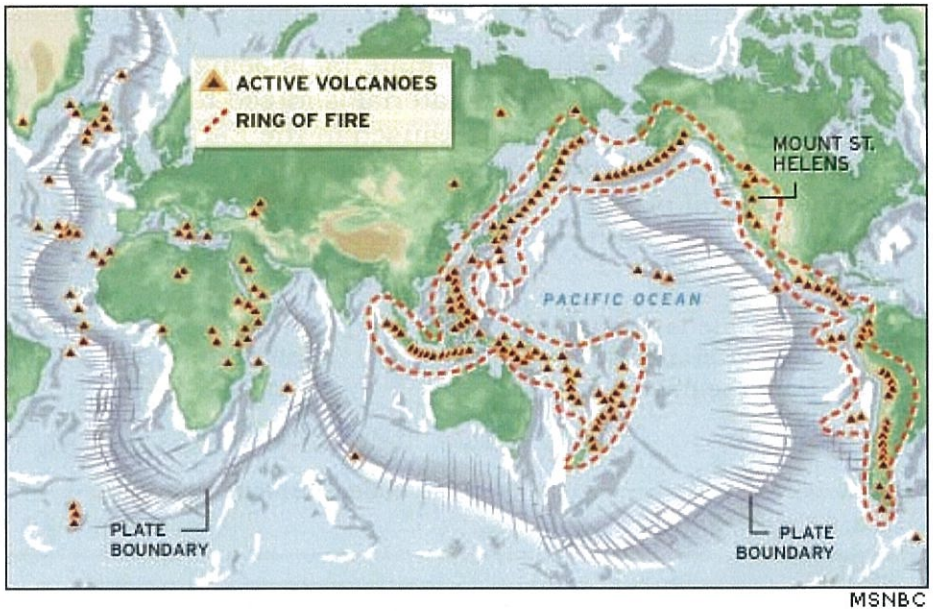
Required:

- Aluminium powder
- 250mL beaker
- Bunsen burner

1. Fill a 250mL beaker with cold water. Add a pinch of aluminium powder. Very gently heat the beaker over a Bunsen burner.
   - What happens to the particles of aluminium?
   - Explain their movement using terms like hot water, cold water, low density, high density and convection current in your answer.
2. Explain how the hot core could set up a convection current responsible for the plate movements.
3. What activities may occur at mid-ocean ridges as a result of the sea floor spreading occurring at the mid-ocean ridges?

ACTIVITY 7: THE RING OF FIRE

Examine the following map of the World then answer the questions that follow.



Questions:

1. Describe the distribution of volcanoes over the World.
2. What is the 'Ring of Fire'? Why is it located where it is?
3. Use the Internet to find out what happens at the boundaries of crustal plates.
4. What is a **mid-ocean ridge**? Describe how it forms.
5. Hawaii is located in the middle of the Pacific Plate, not at its boundary, yet it has many active volcanoes. Explain why this is so.
6. How would you use a hard boiled egg (you could try an unboiled one!) to illustrate **plate tectonics**?
7. Put the following words into a copy of the sentences below to describe the structure of the Earth's crust.

plates, moving, Earth's, forces, apart, slow, colliding, boundaries

The _____ crust is composed of seven major and five minor _____ which float on the magma layer. These plates are _____ but the movement is very _____. When the plates of the Earth's crust move, tremendous _____ are set up at the plate _____. In some places the plates are moving _____ and in other places the plates are _____.