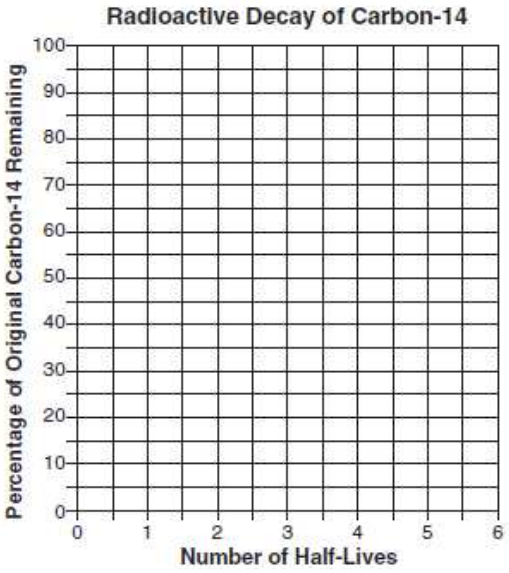
Grade Recovery Packet
Earth Science

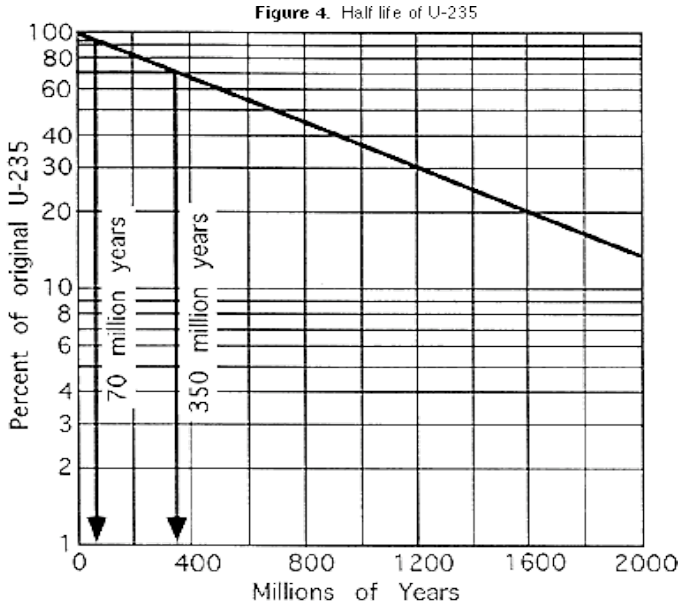
Part I: Creating a Graph- Radioactive Decay
Directions: Create a graph of the radioactive decay of Carbon-14 using the data table.



Radioactive Decay of Carbon-14

Number of Half-Lives	Percentage of Original Carbon-14 Remaining	Time (years)
0	100	0
1	50	5700
2	25	11,400
3	12.5	17,100
4	6.3	
5	3.1	28,500
6	1.6	34,200

Part II: Selecting Information from a graph- Radioactive Decay
Directions: Complete the table by using the ratio of U-235:Pb-207.



	Ratio U-235:Pb-207	% U-235	Age of rock layer
siltstone	47:3		
basalt	7:3		
pegmatite	1:1		
granite	1:3		

Part III: Finding Information in Text
The "Ring of Fire" is an arc stretching from New Zealand, along the eastern edge of Asia, north across the Aleutian Islands of Alaska, and south along the coast of North and South America. The Ring of Fire is composed over 75% of the world's active and dormant volcanoes.

This huge ring of volcanic and seismic (earthquake) activity was noticed and described before the invention of the theory of plate tectonics theory. We now know that the Ring of Fire is located at the borders of the Pacific Plate and other major tectonic plates. Plates are like giant rafts of the earth's surface which often slide next to, collide with, and are forced underneath other plates. Around the Ring of Fire, the Pacific Plate is colliding with and sliding underneath other plates. This process is known as subduction and the volcanically and seismically active area nearby is known as a subduction zone. There is a tremendous amount of energy created by these plates and they easily melt rock into magma, which rises to the surface as lava and forms volcanoes. Volcanoes are temporary features on the earth's surface and there are currently about 1500 active volcanoes in the world. About ten percent of these are located in the United States.

1. What tectonic force takes place at the Ring of Fire?
2. How does this tectonic force work?
3. What forms from theses tectonic forces?
4. Where are 75% of the Earth's volcanoes found?
5. Besides volcanoes what else happens at the plate boundaries?

Part IV: Finding Information in Text- Pangaea

Directions: Read the two opposing views about how the continents developed into their current shape and answer the following questions. .

Scientist 1

According to a theory based on plate tectonics, the land surface of Earth once comprised a single continent, termed *Pangaea,* which was surrounded by a single vast ocean. Pangaea broke apart because the surfaces of Earth floated on massive plates above the deeper mantle of ocean's basin. Horizontal movement of the plates began to split up the land about 137 million years ago during the Jurassic period. The continents and the ocean basins moved along convection currents in the mantle resulting in a continuous degeneration of Earth's physical features. The movement of these rigid plates produced zones of tectonic activity along their margins such as earthquakes, volcanoes, and mountain formations. Fossil records as well as geological evidence show similarities between widely displaced continents. For instance, the coastlines of South America and Africa contain similar rock formations and appear to fit together like a jigsaw puzzle.

Scientist 2

The continents and the ocean basins of Earth are permanent, fixed features of the planet. The hypothesis of plate tectonics is flawed because there is insufficient evidence to support it. The force of gravity is stronger than any tangential force that can act on Earth's crust. The layers of crust that support the continents and ocean basins are strong enough to preserve Earth's physical features and are too strong permit horizontal drift. Tectonic activity has always been present, but the hypothesis of plate tectonics explains such activity only in one late period of ancient history. In addition, it is not clear what kind of force could allow the continents, composed largely of granite, to move through areas of dense, iron-rich rock that comprise the ocean basins. Any geological evidence that supports such a theory may be because of the existence of similar conditions on different continent.

6. What is the main point of Scientist 1?

7. What is the main point of Scientist 2?

8. Which of the following statements is the most inconsistent with the belief of Scientist 1?

a. Continents were once part of a large land mass
b. Continents split up and drifted apart
c. Ocean basins have not changed for millions of years
d. Geological evidence shows similarities between widely displaced continents

9. Scientist 1 studied the fossils along the coast of South America and Africa and found identical fernlike plants on rocks of the same age. What claim could Scientist 2 make to refute the findings of Scientist 1?

a. The dating and comparison of plant fossils is an exact science
b. The soil and climate conditions along the two coasts must have been very similar at the time the fossils were created
c. The ferns were extremely large
d. Ferns will only thrive in their original habitat

10. A new zone of tectonic activity has been discovered in the large land mass of Eurasia. This zone shows geological evidence of having been active for several thousand years. Which scientist is supported by this finding and why?

a. Scientist 1, because it proves that tectonic activity occurs on the planet
b. Scientist 1, because it shows that Pangaea and Eurasia are the same land mass
c. Scientist 2, because it proves that tectonic activity occurs in land masses and not solely in the ocean basin and along coastlines
d. Scientist 2, because it shows that the continents are made out of granite

11. **Both Scientist 1 and Scientist 2 are experts in plate tectonics. To what discipline of science do these scientists belong?**

a. Physics
b. Geology
c. Biology
d. Chemistry

12. **Which of the following claims would be supported by both scientists?**

I. Tectonic activity has always been a factor in the geology of land masses.
II. The continents and the ocean basins are fixed features of the planet.
III. Continental drift occurred in the Jurassic period.

a. I only
b. II only
c. I and II only
d. II and III only

Part V: Selecting Information from a Diagram- Earth's Tectonic Plates

Directions: Answer the following questions using pages 262-263 in your Earth Science textbook

13. How many tectonic plates are there on the Earth?

    _____

14. What are convergent boundaries?

    _____

    _____

15. What are divergent boundaries?

    _____

    _____

16. What are transform fault boundaries?

    _____

    _____

17. Name 4 pairs of plates that have a convergent boundary. (Ex: Eurasian Plate and Austrailian-Indian Plate)

    _____

    _____

    _____

    _____

18. Name 4 pairs of plates that have a divergent boundary. (Ex: Nazca Plate and Pacific plate)

    _____

    _____

    _____

    _____

19. Name a pair of plates that has a transform plate boundary.

    _____

20. What plate do we live on?

    _____

21. What type of boundary forms mountain ranges?

    _____

22. What type of boundary forms ridges?

    _____

23. Name a plate the Australian-Indian plate is moving away from.

    _____

24. Name a plate the Australian-Indian plate is moving toward.

    _____

Part VI: Converting between units- Scale Model of Earth's Layers

Directions: Convert the following measurements to create a scale model of earth's layers. **Show your work!**

Scale: 6371 km on Earth = 20cm on model

25. Crust thickness: 15 km on Earth = _____cm on the model
26. Upper Mantle thickness: 400 km on Earth= _____cm on the model
27. Lower Mantle thickness: 2,485 km on Earth= _____cm on the model
28. Outer Core thickness: 2,255 km on Earth= _____cm on the model
29. Inner Core thickness: 1,216 km on Earth= _____cm on the model

Part VII: Combining Information- Igneous, Sedimentary, and Metamorphic Rocks

Directions: Using the rock figures on the yellow and blue papers in Room 311 or online, answer the following questions.

30. Through what process does an igneous rock or a sedimentary rock become a metamorphic rock?

    _____

31. If a stream is moving with a velocity of 0.05 cm/s what is the largest particle size that can be carried by the stream?

    _____

32. How fast must a stream be moving to transport pebbles?

    _____

33. Which rocks form from chemical precipitates?

    _____

34. Which two rocks are non-crystalline?

    _____

35. Put the following metamorphic rocks in order of grain size from least to greatest quartzite, slate, gneiss.

    _____

36. Which of the following metamorphic rocks is non-foliated; slate, gneiss, or marble.

    _____

37. Slate is formed from which sedimentary rock?

    _____

Part VIII: Finding Information in Text- Types of Rocks

Directions: Take Cornell Notes on the following article. Your Cornell Notes must include 12 questions and a complete summary at the end.

Introduction:

What is a rock, and how are rocks formed? Examining and classifying rocks can help us understand not only how rocks are formed bus also the transformation of rocks via the rock cycle.

Background

Rocks are mixtures of minerals such as quartz, feldspar, mica, and calcite, to name a few. The rock cycle shows how rocks change over time by a variety of physical and chemical processes (see Figure 1). Natural processes that are part of the rock cycle include weathering, erosion, lithification, metamorphism, melting, and cooling. *Weathering* involves both the chemical and physical breakdown of rock at or near the Earth's surface. This results in the accumulation of *sediments*—loose materials such as rock and mineral fragments or pieces of animal and plant remains that have been transported. *Lithification* is the transformation of sediment into a rock. The main processes involved in lithification are *cementation*—large sediments are held together by natural cements, and *compaction*—layers of sediments are compressed by the weight of the layers above them. *Metamorphism* is the process by which rocks are changed by heat, pressure, shear, stress or chemicals. Rocks are classified into three distinct groups— igneous, metamorphic, or sedimentary—based on how they are formed.

Types of Rocks

Igneous rocks (the most abundant type of rock on Earth) are formed by the cooling of molten material from volcanic activity. Magma that is trapped below the Earth's surface is insulated by the rocks surrounding it. This holds in the heat and causes the magma to cool slowly. As the magma cools slowly, the atoms have enough time to arrange into large crystals called mineral grains. The mineral grain size is determined by how fast the magma cools. Rock forms as these mineral grains grow together. The most common minerals found in igneous rocks are feldspar, quartz, and biotite. Feldspar is generally a white or chalky-looking grain, quartz is a dark-gray glassy grain, and biotite is a small black grain. *Intrusive igneous rocks* grow deep below the Earth's surface, are cooled very slowly and have a large grain size. *Extrusive igneous rocks* are formed when lava cools at or near the Earth's surface. When lava cools on the Earth's surface, it is exposed to air and moisture. Lava cools very quickly under these conditions, hence, only small mineral grains will form. Sometimes extrusive igneous rocks cool so rapidly that there is no time for crystals to form. This give rocks of this type a glassy appearance. Other extrusive igneous rocks form as gas bubbles pop which gives them a bubbly or vesicular appearance.

Sedimentary rocks form when sediments become pressed or cemented together or when sediments fall out of solution. Sediments are moved by erosion to a new location where they are deposited. As layer upon layer of sediment is settled in this location, pressure from the upper layers pushes down on the lower layers. The sediment then sticks together and forms solid sedimentary rock. There are three types of sedimentary rock—clastic, organic, and chemical. *Clastic sedimentary rocks* are made of broken fragments of other rocks. These sediments are compacted and cemented together. *Organic sedimentary rocks* form from the remains of once living things. *Chemical sedimentary rocks* form from minerals dissolved in solution.

Metamorphic rocks are rocks that have changed due to temperature and/or pressure increases. Metamorphic rocks may be formed from changes in igneous, sedimentary, or other metamorphic rocks. When mineral grains flatten and line up in parallel bands, a metamorphic rock will have a foliated or banded texture. In some metamorphic rocks, no banding occurs. The mineral grains change, grow, and rearrange but they do not form bands. This process produces a non-foliated texture.