Earth Science
Notes—Ch. 13 Clues to Earth's Past

NAME: _____

PERIOD: ____

I. What are fossils?

a.

II. History of Fossil Formation.

a. Ancient Greeks recognized fossils as remains of past life.
b. In the Middle Ages, fossils were the work _____ to produce living forms in rock.
c. In 15th century, _____recognized fossils as the remains of organisms.
d. A total of perhaps _____may have lived since life began.
e. 200,000 fossil species are recognized with new fossils still being discovered.
f. Most of the 1.4 million species estimated to have lived in the recent past were:
    i. 95% _____
        i. 75% of 95% were: _____

III. What conditions are necessary for fossils to form?

a. _____—from scavengers & microbes
    i. ex. Organism dies, sinks to bottom of pond, covered by sediments.
b. _____—bones, shells, teeth.

IV. Fossil Types—permineralized remains

a. Also called: _____
    i. Hard/rocklike parts replaced by minerals.
    ii. For example, dissolved _____may replace calcium of bones.
    iii. What is an example?

V. Fossil Types—carbonaceous films

a. All life contains carbon
    i. Dead organisms are buried
    ii. Add heat & pressure
    iii. Pushes out liquids & gases

iv. Leaves carbon film, forming an outline of organism—process is called carbonization

b. Total Carbonization

i. If an organism complete carbonizes it forms _____.

ii. Large volumes of plant matter accumulate.

iii. This is a useful energy source, but tells us little about an organisms past.

VI. Fossil Types—Molds

a. Cavity in rock formed from organism

b. Organism dissolved away, leaving *imprint*

VII. Fossil Types—Casts

a. Sediments fill in mold & harden into rock

b. Looks like original.

c. Examples

VIII. Fossil Types—Original Remains

a. Actual organism or part preserved.

b. Examples:

IX. Fossil Types—Trace Fossils

a. Fossilized tracks and other evidence of animal activity.

b. May tell more than fossil remains.

c. Examples:

X. Index Fossils

a. Species used to determine age of rocks.

b. To be used must:

i.

ii.

iii.

	Leptaena	Platystrophia	Billingsella
Triassic			
Permian			
Pennsylvanian			
Mississippian			
Devonian			
Silurian			
Ordovician			
Cambrian			
Precambrian			

XI. Fossil Clues to Ancient Environments

a. Ex. *Glossopteris*—Fern _____

b. Ex. *Brachiopods*—

_____

_____

c. *Our state fossil was a brachiopod. Do you know what our state fossil is?*

i.

ii. _____

_____

_____

_____

_____

_____

XII. What group of animal ruled the earth longer than any other?

XIII. Meteorite Hypothesis

a. This hypothesis first came about in 1980.

b. It is also called the _____, named for Luis & Walter Alvarez, University of California at Berkley.

c. An extraterrestrial object hit the Earth _____.

d. Dust & debris would have filled the atmosphere….leading to the blocking of the sun.

e. Result:

f. So, what supports this theory?

i.

ii.

iii. It has been found in clay & fossils which are 66 myo.

iv. It is also very common in meteorites.

v. We know that a large meteorite hit Earth around 66 mya in the

_____

g. How often do meteorites hit the earth?

i. Pea-size meteoroids - _____

ii. Walnut-size - _____

iii. Grapefruit-size - _____

iv. Basketball-size - _____

v. 50-m rock that would destroy an area the size of New Jersey -

_____

vi. 1-km asteroid - _____

vii. 2-km asteroid - _____

viii. A "nemesis" parabolic comet impactor would give us only a 6-month warning.

XIV. Volcano Hypothesis

a. Volcanic activity possibly filled the atmosphere.

i. Result:

XV. Slow environmental changes

a. As plates moved, temperatures would have changed on the various continents.

b. Or, perhaps their extinction was natural.

XVI. Some invalidated hypothesis

a. Flowering plants caused the dinosaurs to die from hay fever.

b. Sniffles killed the dinosaurs.

c. Dinosaurs got too big & they crushed themselves.

d. Mammals out competed the dinosaurs.

e. Mammals ate the dinosaurs eggs.

f. Cosmic rays killed the dinosaurs.

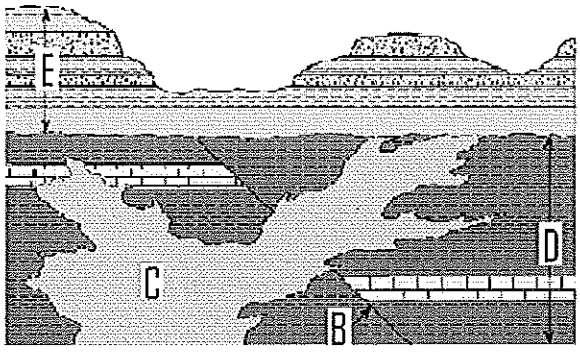
XVII. Relative ages of rocks

a. Principle of superposition

b. Relative Dating
   i. Relative dating is used to determine the order of events and relative age of rocks.
   ii. This is NOT used to determine EXACT AGE.
   iii. Works best if rocks have been undisturbed.
   iv. If you find fossils in a lower layer that are younger, then what can you hypothesize?

c. Unconformities
   i. Unconformities are layers of rocks that are missing due to erosion. There are three types.
   ii. Angular Unconformities
      i. Horizontal layers are tilted & uplifted.
      ii. New sediments deposit horizontally.
      iii. See Fig. 13 (Pg 372) & Fig 14 (Pg 373)
   iii. Disconformity
      i. Layer of rocks look complete, but layers are missing.
      ii. May find old erosional surfaces.
      iii. Cause: layers are exposed, eroded & covered.
      iv. Fig. 14 (Pg 373
   iv. Nonconformity
      i. Sedimentary rocks form above metamorphic or intrusive igneous rocks.
      ii. The metamorphic or igneous rocks uplift & erode.

d. Can you determine the order of events?



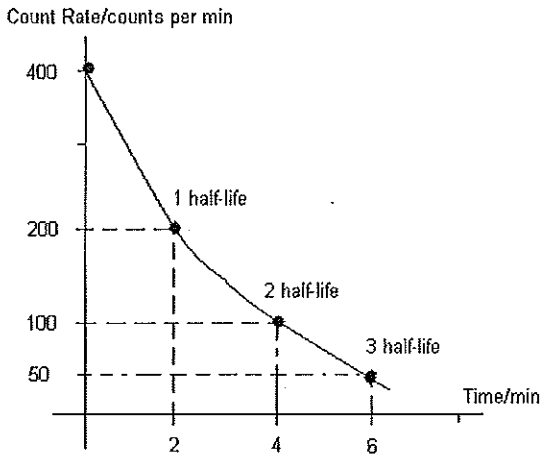
e. Correlating Rock Layers
    i. Geologist match up layers of rock in one place with another.
    ii. Examples

XVIII. Absolute Dating

a. Method used to determine age in years of rock, fossil, or other object.
b. Radioactive decay is used to determine the age of an object.
c. Radioactive Decay

XIX. Half Life

a. Time for half the atoms in an isotope to decay.
b. Ex. C-14
    i. 5,730 years for half of C-14 to become N-14
c. It will take another _____ for half of the remaining C-14 to decay into N-14.
d. After many half-lives (20), such a small amount remains of the parent, it might not

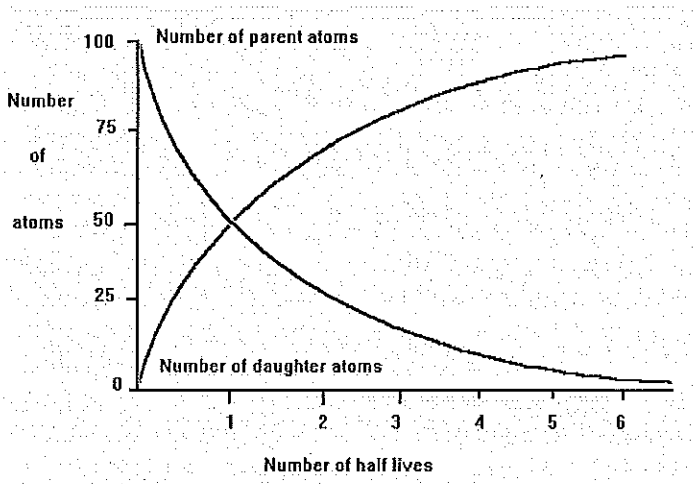


be measurable.

e. Radiometric Dating

i. Dating by **<u>comparing percent of parent & daughter</u>** materials in a rock.

ii. Scientists pick an isotope **<u>appropriate for the estimated age of the rock</u>**.



iii. If scientists feel a rock is old, they will pick an isotope with a large half-life.

iv. Example:

f. Some other isotopes

Radioactive Parent	Stable Daughter	Half life
Potassium-40	Argon-40	1.25 billion yrs
Rubidium-87	Strontium-87	48.8 billion yrs
Thorium-232	Lead-208	14 billion years
Uranium-235	Lead-207	704 million years
Uranium-238	Lead-206	4.47 billion years
Carbon-14	Nitrogen-14	5730 years