Question: Are there different types of fossils? If so, what are they?

FOSSILS

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ preserved remains or traces of living things and are formed when living things die and are buried by sediments

Fossils found in rocks include:

• \_\_\_\_\_\_\_\_\_\_\_ hollow area in the sediment which shows the shape of an organism or a part of an organism

• \_\_\_\_\_\_\_\_\_\_\_\_ solid copy of the shape of an organism

• \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ fossils in which minerals replace all or part of an organism

• \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ extremely thin coating on rock

• \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ provide evidence of the activities of ancient organisms

Some processes preserve the remains of organisms with little or no change such as those organisms that become trapped in tar, ice or amber

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - scientists who study, collect and classify fossils

Information gathered by paleontologists is called the fossil record which provides evidence of:

• history of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

• groups of organisms changing over \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ periods of time

• \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

• \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and changes in Earth’s surface

The fossil record provides \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ gradual change in living things over long periods of time

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ well-test concept that explains a wide range of observations

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ when an organism no longer exists and never will again

Question: Why do geologists study index fossils?

DETERMINING AGE OF ROCKS

One way to determine the age of a fossil is by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ it was found in.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ age of a rock – age compared with ages of other rocks

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ age of a rock – number of years since the rock formed

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – in horizontal sedimentary rock layers the oldest layer is at the bottom; each higher layer is younger than the layer below it

To determine relative age of rocks, geologists also study the following:

• \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – lava that hardens (igneous rocks) on the surface

• \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – magma that cools and hardens into a mass of igneous rocks beneath the surface

• \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – break in Earth’s crust which is always younger than the rock it cuts through

• \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – gap in the geological record where some rock layers have been lost because of erosion

Certain fossils, called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, must be widely distributed and represent a type of organism that existed only briefly in order to help \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ tell the relative ages of the rock layers in which they occur.

Geologist use \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to determine the absolute ages of rocks, by first determining the amount of a radioactive element in a rock.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ all the atoms of a particular type of matter are the same

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ process by which one unstable element breaks down into another element that is stable

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ time required for half of the unstable element to decay

Question: What are the different units of the geological time scale?

GEOLOGICAL TIME SCALE

Earth’s history is divided into units of time that make up a geological time scale which is divided into four major subdivisions:

• \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ longest subdivisions; based on abundance of fossils

• \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ marked by significant worldwide changes in the types of fossils present in rock

• \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ based on types of existing life globally at a particular time

• \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ divided periods characterized by differences in life forms

Geological time begins with a long span of time called Precambrian Time, which covers about \_\_\_\_\_\_\_\_\_\_\_\_\_\_cpercent of Earth’s history and ended about 544 million years ago.

Scientists hypothesize that Earth formed roughly \_\_\_\_\_\_\_\_\_\_\_\_\_\_ billion years ago.

During the first several hundred million years of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Time, an atmosphere, oceans and continents began to form.

During \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Time (4.6 billion – 544 million years ago):

• very few fossils remain from this time

• Precambrian rocks have been buried, causing fossils to be changed by heat and pressure

• most Precambrian organisms lacked hard parts

Earliest life form to appear was \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, or blue-green algae which added oxygen to the atmosphere through photosynthesis

The time between Precambrian Time and the present is divided into three long units called eras:

• \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Era

• \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Era

• \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Era

Eras are divided into periods which are named by geologists from places around the world where they found certain rocks and fossils.

Question: What era, period and epoch do humans live in?

EARTH’S ERAS

The Phanerozoic Eon is characterized by three eras:

Paleozoic era – oldest era divided into six periods

Mesozoic era – middle era divided into three periods

Cenozoic era – youngest era divided into two periods

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ERA – 544 million years ago to 245 million years ago

Early Paleozoic consists of the Cambrian and Ordovician periods

• often called Age of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

• \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ covered by large, shallow inland seas

• no life existed on land; Ordovician period ended with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Middle Paleozoic consists of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ periods

• often called Age of Fishes

• some invertebrates lived on land (cockroaches/dragonflies)

• continents colliding forming mountain ranges

Late Paleozoic consists of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ periods

• Age of Amphibians (reptiles evolved from amphibians)

• continental collisions led to formation of Pangaea

• largest mass extinction occurred, reason under debate

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ERA – 245 million to 65 million years ago

• often called the Age of the Reptiles

• contained the Triassic, Jurassic and Cretaceous periods

• dinosaurs dominated, small mammals and birds appeared

• flowering plants (angiosperms) appeared

• Pangaea separated into continents, oceans began to form

• mass extinction from large meteorite impact scientists believe

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ERA – 65 million to present

• Early in Tertiary period, India collided with Asia to form Himalayas, Africa and Europe collided to form Alps; Cascades and Sierra Nevadas began to form in North America

• new grasses and flowering plants dominated land

• mammals continued to evolve

• Homo sapiens, or humans appeared about 400,000 years ago – we live in the Holocene epoch of the Quaternary period