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EARTH SCIENCE – UNIT 5 – CHAPTER 14 NOTES

GEOLOGIC TIME

14.1 Geologic Time Scale
- the division of Earth's history into smaller units of time
- made up of eras, periods, and (sometimes) epochs

1. - Pre-Cambrian Time: 4600 MYA – 544 MYA (not divided into any periods)

2. - Paleozoic Era: 544 MYA – 248 MYA (7 periods in the Paleozoic Era)

3. - Mesozoic Era: 248 MYA – 66 MYA (3 periods in the Mesozoic Era)
   → Triassic Period
   → Jurassic Period
   → Cretaceous Period

4. - Cenozoic Era: 66 MYA – present day (2 periods in the Cenozoic Era)
   → Tertiary Period
   - 5 epochs
   → Quaternary Period
   - 2 epochs

PLACE THESE EVENTS IN THE CORRECT ORDER FROM 1 (FIRST) TO 13 (LAST).
ALSO INDICATE THE ERAS IN WHICH THEY TOOK PLACE.
REFER TO PAGE 393 IN THE TEXTBOOK.

a. first trilobites evolved _____ _____
b. the Jurassic Period began _____ _____
c. early bacteria (first life) are present _____ _____
d. the Himalaya Mountains formed _____ _____
e. first birds appeared _____ _____
f. first amphibians evolved _____ _____
g. first reptiles evolved _____ _____
h. first fish evolved _____ _____
i. first land plants evolved _____ _____
j. the 1st mass extinction took place _____ _____
k. the 2nd mass extinction took place (dinos) _____ _____
l. Pangaea broke up _____ _____
m. present day _____ _____

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14.2 EARLY EARTH HISTORY: PRE-CAMBRIAN TIME & THE PALEOZOIC ERA

14.2 Pre-Cambrian Time

- 4600 MYA – 544 MYA
- very limited fossil record for 3 reasons:
    1. rocks are deeply buried in the Earth (principal of superposition)
    2. rocks and fossils are highly affected by heat and pressure
    3. rocks are highly eroded
- early life:
    1. Cyanobacteria (one of the first organisms) first appeared 3500 MYA.
    2. Invertebrate animals (without a backbone) appeared late in Pre-Cambrian Time.
    3. PROOF: fossil imprints of jellyfish and marine worms
    4. BUT… ONE PROBLEM: these were soft-bodied organisms (no hard parts) so very few fossils actually formed
- early atmosphere:
    1. There was no oxygen!!!!
    2. Oxygen didn't appear until plants evolved and started doing photosynthesis.
    3. There was virtually no ozone layer for UV protection (ozone is made of oxygen)

14.2 Paleozoic Era

- "ERA OF ANCIENT LIFE"
- 544 MYA – 248 MYA
- transition from the Pre-Cambrian Time to the Paleozoic Era:
    1. The Paleozoic Era began with the evolution of organisms with hard body parts.
    2. There are lots of fossils from organisms that lived in the Paleozoic Era.
    3. Most life forms were marine because most of the Earth was covered with water.
- geologic events:
    1. The Appalachian Mountains formed. The Eurasian and African plates both collided with the North American plate.
    2. During the Paleozoic Era, the shallow seas that completely covered North America began to dry up.
- ancient life:
    1. Plants evolved from marine plants into land plants.
    2. Fish were a dominant form of life in the early Paleozoic Era.
    3. As the shallow seas dried up, the fish evolved into amphibians and reptiles.
    4. Amphibians evolved. Amphibians can live on land and breathe air, but must return to the water in order to lay their eggs.
    5. Amphibians were a dominant form of life in the middle Paleozoic Era.
    6. Reptiles evolved. Reptiles can live and reproduce on land. They produce an *amniotic egg*, which they lay on land, not in the water.
    7. Reptiles were a dominant form of life in the late Paleozoic Era (Mesozoic).
- end of the Paleozoic Era:
    1. The continents collided to form Pangaea.
    2. There were many mass extinctions (a time when a lot of plants and animals died). There were 4 main causes of the mass extinctions:
        - the shallow seas were drying up
        - deserts were forming
        - mountains were built
        - climate was changing

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14.3 MIDDLE AND RECENT EARTH HISTORY: THE MESOZOIC & CENOZOIC ERAS

14.3 The Mesozoic Era

- "ERA OF MIDDLE LIFE"
- "AGE OF REPTILES"
- 248 MYA – 66 MYA
- 3 periods of the Mesozoic Era: Triassic Period, Jurassic Period, Cretaceous Period
    1. Triassic: breakup of Pangaea, small dinosaurs, first mammals
    2. Jurassic: breakup of Pangaea continues, larger dinosaurs, first birds
    3. Cretaceous: breakup of Pangaea continues, larger dinosaurs, first angiosperms
- breakup of Pangaea:
    1. Pangaea formed at the end of the Paleozoic Era.
    2. Pangaea began to break up at the beginning of the Mesozoic Era.
    3. As continents moved into different areas, the environment changed.
    4. The environments had different climates and less water.
- reptiles:
    1. Reptiles have hard scales to prevent them from drying out in the drier climates.
    2. Reptiles lay an amniotic egg, which does not have to be placed in the water.
- dinosaurs:
    1. Dinosaurs were reptiles that came in a variety of sizes.
    2. Dinosaurs had a range of diets. Some were carnivores (meat-eaters) and some were herbivores (plant-eaters).
- birds
    1. Dinosaurs (reptiles) evolved into birds.
    2. Birds have wings and feathers, which they use to fly.
    3. *Archaeopteryx* was the link between dinosaurs and birds.
        - It had teeth and claws, which are dinosaur traits.
        - It had wings and feathers, which are bird traits.
- mammals
    1. Mammals evolved throughout the Mesozoic Era, but did not become dominant until the Cenozoic Era.
    2. Mammals are vertebrates (have a backbone) with 4 main traits:
        - They can regulate their own body temperature (warm-blooded).
        - They have body hair.
        - The females produce milk and nurse their young.
        - The females have a live birth (babies do not hatch from eggs).
- gymnosperms
    1. Gymnosperms are called *naked seed plants*.
    2. Gymnosperms are plants that do not produce fruit or flowers.
    3. They are the simpler form of plants.
- angiosperms
    1. Angiosperms are called *flowering plants*.
    2. Angiosperms are plants that produce fruit and/or flowers.
    3. They are the more complex form plants.
- end of the Mesozoic Era
    1. Meteorite Hypothesis?
    2. Alternate Hypothesis?

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14.3 The Extinction of Dinosaurs

1. Meteorite Hypothesis:
   - Meteor collided with Earth.
   - Dust and debris were then released into the atmosphere.
   - The sun was blocked out.
   - Plants died from a lack of photosynthesis.
   - Plant-eating dinosaurs had no food and died.
   - Meat-eating dinosaurs had no food and died.

   PROOF:
   - evidence of an impact from 65 million years ago
   - the crater contains a lot of iridium (often found in meteors)
   - data from rocks indicate a temperature drop at this time

2. Alternate Hypothesis:
   - Dinosaurs went extinct through environmental changes.
   - This is an example of natural selection (Charles Darwin's theory)
   - Dinosaurs could not survive the colder temperatures.

   PROOF:
   - iridium-rich sediments could have come from volcanic activity
   - volcanic activity could have put dust and debris in the air

14.3 The Cenozoic Era

- "ERA OF RECENT LIFE"
- "AGE OF MAMMALS"
- 66 MYA – present day
- 2 periods of the Cenozoic Era: Tertiary Period, Quaternary Period
- geologic events:
  1. The Alps Mountains formed when the African and Eurasian plates collided. (TERTIARY)
  2. The Himalaya Mountains formed when the Indian and Eurasian plates collided. (TERTIARY)
  3. The Grand Canyon formed as the Colorado River cut through the Colorado Plateau. (QUATERNARY)
  4. There was a major ice age in North America. (QUATERNARY)
- biological events:
  1. Mammals continued to evolve and become dominant. Some mammals, like whales and dolphins, even moved back into the water. (TERTIARY)
  2. Some mammals, like kangaroos, became isolated on certain continents due to the breakup of Pangaea. (TERTIARY)
  2. Angiosperms (the flowering plants) continued to evolve and become dominant. (TERTIARY)
  3. Early human-like ancestors (cave-men) evolved about 5 MYA (QUATERNARY)
  4. Humans (*Homo sapiens*) evolved about 0.5 MYA (500,000 years ago) (QUATERNARY)
  5. Humans became dominant about 0.01 MYA (10,000 years ago) (QUATERNARY)