

APES – Chapter 8 – Earth Systems

Intro: Are Hybrid Electric Vehicles as Environmentally Friendly as We Think?

- a) what are the environmental trade-offs we make with HEV technology?
- b) what rare metals are used and where do they come from?
- c) what are the impacts of extraction and processing these materials?

I. Resource availability tied to Earth's formation

- A. **Basic geological structure of the Earth** (see figs. 8.1 and 8.2, p. 208, 209)

II. Dynamic Earth

- A. **Plate Tectonics Theory** – Geology's Big Idea

Be familiar with the theory, how it works, what phenomena it describes... as well as the evidence that has been discovered that support the theory... (see pp. 210 – 217)

- B. **Environmental and Human Toll** of Earthquakes and Volcanoes

List the many environmental consequences of these phenomena:

III. The Rock Cycle (see fig. 8.15, p. 218)

Be able to describe all processes involved in this cycle, as well as the conditions underwhich each specific type of rock forms:

A. Igneous Rocks

1. Intrusive rocks
2. Extrusive rocks

B. Sedimentary Rocks

C. Metamorphic Rocks

IV. Soil – The link between rock cycle and biosphere

What is soil?

What ecosystem services are provided by soil? (see fig. 8.19, p. 221)

A. **Soil Formation** – 5 basic factors are involved: (see fig. 8.2, p. 222)

1. Parent Material
2. Climate
3. Topography
4. Organisms (biotic activity)
5. Time

B. **Soil Structure** – Soil Horizons

(see fig. 8.21, p. 223) Be able to describe the vertical structure/properties.

O Horizon

A Horizon

E Horizon (in certain soils)

B Horizon

C Horizon

Unweather Parent Material

C. **Properties of Soil** (see figs. 8.22, 8.23, 8.24 on pages 224-225)

1. Physical properties

Texture as a proportion of sand, silt and clay

Porosity as a result of grain texture

Soil drainage (permeability) is an important characteristic

2. Chemical properties

Cation Exchange Capacity (CEC)...what is it, and how is it important?

Importance of clay –

Importance of soil pH –

Soil bases – Ca, Mg, K, Na ions and compounds

Soil acids – H, Al, S ions and compounds

Plant nutrients – N, P, K

3. Biological properties – know the roles/importance of:

Fungi –

Bacteria –

Protozoans –

Detritivores –

Herbivores –

Foragers and Grazers-

D. **Soil Degradation and Erosion** – how does soil get damaged?

V. **Mineral Resources – Distribution, Extraction and the Environment**

A. **Abundance and Distribution** (see fig. 8.26, p. 226) and Table 8.1, p. 227

Ores

Metals

Disseminated deposits

Reserves

B. **Types of Mining – Extraction methods:** (see figs. 8.27 and Table 8.2)

1. Surface mining can be done in several ways:

Strip mining

Open Pit mining

Mountaintop removal

Placer mining

2. Subsurface mining

C. **The Problems of Mining:**

Dealing with Spoils / Tailings

Acid Mine Drainage

Heavy metals and other Hazardous materials

Air pollution

Safety issues

D. **Important Mining Legislation** (Provisions, Protections, Problems)

The Mining Law of 1872 (The General Mining Act)

Surface Mining Control and Reclamation Act (1977)

WORKING TOWARD SUSTAINABILITY

Mine Reclamation and Biodiversity (p. 229-230)

a) how is a mine reclaimed? What steps are critical to successful reclamation?