

## I. Nonrenewable Resources (unsustainable)

A. \_\_\_\_\_ include coal, petroleum (oil), and natural gas

**List each one in order from most polluting to least polluting.** \_\_\_\_\_

1. Fossil fuels, when combusted, free up energy from the Sun that was \_\_\_\_\_ in plants & animals that died millions of years ago.
2. They are *made so slowly over time*, we use them up much faster than they are replenished.

B. Coal is the major fuel used in power plants to \_\_\_\_\_.

1. It is used to heat water into steam, that turns a turbine, that turns an electric generator.
2. Problems with coal use include environmental damage from mining and \_\_\_\_\_ from burning it.

**What is the primary way that mining coal pollutes?** \_\_\_\_\_

**What are the top two major pollutants found in coal smoke?** \_\_\_\_\_

**Which three country's in the world use coal as their major energy source to produce electricity? List in order from largest to smallest.** \_\_\_\_\_

## C. Oil and Natural Gas

1. Petroleum formation begins with the burial of large quantities of \_\_\_\_\_ from dead sea life millions of years ago.
2. Usage in the U.S. - Combined, provide more than \_\_\_\_\_ of the energy consumed in the U.S.
  - a. In 2011, natural gas production \_\_\_\_\_ coal production for the first time in 30 years

**How much oil do we import from other countries?** \_\_\_\_\_

**What country comprises 50% of imported oil?** \_\_\_\_\_

**Why does U.S. foreign policy give so much attention to the Middle East?** \_\_\_\_\_

## D. Where Oil &amp; Gas Are Found

1. An oil trap is an environment that allows for \_\_\_\_\_ significant amounts of oil and gas to accumulate underground.
  - a. We tap into these reservoirs and \_\_\_\_\_ and gas to the surface.
2. Oil Sands are mixtures of clay and sand combined with water and bitumen (a viscous tar)
  - a. Oil in oil sands is much more viscous and cannot be pumped out
  - b. Obtaining oil from tar sands requires \_\_\_\_\_ of energy and has significant environmental drawbacks

**What country in the Keynote is used as an example of a country with large oil sand fields?** \_\_\_\_\_

## 3. Hydraulic Fracturing

- a. In some regions, \_\_\_\_\_ of natural gas are trapped in shale with low permeability.

**What does it mean to be permeable?** \_\_\_\_\_

- b. Oil Shale, a type of sedimentary rock, is shattered (“fracking”) to release the gas.
- c. Concerns for \_\_\_\_\_ and induced seismicity.
- d. It is a \_\_\_\_\_ process to obtain natural gas.

4. Nuclear energy is an important part of U.S. energy needs

- a. Fuel comes from energy released by \_\_\_\_\_ (splitting atoms)
- b. Resulting controlled chain reaction \_\_\_\_\_ used to drive steam turbines
- c. Uranium-235 is the only naturally occurring isotope that is readily fissionable & is the primary fuel used in nuclear power plants

(1) \_\_\_\_\_ in Earth’s crust & is mined and can be hazardous to mine workers.

d. Obstacles to Development

- (1) Plant safety including the skyrocketing costs for \_\_\_\_\_.
- (2) Storage of \_\_\_\_\_ which is dangerous to living things for thousands of years
- (3) Plants cannot explode like bombs, however the escape of \_\_\_\_\_ during a \_\_\_\_\_ is a major hazard.

**Which two examples of nuclear meltdowns are provided in the Keynote? When did they occur?** \_\_\_\_\_

**How has nuclear power production changed in the last 30 years?** \_\_\_\_\_

II. Elemental Ores

A. Mineral resources are the endowment of \_\_\_\_\_ ultimately available commercially. Mineral resources include:

- 1. Reserves—already \_\_\_\_\_ from which minerals can be extracted \_\_\_\_\_.
- 2. An ore is a useful \_\_\_\_\_ that can be mined for profit.
- 3. The mining of ores can cause \_\_\_\_\_ into streams.

B. Metal ores are generally found near ancient and new \_\_\_\_\_.

- 1. Magmatic Differentiation - As magma cools underground, different elements and compounds crystallize at \_\_\_\_\_.
- a. This type of metal extraction requires the ore to be \_\_\_\_\_. The heavy metals will sink to the bottom.

**What is this process called?** \_\_\_\_\_

- 2. Hydrothermal solutions are the best known and most important generator of ore deposits.
  - a. \_\_\_\_\_—deposits - hot, metal-rich fluids migrate through cracks in the rock before eventually depositing the metals.
  - b. Many of the most productive deposits of \_\_\_\_\_, silver, and mercury occur as hydrothermal vein deposits.
- 3. Instead of being concentrated in narrow veins, \_\_\_\_\_ deposits are distributed as \_\_\_\_\_ (nuggets) throughout the entire rock, also referred to as “native.”

C. Other major metallic ores include

- 1. \_\_\_\_\_—aluminium

**What type of trade barrier was placed on aluminum imports by the current president?** \_\_\_\_\_

2. Monazite - neodymium (used in all \_\_\_\_\_, computers, etc...)

3. Magnetite - iron, needed for the production of \_\_\_\_\_

D. Non-metallic mining includes:

1. Diamonds

2. Marble

3. Salt, which is usually found and mined near \_\_\_\_\_.

4. Gemstones

5. Gypsum, which is used in \_\_\_\_\_ to make products such as dry wall.

6. Potash (fertilizers)

**What major non-metallic mineral is mined along near and along the Georgia coast, and is used in sunscreens and paint?** \_\_\_\_\_

III. Renewable Resources (sustainable)

A. Renewable energy sources regenerate and can be \_\_\_\_\_.

B. Solar energy is the \_\_\_\_\_ of the Sun's rays to supply energy.

**What are three major hinderances to the expanded usage of solar power?** \_\_\_\_\_

C. Wind energy converts the kinetic energy of a moving air mass (\_\_\_\_\_) into other forms of energy to perform work.

1. Need \_\_\_\_\_ to be useful.

2. Causes \_\_\_\_\_ & kills many birds, such as bald eagles & falcons.

3. When placed off the coast where there is \_\_\_\_\_, the create eyesores to scenic coastal vistas.

**What is one major benefit wind power has over solar power?** \_\_\_\_\_

D. Geothermal energy is power generated by tapping into \_\_\_\_\_ and hot water and is used for heating and to generate electricity.

1. This is usually used in places where "liquid hot \_\_\_\_\_" is close to the surface.

E. Biomass—is renewable energy from plants and \_\_\_\_\_.

1. It is \_\_\_\_\_ material made from plants and animals.

F. Tidal power is harnessed by constructing a dam \_\_\_\_\_ of a bay or estuary in a coastal area.

1. The ocean's energy potential remains largely \_\_\_\_\_.

2. Not every place has a large difference in their high and low tides.

G. Hydroelectric power is power generated by \_\_\_\_\_ used to drive turbines to produce electricity.

1. Most energy is produced at \_\_\_\_\_.

**Provide an example of a large dam in the U.S., China, & Brazil/Paraguay.** \_\_\_\_\_

2. Dams have \_\_\_\_\_ lifetimes.

3. Dams cannot be built just anywhere. The local, geology must be surveyed.

4. They can causes major \_\_\_\_\_ both downriver and where the reservoir will form.

5. They can cause \_\_\_\_\_ if the river being dammed passes through more than one country.

Provide a current example of this in the Middle East.

5. Some existing but older damns are being considered for removal to \_\_\_\_\_ & scenic beauty

What is the major difference between renewable and non-renewable energy resources? \_\_\_\_\_

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What are some things you and your family can do as citizens to help your state and country better handle these land resources?

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