

### Ecological Cycles Part 3- An Illustrated diagram of the Energy NON-Cycle

Take a 11" x 17" sheet of paper and draw an illustrated diagram of the Earth's energy flow according to the following directions. Use erasable pencil at first, then color it in with crayons, colored pencils and/or pens.

***This assignment is DIFFERENT from the water and carbon assignments because it tracks energy flow, not matter cycling. Energy cannot be recycled.***

Draw a landscape showing the sun, plenty of atmosphere, ocean, and land. Leave room for some interplanetary space *above* the atmosphere. Include sediments under the ocean, a cornfield, a windmill and a dam with water flowing over it. The windmill and dam should be connected with wires to light bulbs.

A big label entitled "WASTE HEAT" should be prominent in the center of the scene.

1. Sunlight enters the atmosphere. Some is reflected back. So draw arrows labeled "Sunlight" going from the sun to the air, ocean, and land, with a few arrows bouncing back into space.
2. Sunlight warms the air, ocean, and land and this generates waste heat. So draw arrows from those places going to the big "WASTE HEAT" label.
3. Plants PHOTOSYNTHESIZE and make sugar. They grow. So, draw some sunlight arrows going into plants and put the label "photosynthesis" next to the plants. Draw an arrow from the plants to "WASTE HEAT".
4. Animals eat plants and each other. They metabolize the sugar and move, grow, reproduce, etc. All the energy ends up as "waste heat" (or room-temperature heat) in the environment. So, draw an arrow going from the plants to animals labeled "respiration" and an arrow going from an animal to "WASTE HEAT".
5. Bacteria and Fungi decompose dead organic material that still has some sugar in it. This energy also becomes waste heat. So, draw an arrow going from an animal to some bacteria or mushrooms in the soil, and from the bacteria or mushrooms to "WASTE HEAT".
6. Some dead plant material is buried and becomes fossil fuels: Plankton in the sea die and settle to the bottom. They get buried in ocean sediments and become oil and natural gas. Freshwater swamp plants get buried to make peat and coal. So, draw an arrow from the surface waters of the ocean and/or some dead plants going underground to some buried oil or coal. Label the arrow "burial."
7. We dig up peat and coal and pump out the oil and natural gas. We burn them to make cars go, generate electricity, heat homes, etc. All of the energy ends up as waste heat. So, draw an arrow from the buried coal or oil through a smokestack and going to the "WASTE HEAT" sign. Label that arrow "combustion."

8. Sunlight warms the atmosphere in places and makes the winds blow. We use the wind in windmills to generate electricity and make sailing ships move. The energy ends up as waste heat. So, draw an arrow from the sun to the windmill (label it "Wind") and then from the windmill to "WASTE HEAT".
9. Sunlight evaporates water off the surface of the ocean and makes it rain. We capture rainwater behind dams and let it fall over turbines to generate electricity. As always, the energy is transformed into waste heat. So, draw an arrow going from the sun through some raindrops to the dam, and then from there to "WASTE HEAT". Label the arrow "evaporation".
10. Do you notice how everything that happens makes waste heat? All that waste heat generates infra-red light. (All objects glow.) The infra-red light escapes through the atmosphere and goes out into interplanetary space. For every 100 watts of sunlight that is absorbed by the earth in the first step, 100 watts in infra-red light are emitted into space. So, draw lots of arrows representing infrared light going from "WASTE HEAT" up & out into space. You can represent infra-red light by wavy arrows.

Your instructor will show you examples.