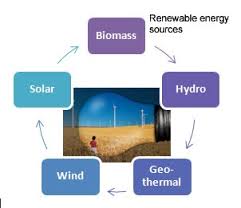
**Environmental Science**

**Chapter 18:**

**Renewable Energy**

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***Class Website:*** http://aofscience.weebly.com

***Mr. Gutierrez’s email:*** gutierrezbr@elizabeth.k12.nj.us

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| --- | --- | --- | --- |
| **Packet** | | **Followed All Classroom Policies** | |
| /80 | Completed Class Notes | / | Monday |
| /20 | Writing Name on Every Page | / | Tuesday |
|  | | / | Wednesday |
| / | Thursday |
| / | Friday |
| /100 | Total Points | / | Total Points |

Name of Environmental Scientist (Your Name):

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Period: \_\_\_\_\_\_\_\_\_\_\_

**Table of Contents**

|  |  |  |
| --- | --- | --- |
| *Topic* | *Packet Page* | *Textbook Page* |
| 1. **Biomass Energy** | **3 – 5** | **551 - 553** |
| **2. Geothermal Energy** | **6 – 8** | **553 - 555** |
| **3. Hydropower** | **9 – 11** | **557 - 560** |
| **4. Solar Energy** | **12 – 14** | **562 – 564** |
| **5. Wind Energy** | **15 - 16** | **566 – 569** |
| **\*Waste Management** | **20 – 21** | **582 – 605** |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Objective: SWBAT explain how biomass energy is used.** |
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**BIOMASS ENERGY**

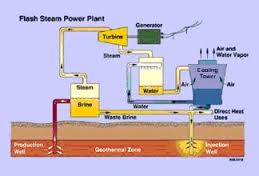
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Energy derived from biomass is used for cooking, heating, powering motor vehicles, and generating electricity.**   * Biomass is material—such as wood, manure, and grain—that makes up\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_or comes from living organisms. * Biomass energy, called *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_,* is produced by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. * Biomass energy can be used for heating, cooking, lighting, vehicle fuel, or electricity generation.   **Sources of Biomass**   |  |  | | --- | --- | | **SOLID** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, charcoal, manure, agricultural and timber waste, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | **GASES** | **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**produced by breakdown of waste in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (where garbage is thrown) | | **LIQUID (BIOFUEL)** | 1. *Ethanol:*   * + - Produced by fermentation of starches and sugar     - Mainly produced from \_\_\_\_\_\_\_\_\_\_\_\_   imgres.jpg  2. *Biofuel:*  Produced from ­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |   **THINK. PAIR. SHARE.**  With a partner, take a few moments to discuss the benefits and costs of biomass energy.   |  |  | | --- | --- | | **BENEFITS** | **COSTS and DISADVANTAGES** | |  |  |   ***Benefits and Costs of Biomass Energy***   |  |  | | --- | --- | | **BENEFITS** | **COSTS and DISADVANTAGES** | | * + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**   + Can be produced by all nations | * + Takes away land from food crops or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   + \_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_and desertification can result if plant biomass is harvested \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   + \_\_\_\_\_\_\_\_\_\_\_\_\_\_ input is needed.   + Burning biomass indoors can lead to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Objective: SWBAT describe how geothermal energy is harnessed and used.** |
|  |

**GEOTHERMAL ENERGY**

**Steam and how water produced by geothermal energy can be used for generating electricity and for heating.**

* Underground heat generated by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and breakdown of radioactive elements
* Usually accessed by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ below ground; \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, generating electricity.

****

* Can be used directly by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from its source into homes and businesses
* Ground source heat pumps use naturally temperate soil, a few feet underground, to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and to cool them in summer.



\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (shown above) erupt because of geothermal energy.

**THINK. PAIR. SHARE.**

With a partner, take a few moments to discuss the benefits and costs of geothermal energy.

**Benefits and Costs of Geothermal Energy**

|  |  |
| --- | --- |
| ***BENEFITS*** | ***COSTS/DISADVANTAGES*** |
|  |  |

**Benefits and Costs of Geothermal Energy**

|  |  |
| --- | --- |
| ***BENEFITS*** | ***COSTS/DISADVANTAGES*** |
| * + Causes much less air pollution than fossil fuels   + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**   **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** | * + Not sustainable if **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**than it is naturally replenished   + Hot groundwater can contain **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** or add to pollution.   + Some geothermal energy projects can **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**   + Geothermal power plants **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** in places with **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** to geothermal energy. |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Objective: SWBAT explain how flowing water can be used to generate electricity.** |
|  |

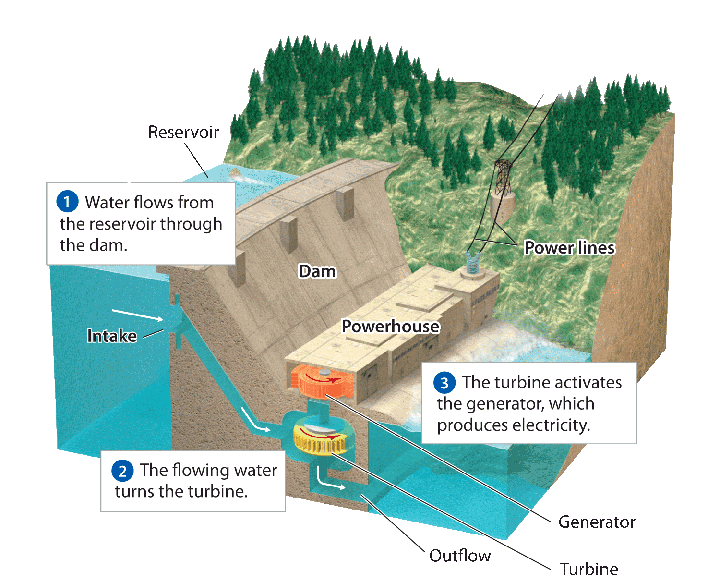
**ELECTRICITY FROM HYDROPOWER**

**The movement of water can be used to generate electricity.**

* Hydropower is generated by **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**
* *Two basic approaches:*

1. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**and pushes turbines.
2. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is diverted through turbines.

* Naturally flowing water can lead to a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**supply of electricity. Dams provide **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** electricity but can **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** natural habitats.

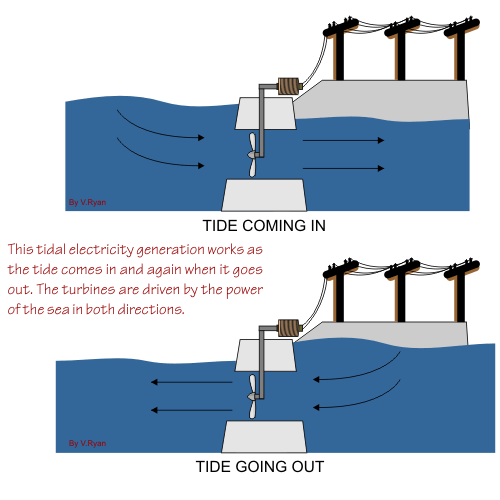
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**Benefits and Costs of Hydropower**

|  |  |
| --- | --- |
| ***BENEFITS*** | ***COSTS/DISADVANTAGES*** |
| * + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**   + No air pollution or greenhouse gas emissions   + Yields relatively \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_electricity | * + Dams **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and affect organisms (especially fish).   + Dams **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, preventing it from reaching downstream.   + Building dams and reservoirs can **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** people. |

**TIDAL ENERGY**

* Electricity generated by the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Tidal waters push turbines in a dam.
* The best places to harness tidal energy have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the heights of high and low tides.
* Generates \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, but shore ecosystems can be negatively affected and very few locations are currently suitable.

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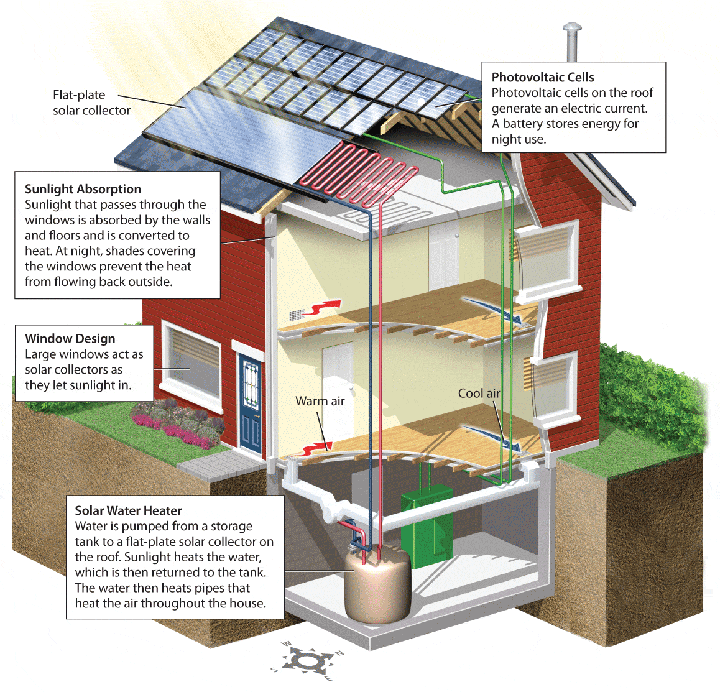
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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Objective: SWBAT describe how solar energy is harnessed.** |

**SOLAR ENERGY**

**** **The sun’s energy can be used to heat buildings and generate electricity.**

|  |
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| Using Solar Energy for **HEAT**   1. ***Passive solar heating***: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to efficiently \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_; can be used to heat homes and businesses 2. ***Active solar heating***: Uses \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, such as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, to capture, store, and distribute the sun’s energy |

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| Using Solar Energy for **ELECTRICITY**   * **Photovoltaic cells (solar panels):** Convert **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** directly into **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**   0133724778a151   * **Concentrating solar power:** Uses\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to focus the sun’s rays on a vessel containing fluid; **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and generate electricity. |



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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Objective: SWBAT analyze the benefits and costs of solar energy.** |
|  |

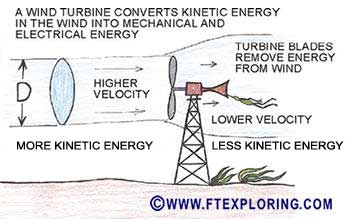
**Benefits and Costs of Solar Power**

|  |  |
| --- | --- |
| ***BENEFITS*** | ***COSTS/DISADVANTAGES*** |
| * + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   + Clean—no air or water pollution produced during operation   + Low maintenance devices   + New \_\_\_\_\_\_\_\_\_\_\_ to make solar devices | * + Some pollution during manufacture   + Many regions **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**   + Devices are **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Objective: SWBAT explain how wind energy can be used to produce electricity.** |
|  |

**WIND ENERGY**

* Wind turbines (windmills) convert wind’s **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** to **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**
* Wind turbines can be placed on **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**
* Turbines can be **\_\_\_\_\_\_\_\_\_\_\_\_\_** or built in **\_\_\_\_\_\_\_\_\_\_\_** called wind farms.



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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Objective: SWBAT analyze the benefits and costs of wind energy.** |
|  |

**Benefits and Costs of Wind Power**

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| --- | --- |
| ***BENEFITS (Advantages)*** | ***COSTS (Disadvantages)*** |
| * + No pollution or greenhouse gases produced during operation   + Under good wind conditions, produces far \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   + Relatively cheap to operate | * + High startup costs   + Winds can be \_\_\_\_\_\_\_\_\_\_\_\_   + Fastest winds are often not near population centers.   + Communities complain about the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of wind farms.   + Can be harmful to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

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**Renewable Energy Resources Summary**

Use this as a guide to help you study the different types of renewable energy sources.

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| --- | --- | --- | --- |
| **Type of Renewable Energy** | ***How it Works*** | ***Pros*** | ***Cons*** |
| 1. *Biomass* |  |  |  |
| 1. *Geothermal* |  |  |  |
| 1. *Hydropower* |  |  |  |
| 1. *Solar* |  |  |  |
| 1. *Wind* |  |  |  |
| 1. *Hydrogen Fuels* |  |  |  |

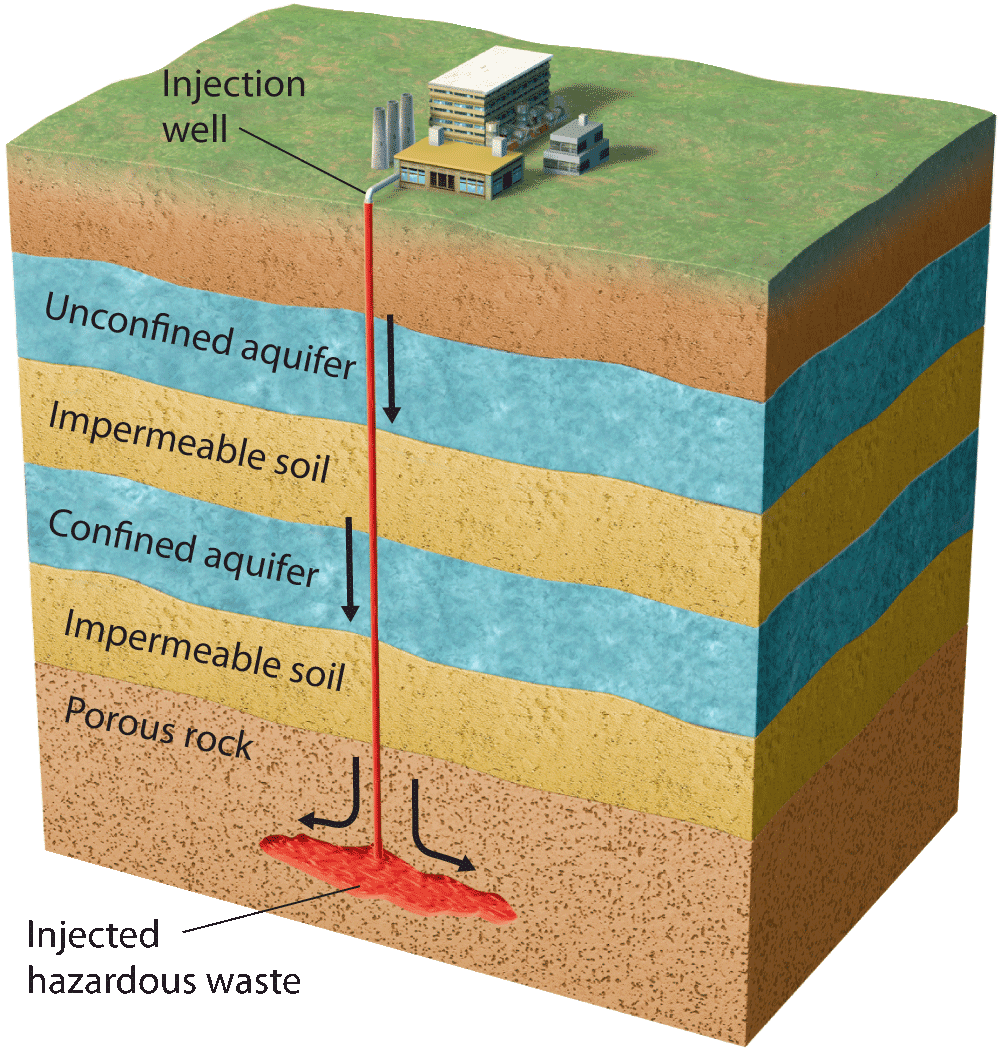
**CHAPTER 19: Waste Management**

What is waste?

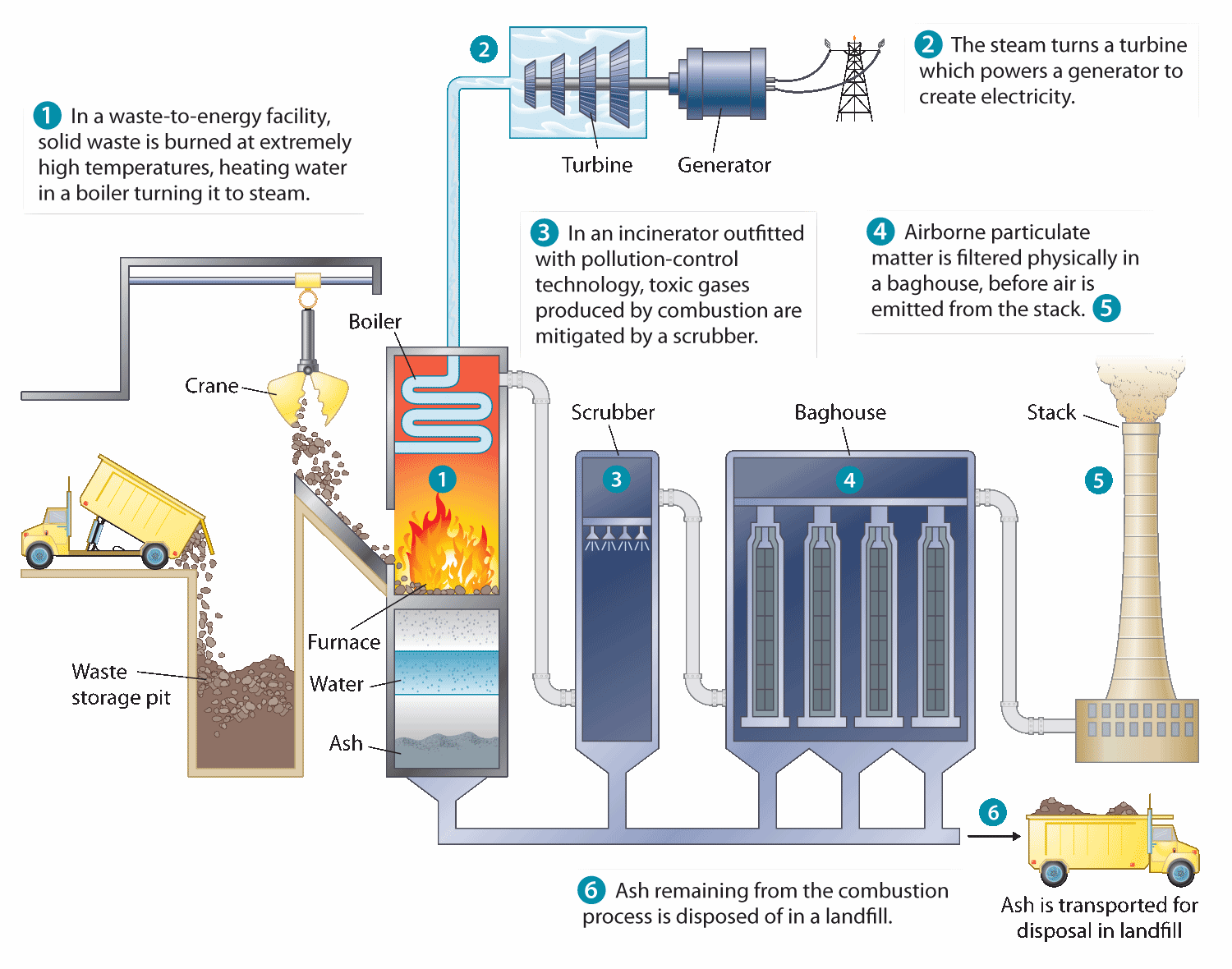
* Any unwanted material or substance that results from a human activity or process
  + **Municipal solid waste:** From homes and businesses
  + **Industrial waste:** Resulting from manufacturing, agriculture, and mining
  + **Hazardous waste:** Toxic, reactive, flammable, and corrosive
    - **E-waste:** Contains heavy metals and toxic chemicals, but mostly treated as conventional solid waste
  + **Wastewater:** Includes used, discarded water and runoff

**DISPOSING OF HAZARDOUS WASTE**

* **Landfills:** Specifically designed to keep hazardous waste contained
* **Surface impoundment:** Liquid waste poured into shallow lined pits; water evaporates and solid waste is transported elsewhere
* **Deep-well injection *(see diagram below****)*: Wastes injected into deep, confined porous rock layers



**INCINERATION**



|  |  |
| --- | --- |
| ***Benefits of Incineration*** | ***Costs of Incineration*** |
| * Incinerating waste reduces its weight by up to 75% and volume by up to 90%. * Heat from burning trash can be used to generate electricity (waste-to-energy). | * Toxic ash must be disposed of. * Dioxins, heavy metals, and PCBs can be created and released by burning waste. |

*Question to ponder:* **What do we need to do to make sure that we safely manage our hazardous waste from our households?**

Make sure Mr. Gutierrez stamps/signs this by the end of the period. You CANNOT get the stamp/signature for a day later on. It is your responsibility to remind Mr. Gutierrez. You will NOT receive a stamp if you did not follow all classroom policies or actively work on the practice problems during the allotted class time.A stamp means you received all 10 points. No stamps means you’ve received zero points. If you completed some work, I may give you partial credit based on my discretion. ***If you are absent, write the date on the day you were absent and write the word “Absent.” DO NOT LOSE THIS SHEET!!!*** (If you lose this sheet, you will lose all of your participation points. NO EXCEPTIONS.)

|  |  |  |
| --- | --- | --- |
| **Day of Week** | **Followed All Classroom Policies** (Respectful, on time, prepared, engaged…) | **Class work Participation** |
| *Monday* | /10 | /10 |
| *Tuesday* | /10 | /10 |
| *Wednesday* | /10 | /10 |
| *Thursday* | /10 | /10 |
| *Friday* | /10 | /10 |