**(AP) ENVIRONMENTAL SCIENCE 2022-23 January 12, 2023**

**Today’s Agenda (Day 86)**

1. Housekeeping Items

🡪 BRING: cupcakes (or other cream-filled center cake) 🡪 FRIDAY

1. Homework Check:

🡪 SCIENCE FAIR: Literature Review and Reverence Page; Experimental Design

🡪 Chapter 10 Vocabulary

🡪 Chapter 10 Reading Guide

1. Class Activity:

🡪 Day 8: Science Fair

\*Finalize Experimental Design – identify variables (controls, independent, dependent), outline materials needed and procedures (step-by-step); OR Sketch of Prototype Design --include materials needed and timeline of how prototype will be constructed

\*Prepare to have materials ready to begin experimental study/prototype construction for MONDAY!

🡪 **CONT’D: a) Lab – Non-Renewable Energy: Natural Gas – Day 8 Observations**

🡪CONT’D: Chapter 10 PPT Review

1. **Section 9.10.2 – Major kinds of renewable energy**
2. Section 10.3 – Energy Conservation

HOMEWORK:

* READ: Chapter 10 – Renewable Energy Sources
* COMPLETE: SF materials, procedure, variables, prototype design
* **STUDY**: Chapter 10 Test

Chapter 10 Vocabulary

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Active solar system | Anaerobic Bioreactor | Anaerobic digestion | Biofuels | Biomass | Clerestory |
| Crop residues | Daylighting | Desertification | Fuelwood | Gasification | Geothermal energy |
| Methane Digester | Passive solar system | Photovoltaics | Pyrolysis | Renewable energy | Solar power tower |
| Sunspace | Tidal Power | Trombe wall |  |  |  |

REMINDER

* **TEST: Ch 10🡪 ~~Thursday, Jan. 12~~ Jan. 17**

**(AP) ENVIRONMENTAL SCIENCE 2022-23 LAB** **Non-Renewable Energy: How is Natural Gas Formed Laboratory Activity**

Think about the energy you use every day to cook, heat or cool or light your home, or to travel from one place to another. For most of us, the main sources of this energy are the **fossil fuels: *coal, oil, and natural gas.*** Whether used directly, as gasoline, heating oil, or natural gas, or to generate electricity (by burning coal), fossil fuels are a large part of the world’s energy picture.

**But how do fossil fuels form?**

The story starts millions of years ago, during the **Carboniferous Period of the Paleozoic Era.** The Earth was warm and was covered with plant-filled swamps and shallow seas teeming with **algae** and **simple animal life forms such as plankton.** When the plants and animals died, their remains fell to the bottom of the swamps and seas and accumulated there. Much of the organic matter decayed before it was buried by more sediment. Some of it, however, was buried before it could decay. Over millions of years, more and more **sediments accumulated and the great heat and pressure changed the plant and animal materials into coal, oil, and natural gas.** These deposits can be trapped between layers of porous and nonporous rock.

**Natural gas** is found in nearly all petroleum deposits. Coal forms in a similar manner. All three types of fossil fuel are nonrenewable resources because they are used more quickly than they can be replaced.

**Objective**

In this activity, you will make a **model** of how **natural gas might be formed** from decaying organic material.

**Materials:**

Two 1-L (1-qt) plastic bags (resealable)

Leafy green vegetables, such as lettuce, cabbage, or spinach, at room temperature

Large clear measuring cup, measuring tape

Refrigerator

Notebook, pen or marker, tape, camera

**Procedures:**

1: Take out your leafy green vegetables. If the greens are cooler or warmer than the room, leave them on a table or shelf long enough for them to come to the temperature of the room.

2: Add the greens to the measuring cup and pack them down as much as possible. Keep adding greens and pushing them down until the level of the greens is at the 250-mL (8-oz, or 1-cup) mark.

3: Fill one of the plastic bags with the greens from the measuring

cup, and then repeat the process for the second bag. You should have two bags that each contain 1 cupful of greens.

4: Distribute the greens evenly along the bottom of each bag. Then roll up each bag from the bottom—to press all of the air out—and seal tightly. If the bag is not resealable, use tape to seal the bag.

5: Once each bag is rolled up, use the measuring tape to find the circumference of the two rolled-up bags. Record this information in your notebook. **Write a description of your greens—how they look and feel— or take a photograph of each rolled-up bag.**

6: Unroll the bags and **put one in a refrigerator.** This will be the "control" bag, where the lower temperature will keep the greens from decaying quickly. Place the other bag on a table or shelf where it can remain at room temperature. *The warmer temperature will cause the greens to decay more quickly.* Be sure the bag is not in sunlight, because this will affect the experiment.

**Data Table:**



7: Once a day for next ten days, gently roll each bag and **measure the circumference.**

**Record this information in your data table.** Also, look at the greens and ***write down your observations of their appearance.*** You might also find it useful to take a picture of the bags each day.

8: On the tenth day of the experiment, measure a final distance around the two rolled bags. Record these two final measurements in your data table. *Describe how have these measurements changed over the ten days.*

9: After you have made your final measurements, **discard both bags.**

**Data Analysis**

**Discuss:** What changes do you see in the warm bag and the cool bag? How can you explain what you see? How do these changes relate to what you know about how decaying material produces natural gas?

**Conclusion:** Discuss the principles that you learned by doing this activity. What worked? What didn’t? How may you change this lab in the future? How can you expand this experiment?

**(AP) ENVIRONMENTAL SCIENCE 2022-23 LAB**

 LAB: Yeast Fermentation

Use the following lab to compare fermentation of various ingredients.

Choose two of the sugars as your independent variables. Compare with your control of NO sugar.

 Corn syrup

 Molasses

 Honey

 Condensed Milk

 Splenda

**HYPOTHESIS**: Which ingredient do you think will produce the most CO2? And why?

**PROCEDURES:**

For this experiment use the temperature that the instructor has prepared.

1. Record the Temperature: Beginning \_\_\_\_\_ °C Ending \_\_\_\_\_ °C
2. Observe height of foam formed/size of balloon, as per time period.

|  |  |  |  |
| --- | --- | --- | --- |
| **Time** | **Sugar 1** | **Sugar 2** | **Control (no sugar)** |
| **5 minutes** |  |  |  |
| **10 minutes** |  |  |  |
| **15 minutes**  |  |  |  |
| **20 minutes** |  |  |  |

**POST-LAB QUESTIONS:**

1. Are the results what you expected?
2. Do you think an increase in temperature would have increased CO2 production? Why?
3. What other ingredients could you use?
4. Design another experiment you could run. Choose a different factor of growth to observe.
5. Graph the CO2 production from the classes’ experiments. (Use time as x-axis and y-axis as CO2 production in mL)



**(AP) ENVIRONMENTAL SCIENCE 2022-23 READING GUIDECHAPTER 10**

REVIEW QUESTIONS

1. What are the general characteristics of renewable energy sources?

2. What percent of world energy comes from renewable energy sources?

3. What renewable energy source provides the majority of renewable energy?

4. List industries that typically make use of the waste they produce to provide themselves with energy.

5. Why is burning of municipal waste to produce energy more common in Europe than in North America?

6. How is the biofuel ethanol produced?

7. List three negative environmental impacts of using biomass to provide energy.

8. What are negative environmental impacts of developing hydroelectric power?

9. Compare a passive solar heating system with an active solar heating system.

10. Describe two different ways sunlight is used to make electricity.

11. List two reasons people oppose additional wind energy development.

12. List three energy conservation techniques.

CRITICAL THINKING QUESTIONS [for APES students only]

1. Imagine you are an official with the Department of Energy and are in the budgeting process for alternative energy research. Decide where you would invest money and explain why you made your choice. What do you think the political repercussions of your decision would be? Why?

2. Do you believe that large dam projects like the Three Gorges Dam project in China are, on the whole, beneficial? Do you believe they are not beneficial? What alternatives would you recommend? Why?

3. Energy conservation is one way to decrease dependence on fossil fuels. What are some things you can do at home, work, or school that would reduce fossil-fuel use and save money?

4. What alternative energy resources that the text has outlined are most useful in your area? How might these be implemented?