

# FRANKLIN-SIMPSON HIGH SCHOOL

**Course Name:** AP Environmental Science      **Unit Name:** Intro/ Energy

## **Objectives:**

### **Energy Resources and Consumption**

A. Energy Concepts

(Energy forms; power; units; conversions; Laws of Thermodynamics)

B. Energy Consumption

1. History

(Industrial Revolution; exponential growth; energy crisis)

2. Present global energy use

3. Future energy needs

C. Fossil Fuel Resources and Use

(Formation of coal, oil, and natural gas; extraction/purification methods; world reserves and global demand; synfuels; environmental advantages/ disadvantages of sources)

D. Nuclear Energy

(Nuclear fission process; nuclear fuel; electricity production; nuclear reactor types; environmental advantages/disadvantages; safety issues; radiation and human health; radioactive wastes; nuclear fusion)

E. Hydroelectric Power

(Dams; flood control; salmon; silting; other impacts)

F. Energy Conservation

(Energy efficiency; CAFE standards; hybrid electric vehicles; mass transit)

G. Renewable Energy

(Solar energy; solar electricity; hydrogen fuel cells; biomass; wind energy; small-scale hydroelectric; ocean waves and tidal energy; geothermal; environmental advantages/disadvantages)

## **Purpose of the Unit:**

The purpose of this unit is for students to learn how energy is used, what different nonrenewable and renewable resources are available, and how to calculate projections for future supplies of these resources. As well as explain the advantages and disadvantages of each type of energy. Students will also use case studies to help further their understanding of the pros and cons.

## **Prerequisites:**

Biology, Earth/Space, Physics

## Daily Lesson Guide

Day	Lesson Content and Objectives	Focus Questions	Critical Thinking (High Yield / Literacy /LTF/etc.)	Engagement	Assessment and/or Accommodations
<b>1</b> W 8/8	<i>Introduction to APES</i> -Rules/Expectations -Schedule -The class -Questions -Distribute Books	-What questions do you have about APES?			
<b>2</b> R 8/9	<i>The Lorax</i> -An analog for APES <i>FRQ Writing Techniques</i>	-Compare today's ideas of business and environmental stability to those of The Lorax. - Discuss issues such as raw material use, waste disposal, energy consumption, and worker rights. -How can an individual impact an ecosystem?	Knowledge/ Application/ Comprehension	Personal Response Clear/Modeled Expectations	Formative in class assignment
<b>3</b> F 8/10	<i>APES Math Practice</i> -Metric Conversions -Dimensional Analysis <i>Experimental design</i>	-What math skills do we need to work on?	Knowledge/ Application/ Comprehension	Clear/Modeled Expectations Learning with Others Authenticity	Formative in class assignment Exit Slip
<b>4</b> M 8/13	<i>Energy Review (A, B)</i> -Potential vs Kinetic - Forms of energy -Work vs Power -Laws of Thermodynamics	-Describe how "simple" kinetic and potential energy is turned into the various forms of usable energy.	Application/Synthesis	Learning with Others Authenticity Sense of Audience	Bell ringer/Exit Slip Formative, watching the kids as they present a mini lesson

		-Explain the laws of thermal dynamics and how power companies use that information to provide energy to their users.			
<b>5</b> T 8/14	<i>Energy Math (A, B)</i> -Units -EROEI -Finding the right source	- Calculate how a house hold can determine how to save money on their energy bill. -How do electric companies configure energy bills?	Knowledge/ Application/ Comprehension	Learning with Others Authenticity	Bell ringer/Exit Slip Group kids by ability
<b>6</b> W 8/15	<i>Nonrenewable Energy (C, F)</i> -World Use -Green House Gases -Electricity generation -Synfuels -Mass Transit	-Determine what make an energy source nonrenewable. -Describe how energy use and energy resources have varied over time, globally. -Describe the difference between energy efficiency and energy quality. -Show we determine the overall efficiency of energy use in a system? -Explain the basic process by which the energy in a fuel is converted into electricity.	Application/ Comprehension	Summarizing/ Note making Discussion Personal response	Bell ringer/Exit Slip

<b>7</b> <b>R</b> <b>8/16</b>	<b>Coal (B, C)</b> -Energy Production -Extraction -Clean Coal -World Coal Reserves -Pros and Cons -Types	-Summarize how the different types of coal are formed. -Debate the major advantages and disadvantages of using coal. -Where are the major reserves, and major demands?	Application/ Comprehension	Summarizing/ Note making Discussion Personal response	Bell ringer/Exit Slip
<b>8</b> <b>F</b> <b>8/17</b>	<b>Coal Lab(B, C)</b>	-Summarize how the different types of coal are formed. -Debate the major advantages and disadvantages of using coal. -Where are the major reserves, and major demands?	Analysis/Synthesis	Learning with Others Novelty/ Variety	Bell ringer/Exit Slip Turn in lab
<b>9</b> <b>M</b> <b>8/20</b>	<b>Petroleum (B, C)</b> -OPEC -Extraction -Pros and Cons <i>Bird Lab</i>	- Summarize how oil is formed, and why it needs to be refined? - Debate the major advantages and disadvantages of using oil. -Where are the major reserves, and major demands?	Application/ Comprehension/ Analysis	Summarizing/ Note making Discussion Personal response	Bell ringer/Exit Slip
<b>10</b> <b>T</b> <b>8/21</b>	<b>Natural Gas(B, C)</b> -Methane Hydrates -Gas Reserves -Pros and Cons <i>Other Fossil Fuels</i> -Tar Sands -Oil Shale -Pros and Cons	- Debate the major advantages and disadvantages of using them? -Explain the relationship between energy intensity and use per capita.	Application/ Comprehension/ Analysis	Summarizing/ Note making Discussion Personal response	Bell ringer/Exit Slip

	-Use	-Describe the Hubbert curve and its significance. What are the major considerations involved in the future of fossil fuels?			
<b>11</b> W 8/22	<b>Nuclear Energy (B, D)</b> -Half Lives -Isotopes -Uranium, plutonium, deuterium, tritium -Fission -Fusion -Plant Components -Types of Reactors -Price-Anderson Act -Chernobyl -3 Mile Island	-Describe how a nuclear reactor works, and what makes it a desirable energy option. - Discuss the two major concerns about nuclear energy? -What are the promising aspects of and problems with nuclear fusion?	Application/ Comprehension	Summarizing/ Note making Discussion Personal response	Bell ringer/Exit Slip
<b>12</b> R 8/23	<b>Renewable Energy (B, F, G)</b> -Electric Bill Analysis -Conservation, Energy Star -Use -Sustainability -CAFÉ -Electric Cars	-Define renewable energy resources. -Describe strategies to conserve energy and increase energy efficiency. -Explain the designations nondepletable, potentially renewable, and nonrenewable for energy sources.	Application/ Comprehension/ Analysis	Summarizing/ Note making Discussion Personal response	Bell ringer/Exit Slip
<b>13</b> F 8/24	<b>Biomass (B, G)</b> -Use -Pros and Cons <i>Bio Fuels</i> -Use	-Describe the major forms of biomass energy and how they are used. -Explain why energy	Application/ Comprehension	Summarizing/ Note making Discussion Personal response	Bell ringer/Exit Slip

	<ul style="list-style-type: none"> <li>-Pros and Cons</li> <li><i>Hydrogen Fuel Cells</i></li> <li>-Use</li> <li>-Pros and Cons</li> </ul>	<p>from modern carbon is potentially carbon neutral.</p> <ul style="list-style-type: none"> <li>-Why is it important for find abundant sources of biomass energy, and what the advantages and disadvantages?</li> </ul>			
<p><b>14</b> M 8/27</p>	<p><i>Hydro Power (B, E)</i></p> <ul style="list-style-type: none"> <li>-Pros and Cons</li> <li>-Flood Control</li> <li>-Dam impacts</li> <li>-Salmon</li> <li>-Small Scale H Power</li> <li>-Ocean and Tidal</li> </ul>	<ul style="list-style-type: none"> <li>-Explain the types of hydroelectricity generation systems.</li> <li>-Analyze the trade-offs associated with using hydroelectricity compared with biomass energy.</li> <li>-Discuss the major impacts of using hydroelectricity.</li> </ul>	Application/ Comprehension	<ul style="list-style-type: none"> <li>Personal Response</li> <li>Clear Modeled Expectations</li> <li>Authenticity</li> </ul>	<ul style="list-style-type: none"> <li>Bell ringer/Exit Slip</li> <li>Turn in work</li> </ul>
<p><b>15</b> T 8/28</p>	<p><i>Solar Power (G)</i></p> <ul style="list-style-type: none"> <li>-Active</li> <li>-Passive</li> <li>-Pros and Cons</li> <li>-Use</li> <li><i>Lab</i></li> </ul>	<ul style="list-style-type: none"> <li>-Compare the ways in which humans capture solar energy for their use.</li> <li>-Explain why solar energy systems are not feasible everywhere.</li> <li>-Describe how active and passive solar systems work, and the pros and cons of each.</li> </ul>	Application/ Comprehension/ Analysis	<ul style="list-style-type: none"> <li>Learning with Others</li> <li>Authenticity</li> </ul>	<ul style="list-style-type: none"> <li>Bell ringer/Exit Slip</li> <li>Turn in lab</li> </ul>
<p><b>16</b> W 8/29</p>	<p><i>Geothermal (G)</i></p> <ul style="list-style-type: none"> <li>-Pros and Cons</li> <li>-Types</li> <li><i>Wind</i></li> <li>-Pros and Cons</li> </ul>	<ul style="list-style-type: none"> <li>-Where does geothermal energy come from and how do humans harness it?</li> </ul>	Application/ Comprehension/ Analysis	<ul style="list-style-type: none"> <li>Summarizing/ Note making</li> <li>Discussion</li> <li>Personal response</li> </ul>	<ul style="list-style-type: none"> <li>Bell ringer/Exit Slip</li> </ul>

	-Use	-Explain a ground source heat pump. -How would you determine which type of energy extracted from underground is most useful, and what are their main differences?			
<b>17</b> R 8/30	Alternative Energy Debate Research <b>(ALL)</b> (Ford Company)	Choose an alternative energy source, and defend why Ford should choose to use it. Debate with other groups.	Synthesis	Personal Response Clear/Modeled Expectations Emotional/Intellectual Safety Learning with Others Sense of Audience Authenticity	Bell ringer/Exit Slip Working towards summative assessment tomorrow.
<b>18</b> F 8/31	Debate Day <b>(ALL)</b>	Choose an alternative energy source, and defend why Ford should choose to use it. Debate with other groups.	Evaluation	Personal Response Clear/Modeled Expectations Emotional/Intellectual Safety Learning with Others Sense of Audience Authenticity	Bell ringer/Exit Slip Summative through written work and spoken debate.
<b>19</b> W 9/5	Review	-Determine how we can use less energy as individuals and as societies. -Explain peak demand and how it relates to energy conservation. -Justify a building design in terms of its contribution to energy conservation and efficiency.	Synthesis, Evaluation	Personal Response Clear/Modeled Expectations Emotional/Intellectual Safety Learning with Others	Bell ringer/Exit Slip Formatively through class review.

<b>20</b> R 9/6	MC Test Day ( <b>ALL</b> )		Evaluation		Bell ringer/Exit Slip Summative Exam
<b>21</b> F 9/7	FRQ Test Day ( <b>ALL</b> )		Evaluation		Bell ringer/Exit Slip Summative Exam