Chemistry

Unit 1: Combustion

Section 2

Name: ______________________________ Period: ______

Guiding Question:

Do Now:

Important Definitions and Equations:

Notes:

Rule 1: All matter is made of ________________. These are also called atoms, molecules, compounds, or ions.

Rule 2: We draw them using ______________ and shade them differently (or use different colors) if they are different particles.

Rule 3: We draw solids, liquids, and gases differently because they each have different amounts of __________________ between particles

Rule 4: We use __________________ to indicate direction and strength of movement (magnitude) of a particle. These are called ___________________.

Rule 5: We can show energy transfer by ____________________________ (larger than moving ________________) from one region to another, or one particle to another.

Remember: A good model is…

- Labeled
- Has arrows
- Detailed

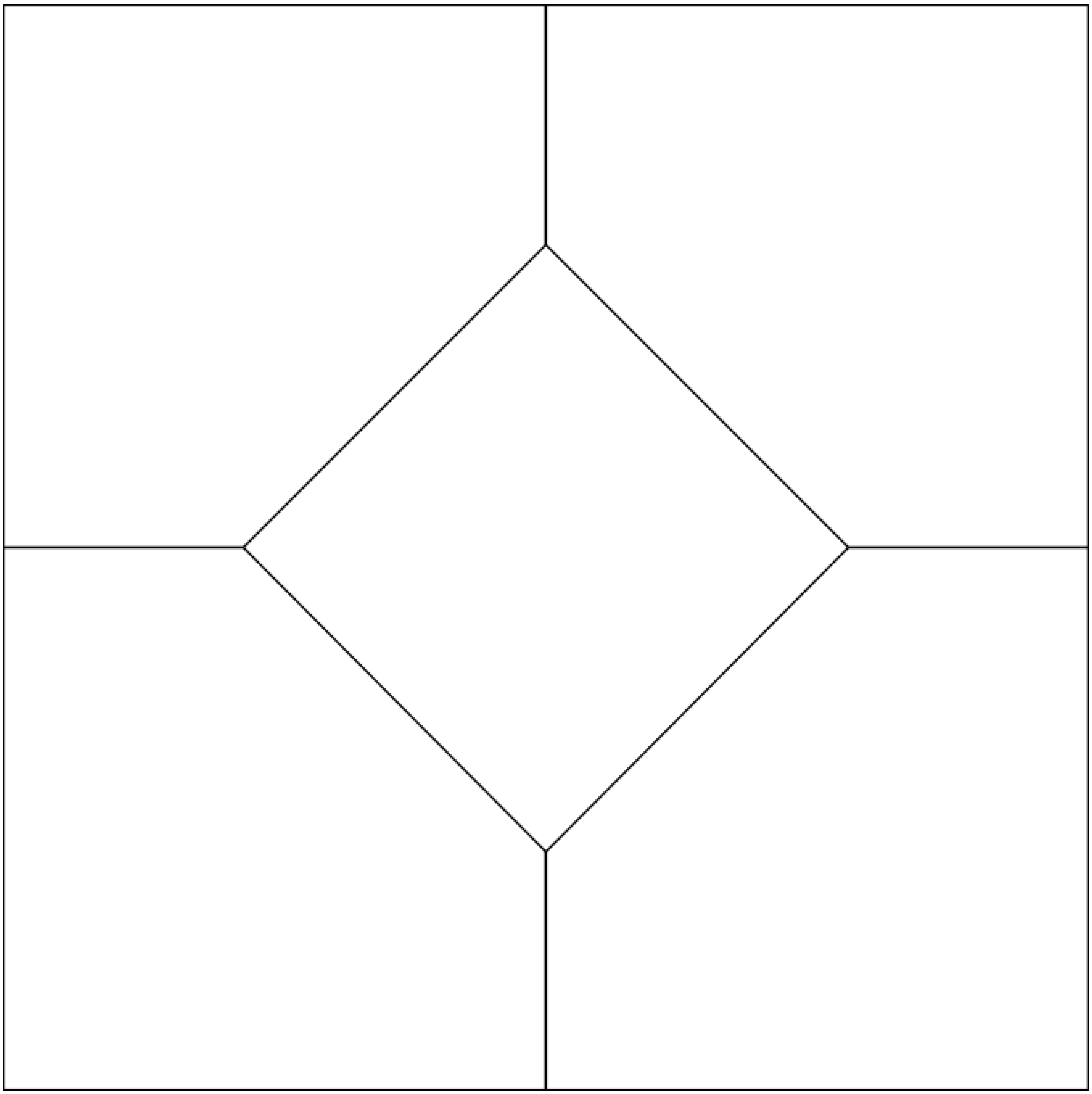
Response:

5 Feel the Energy Move
Energy Flow Diagrams

<u>How to Draw Particle Models</u>

Rule 1: All matter is made of particles. These are also called atoms, molecules, compounds, or ions.

- Fill in the diagram below showing the differences between each of the four and how they are all similar in the middle. You may use drawings in addition to a written description.



Rule 2: We draw them using dots and shade them differently (or use different colors) if they are different particles. A key is required to tell the difference.

- For the three different diagrams below, create particle models based on their description.

Example: Mixture of 2 particles	Scenario 1: only 1 particle	Scenario 2: 3 different particles; one has a much lower amount than the other two	Scenario 3: 3 different particles; all have different amounts, high, medium, and low.
Key	Key	Key	Key

Rule 3: We draw solids, liquids, and gases differently because they each have different amounts of space between particles

- Determine the amount of space between particles (roughly) for solids, liquids and gases:
    - Solids: ______________________________
    - Liquids: ______________________________
    - Gases: ______________________________

- Draw a particle model for each type of substance below:

Solid	Liquid	Gas

Rule 4: We use arrows to indicate direction and strength of movement (magnitude) of a particle. These are called vectors.

- For the different diagrams below, create particle models based on their description.

Example: Particles moving at the same speed in random directions	Scenario 1: 2 different types of particles, same amounts, moving at the same speeds	Scenario 2: 3 different particles; one with a lower amount; all are moving at about the same speed	Scenario 3: 2 different types of particles; similar amounts; all are moving at different speeds.
Key	Key	Key	Key

Rule 5: We can show energy transfer by drawing arrows (larger than moving arrows) from one region to another, or one particle to another.

- For the different diagrams below, create particle models based on their description.

Example: Particles in a cold solid absorbing energy from warmer air molecules	Scenario 1: Fast moving particles and slow moving particles transferring energy	Scenario 2: A hot pot of water heating a mixing spoon

Key	Key	Key

You Practice

- Using your data and lab set up, draw a macroscopic scale of your lab (the can, ring stand, and food prong set up).
- Then draw a microscopic zoom in of your lab to show (1) how particles are moving in the liquid, (2) how energy gets from the food to the can, and (3) how the energy gets from the can to the liquid. This may include more than one microscopic view on the same macroscopic drawing.
- Then, using the larger arrows, show where the energy of the whole reaction system is going (there may be more than one).

Compare

- Now you will look and discuss with your group. What are the good points of each person's drawing(s)? Where can improvements be made? Is it scientifically accurate and fully complete given your data? Use the space below to record notes. They will be helpful for your poster project later.

Energy Flow Diagram Poster (Pt. 2) 3D Assessment Rubric

PE: HS-PS1-4 Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.			
SEP: Developing and Using Models	DCI: HS-PS1 Matter and Its Interactions: Structure and Properties of Matter, Chemical reactions		CCC: Energy and Matter
Advanced (4/A)	Proficient (3/B)	Developing (2/C)	Beginning (1/DF)
Title • Highly visible, relevant, and creative Procedure • Meets all requirement of Proficient Model • Meets all requirements of Proficient Written Explanation • Meets all requirements of Proficient • Analyzes procedure and identifies and evaluates sources of error Modification • Meets all requirements of Proficient • Includes additional, future modifications Overall Appearance • Meets all requirements of Proficient • Organization and presentation of materials is exceptional	Title • Highly visible and relevant Procedure • Clear, communicates all steps • Relevant to their experiment • Format of procedure is legible and in list format Model • Includes macroscopic (large image) and microscopic (particle model) visuals ○ Lab set-up & particle model are clear • Particle Model of Liquid ○ Clearly shows movement of particles of liquid inside of can ○ Utilizes arrows to show speed of particle movement ○ Utilizes dotted lines to show attractive interactions between particles • Energy Flow ○ Labeled arrows clearly show where energy is coming from and going to ○ Particle model clearly shows where energy is coming from Written Explanation • Shows clear understanding of energy flow and KMT as it applies to particle motion. • Demonstrates understanding that particles interact and can stick to each other in various ways • Shows substantial understanding of how bonds are broken and made that causes changes in energy and how it is measured using support from evidence Modification • Clearly identifies what was changed in procedure • Justifies why these changes were made • Evaluates and accurately explains how the changes affected their experiment including intermolecular forces and/or total bond energy, supported by evidence Overall Appearance • Poster clearly communicates information • Color is used	Title • Visible OR relevant Procedure • Communicates most steps, or not all clear • A few errors in procedure or steps missing • Format of procedure is legible Model • Includes macroscopic (large image) and microscopic (particle model) visuals ○ Lab set-up or particle model has errors • Particle Model of Liquid may (missing 1): ○ Show movement of particles of liquid ○ Utilize arrows to show speed of particle movement ○ Utilize dotted lines to show attractive interactions between particles • Energy Flow may (missing 1) ○ Be labeled with arrows that show where energy is coming from and going ○ Particle model shows where energy is coming from Written Explanation • Shows some understanding of energy flow and KMT as it applies to particle motion. • Demonstrates understanding that particles interact and can stick to each other in various ways • Shows some understanding of how bonds are broken and made that causes changes in energy and how it is measured; evidence may be missing Modification may (missing 1): • Identify what was changed in procedure • Justify why these changes were made • Evaluate and explain how the changes affected their experiment including intermolecular forces and/or total bond energy; evidence may be missing Overall Appearance • Poster clearly communicates information • Color is used	Title • Missing or incomplete Procedure • Communicates some steps; not clear • Multiple errors in procedure and steps missing • Format of procedure is illegible Model • Includes macroscopic (large image) OR microscopic (particle model) visuals with errors • Particle Model of Liquid may (missing 2-3 with errors): ○ Show movement of particles of liquid ○ Utilize arrows to show speed of particle movement ○ Utilize dotted lines to show attraction interactions between particles • Energy Flow may (missing 2-3, with errors): ○ Be labeled with arrows that show where energy is coming from and going ○ Particle model shows where energy is coming from Written Explanation • Shows little understanding of energy flow and KMT as it applies to particle motion. • Does not demonstrates understanding that particles interact and can stick to each other • Shows no or little understanding of how bonds are broken and made that causes changes in energy and how it is measured, evidence may be missing Modification may (missing 2-3, with errors): • Identify what was changed in procedure • Justify why these changes were made • Explain how the changes affected their experiment, evidence not used Overall Appearance • Needs improvement, incomplete

Guiding Question:	
Do Now:	
Important Definitions and Equations:	**Notes:** ________________ studies the movement of heat (energy) • Some objects are able to move heat better (__________) and some do not (__________) • The ability of an object to hold heat, but not get hot (or not get very cold) depends on its ________________, or ability to hold heat energy. If an object has a lower heat capacity: • It tends ________________ ________________ • Is a ________________ If an object has a higher heat capacity: • It tends ________________ ________________ • It is a ________________ When redesigning you want to keep in mind your goal(s): • Increase the efficiency of energy transfer • Increase the accuracy of your measurements
Response:	

6 Make it Better

Calorimetry Lab Pt. 2

With your group, you will modify your previous procedure to determine the amount of energy stored in a food product of your choice from a collection of possible materials. You may need to reference online resources to aid you in the development of this procedure. You need to change at least one component of your system and explain why you are doing it.

Purpose:

Materials: (only include the ones you plan to use)

Procedure: (use a list format to create a step-by-step procedure; be as specific as possible; highlight or circle the part you are changing)

Justification for change: (explain why you are changing one area and what you expect the outcome to be)

Data:

Analysis: From the first procedure to the second, how did the amount of energy change? Why do you think that happened?

Conclusion: Based off of the notes for energy transfer (including diagrams) and your analysis, as well as your poster from part 1, did your prediction (from the justification) match your results (data)? Use what you know about energy transfer to explain how different materials can hold different amounts of energy.

Guiding Question:

Do Now:

Important Definitions and Equations:	**Notes:**
	The human body harnesses energy from ______________________in food to use for different processes that make the body work. • Not all of that energy from food makes it into a process in your body. • Some of it is ______________________. Is losing heat beneficial for your body? • ________Think back to biology. Your body needs to be ______________ ______________. The heat lost from food is actually ______________ ______________________________. Cars also use ______________________to make the engine run. • In a controlled explosion, ______________________and the resulting energy is used to power the engine. • Not all of the energy goes to powering the car. Most of it is______________ ______________________.

Response:

7 Fuel Your Body
Food as Fuel

Directions: Read and annotate the two articles that follow. Be certain to identify the key idea from each paragraph. Then, answer the questions that follow. You will need to be prepared to share with your group and whole class.

How efficient is the human body at converting matter (food) into energy?

And if I were to create an evil Matrix like world could I farm humans to power it?
Depending on what kind of energy, either 20% or 100%.

First, technically, the human body doesn't convert matter into energy, it just extracts chemical energy from the food. The actual matter is either absorbed into the body (like proteins) or is discarded in the form of either moisture or waste.

Studies on athletic motion suggest that the human body can turn about 20% of the food energy it absorbs into actual mechanical energy (like turning a generator or lifting objects). The rest goes into the normal energy of body processes, or is lost to inefficiency. The thing is, like any energy user, all of the energy that's lost ends up as waste heat. That means that, if you don't produce any other form of energy, then all the calories you burn end up as body heat.

The answer to your second question, though is "no". The energy plot is one of the major plot holes in "The Matrix" (and has led to a lot of fan speculation). Even though all of the food we eat ends up as heat, converting that heat into electricity would create huge losses. I won't get into the thermodynamics of it, but it's pretty much impossible for the machines to get more than a few percent of that body heat converted into electricity.

Moreover, feeding the dead to the living is an insanely self-limiting proposition. Each person would consume the equivalent of several human bodies every year. That means that you'd have to kill off three quarters of the population every year to keep the remaining one quarter alive, then kill off three quarters of the remaining population the next year, and you'd be out of people pretty fast.

Any way you slice it, using humans as power generators is ridiculously inefficient. Apparently the Wachowski's originally had different ideas about why the machines would be farming humans, but the studio wanted them to change it because they thought the original ideas were too complicated.

Eat to Fuel Your Body

By Dana Sullivan

Published 6/29/2010

Unlike your car, your body doesn't run equally well whether it's completely topped off or just a drop away from empty. So it's critical to keep your fuel level relatively even throughout the day — eating too much at one meal or not enough at another can leave you lagging. That's one reason nutrition experts are virtually unanimous in their advice to eat small meals — as many as six — throughout the day. "If you refuel every few hours, you avoid the boom and bust cycle that makes you feel depleted and can also lead to overeating," says Sari Greaves, RD, a New York City-based spokeswoman for the American Dietetic Association. If you rely on caffeine and sugar to keep you going at various times of day, you're not fooling your body. "There's no denying the quick fix you get from both, but the effects don't last long," says Greaves. She recommends sticking with "foods that take the edge off *and* prevent rebound hunger." That means meals that contain both complex carbohydrates and lean protein.

Count on Carbohydrates

Carbohydrates have gotten a bad rap thanks to the last decade's worth of fad diets, but they are actually the body's main source of fuel. It's just that in our culture, we rely too much on the carbohydrates that are found in sweet and processed foods, rather than on the complex ones found in whole grains, fruits, vegetables and beans. It's the complex carbs that make you feel comfortably full for longer (which is why they are helpful for weight loss too), according to Cindy Moore, MS, RD, director of the Nutrition Therapy Department at the Cleveland Clinic. "Whole grains, including whole-wheat bread or whole-grain pasta, have staying power because you digest them more slowly than refined grains," she says, "and they also keep blood sugar levels stabilized so you don't feel like your batteries are running low."

About 60 to 65 percent of your total daily calories should come from carbohydrates, ideally of the complex variety. One reason to limit refined carbohydrates (e.g., white and enriched flour and white rice) is that, because their fiber has been stripped away, you use the energy they provide quickly and get hungry again sooner than you do when you eat the more fibrous complex carbs.

Protein Power

Along with the complex carbs, you need protein. "The cells in our body are constantly turning over and need to be replaced," says Moore. "Protein is necessary to help fuel the building of new cells." Protein also helps regulate body processes, such as keeping blood vessels open, and it supplies energy if you aren't eating enough carbohydrates. A typical adult needs between 0.6 and 0.8 grams of protein per 2.2 pounds of body weight. If you weigh 140 pounds, that means you need about 44 grams a day; if you weigh 200 pounds, you need about 63 grams a day. A serving of chicken or beef — which is approximately the size of a deck of cards — contains roughly 21 grams of protein. A cup of yogurt contains approximately 11 grams, and an egg contains about seven.

Essential Iron

What else does your body need? Iron is a mineral that we literally can't live without. Iron's main job is to carry oxygen in the hemoglobin of red blood cells. In turn, the hemoglobin takes oxygen to all the cells in your body. That's why if you're not getting enough iron, you feel weak and fatigued. While Popeye may have gotten his iron from spinach, these days it's easy to find it in fortified cereals and breads, says Moore. Iron from animal sources (called heme iron) is better absorbed by the body than iron from plant sources (nonheme iron). The best sources of heme iron include beef liver (although it's also very high in cholesterol), lean sirloin, lean (as in 90 percent fat free) ground beef and skinless chicken. Nonheme sources include fortified breakfast cereals, pumpkin seeds, soybean nuts, leafy greens such as kale, prune juice and bran; many varieties of beans are also good sources of iron. How much is enough? Men 19 years and older need 8 mg of iron a day; women who are not pregnant and are between 19 and 50 need 18 mg a day (during pregnancy, they need 27 mg a day). After age 50, 8 mg is adequate for women too. If your iron levels are low, try eating meals that include both iron and vitamin C to maximize iron absorption.

Good Fats

Now hear this: Fat is not a four-letter word! Yes, a *high*-fat diet — especially one that includes mainly saturated fats (e.g., meat, whole-milk dairy products, butter) — is unhealthy and causes all sorts of health havoc, from heart disease and obesity to some types of cancer and diabetes. But we actually need some fat in our diet to stay healthy. Like carbohydrates and proteins, fat supplies energy that powers both mental and physical activity. And without it we can't make two essential fatty acids, linoleic acid and alpha-linolenic acid, which we need to help keep our main motor — our brain — running.

The best sources for the fats we need are fish (salmon, anchovies and sardines are especially good) and oils such as olive, canola, sunflower and safflower. The recommended daily limit for fat, according to the American Dietetic Association, is 30 percent of our daily calories. Of that total, at least 20 percent should come from "healthy" fats and no more than 10 percent from saturated fat.

How Much Is Enough?

The American Dietetic Association has a formula that can help you figure out just how much energy you need, in the form of calories, to maintain (or reach) a healthy weight.

1: Multiply your healthy (or ideal) weight in pounds by 10. For example, if you weigh 160 pounds, your basic energy need is 1,600 calories.

2: Now figure out your how much more fuel you need for physical activity. If you are sedentary, multiply your basic energy need by 20 percent; if you engage in light activity (housework, walking leisurely), multiply by 30 percent; if you engage in moderate activity every day (brisk walking, very little sitting), multiply by 40 percent and if you are very active, multiply by 50 percent. For example, if you are moderately active, 1,600 x 0.30 = 480 calories, plus 1,600, for a total of 2,080 calories.

3: Next, figure out how much energy it takes for digestion and absorbing nutrients by multiplying by 10 percent: 2,080 x 0.10 = 208 calories.

4: Finally, add the total number of calories together for your total energy needs. In this case, it's 2,288 calories a day.

Analysis

1. Explain what happens to energy and matter in the food you eat.

2. The human is not perfect at harnessing energy from food. How much is used for bodily functions?

3. If only a small percent of the energy available in food is used for different functions that the body does, where does the rest of the energy go? Is this beneficial? Justify your answer using what you know about the body from your biology class. (Hint: Do you need to be warm? Isn’t your body heat just waste from food?)

4. Fueling your body is important, but how does the fueling process for your body (eating) compared to that of a car? Justify your answer with citations from the articles you just read.

5. Are all carbohydrates bad? Justify your answer with evidence from the articles.

6. Fill in the table below with daily requirements from the article on the pages 27 and 28. Then, using your weight (you can make one up if you want) determine the amount of each you need in your diet. Carbohydrates are harder, so follow the formula provided to you below.

	Weight (lb)	grams of nutrient per pound (g/lb)	Total grams = Weight X g/lb
Protein			
Iron			
Fat			
Carbohydrates			Total grams = (2000calories/day x .65)/4

7. Are all types of nutrients (protein, fat, carbohydrates) created equal? Are any of them totally bad for you? Justify your answer using evidence from the articles and from your answers in the previous questions. Be sure to cite (paragraph number or question number) where you got information from.

Guiding Question:	
Do Now:	
Important Definitions and Equations:	**Notes:**
Response:	

8 Fuel Your Life

Socratic Seminar

Directions:

1. Go to the articles listed below, you must read Article 1 and one additional article from the list below. You can use the link, scan with a QR code or access online (Google Classroom/Schoology). Read the articles, take notes in the space provided below.
2. Go to the videos below. You must watch 1 video. Use the link, scan with QR code, or access online (Google Classrooom/ Schoology). Watch the video and take notes in the space provided below.
3. Create 3 discussion questions. These may be questions that you still have after reading the articles and watching the video, though it is not required. They need to be thought provoking and lend towards a discussion. These are not yes/no, I agree/disagree, or short response (where the answer is given in the article or video) question. They should build on the work you already did with the articles and connect to the articles you read earlier in this workbook..
4. Do all of this PRIOR to coming to class for the discussion. If the work is incomplete (even if you don't do just the questions), you will not be allowed to participate.
5. Use the rubric at the end of the activity (packet) to determine what you need to do for the seminar. For an A or extra credit, you must do more than what the directions specify.

Article 1: ***Energy Density*** **(EVERYONE MUST READ THIS ONE)**

https://drive.google.com/open?id=0B5lB-uW7jKhraDZsMHRuTDc0WjA

Article 2: ***Few transportation fuels surpass the energy density of gasoline and diesel.***

https://drive.google.com/open?id=0B5lB-uW7jKhrUFJXTEhIanhHSG8

Article 3: ***Crunching the Numbers on Alternative Fuels***

https://drive.google.com/open?id=0B5lB-uW7jKhra1V3QUpOSnNNLVE

Article 4: ***Types of Alternative Fuels***

https://drive.google.com/open?id=0B5lB-uW7jKhrMWZ1Nm5kYzdueUU

Date:

Video 1: "This is 200 calories."

https://youtu.be/KMGUmcveQeg

Video 2: "What if the world went vegetarian?"

https://youtu.be/ANUoAdXfA60

Video 3: "Why are we addicted to gasoline?"

https://youtu.be/4589op6bH8Y

Notes

Article 1:

Choice Article: ____

Video: ____

Questions

1.

2.

3.

Seminar Notes

Energy in Fuels Rubric Socratic Seminar 3D Assessment Rubric

PE: HS-PS1-3 (Plan and) conduct an investigation (*research*) to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.			
SEP: Analyzing and Interpreting Data, Asking questions and defining problems, Arguing from Evidence	DCI: HS-PS1 Matter and Its Interactions: Structure and Properties of Matter, Chemical reactions		CCC: Energy and Matter
Advanced (4/A)	Proficient (3/B)	Developing (2/C)	Beginning (1/DF)
Preparedness • Notes ○ Meets Proficient ○ Includes notes from a source not provided by teacher and a printout of article • Questions ○ Meets Proficient ○ More than 3 Questions Discussion • Exceeds Proficient in at least 3 points Written Reflection • Exceeds Proficient ○ 500+ Word count ○ Typed only ○ Cited ○ Additional source(s) used appropriately	Preparedness • Notes ○ All resources have thorough and detailed notes ○ Show that individual has read and understood most of the content • Questions ○ 3 Questions ○ Thought and discussion provoking; not yes/no questions ○ Relate back to the resources Discussion • Asks at least 1 question • Responds to at least 1 student in a productive way that adds to the discussion • Participates in at least 1 large group discussion on a particular topic/question • *Specifically* refers back to 2 resources, one must be a text resource • Communicates in a respectful way that does not diminish the integrity of another student • Looks at the person speaking • Does not engage in side conversations or activities (no phone) • Is an attentive listener while part of discussion circle and observing Written Reflection • Ties in class discussion with reading and lab work with specific details from each and citations (title of lab or article is sufficient) • Compare food fuels to mechanical fuels using support from text/lab/discussion • Decide what mechanical fuel would be the best based on energy density and impact on environment and defend your decision • 300 words minimum; legible (may be handwritten or typed)	Preparedness • Notes ○ Most resources have notes; lack detail ○ Show that individual has read and understood some of the content • Questions ○ 2-3 Questions ○ 1 may be a yes/no question ○ May not relate back to the resources Discussion, does not do at least 1 of the following: • Asks at least 1 question • Responds to at least 1 student • Participates in at least 1 large group discussion on a particular topic/question • Refers back to 2 resources, one must be a text resource; may not be specific • Communicates in a respectful way that does not diminish the integrity of another student • Looks at the person speaking • Does not engage in side conversations or activities (no phone) • Is an attentive listener while part of discussion circle and observing Written Reflection • Ties in class discussion with reading and lab work, some details from each are missing and no or insufficient citations • Compare food fuels to mechanical fuels; may use some support, but it is not sufficient • Decide what mechanical fuel would be the best; incomplete or insufficient defense of choice • 200-300 words, may be hard to read (handwritten or typed)	Preparedness • Notes ○ Some resources have notes; lack detail; some are missing completely ○ Show that individual has read and understood some of the content • Questions ○ 1-2 Questions ○ 1-2 are a yes/no question ○ Do not relate back to the resources Discussion, does not do at least 3 of the following: • Asks at least 1 question • Responds to at least 1 student • Participates in at least 1 large group discussion on a particular topic/question • Refers back to 2 resources, one must be a text resource; may not be specific • Communicates in a respectful way that does not diminish the integrity of another student • Looks at the person speaking • Does not engage in side conversations or activities (no phone) • Is an attentive listener while part of discussion circle and observing Written Reflection • Ties in class discussion with reading and lab work, details from each are missing and no citations • Compare food fuels to mechanical fuels, no or insufficient support • Decide what mechanical fuel would be the best; incomplete defense or explanation • Less than 200 words, hard to read (handwritten or typed)