|  |  |
| --- | --- |
| Quiz(14pts) |  |
| Completeness(10pts) |  |
| **GRADE:** |  |

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ APES

Mr. Crisci

**Lab: ENERGY SAVINGS** Date: **\_\_\_\_\_\_\_\_\_**

**PART I:** Approximately 20 percent of the energy used in the United States is consumed in the home. Energy is used in many ways: to heat, cool, and light your rooms, to heat water, to refrigerate and cool your food, to wash and dry clothes, to entertain you, and to aid in personal care. In this activity you will explore the number and kinds of appliances you have in your home. You will compare this information with the appliances and adult had in his/her home a generation ago. Your results should help you understand the important role that energy plays in your life, and why energy demand has increased. Keep in mind that most of this energy comes from fossil fuels.

PROCEDURE:

1. Under column 1 of the appliance survey, record the number of each kind of appliance you have in your home. Total the number of appliances in column 1.
2. Ask one of your parents to complete the survey by listing the appliances found in his/her home when he/she was the age you are now. Record their results in column 2. Total the number of appliances in column 2.

|  |  |  |  |
| --- | --- | --- | --- |
| **APPLIANCE** | **NUMBER YOU HAVE** | **NUMBER YOUR PARENTS HAD** | * **OR X**
 |
| Televisions |  |  |  |
| Smart/Cell Phones |  |  |  |
| Desktop Computer |  |  |  |
| Laptop Computer |  |  |  |
| Tablet Computer |  |  |  |
| Washing Machine |  |  |  |
| Dryer |  |  |  |
| Hair Dryer |  |  |  |
| Video Game Console |  |  |  |
| DVD and/or VCR Player |  |  |  |
| Microwave |  |  |  |
| Refrigerator |  |  |  |
| Air Conditioner or Central Air |  |  |  |
| Curling Iron/Straighteners |  |  |  |
| Cloths Iron |  |  |  |
| Coffee Maker |  |  |  |
| Dishwasher |  |  |  |
| Vacuum or Robotic Vacuum |  |  |  |
| Air Filters/Humidifiers  |  |  |  |
| **TOTAL:** |  |  |  |

QUESTIONS:

1. How does the total number of appliances you use today differ from the number of appliances used by a young adult when he/she was the age you are now?
2. Why do you think the numbers differ (what kinds of changes have taken place to make this possible)?
3. Go back to the table above and put a check mark you simply could not live without and put an X in the space which you feel you could eliminate from your home. Is it similar or different to what your parents had?
4. What are TWO environmental impacts of the appliance/electronic explosion?

|  |  |  |
| --- | --- | --- |
|  | **Old fixture** | **LED fixture** |
| **Initial cost** |  |  |
| **Wattage** |  |  |
| **Electricity cost** (19¢/kWh) |  |  |
| **Lifespan** (continuous use) |  |  |
| **Lifespan when used for12 hours a day, 7 days a week** |  |  |
| **No. of times an old fixture to be replaced each year** |  |  |
| **No. of times an old fixture to be replaced during the LED fixture's lifespan**(\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)) |  |  |
| **Cost of replacements each year**([Incand. bulb cost] × [Number of replacement per year]) |  |  |
| **Total annual cost**([Cost of replacing fixtures] + [Electricity] + [Labor cost]) |  |  |
| **Total cost**(after \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) |  |  |
| **Total savings /w LED fixture (ROI)**(after \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) |  |
| **Break-even point**(The amount of time necessary to save as much money as you invested initially) |  |

**PART II:** The purpose of this part of the activity is to see what the savings in dollars and CO2 emissions would be if you replaced the incandescent light bulbs or compact fluorescent lightbulbs (CFL’s) with newer LEDs (light emitting diodes)

**Google: LED Bulb Savings Calculator or go to** [**https://www.ledwaves.com/led-calc.html**](https://www.ledwaves.com/led-calc.html)

Procedure:

1. *Go around your house and count up how many incandescent or halogen light bulbs you are currently using and fill in the chart below.*

 Fill in the FORM below and enter

it in the calculator:

|  |  |
| --- | --- |
| *# of incandescent/halogen bulbs* |  |
| Wattage | 60 watts |
| Price per bulb | 1.00 |
| Lifespan | 1,000 |
| LED replacement wattage | 9 watts |
| Price per bulb | 4.00 |
| Lifespan | 50,000 hrs |
| Energy rate on Long Island | 19 cents/kWh |
| Average Hours of Operation |  |
| Lit days per week |  |

***Hit the calculate button***

**Calculate how much CO2 emissions you would save by switching to LEDs:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| # OF INCANDESCENT | WATTS PER BULB | TOTAL WATTS OF ALL BULBS | AVERAGE HOURS ON PER DAY  | AVERAGE HOURS ON PER YEAR(x 365) | CONVERT TO KILOWATTS PER HOUR (1,000 watts = 1 kilowatt) | CALCULATE CO2 (1kWh = 1.25 pounds of CO2) |
|  | 60 |  |  |  |  |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| # OF LEDs if replaces all bulbs in house | WATTS PER BULB | TOTAL WATTS OF ALL BULBS | AVERAGE HOURS ON PER DAY  | AVERAGE HOURS ON PER YEAR(x 365) | CONVERT TO KILOWATTS PER HOUR (1,000 watts = 1 kilowatt) | CALCULATE CO2 (1kWh = 1.25 pounds of CO2) |
|  | 9 |  |  |  |  |  |

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Subtract the total pounds of CO2 from the traditional bulbs from the total in one year from the LEDs. That is how many pounds of CO2 you would save per year by switching. Show work and circle how much CO2

LED bulbs last for about 25 years. Now calculate your CO2 savings over that time span. Show your work below and circle your final answer.

**PART III: Home Solar Energy:**

**Google: Project Sunroof**

1. *Ask your parents about how much your electric bill is per month: \_\_\_\_\_\_\_\_\_\_\_\_\_*
2. After finding your home, look at the map and record what direction your roof faces: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. What is the total hours of usable sunlight per year your roof receives? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. What is the square footage available for solar panels? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Click on fine-tune estimate and record the percentage of your electricity usage the panels would cover and the size in kilowatts (kW) of the solar system:
6. There is two main ways to finance your solar panels. Please make sure you click on lease / PPA and then *click on the show detailed estimates* dropdown. Record the costs and savings:

|  |  |
| --- | --- |
| Up-front cost of installation |  |
| Total payments over 20 years |  |
| Total 20-year cost with solar |  |
| Total 20-year cost without solar |  |
| **Total 20-year savings** |  |

1. Now click on Buy, *hide the detailed estimates this time*. Record the costs and savings:

|  |  |
| --- | --- |
| Up-front cost after incentives (both federal and state) |  |
| 20-year benefits |  |
| **Total 20-year savings** |  |
| How many years until payback (break-even point) |  |

1. Stay on the buy finance column but click on the *show the detailed estimates* and record the different incentives you would receive from the government and local utility.

|  |  |
| --- | --- |
| Federal Investment Tax Credit (ITC) |  |
| State tax credit |  |
| Utility incentives |  |
| **Total Incentives** |  |

1. Based on this info would you considering purchasing solar panels for your home? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Explain why you chose yes or no:

1. Besides the economic benefits of solar panels, what are TWO environmental benefits of residential solar energy?