Wind Turbine Project

Name:_____Date_____Hour____

Partner Name:_____

Introduction: Alternative energy has been a hot topic in the last few years. We have seen more and more wind turbines and wind farms implemented to shift our main use of energy from nonrenewable sources to renewable sources of energy.

A **nonrenewable source** of energy is energy that we cannot make more of. There is a certain amount of this type of energy, and once it is depleted, there is not a way to create more for our use.

Examples of nonrenewable sources of energy include coal, natural gas, and oil.

A **renewable source** of energy is energy that we can easily get more of. We can either create more within our lifetime or there is constantly more around.

Examples of renewable sources of energy include sun, wind, water current, biomass (living energy like wood), etc.

Problem: Most of our energy consumption today comes from nonrenewable sources. For example, we fill our cars up with oil. Most of our electricity comes from coal. This is a problem because there will be a point when **we run out** of these nonrenewable sources.

Solution: Therefore, we have to start becoming creative and shift our energy sources to renewable sources. One idea that is very popular is wind turbines. Wind turbines have many different shapes and sizes.

Your Task: You are going to design a wind turbine that will lift at least 10 pennies off the ground with only the power from wind. The pennies must be lifted at least 30 cm from the ground. Before you design the wind turbine, you should know some of the limitations of your wind turbine design. Your wind source will be a box fan. You can position the wind turbine at any angle or distance from the box fan. You have a budget of twenty dollars and you can only use the materials presented on the following pages.

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Part 1-Research: The first job of a designer is to research designs that you think will work best. Here is a graphic organizer to help you conduct your research.

There are two types of wind turbines: **a vertical axis** turbine and **a horizontal axis** turbine. Research each type on your laptop and record your data below. You should also draw pictures of each type to help with your design. Attach more paper if you need it.

Vertical Axis Turbine	Horizontal Axis Turbine

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Part 1-After researching, answer the following questions about wind turbines.

1. What are some **advantages** of a horizontal axis wind turbine?

2. What are some **disadvantages** of a horizontal axis wind turbine?

3. What are some **advantages** of a vertical axis wind turbine?

4. What are some **disadvantages** of a vertical axis wind turbine?

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Part 1-Planning

Constraints: You have $20 to spend. Below is a table of the supplies and their cost. Remember that your only wind source is a box fan.

Material	Price
Popsicle Stick	$1.00
Rubber Band	$1.00
Straw	$1.00
Styrofoam Block	$1.00
String	$1.00/ 30 cm
Dixie Cup	$1.50
Cardstock	$1.00
Bamboo Skewer	$1.00
Tape	$1.00/ 30 cm

1. With your partner, discuss whether you want to construct a horizontal or a vertical axis turbine. Write a paragraph below explaining why you think the type of axis you chose is the best for your turbine. **You must give at least 3 reasons. Underline your reasons in your paragraph.**

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Part 2: Draw a picture below what you want your turbine to look like. **Label the supplies that are used**. Make sure that this picture is detailed! It doesn't have to look like the work of Michelangelo, but I need to be able to tell exactly how you plan to construct it.

3. Below, complete your order form of your desired materials. Remember that you have a budget of $20 that you cannot exceed.

Material	Price	Quantity	Total Price
Popsicle Stick			
Rubber Band			
Straw			
Styrofoam Block			
String			
Dixie Cup			
Cardstock			
Bamboo Skewer			
Tape			

Grand Total $_____

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Part 2: Begin constructing your wind turbine. Use the box fan to constantly check your design to be sure it is working. If it does not, you can change your plan. Only **TWO** groups at the box fan at a time. Here is the rubric for grading:

Rubric

Wind Turbine Structure	10 points Wind turbine is constructed, and blades turn in wind.	5 points Wind turbine is constructed, but blades do not turn.	0 points Wind turbine is not constructed.
Number of Pennies	20 points Can lift at least 10 pennies 30 centimeters off the ground	10 points Can lift at least 5 pennies 30 centimeters off the ground	0 points Lifts less than 5 pennies 30 centimeters off the ground

Part 3:

Circle one rectangle in each category that you feel was earned after testing your turbine.

What is your total number of points? _____

Why do you think you earned these points?

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Part 3: You will have 20 minutes to finish up your wind turbine design. You will be presenting them to the class today. You need to tell the class:

1. How you constructed your wind turbine
2. Why you constructed it this way
3. The good/bad about your design

Finally, you will test your design in front of the class to see how many pennies it can raise to 30 cm.

Part 4: Variables
Today you will apply Scientific Principles to your wind turbine by changing some variables. Like all designs, only one variable can be changed at a time. You are going to change one variable on your wind turbine. **List some possible variables that you could change:**
(Example: blade height)

_____
_____
_____
_____

Circle the variables that you want to test. When you change the variable, you must run several tests on the new variable. One test is not very reliable because something odd may have happened during that test. Testing a variable multiple times makes sure that the data is reliable. You must also test it the old way multiple times to see how the new variable compares to the old one. Therefore, you can clearly see which variable will give the most desired results. For example, if you are changing blade height, you need to test the blades at your initial size. Let's say your initial size was 15 cm. You are going to test how many pennies the blades at 15cm can lift at five times. Then, you are going to change the blades to 25 cm. You are going to test how many pennies the blades at 15cm can lift at five times. If you have more data, you will have more reliable results.

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Now, **explain** how you are going to change that variable. (For example, I would change the blade height by having two different sizes of blades. One set of blades will be 15cm, and the next set of blades will be 25 cm.)

Finally, test your variables with the pennies multiple times.
Then, fill out the data table.

Changes	Number of pennies that were lifted to 30 cm
Change #1:	
Change #2:	

Explain your results with the changed variables.

Alternative Energy Questions

1. Why is wind energy a better alternative than energy from fossils fuels (coal, natural gas)?

2. What was your most difficult challenge when trying to create a wind turbine to lift the greatest amount of pennies?

3. What did you do to overcome this challenge?

4. From your knowledge that you now have about wind turbines, what would happen if you had too much wind?

5. From your knowledge about wind turbines, what would happen if you had too little wind?

6. From your knowledge about wind turbines, what would happen if your wind turbine was not in the direction of the wind?

7. From your knowledge about wind turbines, what would happen if your wind turbine was very low to the ground?