

Lab 67: Measuring Wind Speed and Direction

Key Words: Anemometer, Wind Vane

Getting Started:

1. Read the following account of Francis Beaufort and the Wind-Force Scale

Francis Beaufort left his home country of Ireland and began sailing at the age of thirteen. He began as a cabin boy and, within 10 years, had risen to the rank of lieutenant in the British Navy. During this time, he was aboard a ship that shipwrecked. Beaufort, and the crew with whom he worked, were stranded and became dangerously close to starving. Luckily, they were rescued before it was too late. This experience compelled Beaufort to develop improved methods for determining wind speed and ship navigation. In 1806, when he was in his 20s, he developed a scale to record daily wind speed based on the size of waves and the moving sails of ships that he could observe while at sea. In 1836, the British Navy decided that all ships would use Beaufort's method for ranking wind speed. In the 1920s, a British meteorologist adapted the scale to land-based observations, such as the movement of leaves on trees or a flag on a flagpole.

2. Look at Transparency 67.1, "Samples of Beaufort Wind Force Scale," which is attached to this packet. This scale is still in use today. The Beaufort Scale is a method for visually judging the force of wind, allowing people to describe relative wind speed on a scale of 1 to 12. It does not provide an exact measurement of the speed at which the wind is travelling.
3. Read the introduction and Challenge to Activity 67, "Measuring Wind Speed and Direction," in your Student Book.
4. Look at the pictures in your Student Book of different designs for instruments to measure wind speed and direction. Do you think each of these tools measure wind speed, wind direction, or both? How might each tool work to measure the wind?

Top Left:

Top Right:

Name _____

Date _____ Block _____

Bottom Left:

Bottom Right:

Procedure:

Part A: Creating a Design

1. You will make a wind vane and an anemometer.
2. Review the list of materials that are available to you in your Student Book. Think about how you would like to build your instrument.
3. Draw and label the parts of your design on Student Sheet 67.1, "The Design Process," which is attached to this packet.
4. Your classmates shared feedback with each other on Student Sheet 67.1. You will need to talk to a lab partner when you return to class in order to attain feedback.
5. On Student Sheet 67.1, write a step-by-step procedure that explains how to use your instrument to measure the wind.

Part B through Part D:

1. When you return to class, you will need to build, test, redesign, and refine your design. You will then collect wind data. You must talk to your teacher when you return to class to set up a time to complete Parts B through D.

Analysis Questions:

1. Evaluate your two instruments by completing the following table.

<u>Instrument Evaluation</u>		
Instrument	Strengths	Weaknesses
Wind Vane		
Anemometer		

2. What do the more successful wind-measurement instruments have in common? Hint: You must gather data on the rest of the class’ designs.

3. You designed and tested your anemometer and wind vane at school. Imagine using them on a ship, as Francis Beaufort did.

a. What factors might be different on a ship than at school?

b. Describe how you would adjust the design of your instruments so that they would work well on a ship.

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Samples of Beaufort Wind Force Scale

Force	Description	On Land	Wind Speed (km/hr)
0	calm	Smoke rises straight up	0
3	gentle breeze	Leaves constantly moving, light-weight flags extended	12–19
5	fresh breeze	Small trees with leaves begin to sway, flags extended	30–39
7	near gale	Resistance felt against walking	51–61
9	strong gale	Damage to buildings, slate blows off roofs	75–87
11	violent storm	Trees uprooted	101–119

Name _____

Date _____ Block _____

The Design Process

A. Instrument (circle one): wind vane anemometer

B. Instrument measures (circle one): wind direction wind speed

C. Your Design (sketch your design and label all materials)

D. Feedback from group:

1.

2.

E. Testing Procedure (explain how to use your instrument to measure wind)

1.

2.

3.

4.

The Design Process (cont.)

F. Table 1: Results of Testing the Instrument

Possible problem with instrument design	Planned changes	Results of testing revised design

G. Final Design (draw sketch of revised design and label all materials)**H. Table 2: Measuring Wind Data** (speed or direction)

	Trial 1	Trial 2	Trial 3
Date			
Time			
Location			
Wind data			