



Name \_\_\_\_\_

## Jet Stream 101

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1. What are jet streams? **A jet stream is a river of wind in the upper atmosphere that can reach speeds of up to 300mph.**
2. Sketch United States and draw in where the jet streams are located for today.  
**Answers will vary according to current real time data.**
3. How are jet streams formed?  
**Jet Streams form along the boundaries of global air masses where there is a significant difference in atmospheric pressure.**
4. In which direction do jet streams flow?  
**West to east.**
5. Where are jet streams typically found around the globe?  
**Two are found in each hemisphere: the polar jet and subtropical jet.**
6. What type of air masses do jet streams separate?  
**They separate cold air masses and warm air masses.**
7. Why do you think it takes longer flying back to the United States from Europe than it takes flying from the United States to Europe?  
**This phenomenon is explained by tail winds and head winds created by jet streams. If you are flying with the jet stream, you don't use as much gas and can go further.**
8. How are jet streams and the Gulf Stream alike? How are they different?  
**Answers may include:**  
**Similarities: both flow, they have affects on climate and they curve like rivers**  
**Differences: different direction flows, different speeds, different locations, and different flow behaviors (i.e. Gulf Stream branches off)**
9. If you were in a hot air balloon traveling across the Atlantic Ocean, how would the jet stream affect your flight?  
**Jet stream winds would increase the speed of the balloon's flight. The energy consumption would be less because of high wind speeds. Outside temperatures would drop considerably. The high altitude affects breathing.**



Name \_\_\_\_\_

## METEOROLOGIST

1. What is an anemometer?

An anemometer is an instrument that measures the speed and force of the wind.

2. What are knots? (Not the ones used in ROCK CLIMBING!!!)

A knot is a nautical unit of speed equal to the velocity at which one nautical mile is traveled in one hour.

3. What is the speed in meters/second of 25 knots?

12.86 m/s

4. What is a meteorologist?

A meteorologist is a scientist who studies the atmosphere phenomena.

5. What are the responsibilities of a meteorologist?

Forecasters use the observations from ground and space with formulas and rules based on experience of what has happened in the past and then make their forecast.

6. What type of tools and equipment do meteorologists use to predict weather (minimum of 3)?

Thermometer, barometer, rain gauge, anemometer, satellite, and radar

7. Name a local meteorologist.

Answers will vary according to local television website.

### **BONUS (EARN YOUR METEOROLOGIST CERTIFICATE)!!!**

Send an email to a local meteorologist asking him/her a question. When you receive a response, **print** the response and present the information to the class.

Answers will vary.

Name \_\_\_\_\_

# GEOLOGIST



The Coriolis Effect is a subtle but very important part of meteorology. People still argue whether or not it affects bathtubs. Even meteorologists sometimes have difficulty explaining it carefully. Do not be discouraged if this section seems hard.

1. What is the Coriolis Effect?

**The Coriolis Effect is a force per unit mass that arises solely from the earth's rotation, acting as a deflecting force.**

## **Lab: Effect of Rotation on Streams of Water (Coriolis Effect)**

### Questions to "Effect of Rotation on Streams of Water" Lab

1. What happened to the direction of the stream of water when you added water to the liter bottle in step 1? (This is before you rotate the turntable.)

**The water flowed in a straight line.**

2..What happened to the direction of the stream of water in step 1 when you rotated the turntable?

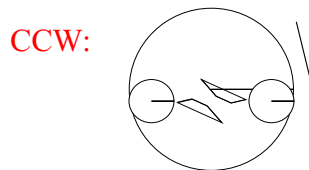
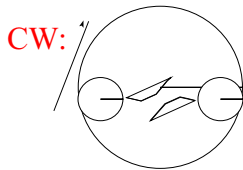
**Clockwise: water flowed to the left**

**Counterclockwise: water flowed to the right**

3. What happened to the direction of the streams of water in step 2 when you rotated the turntable with the 2 liter bottles clockwise? Counterclockwise? (You may want to sketch a drawing instead of writing it out).

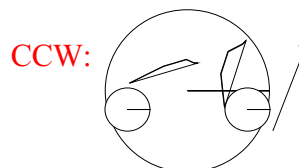
**Clockwise: Both streams flowed to the left**

**Counterclockwise: Both streams flowed to the right**



4. In step 3, the two bottles were placed against the wall of the container with their openings parallel to the wall. What happened to the direction of the streams when rotated clockwise? Counterclockwise? (You may wish to sketch a drawing).

**The stream that is flowing in the same direction as the direction of rotation should curve toward the wall of the container. The stream that is flowing in the opposite direction as the direction of rotation should curve away from the wall of the container.**



5. When the turntable is rotating counterclockwise, the direction of the stream of water should be towards the right. This is analogous to the Northern Hemisphere of the Earth. If you lived in Africa, what direction would the direction of the stream of water turn? Why?

The stream of water would flow to the left because the Earth's rotation is clockwise when viewed from the South Pole. When viewed from the North Pole, the Earth's rotation is counterclockwise causing the water to flow to the right.

6. Sketch the pathway of the ball demonstrating the Coriolis Effect in the following website. Explain why the ball took the path it did.

Students should sketch the graphic depicting the path of the ball and the Coriolis force vectors located in the link provided.

7. Go the following website to view a demonstration on the Coriolis Effect. Once you reach that website, select the following file: Coriolis.mpg

Write a few sentences about what you observed.

Answers will vary depending on student observation.

8. Is the reason the water flows down a certain direction in a toilet bowl because of the Coriolis Effect? Explain why or why not?

The Coriolis Effect does not have an effect on what direction the water flows down the toilet bowl. The reasons are:

- a. The water is moving too slowly. The Coriolis Effect only affects things with high speeds.
- b. The Coriolis Effect operates on much larger scale.



Name \_\_\_\_\_ **ENGINEER**

1. What is the Conservation of Momentum?

The Conservation of Momentum states that the total momentum of an isolated system does not change.

**2. Conservation of Momentum Demonstration.** (See teacher for supplies.)

Have one five-pound weight in each hand (a total of 10 pounds.)

- a. Sit on a rotating office stool or chair.
- b. Hold your arms (with the weights in each hand) straight to the side.
- c. Have one of your classmates lightly spin the stool.
- d. Make note of how fast you are spinning.
- e. Slowly move your arms into your body.
- f. Make note of how fast you are spinning.
- g. Slowly move your arms straight to your sides again. Note your speed again.
- h. *Virtual Demonstration: View the following website for a demonstration of Conservation of Angular Momentum.*

*Questions:*

1. What happened to your speed when you pulled your arms into your body?

The speed that the stool was rotating at increased.

2. How does this demonstration explain the Conservation of Momentum?

The energy in a system must always remain the same. The shorter the distance of your arms are extended, the faster the stool will spin. The longer the distance of your arms are extended, the slower the stool will spin.

**Change in Pressure Demonstration**

1. Obtain a balloon from your teacher.
2. Blow into the balloon. Seal the end with your finger.
3. Let go of the balloon.

*Questions:*

1. What kind of pressure did you have in the balloon (High or Low) when you sealed it? High

2. In comparison, what kind of pressure did you have in the room (High or Low)?

Low

3. When you released the balloon, did the air flow from high pressure to low pressure or vice versa?

High pressure to low pressure

4. How is the strength of the force of wind related to air pressure difference?

The greater the difference in pressures, the stronger the force.