**Factors Affecting Evaporation Lab**  Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Partners: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Introduction:**

When liquid evaporates to a vapor, the particles take their energy with them and therefore remove heat from the surrounding material. When we are hot, we sweat. When sweat evaporates, it makes us feeling cooler. Since the pores in your skin are always producing moisture, your body heat is continually drawn away as the moisture evaporates. Moving air, like a fan or wind, *affects the rate of evaporation.* Different substance have different rates of evaporation depending on their chemical structure.

**Purpose:** To determine factors that affect evaporation rates.

**Materials: 1** thermometer, 3 pieces of double layer cheese cloth, rubber band, three small beakers (50-100 ml), water, glycerol, ethanol

**Part A: Letting Water Air Dry**

1. Obtain 3 small beakers and label: water, ethanol, glycerol.
2. Pour about 10-20 ml of each liquid into respective beakers.
3. Create a “Wet Bulb Thermometer” by wrapping a square of double layer cheese cloth around the bulb of the thermometer and secure with rubber band. Record initial temperature.
4. Dip thermometer into the water beaker.
5. Without waving the thermometer, let it “air dry” for 1 min. Record the temperature after 1 minute in table below. Then again after 2 minutes.

**Data Table A:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Initial temperature(dry bulb) | Air Dry Temperature: 1 min | Air Dry Temperature: 2 min |
| Water |  |  |  |

**Part B: Letting Liquids Blow Dry**

1. Using the same thermometer and cloth from Part A, let cloth end of thermometer sit in water beaker for 1 min. Record this initial temperature in chart below (Data Table B).
2. Remove thermometer from beaker and hold it in front of fan and start timer. Record temperature at 1 min and again at 2 minutes.
3. Remove cheese cloth and discard into garbage. Clean and dry thermometer.
4. Assemble a new “Wet Bulb” as do the same (repeat steps 1-3) for ethanol and glycerol with new cheesecloth and same, clean, dry thermometer.
5. Place a drop of water and a drop of ethanol on different spots on the back of your hand and let them evaporate. You can use the fan if you like. Note how the area with the drops feels compared to the rest of your hand. Does each drop feel different from each other?
6. Clean up and individually answer the questions on the following page. Hand in.

Data Table B:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Initial Temp | Temperature After blow drying 1 min | Temperature after blow drying 2 min |
| Water |  |  |  |
| Ethanol |  |  |  |
| Glycerin |  |  |  |

**Analysis:**

1. What is the independent variable in this experiment? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What is the dependent variable in this experiment? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Why was it important to record the room temperature at the beginning and end of the experiment?
4. Compare your temperature results of water AIR drying (Table A) to BLOW drying (Table B). In which table was there a ***greater change*** in temperature between the first and second minute? Use CER (Claim, Evidence, Reasoning) to answer:

CLAIM: The trial with the greatest temperature change was: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

The EVIDENCE was: (state your results): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The REASONING for this is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Compare the temperatures in Data Table B. Use CER (Claim, Evidence, Reasoning) to explain which liquid had the fastest rate of evaporation.

CLAIM: \_\_\_\_\_\_\_\_\_\_\_\_ had the fastest rate of evaporation.

The EVIDENCE is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

The REASON for this is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. When you put a drop of water and a drop of alcohol on the back of your hand, which evaporated first? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Which felt cooler? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ . If someone has a fever, which would be more effective to sponge them with to cool them down? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. How do you think the rate of evaporation of the liquids (measured by the temperatures) would be affected if the room was very warm or very cold? Explain your reasoning. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Apply: When we feel cold, we put on an extra layer of clothing to keep us warm. Explain why wrapping the thermometer in cheese cloth didn’t keep it warm (as indicated by the decrease in temperature).

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1. Summarize what you have learned from this experiment, specifically:
* How does moving air affect rate of evaporation?
* How does viscosity of liquid affect rate of evaporation?
* How does ambient temperature affect rate of evaporation?
* How does evaporation affect temperature of object?
1. Why was cloth fastened to the bulb of the thermometers? What affect did this have on the rate of evaporation?
2. Going Further: Wind Chill describes how much colder it “feels” than the actual temperature outside when it is windy. This is important in areas where the weather is near the temperature can give you frostbite (when exposed skin freezes and becomes damaged). Explain why wind chill is not a factor for a car left outside on a cold, windy night.

On South Georgia Island, the wind chill can get as low as -57° C. Research and explain why penguins do not freeze to death in the An Once the wind chill makes the temperature feel like –28◦ C or colder, exposed skin can freeze in less than 30 minutes. When it drops to –40 ◦ C, frostbite can occur in less than 10 minutes. Take it to –55◦ C, and you're in danger within two minutes. Frostbite will only occur when the surrounding temperature is below freezing.

tarctic. Wind chill is based on the rate of heat loss from exposed skin caused by wind. If the temperature is -10 degrees Celsius and the wind is blowing at 15 km/h, the wind chill is (feels like) -17 degrees Celsius.

The only effect wind chill has on inanimate objects, such as car radiators and water pipes, is to shorten the amount of time for the object to cool. Inanimate objects will not cool below the actual air temperature because they are not producing moisture that will evaporate.