

Name: \_\_\_\_\_ Date: \_\_\_\_\_

### Lab: Sea Breezes and Land Breezes

**Introduction:** Do you have a pencil? A sea breeze occurs when wind blows from the sea towards the land. A land breeze is just the opposite – it occurs when wind blows from the land towards the sea (or ocean). Sea breezes and land breezes develop due to differences in heating of the sea (or ocean or very large bodies of water) and land by radiation from the sun.

#### Part I. Changing the Density of Air

1. What happens to the density of air (imagine an air parcel) when it is heated? Explain why this happens.

1a. If air is heated, causing its density to change, which direction will it begin to move in? (HINT: think of a hot air balloon that is heated!) Explain.

2. What happens to the density of air (imagine an air parcel) when it is cooled? Explain why this happens.

2a. If air is cooled, causing its density to change, which direction will it begin to move in? (HINT: think of a hot air balloon that is heated!) Explain.

#### Part II. The Specific Heat of Land and Water

Specific heat is the measure of heat energy required to increase the temperature of a certain amount of a substance by a certain temperature interval. In other words, it's how well or how poorly a material absorbs heat energy. More heat energy is required to raise the temperature of a substance with a high specific heat than a substance with a low specific heat. In general, a material with a lower specific heat will heat up faster than a material with a higher specific heat.

1. Using your ESRT, find the specific heats for liquid water (this will represent ocean water) and granite (this will represent the sand on the beach or Earth's solid surface).

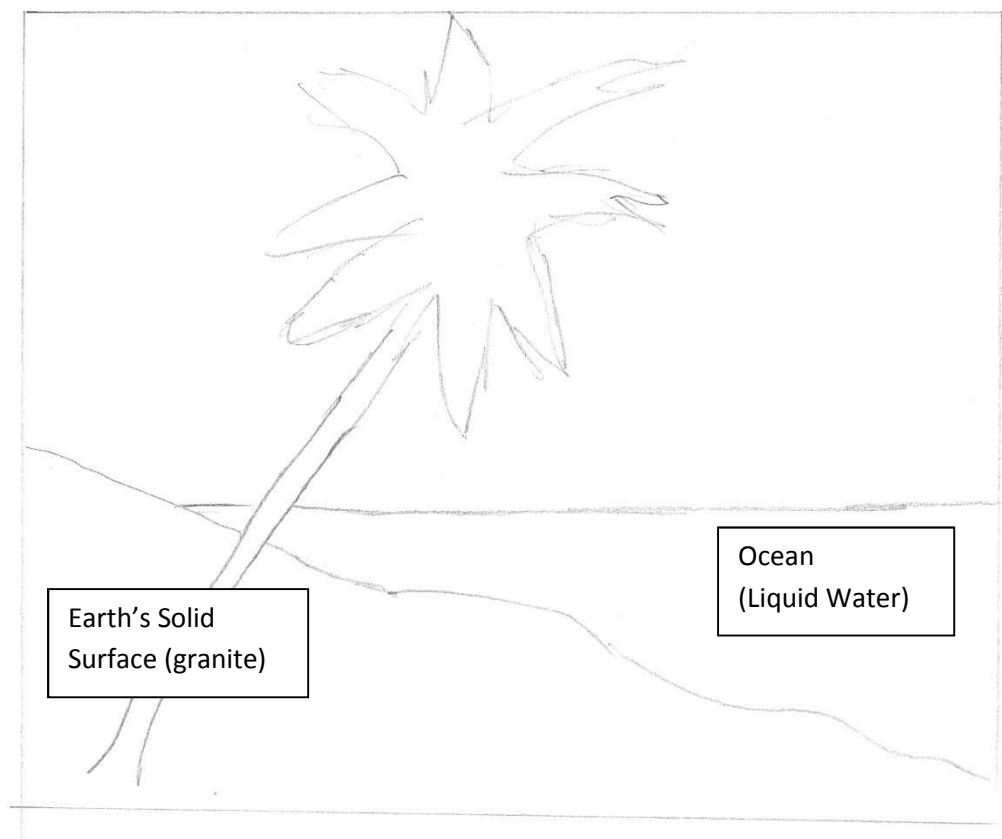
Liquid water (ocean) = \_\_\_\_\_ J/g·°C      Granite (Earth's solid surface) = \_\_\_\_\_ J/g·°C

2. Does liquid water (ocean) or granite (Earth's solid surface) have a higher specific heat?

3. Between water (ocean) or granite (Earth's solid surface), which will **heat up fastest** during a hot summer day. Explain.
  
4. Between water (ocean) or granite (Earth's solid surface), which will **cool up fastest** during a hot summer day. Explain.

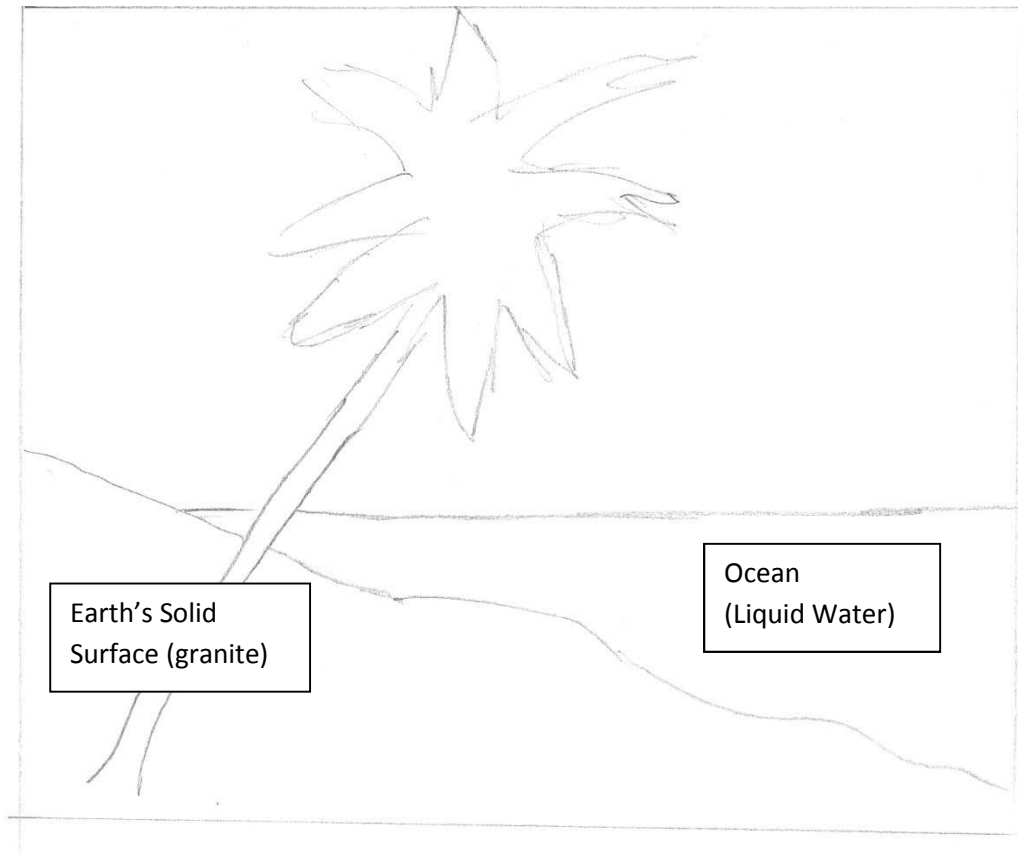
### Part III. Sea and Land Breezes

- a. The picture below shows two main types of surfaces exposed to the sun on a hot summer's day. One surface is titled as the "Ocean (Liquid Water)," whereas the other surface is titled as "Earth's solid surface (Granite)." Draw a couple of arrows pointing up ( $\uparrow$ ) over the surface where air would be heating up fastest. Draw a couple of arrows pointing down ( $\downarrow$ ) over the surface where air would be heating up the slowest (or in other words where the air is cooler). Clouds typically form wherever the air is rising, so draw in a few clouds over the surface where the air is rising.



1. What kind of pressure is associated with rising air? \_\_\_\_\_ sinking air? \_\_\_\_\_
2. Label the diagram above just above the surface with an L or H depending on where the low and high pressures are located.
3. Winds blow from \_\_\_\_\_ to \_\_\_\_\_ pressure.
4. Draw an arrow depicting the air flow and label the type of breeze it is.
5. Finally complete the circulation above.
6. The diagram above represents a \_\_\_\_\_ breeze.

- b. The picture below shows two main types of surfaces on a cool summer night. One surface is titled as the “Ocean (Liquid Water),” whereas the other surface is titled as “Earth’s solid surface (Granite).” Draw a couple of arrows pointing down (↓) over the surface where air would be cooling the fastest. Draw a couple of arrows pointing up (↑) over the surface where air would still be relatively warm (in other words, this surface would be cooling at a slower rate). Clouds typically form wherever the air is rising, so draw in a few clouds over the surface where the air is rising.



1. What kind of pressure is associated with rising air? \_\_\_\_\_ sinking air? \_\_\_\_\_
2. Label the diagram above just above the surface with an L or H depending on where the low and high pressures are located.
3. Winds blow from \_\_\_\_\_ to \_\_\_\_\_ pressure.
4. Draw an arrow depicting the air flow and label the type of breeze it is.
5. Finally complete the circulation above.
6. The diagram above represents a \_\_\_\_\_ breeze

**CONCLUSION:** Write a paragraph explaining what causes a sea breeze and a land breeze to form. Include heating/cooling, density of air, low and high pressure and how wind blows in your conclusion