Name_____ Date _____

Desalination

STEM Sims

Lesson 1: Learning the Parts

A number of places on Earth are having a serious lack of rainfall. These droughts lead to very small supplies of fresh water. Many places need a way to make fresh water to make up for the lack of rain. Desalination is one way to make fresh water. Are you ready to dive into this investigation?

Doing the Science

Part I. The States of Matter

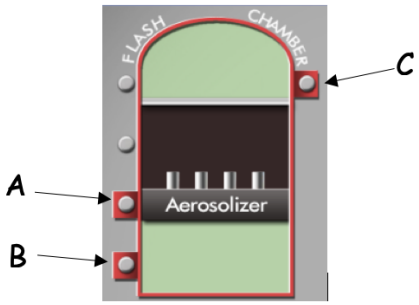
1. The simulation is *not* required for this lesson.
2. Matter can exist in different states. The three most common states of matter found here on Earth are solid, liquid, and gas. For instance, H_2O exists as a solid, known as ice, a liquid, what we drink and call water, and as a gas, called water vapor. Each state of matter has distinct features. Table 1 presents some of these traits.

Table 1. States of Matter Characteristics

	Solid	Liquid	Gas
Distance between particles	Particles are very close together; touching	Particles are very close together, but not a close as a solid	Particles are very far apart
Can be squished into a smaller volume	No	No	Yes
Motion of particles	No change in position, only jiggle in place	Small, slow changes in position and jiggle more than a solid	Very fast motion in many directions and jiggle more than liquids
Definite volume?	Yes	Yes	No, spread out to fill any container
Definite shape?	Yes	No, take the shape of any container because the particles are free to move	No, take the shape of any container because the particles are free to move

Part II. Desalination Plant Parts: The Flash Chamber

3. The image below shows the flash chamber where the aerosolizer is located.



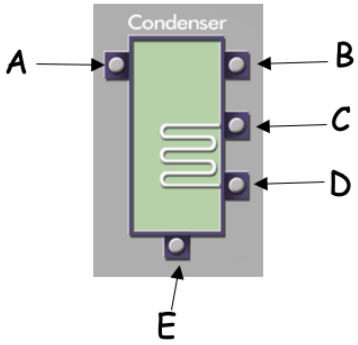
4. The letter "A" shows where liquid warm ocean water is pumped into the flash chamber.

5. The letter "B" shows the outlet return for the liquid warm water to be pumped back into the warm ocean water tank.

6. The letter "C" shows where water in the gas phase is moved through pipes into the condenser.

Part III. Desalination Plant Parts: The Condenser

7. The image below shows the condenser.



8. The letter "A" shows where water in the gas phase enters the condenser.

9. The letter "B" shows where extra water in the gas phase exits the condenser and moves to the gas outlet.

10. The letter "C" shows where liquid cold water enters the condenser.

11. The letter "D" shows where liquid cold water returns to the cold water tank.

12. The letter "E" shows where liquid fresh water exits the condenser and moves to the fresh water storage tank.

What Do You Understand?

1. A one-liter bucket of water spills on the floor and spreads out evenly on the floor into a puddle. What volume of water is now in the puddle? Provide a reason to support your answer.

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2. A one-liter balloon filled with helium gas pops and the helium gas spreads out evenly in the room. What volume of helium gas is now in the room? Provide a reason to support your answer.

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3. Some liquid water is heated. What should happen to the motion of the water particles as the liquid is heated? Provide a reason to support your answer.

_____

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_____

4. Some water in the gas phase is heated. What should happen to the motion of the water particles as the gas is heated?

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5. For the flash chamber in Part II, state which letter(s) need liquid-carrying pipes and which letter(s) need gas-carrying pipes.

Liquid pipes = Letters _____

Gas Pipes = Letters _____

6. For the condenser in Part III, state which letter(s) need liquid-carrying pipes and which letter(s) need gas-carrying pipes.

Liquid pipes = Letters _____

Gas Pipes = Letters _____

7. Does the water in the flash chamber undergo condensation or vaporization? Provide a reason to support your answer.

_____

_____

_____

8. Does the water in the condenser undergo condensation or vaporization? Provide a reason to support your answer.

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9. For the flash chamber in Part II, which water particles have more energy: those coming out of letter "B" or those exiting letter "C"? Provide a reason to support your answer.

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10. For the condenser in Part III, which water particles have more energy: those entering letter "C" or those exiting letter "B"? Provide a reason to support your answer.

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11. As a liquid particle is vaporized, how does the movement of the particle change?

_____

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12. As a gas particle is condensed, how does the movement of the particle change?

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13. What is the main goal of a desalination plant?

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14. As the temperature of a liquid particle increases, what happens to the particle's motion?

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15. Design a simple experiment that could be used to convince a person that water in the gas phase is in normal air.

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