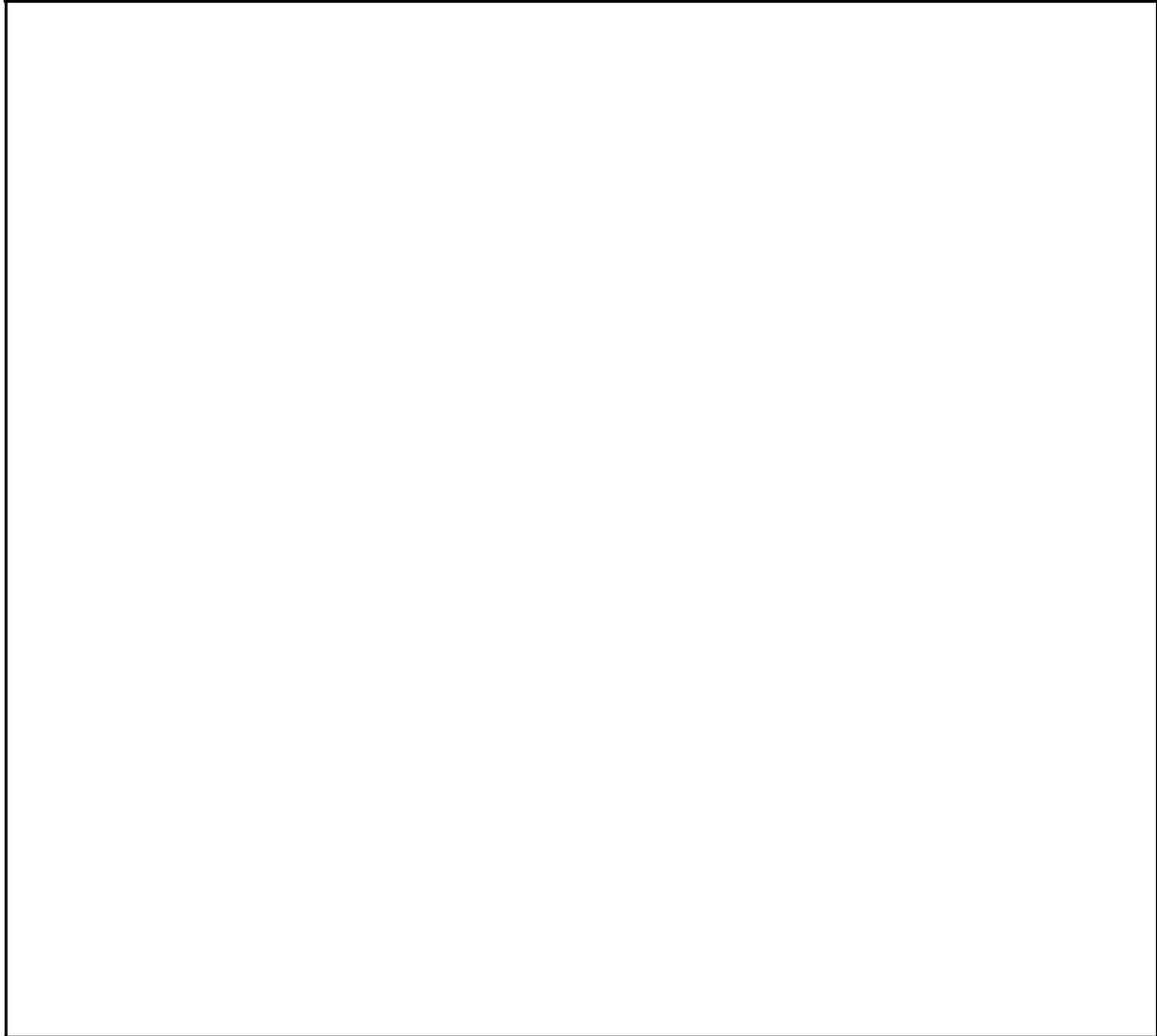


Name: \_\_\_\_\_ Date: \_\_\_\_\_

## What is a Bioengineer?

Draw and label a picture of a bioengineer at work.



Explain your drawing of a bioengineer:

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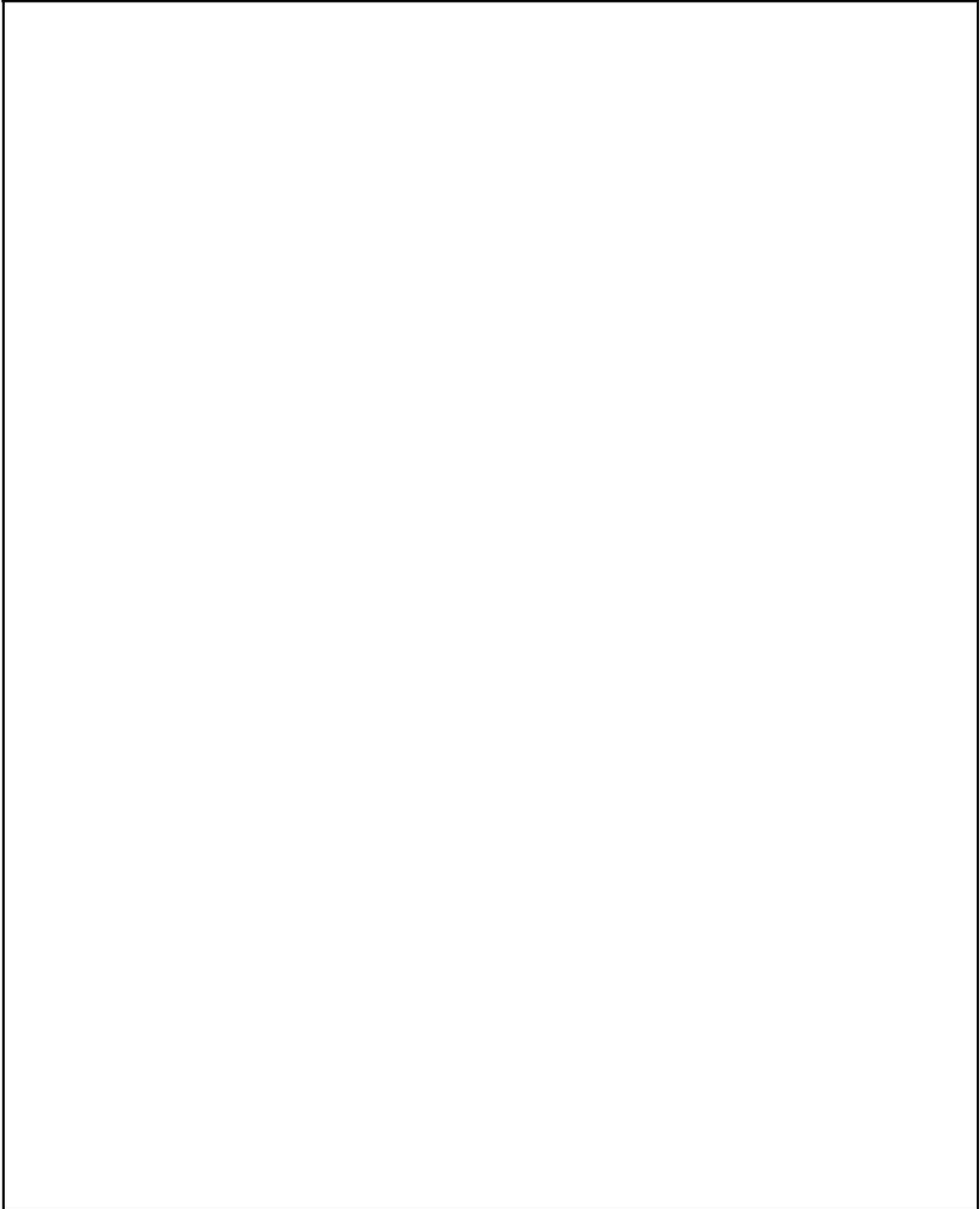
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Name: \_\_\_\_\_ Date: \_\_\_\_\_

**B**

## What is a Bioengineer?

Draw a picture of a bioengineer at work. Label your picture.



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

A

*Directions: For each question below, circle the **BEST** answer.*

1. A company is designing a new kind of airplane that can soar a long way without fuel. How might a bioengineer help?
  - A. He would fix the new airplane engines when they break.
  - B. He would design the airplanes so they don't pollute the air.
  - C. He would study birds to get ideas for the new kind of airplane.
  - D. He would NOT help a company to design a new kind of airplane.
  
2. A bioengineer is MOST LIKELY to help design a technology that:
  - A. will help to protect the environment.
  - B. will help to protect animals and people.
  - C. will be used outdoor in a natural place.
  - D. works in the same way as something in nature.
  
3. For his or her job, a bioengineer might:
  - A. fix boat engines.
  - B. take care of sick animals.
  - C. clean up pollution in a lake.
  - D. study animals to get ideas for new technologies.

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

1. Decide whether each statement below is TRUE (T) or FALSE (F) and circle your answer.

Some membranes protect an organism from the environment.	T	F
Air, water, and nutrients pass through some membranes but not others.	T	F
Membranes have to decide which things they want to let through.	T	F
Plants have membranes inside them.	T	F
Animals have membranes inside them.	T	F

2. Complete the sentence below by circling the BEST choice of the words in **BOLD**.

Cloth is like a **permeable/semi-permeable** membrane because only certain things can pass through.

3. Describe 2 things that membranes do in nature:

(1) \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

(2) \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

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

A

*Directions: Match each human-made tool to the animal structure that solves similar problems.*

B

**Human-made tool**

**Airplane's wing**



**Boat**



**Flippers**



**Knife**



**Rake**



**Animal structure**

**Bird's wing**



**Dog's paw**



**Duck's feet**



**Fish**



**Tiger's teeth**



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

A

*Directions: For each question below, circle the **BEST** answer.*

1. Lizards use sticky pads on their feet to hang on to trees. Observing lizard feet MOST LIKELY would help someone to design:
  - A. stronger glue
  - B. faster running shoes
  - C. more comfortable hiking shoes
  - D. observing lizard feet would NOT help with a design
  
2. The leaves of some plants have tiny slippery bumps so that water runs off them quickly, washing away dirt. Studying these leaves MOST LIKELY would help someone to design:
  - A. a raincoat
  - B. grass leaves
  - C. a wash cloth
  - D. a dishwasher
  
3. What in nature MOST LIKELY gave people the idea to design a parachute?
  - A. a goose flying long distances
  - B. a cat jumping down from a fence
  - C. a leaf falling gently through the air
  - D. a hot air balloon moving slowly through the air

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

1. A teabag is an artificial membrane. Explain what makes it a membrane.



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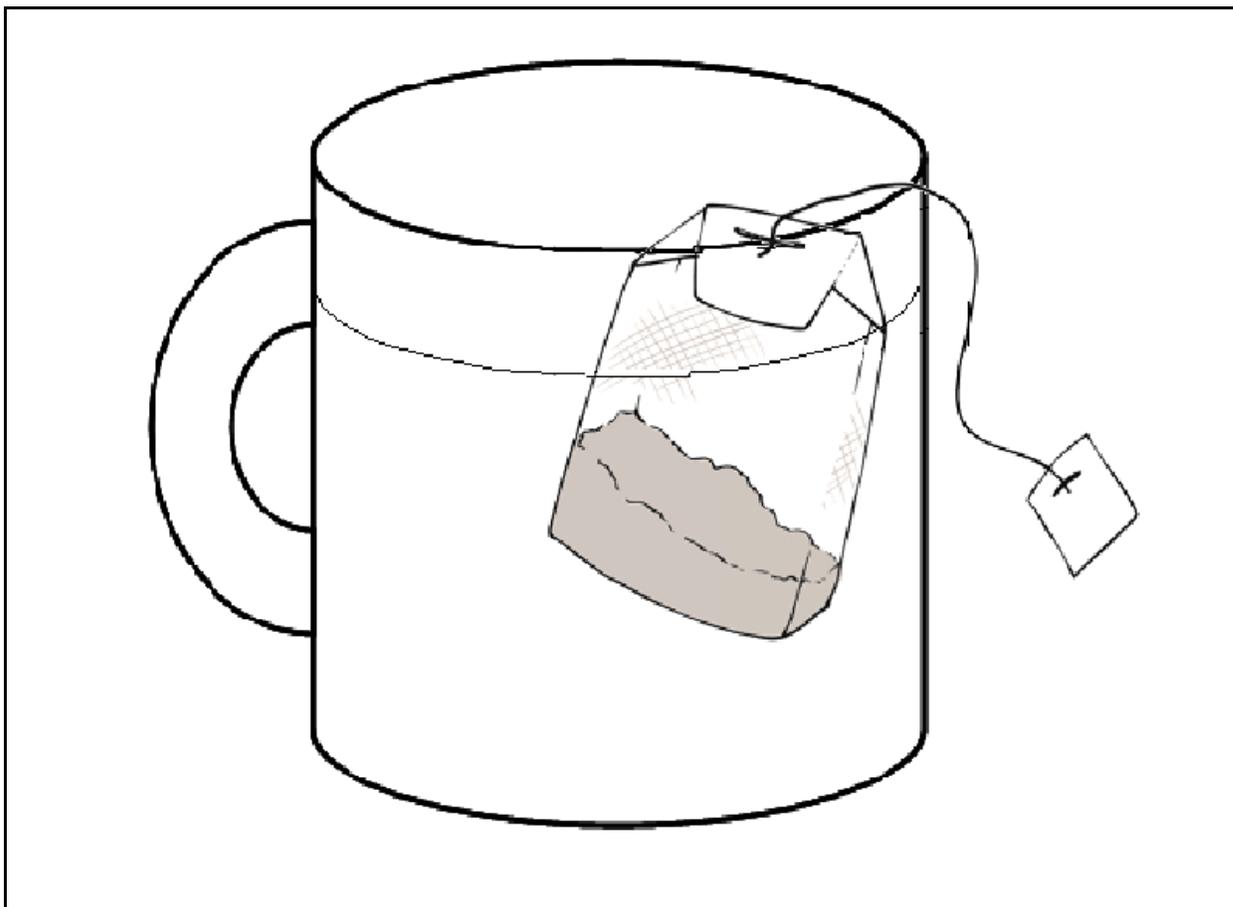
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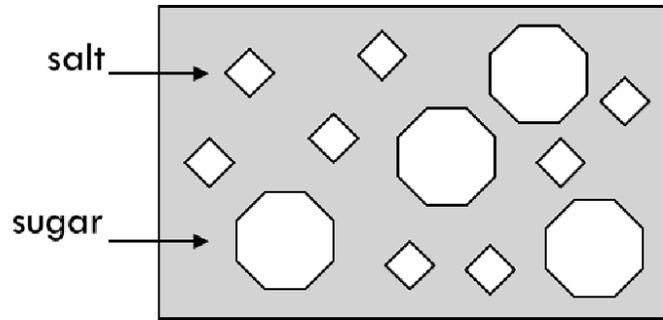
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2. On the picture below, draw and label how the teabag in the mug of hot water is working as a membrane.

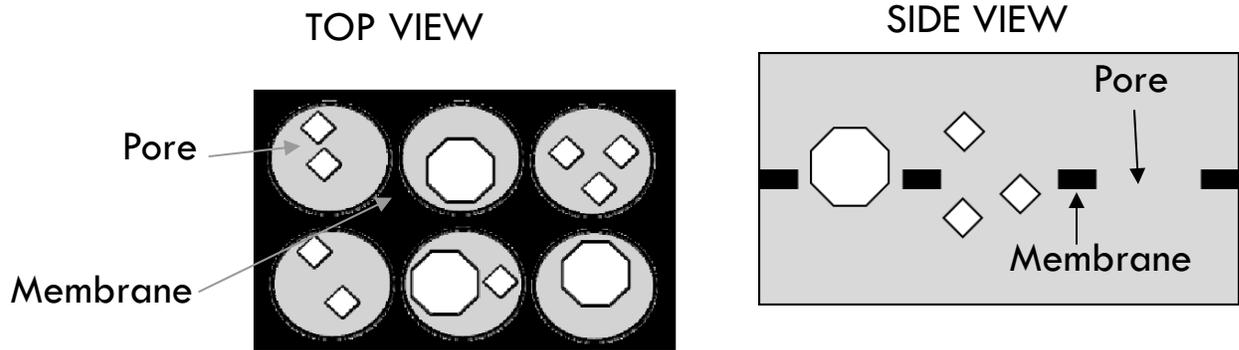


Name: \_\_\_\_\_ Date: \_\_\_\_\_

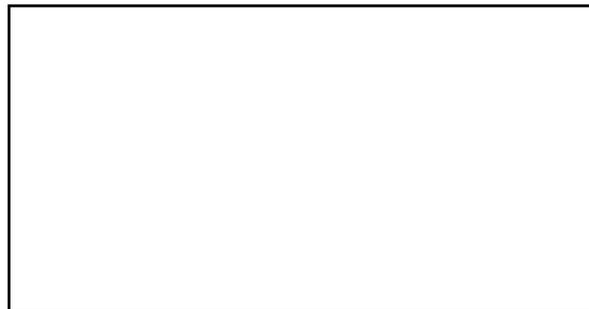
This is a diagram of salt and sugar floating in water.



Here is a membrane that would let water, salt, AND sugar through.



1. Draw a membrane that would let water through but NOT salt or sugar. You can draw either a top or a side view.



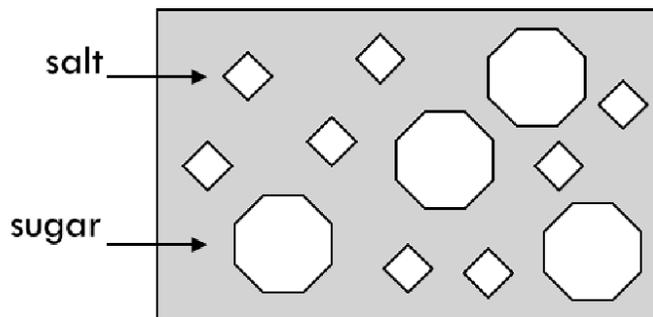
2. Draw a membrane that would let water and salt through but NOT sugar. You can draw either a top or a side view.



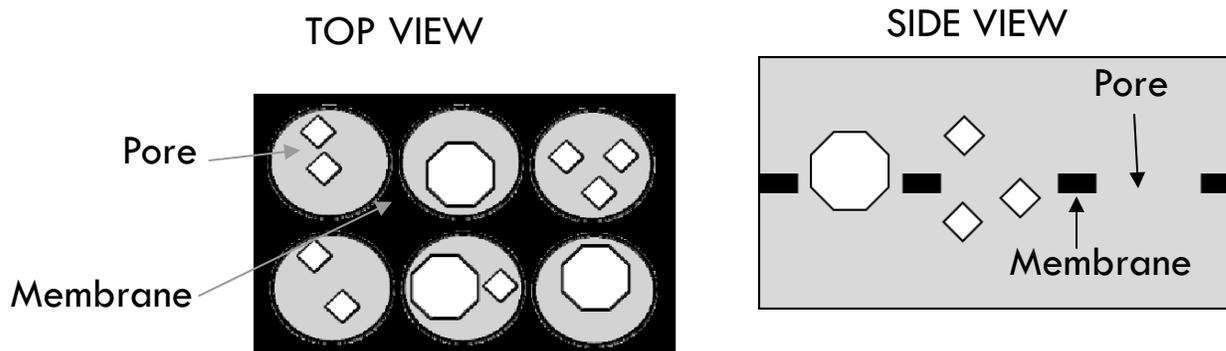
Name: \_\_\_\_\_ Date: \_\_\_\_\_

**B**

This is a diagram of salt and sugar floating in water.



Here is a membrane that would let water, salt, AND sugar through.



*Directions: Draw a membrane that would let water through but not salt or sugar. You can draw either a top or a side view.*

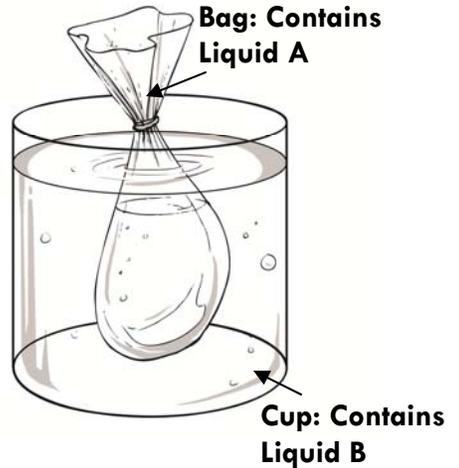


Name: \_\_\_\_\_ Date: \_\_\_\_\_

Liquid A and Liquid B are both clear liquids, like water. However, if they are mixed together, the liquid mixture becomes purple.

A student puts Liquid A in a clear plastic bag and Liquid B in a cup. He puts the bag into the cup.

After an hour, the liquid in the cup turns purple, but the liquid in the bag stays clear.

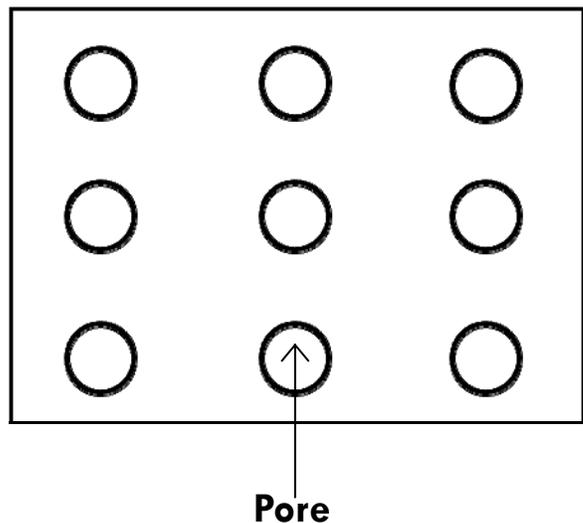


1. What must be happening?

- A. Liquid A can pass through the plastic bag but Liquid B cannot.
- B. Liquid B can pass through the plastic bag but Liquid A cannot.
- C. There must be a hole in the bag so that Liquid A and Liquid B can mix.
- D. Liquid A and Liquid B can both pass through the plastic bag and mix together.

2. The diagram to the right shows what the plastic bag looks like close-up. The circles represent tiny pores that are in the bag.

Using the diagram, draw what Liquid A and Liquid B would look like really close-up. You can use a triangle (▲) to represent Liquid A and a square (■) to represent Liquid B.



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

A girl needs to take her pet goldfish out of its tank and put it into a bowl full of clean water so that she can clean the fish tank.

*Directions: Design something that will let her gently move her fish from the tank to the bowl, but that will also leave the dirty water behind. You can sketch your ideas on the back of this page.*

1. Describe 2 properties that the material(s) you use should have.

(1) \_\_\_\_\_

\_\_\_\_\_

(2) \_\_\_\_\_

\_\_\_\_\_

2. Why are these properties important?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

3. Draw your design plan in the box below. Label the parts.

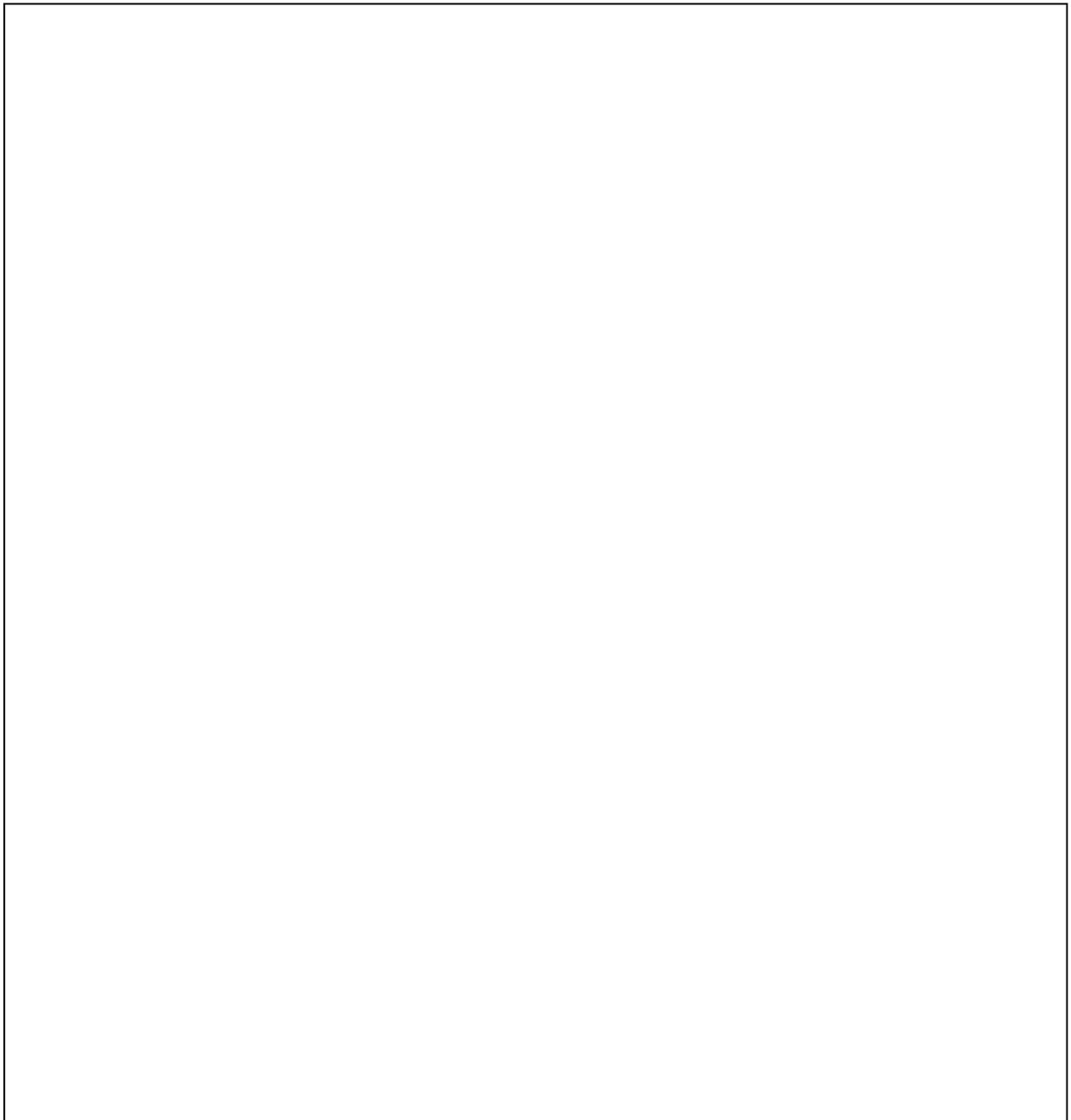
Name: \_\_\_\_\_ Date: \_\_\_\_\_

A girl needs to take her pet goldfish out of its tank and put it into a bowl full of clean water so that she can clean the fish tank.

**B**

*Directions: Design something that will let her gently move her fish from the tank to the bowl, but that will also leave the dirty water behind. You can sketch your ideas on the back of this page.*

Draw your design plan in the box below. Label the parts.



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

## What is a Bioengineer?

Draw and label a picture of a bioengineer at work.

*A good picture would show someone studying nature in order to solve human-made problems. They may be examining nature, drawing plans, discussing ideas with others, etc.*

*Examples include: studying bird wings to design airplanes, studying duck's feet to design swimming flippers, etc.*

Explain your drawing of a bioengineer:

*Answers will vary, but may include: Someone who combines his or her knowledge of science, math, and living things to design technologies that solve problems in nature or uses natural materials to solve human-made problems.*

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

## What is a Bioengineer?

Draw a picture of a bioengineer at work. Label your picture.

*A bioengineer is someone who combines his or her knowledge of science, math, and living things to design technologies that solve problems in nature or uses natural materials to solve human-made problems.*

*A good picture would show someone studying nature in order to solve human-made problems. They may be examining nature, drawing plans, discussing ideas with others, etc.*

*Examples include: studying bird wings to design airplanes, studying duck's feet to design swimming flippers, etc.*

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

*Directions: For each question below, circle the **BEST** answer.*

1. A company is designing a new kind of airplane that can soar a long way without fuel. How might a bioengineer help?

- A. He would fix the new airplane engines when they break.
- B. He would design the airplanes so they don't pollute the air.
- C. He would study birds to get ideas for the new kind of airplane.
- D. He would NOT help a company to design a new kind of airplane.

2. A bioengineer is MOST LIKELY to help design a technology that:

- A. will help to protect the environment.
- B. will help to protect animals and people.
- C. will be used outdoor in a natural place.
- D. works in the same way as something in nature.

3. For his or her job, a bioengineer might:

- A. fix boat engines.
- B. take care of sick animals.
- C. clean up pollution in a lake.
- D. study animals to get ideas for new technologies.

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

1. Decide whether each statement below is TRUE (T) or FALSE (F) and circle your answer.

Some membranes protect an organism from the environment.	<input checked="" type="radio"/> T	<input type="radio"/> F
Air, water, and nutrients pass through some membranes but not others.	<input checked="" type="radio"/> T	<input type="radio"/> F
Membranes have to decide which things they want to let through.	<input type="radio"/> T	<input checked="" type="radio"/> F
Plants have membranes inside them.	<input checked="" type="radio"/> T	<input type="radio"/> F
Animals have membranes inside them.	<input checked="" type="radio"/> T	<input type="radio"/> F

2. Complete the sentence below by circling the BEST choice of the words in **BOLD**.

Cloth is like a **permeable**/**semi-permeable** membrane because only certain things can pass through.

3. Describe 2 things that membranes do in nature:

*Answers will vary, but may include: keep harmful things out (germs, dirt, mold), let water in, let air in, etc.*

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

*Directions: Match each human-made tool to the animal structure that solves similar problems.*

<u>Human-made tool</u>	<u>Animal structure</u>
<b>Airplane's wing</b> 	<b>Bird's wing</b> 
<b>Boat</b> 	<b>Dog's paw</b> 
<b>Flippers</b> 	<b>Duck's feet</b> 
<b>Knife</b> 	<b>Fish</b> 
<b>Rake</b> 	<b>Tiger's teeth</b> 

**Answer Key**

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

*Directions: For each question below, circle the **BEST** answer.*

1. Lizards use sticky pads on their feet to hang on to trees? Observing lizard feet MOST LIKELY would help someone to design:

- A. stronger glue
- B. faster running shoes
- C. more comfortable hiking shoes
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2. The leaves of some plants have tiny slippery bumps so that water runs off them quickly, washing away dirt. Studying these leaves MOST LIKELY would help someone to design:

- A. a raincoat
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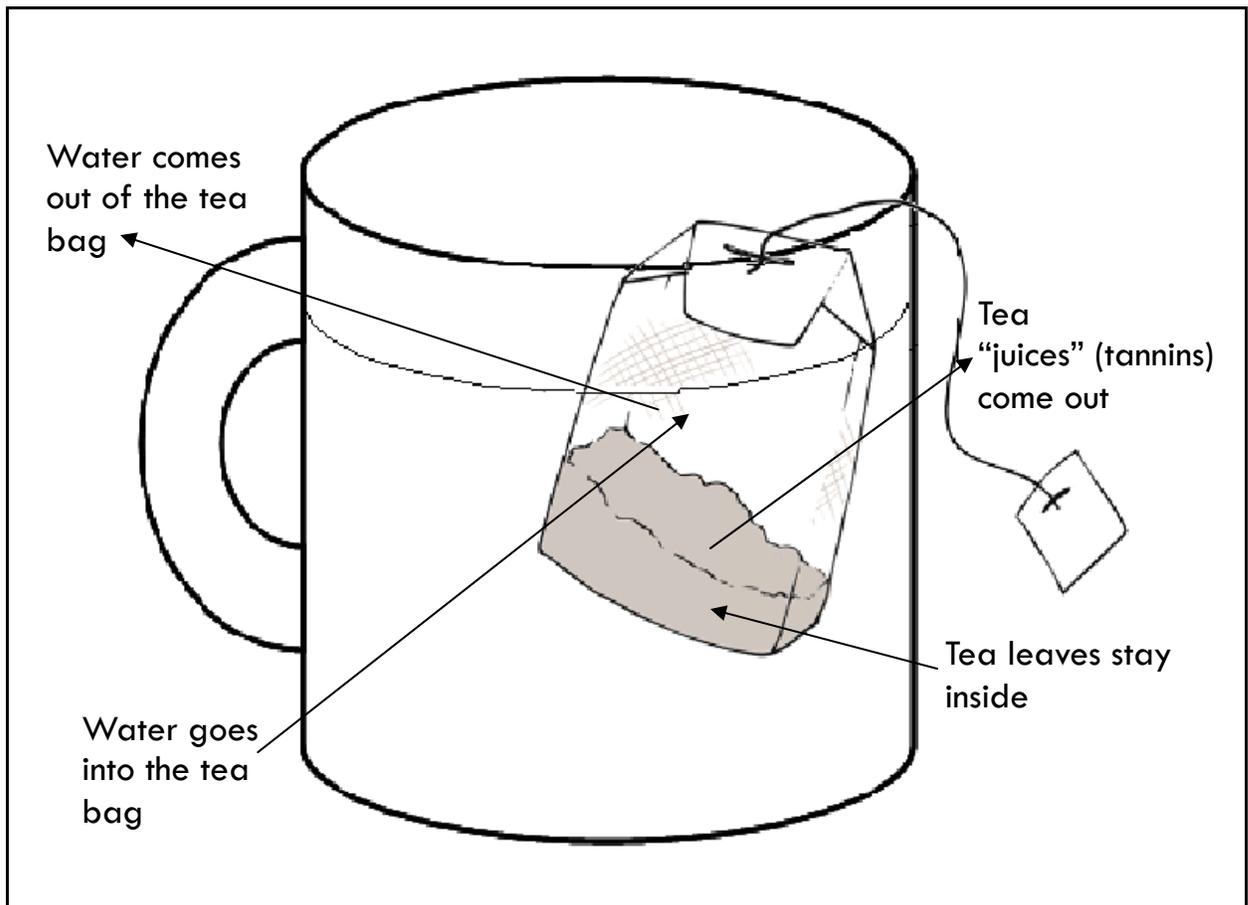
Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. A teabag is an artificial membrane. Explain what makes it a membrane.



*Answers will vary, but may include: It is semi-permeable. It lets the water and liquid tea through, but keeps the tea leaves inside.*

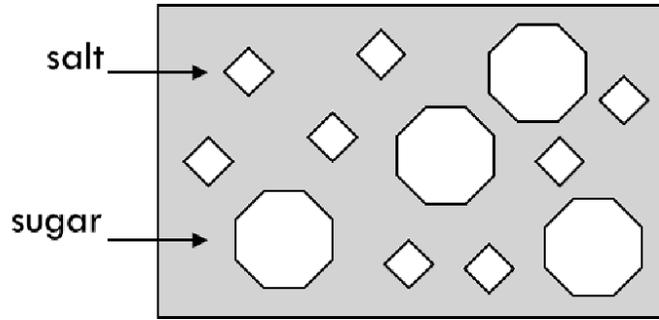
2. On the picture below, draw and label how the teabag in the mug of hot water is working as a membrane.



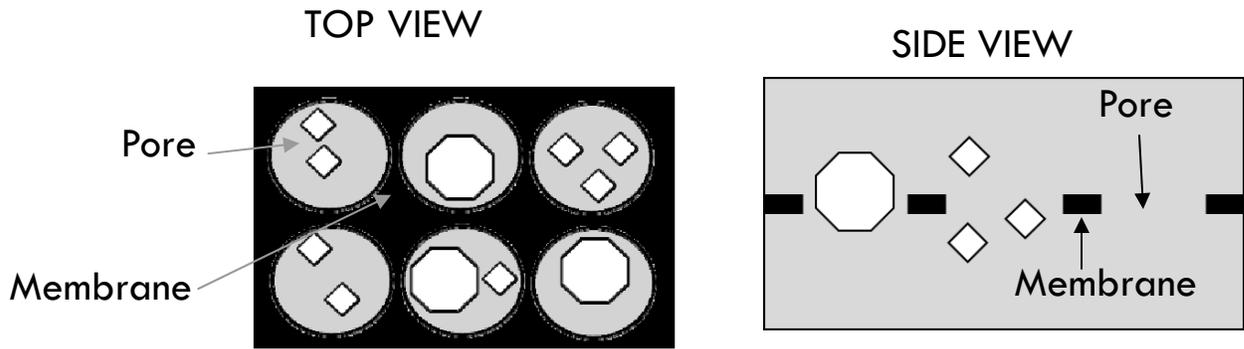
Name: \_\_\_\_\_ Date: \_\_\_\_\_

Answer Key

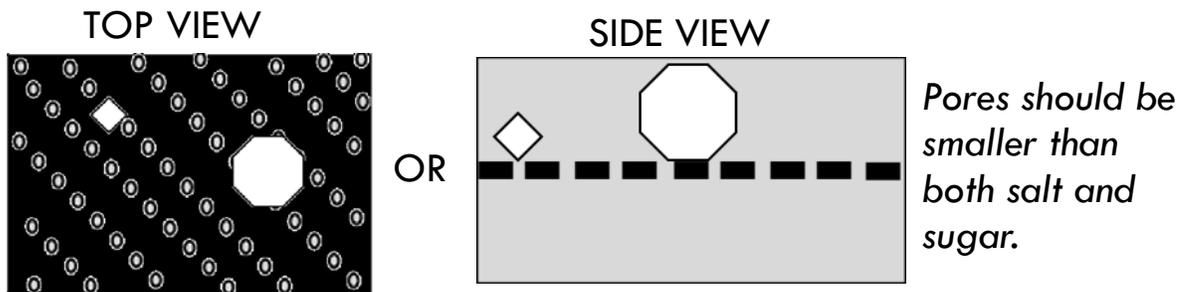
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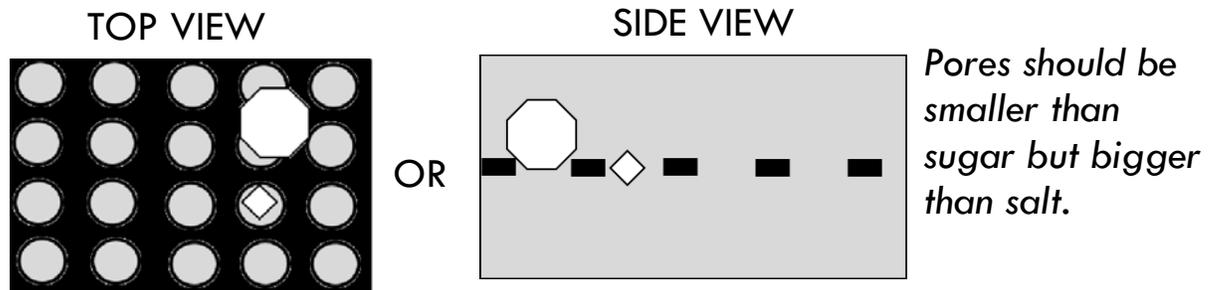
Here is a membrane that would let water, salt, AND sugar through.



1. Draw a membrane that would let water through but NOT salt or sugar. You can draw either a top or a side view.

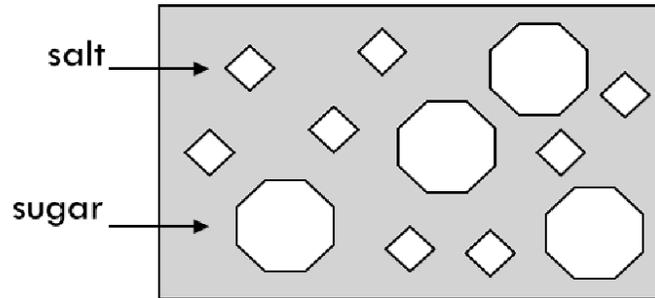


2. Draw a membrane that would let water and salt through but NOT sugar. You can draw either a top or a side view.

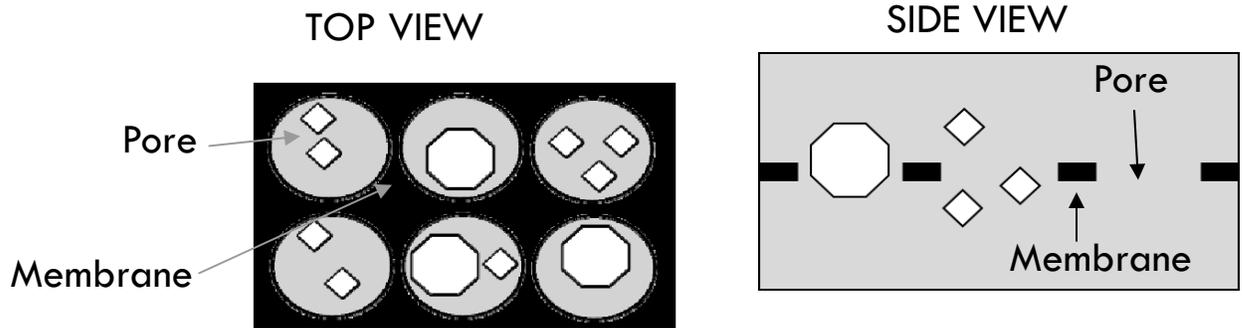


Name: \_\_\_\_\_ Date: \_\_\_\_\_

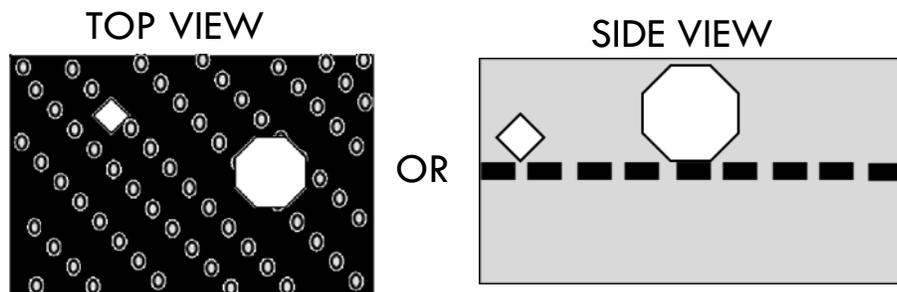
This is a diagram of salt and sugar floating in water.



Here is a membrane that would let water, salt, AND sugar through.



*Directions: Draw a membrane that would let water through but not salt or*



*Pores should be smaller than both salt and sugar.*

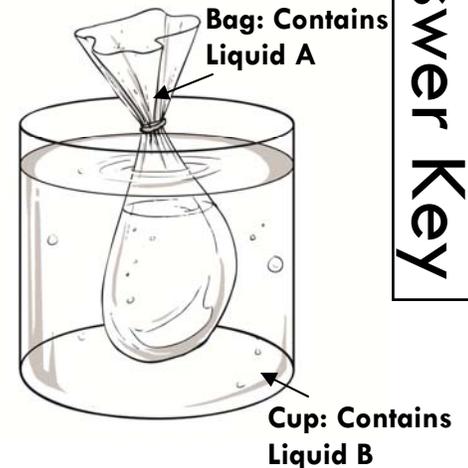
Name: \_\_\_\_\_ Date: \_\_\_\_\_

Answer Key

Liquid A and Liquid B are both clear liquids, like water. However, if they are mixed together, the liquid mixture becomes purple.

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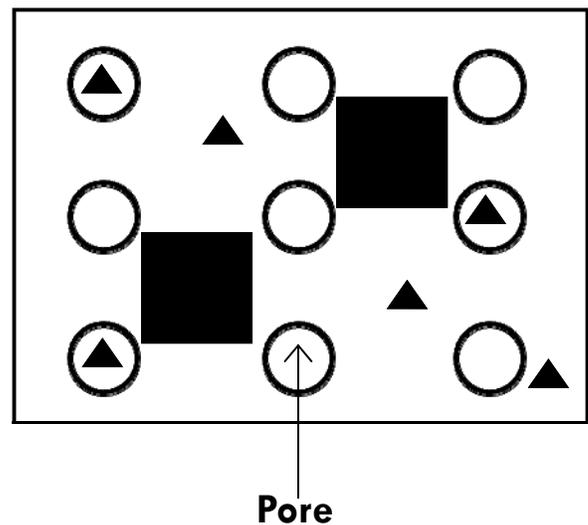


1. What must be happening?

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

A girl needs to take her pet goldfish out of its tank and put it into a bowl full of clean water so that she can clean the fish tank.

*Directions: Design something that will let her gently move her fish from the tank to the bowl, but that will also leave the dirty water behind. You can sketch your ideas on the back of this page.*

1. Describe 2 properties that the material(s) you use should have.

*Answers will vary, but may include: the material should have holes that are big enough to let the water and dirt through, the material should have holes that are small enough to keep the fish inside the scoop, the material should be strong enough to hold the weight of the fish, the material should be waterproof (not fall apart in the water), etc.*

2. Why are these properties important?

*Answers will vary, but should be consistent with above answers. Answers could include: the material needs to let the dirty water through but not the fish, the material needs to be strong enough so that it doesn't break when the fish is inside it, the material needs to be water proof so that it doesn't fall apart when you put it in the water, etc.*

3. Draw your design plan in the box below. Label the parts.



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

A girl needs to take her pet goldfish out of its tank and put it into a bowl full of clean water so that she can clean the fish tank.

*Directions: Design something that will let her gently move her fish from the tank to the bowl, but that will also leave the dirty water behind. You can sketch your ideas on the back of this page.*

Draw your design plan in the box below. Label the parts.

*A good picture should show scoop with holes that are big enough to let the dirty water pass through, but that are not so big that the fish also falls through.*