



Super Science Connections: Make a Blubber Bag!

How well do fat and air insulate?

This activity is intended for children entering grades K-4 in the next school year. To carry it out safely there must be a responsible older person to prepare materials, read directions aloud, and supervise the activity. This could be a parent, guardian, or older sibling. The supervisor should do the preparation steps below and consult the science background information on the last page before leading children through the activity.

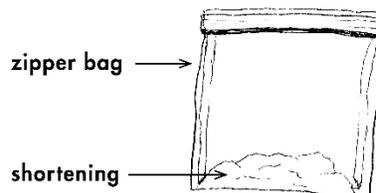
Materials

- Several 1-quart (1-L) or 2-quart (2-L) freezer zipper bags.
- Solid shortening such as Crisco™ (1 or 2 cups).
- A bucket of ice water (use a 5-quart (4.7-L) ice-cream pail or any bucket big enough for the participants to put their hands into).
- Duct tape.
- Bubble wrap or packing peanuts.
- Clock or timer.
- 1-cup measuring cup.

Preparation

Blubber bag / Fat mitten

1. You are going to make a “mitten” where the insulation is fat (Crisco™). You will put the fat into a plastic bag, put a second bag inside the first, and seal the two bags so the fat can't leak out.
2. If you are using 2-quart bags, put two cups (473mL) of the solid shortening into one of the bags. If you

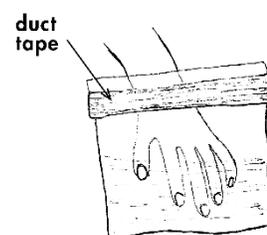
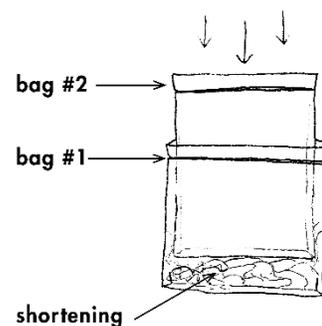


This activity is courtesy of ICE, the Institute for Chemical Education at UW-Madison's Chemistry Department. It is adapted for use at home from Blubber Bag in the Super Science Connections Section 2: Insulation activities offered by ICE at this link:

http://ice.chem.wisc.edu/sites/ice.chem.wisc.edu/files/images/Publications/SSC/SSC_Insulation.pdf

are using 1-quart bags, put one cup (236 mL) of solid shortening into one of the bags.

3. Turn the other plastic zipper bag inside out. Place it inside the bag containing the shortening. You want to seal the inner bag to the outer bag (so the shortening is kept between the bags). Make sure that the zippers are lined up in a way that you can zip and/or duct-tape the inner bag to the outer bag.
4. Zip the bags together on both sides. If you use the brand of Glad-lock™ where each bag has yellow and blue stripes, it is easy to see when it is sealed. (If you use duct tape to seal the sides together around the top, the blubber bag will be reusable for quite a few times.) After the bags have been sealed, you can put your hand in the inner bag without touching the shortening. Knead the shortening until it spreads out evenly in a thin layer on both sides of the inner bag.
5. You have just made a “blubber bag”, also known as a “fat mitten”.



Bubble bag / Bubble-wrap mitten

1. Make a second pair of bags like the fat mitten where bubble wrap (instead of fat) is distributed between the two plastic bags.
2. Cut two pieces of bubble wrap, each a little smaller in length and width than the plastic bag and put the two pieces of bubble wrap into one of the bags.
3. Put the second bag inside the first one, making sure there is bubble wrap on both sides of the second bag,
4. Seal the inner bag to the outer bag.
5. You now have a “bubble bag” or “bubble-wrap mitten”.
(If you use a 2-quart plastic bag there is probably enough space to substitute packing peanuts for the bubble wrap.)

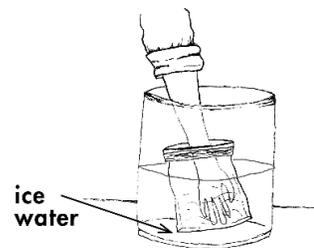
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Directions

1. Place ice from an icemaker or ice-cube trays into a bucket. Add cold water so the bucket is full enough to put your hand completely under water in the bucket. If all the ice melts, add more ice so that solid ice remains in the water.

2. Put the “fat mitten” on one hand. Put both hands into the ice water! Make sure no water gets inside your fat mitten. Can you feel the difference between hands?



- Which hand gets colder faster? Record your observation on the data sheet.
3. Let your hands warm up to normal temperature and then do more experiments.
 - a. Start the timer and put one of your hands into the ice water. How long can you keep your hand in the ice water before your hand gets too cold? Record the time on the data sheet.
 - b. Put your hand that wasn't in the ice water into the fat mitten. Start the timer and time how long you can keep your hand with the fat mitten in the ice water. Record the time on the data sheet.
 - c. Let your hands warm up to normal. Then put the bubble-wrap mitten on one hand. Start the timer and put your hand with the mitten into the ice water. How long can you keep your hand in the ice water? Record the time on the data sheet
 - d. Based on your experiments, which is the better insulator, fat or bubble wrap?

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Data Sheet

Step 2. *With the fat mitten on one hand and nothing on the other hand, what difference do you feel between hands?*

Which hand gets cold faster? _____

Step 3a. *Without a mitten, how long can your hand stand the cold water?* _____ seconds.

Step 3b. *With the fat mitten, how long can your hand stand the cold water?* _____ seconds.

Step 3c. *With the bubble-wrap mitten, how long can your hand stand the cold water?* _____ seconds.

Step 3d. *Which insulates better, fat or bubble wrap?*

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Science Background:

Whales swim in very cold ocean water, sometimes surrounded by ice. So do seals, walruses, and polar bears. Why don't they freeze? One reason is that their bodies are surrounded by blubber—blubber is fat.

Fat is stored in the body of animals in what is called adipose tissue. Fat has three purposes:

- Fat is a fuel reserve — energy stored for when it is needed. More energy can be stored per pound of fat than can be stored in carbohydrates or protein.
- Fat provides padding—a cushion for preventing injury in a fall or an attack.
- Fat is an insulator against the cold. Fat is in a class of chemicals called lipids that are very poor conductors of heat.

Fatty insulation is only one of the ways that some animals stay warm, but it can be very important.

The bubble-wrap mitten (or the packing-peanuts mitten) shows the insulating effect of air. (The bubble wrap is bubbles of air trapped by plastic. The packing peanuts are plastic with lots of tiny air bubbles inside.) Like fat, air does not conduct heat well.

Air insulation is used by many animals. For example, dogs and cats have fur or hair that traps air near their skin. The trapped air prevents loss of heat from their bodies. Birds, including ducks and geese, have feathers and down that can fluff up, trap air, and keep them warm.

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