

# Making Winter's Tail

**Grade Level:** Grades 3, 4, & 5

**Science Skills:**

*Florida Sunshine State Standards:*

*Grade 3:* SC.3.N.1.1, SC.3.N.1.2, SC.3.N.1.4, SC.3.N.1.5, SC.3.N.1.6, SC.3.P.8.3, SC.3.P.11.2

*Grade 4:* SC.4.N.1.1, SC.4.N.1.2, SC.4.N.1.5, SC.4.N.1.8, SC.4.P.8.1

*Grade 5:* SC.5.N.2.1, SC.5.N.2.2, SC.5.P.13.2

**Description:** Students will be divided into two equal groups and design Winter's tail using common materials. They will then test different elements such as the sturdiness of the tail, the amount of heat created by friction, and the force their tail produces given certain limiting criteria.

**Materials:**

- "The Tale of the Tail: Winter's Story" story
- "Making Winter's Tail" worksheets
- 6 shoe boxes or other containers
- Candle; lighter/matches
- Ruler (one per group)
- Scissors (one per group)
- Surface thermometer
- Range scale (included)
- Choose items from the materials chart below (as many or few as you wish):

	Gel	Tail Flukes	Support
Materials	<ul style="list-style-type: none"> <li>• Plastic wrap</li> <li>• Nylon (pantyhose)</li> <li>• Rubber/Latex gloves</li> <li>• Kitchen gloves</li> <li>• Plastic freezer bags</li> <li>• Bubble wrap</li> </ul>	<ul style="list-style-type: none"> <li>• Cardboard</li> <li>• Poster board</li> <li>• Aluminum Foil</li> <li>• Stencil plastic (or other thin plastic)</li> <li>• Foam board</li> <li>• Corrugated board</li> </ul>	<ul style="list-style-type: none"> <li>• Popsicle sticks</li> <li>• Aluminum foil</li> <li>• Rubber bands</li> <li>• Tape</li> <li>• Glue</li> <li>• Toothpicks</li> <li>• Pipe cleaners</li> <li>• Pencils</li> </ul>

**Additional Materials:**

- Book – “Winter’s Tale” by Joanne Benazzi Friedland - available for purchase online (optional)
- Book – “Winter’s Tail” by Juliana Hatkoff, Isabella Hatkoff, and Craig Hatkoff – available for purchase online (optional)
- Activity Book – “Winter: The dolphin who lost her tail” – available free online (optional)
- Video – “Winter: The Dolphin that Could” – available for purchase online (optional)

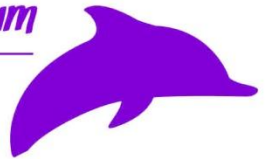
**Preparations:**

Split class roster into two equal groups. Create three shoeboxes for each group, one labeled “Gel”, one labeled “Tail Flukes”, and one labeled “Support”. Use the chart below to group the materials in their appropriate boxes. Print off enough “Making Winter’s Tail” worksheets for each student.

	Gel	Tail Flukes	Support
Materials	<ul style="list-style-type: none"><li>• Plastic wrap</li><li>• Nylon (pantyhose)</li><li>• Rubber/Latex gloves</li><li>• Kitchen gloves</li><li>• Plastic freezer bags</li><li>• Bubble wrap</li></ul>	<ul style="list-style-type: none"><li>• Cardboard</li><li>• Poster board</li><li>• Aluminum Foil</li><li>• Stencil plastic (or other thin plastic)</li><li>• Foam board</li><li>• Corrugated board</li></ul>	<ul style="list-style-type: none"><li>• Popsicle sticks</li><li>• Aluminum foil</li><li>• Rubber bands</li><li>• Tape</li><li>• Glue</li><li>• Toothpicks</li><li>• Pipe cleaners</li><li>• Pencils</li></ul>

**Procedures:**

- 1) Familiarize the class with Winter’s story by reading the included “The Tale of a Tail: Winter’s Story” or other, including books or videos listed in the additional materials.
- 2) Discuss how the design of the tail (outlined in detail in “Winter: The Dolphin that Could”) was the product of creativity, ingenuity, and use of the scientific method.
- 3) Divide the class into two groups depending on your prepared roster.
- 4) Pass out the “Making Winter’s Tail” worksheets and prepared shoeboxes of materials.
- 5) Follow the directions on the “Making Winter’s Tail” worksheets to walk your class through the experimental process.



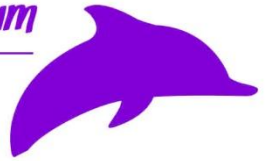
# ***The Tale of the Tail: Winter's Story***

On the calm waters of Mosquito Lagoon one December morning, a crab trap buoy floated gently on the surface of the water. Beneath the buoy was a long rope and tied to the long rope was a crab trap. To a young dolphin calf, it looked like the perfect toy! The dolphin calf grabbed the rope in her mouth and began to play. She swam back and forth, up and down, twisting and turning around the rope. Suddenly, she realized that the rope was tangled all around her body. It was twisted around her fin on top, called a dorsal fin. It was twisted around her fins on the side, called pectoral fins. Most tightly, it was twisted around her tail, called her flukes. The young dolphin needed help and quick!

Luckily, a fisherman nearby saw the crab trap buoy bouncing around on the top of the water. He directed his boat closer and saw the little dolphin all wrapped up in the line of the crab trap. He called for help and waited until a rescue team arrived. The rescue team saw that the little dolphin would need the care of an animal doctor, called a veterinarian, and took her all the way across the state of Florida to Clearwater Marine Aquarium.

Once she was at Clearwater Marine Aquarium, the young dolphin was named Winter after the season in which she was found. The veterinarian and the animal care team at the aquarium realized that Winter's tail was very damaged from her experience with the crab trap – so damaged that she would never be able to use it again. Sure enough, her tail slowly began to fall off until it was completely gone.

Winter didn't let her missing tail slow her down. She learned how to swim side-to-side, like a fish swims. But the animal care team at CMA knew that swimming like that could hurt Winter's back – a dolphin's tail is supposed to move up and down! They worked with a group of people from Hanger Prosthetics, a company that makes artificial legs and arms for people. The doctors at Hanger designed a new tail for Winter. When Winter wears it, she can swim like a normal dolphin does – up and down!



# Making Winter's Tail

**Name:** \_\_\_\_\_

**Description:** Using the given materials, you and your teammates will create your own version of Winter's tail. Follow the step-by-step directions, listed below, and make sure to answer all questions fully!

**Step 1:** Work together with your team to check that all materials are present. Place a check mark next to materials you will use and an "X" next to materials that you will not use.

	Gel	Tail Flukes	Support
Materials	<input type="checkbox"/> Plastic wrap <input type="checkbox"/> Nylon (pantyhose) <input type="checkbox"/> Rubber/Latex gloves <input type="checkbox"/> Kitchen gloves <input type="checkbox"/> Plastic freezer bags <input type="checkbox"/> Bubble wrap	<input type="checkbox"/> Cardboard <input type="checkbox"/> Poster board <input type="checkbox"/> Aluminum Foil <input type="checkbox"/> Stencil plastic <input type="checkbox"/> Foam board <input type="checkbox"/> Corrugated board	<input type="checkbox"/> Popsicle sticks <input type="checkbox"/> Aluminum foil <input type="checkbox"/> Rubber bands <input type="checkbox"/> Tape <input type="checkbox"/> Glue <input type="checkbox"/> Toothpicks <input type="checkbox"/> Pipe cleaners <input type="checkbox"/> Pencils <input type="checkbox"/> Notebook paper

**Step 2:** With your group, plan out which materials you intend to use. Remember that Winter's gel has to keep her comfortable and protect her skin, but a heavy material may cause friction or trap heat. For your Tail Fluke and Support materials, try to choose sturdy items to keep the tail functional.

**Step 3:** Write a physical description of each material below. Be sure to include the width, length, shape, color, texture, and other physical features in your description. If you are going to modify your materials at all (either by cutting or taping), be sure you include your modifications!

Material	Description

[illegible]

***Step 4:*** Before creating your tail, draw out your design below. Each group member should draw their own tail. Make sure to include the approximate sizes of each item in your drawing.

## ***My Tail Design***

**Step 5:** Winter was found on December 10. Choose the team member whose birthday is closest to that day. Write their name on the line below:

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This team member will play the part of Winter. Build the tail around their forearm, which will represent Winter's tail stump.

**Step 6:** In order for the experiment to work, you must be able to slide the artificial tail (and Winter's gel) on and off Winter's tail stump. You also must write down any modifications you make to your materials or tail design drawing so that other scientists may duplicate your design.

Modifications

**Step 7:** Winter's tail must be comfortable. Once your tail is completed, switch tails with the other group. Have each group member try on the tail and rank it on a scale of 1 to 10, 1 being the least comfortable and 10 being the most comfortable.

Circle your ranking of the other group's tail below.

**1    2    3    4    5    6    7    8    9    10**

*Remember, you are not in competition with each other. Scientists work together to come up with the best design! Rate the other group's design fairly!*

Switch back tails with the other group once each member has had a chance to try on your design.

**Step 8:** Dolphin skin is very sensitive and too much friction or heat can hurt their skin. Measure how much heat is trapped when your tail is worn and then how much heat is caused by friction as the tail moves.

1) Temperature of Winter's tail stump without the tail: \_\_\_\_\_ degrees Fahrenheit

2) Temperature of Winter's tail stump after wearing the tail for two minutes:  
\_\_\_\_\_ degrees Fahrenheit

3) Temperature of Winter's tail stump after moving the tail up and down against the range scale for one minute:

\_\_\_\_\_ degrees Fahrenheit  
4) Subtract the answer to #2 from the answer to #1. This is the change in heat caused by wearing the tail.

\_\_\_\_\_ degrees Fahrenheit

5) Subtract the answer to #3 from the answer to #2. This is the change in heat caused by friction.

\_\_\_\_\_ degrees Fahrenheit

What is one reason you think that Winter cannot wear her artificial tail all the time?

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**Step 9:** Part of the reason Winter wears her tail is to exercise her muscles for physical therapy. The tail has to be the perfect weight for Winter to be able to move it up and down efficiently.

Weigh your tail on the scale:

\_\_\_\_\_ grams

If your tail weighs between 1 and 10 grams, you can move it up and down once every second.

If your tail weighs between 11 and 20 grams, you can move it up and down once every two seconds.

**Step 10:** This experiment will imitate the amount of water your tail design would move as Winter moves her tail up and down. In this case, the force of Winter's tail will be tested by seeing how much air it can move. You will measure the force by attempting to extinguish a candle or blow down a piece of folded paper.

Place the tail onto Winter's tail stump. Have the team member with the tail on their arm stand up and place a candle on a desk two feet in front of them. Have your teacher light the candle or prop up the piece of paper. Use Winter's tail to fan the flame or the paper at the rate determined above. If the movement of the tail extinguishes the flame or knocks over the paper, have your teacher move the candle back an additional foot and relight it. Continue moving and relighting the candle, or moving the paper back, until the movement of the tail no longer has an effect on the flame or paper.

How many feet away was the candle when it was last extinguished or was the paper when it was knocked over? \_\_\_\_\_ feet

How many feet away was the candle when it last flickered or the paper last moved backwards? \_\_\_\_\_ feet

**Step 11:** On a separate sheet of paper, write your results and conclusions from the experiment below. Include all your results, including weight and number of feet you were able to move your candle, as well as any changes or modifications you would make to the tail if you were to redesign it. Compare and contrast your tail design with that of the other group. What worked and what didn't work? Finally, write one sentence describing something you learned about Winter's tail.

*Up*



*Start Here*



*Down*