Unit Assessment

Unit Question: What do you think is special about reindeer that allow them to stand in cold snow?

NAME: _____

PERIOD: _____ DATE: _____

INTERMOLECULAR FORCES ASSESSMENT - DON'T FREEZE MY FEET!

Reindeer Feet

If a person exposes their bare foot to ice cold snow for too long, they can experience frostbite. Frostbite is an injury that occurs when parts of the body are exposed to freezing cold temperatures for too long, causing the skin and underlying tissue to freeze.

Not all living creatures have to worry about their feet getting too cold! Take reindeer for example! Reindeer can *effortlessly* walk through the snow without risk of injury because of the ways in which different fats are distributed throughout their bodies. In this task, you will examine how this distribution of fats give reindeer an advantage in the environments in which they live and how these fats differ on a molecular level. You will then use your knowledge of intermolecular forces to explain why this is happening.





Tapping Santa Claus Office GIF By The Elves!, Retrieved from:https://giphy.com/gifs/everwhatproductions-christmas-snow-3ohs7OgmKPNdUtFmus

Segment 1: Creating and Using Models

Question 1: What do you know about solids, liquids and gases?

Reindeer habitats can get extremely cold! In order to retain *mobility* in their legs, reindeer have to have specific fatty acids in various parts of their legs. Let's see why this might be important when thinking about reindeer mobility!

Look at the table below. Use the melting point values of each fatty acid to predict what state of matter the fatty acid might exist in at 20°C:

Fatty Acids Present in a Reindeer's Leg		
Fatty Acid	Melting Point (°C)	State of Matter at 20°C (solid, liquid, or gas?)
Oleic acid	13.4	
Palmitic acid	61.8	
Stearic acid	68.8	

This data was taken from PubChem and is listed below in the references section.

Question 2

Develop a model that answers the question, "What do the particles of each fatty acid look like at 20°C?" Be sure to:

- Use the table of melting points above to help you create your model. Be sure to include appropriate labels.
- Below your model, in the box provided, explain why you chose to represent each fatty acid in the ways that you did.

**You may draw this on paper, take photos of your work, and insert your photos in the boxes below OR use google draw.*

Oleic Acid at 20°C	Palmitic Acid at 20°C	Stearic Acid at 20°C

Explanation:

Sentence starters:

- *At 20°C, oleic acid will exist as a _____. In order to represent this, I drew _____.*
- *At 20°C, palmitic acid will exist as a _____. In order to represent this, I drew _____.*
- *At 20°C, stearic acid will exist as a _____. In order to represent this, I drew _____.*

Question 3

How does your model above explain why oleic acid provides greater **mobility** and flexibility for reindeer feet in cold temperatures?

Sentence Starters:

- *Oleic acid exists as a _____ in cold temperatures as compared to palmitic acid and stearic acid. Because of this, it is (more likely / less likely) to freeze inside of a reindeer's foot.*

Question 4

Use your model to predict what might happen if reindeer feet were primarily composed of stearic acid rather than oleic acid.

Sentence Starters:

- *If reindeer feet had a higher concentration of stearic acid as compared to oleic acid, their mobility would be (increased / reduced) in their feet. This is because _____.*