Nova’s Guide to Invisible Forces

Learning objective: To identify the effects of air resistance, water resistance, and friction as forces that act between moving surfaces.

Read the passage below carefully and answer the questions. Make sure to use your scientific knowledge to explain your reasoning.

Nova the barn owl loves to glide silently through the night air. While observing her flight, she ponders the forces at work. When Nova spreads her wings, she pushes against air molecules, creating air resistance. This upward force helps her stay aloft, while the shape of her body allows her to cut through the air efficiently. On the ground, things work differently. When Leo the lion pushes a heavy wooden crate across the stone floor, he feels a force slowing him down. This is friction, caused by the two surfaces rubbing together. If the floor were covered in ice, the friction would be much lower, making the crate easier to slide. In the ocean, Finn the dolphin experiences water resistance. Because water is much denser than air, Finn has evolved a streamlined, sleek shape to reduce drag and move quickly through the waves. Whether it is air, water, or a solid surface, invisible forces are constantly acting on objects, either helping them move or slowing them down. Understanding these forces is the key to solving the puzzles of how things move.

Word bank: resistance · friction · aerodynamic · surface · gravity · motion

1. Identify two types of resistance mentioned in the text that act on moving objects. (2 marks)

2. According to the passage, why is it easier to slide a crate on ice than on a stone floor? (2 marks)

3. Why does Finn the dolphin have a streamlined body shape? (2 marks)

4. What might happen to the speed of a falling object if it were shaped like a flat piece of paper rather than a ball? (2 marks)

5. Nova says that forces are 'invisible'. Do you agree that forces are important even though we cannot see them? Justify your answer using examples from the text. (3 marks)

Draw: Draw a diagram of Nova the barn owl flying and a boat moving through water. Use arrows to label where air resistance and water resistance are acting on them.

Extension challenge: Research how modern engineers use the concept of 'streamlining' to design faster cars or bicycles. Write a paragraph explaining one feature they add to vehicles to reduce air resistance.