

Forces Assessment: The Physics of Motion

Learning objective: To demonstrate an understanding of gravity, air resistance, water resistance, friction, and the use of simple mechanisms.

Read each question carefully. Use your scientific vocabulary to explain your reasoning. Ensure your answers are clear and concise.

Nova the owl is observing the natural world from her favourite branch. She watches a leaf fall slowly to the ground, a diver leaping into a swimming pool, and a cyclist pedalling uphill. Max the monkey is nearby, trying to lift a heavy crate of bananas using a pulley system to save his energy. They are both curious about how the world moves.

Word bank: gravity · air resistance · friction · upthrust · surface area · mechanism · gears · levers · pulleys · streamlined

1. Nova observes a leaf drifting slowly to the ground while a stone falls quickly. Explain the force acting on both objects and why they fall at different speeds. (2 marks)

2. Define 'friction' and provide an example of how friction can be useful in everyday life. (2 marks)

3. Max is using a pulley to lift a crate. Explain how a pulley system acts as a mechanism to make lifting a heavy load easier. (3 marks)

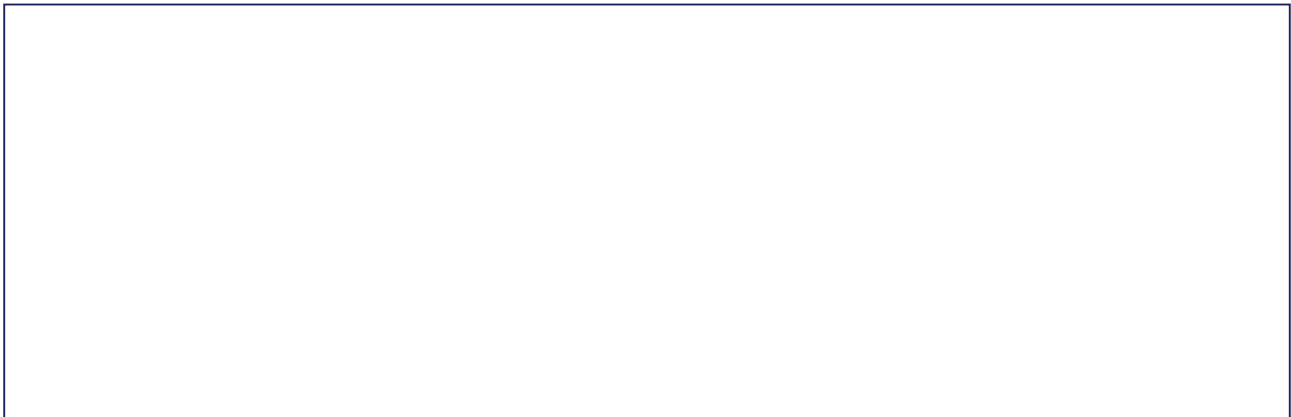
4. Compare and contrast air resistance and water resistance. How does the shape of an object affect both forces? (4 marks)

5. Justify why a professional swimmer might choose to wear a specially designed suit to reduce water resistance. (3 marks)

6. What might happen if there were no friction between the tyres of a bicycle and the road? Explain your reasoning. (3 marks)

7. Imagine you are an engineer designing a new delivery drone. Write a 5-mark extended response detailing how you would use your knowledge of forces (air resistance, gravity, and thrust) to ensure the drone flies efficiently and lands safely. (5 marks)

Draw: Draw a free-body diagram of a ball being thrown into the air. Label the forces of gravity and air resistance with arrows indicating their direction.



Extension challenge: Total: /25. Challenge: Investigate how surface area impacts terminal velocity. Design an experiment to test if two parachutes of different sizes fall at different rates. Justify why your results might differ from your initial hypothesis.