**Newton’s Laws of Motion**

1. What is Newton’s first law of motion?
2. Use Newton’s law to explain why you feel as if you have been thrown forwards when you are in a car that brakes suddenly?
3. Why are seatbelts an important safety feature of cars?
4. Magicians often pull a table cloth from under a table set with china.
   1. Use Newton’s first law to explain how this is possible.
   2. In reality, the china will probably still move slightly in the direction of the table cloth. Explain why this happens.
5. Rockets and satellites in space keep moving without needing engines to do so. Use your knowledge of Newtons 1st Law and the composition of space to explain why this occurs.
6. Explain the concept of inertia, and describe how mass affects the inertia of an object.
7. A car on ice is almost impossible to stop.
   1. Use the concept of inertia to explain why.
   2. What is the force that is required to regain control?
8. Are passengers in the rear of a car safe when not wearing seatbelts? Explain why or why not.
9. What is Newton’s second law of motion?
10. Describe what happens to the acceleration when the same force pushes larger and larger masses.
11. Describe what happens to the acceleration of an object if the force pushing it is increased.
12. Calculate the force, in Newtons (N), being applied if:
    1. A 5 kg box accelerates at 4.1 m/s2.
    2. A 1.3 tonne car accelerates at 2 m/s2.
    3. A 400 g ball accelerates at 4 m/s2.
13. Calculate the acceleration, in m/s2 caused by:
    1. A 40 N force applied to a 0.5 kg mass.
    2. A 0.5 N force applied to a 50 kg mass.
14. Calculate the mass, in kg, of:
    1. A block accelerating at 2.5 m/s2 pushed by a 65 N force.
    2. A force of 1 N accelerating a toy car at 3 m/s2.
15. What force would cause a 1.5 kg glass salad bowl to accelerate across a table at 0.3 m/s2?
16. Two identical toy carts, A and B, each with a mass of 1 kg, are pushed across a smooth, level table top with the same force. One of them contains a heavy brick. Cart A accelerates more rapidly that Cart B.
    1. Which toy cart contains the brick? How do you know?
    2. If the acceleration of Cart A is 2 m/s2, what is the force acting on each cart?
    3. If the acceleration of Cart B is 0.5 m/s2, what is the mass of the brick?
17. What is Newton’s third law of motion?
18. Describe two pairs of ‘action’ and ‘reaction’ forces by drawing a diagram and briefly explaining the forces involved.
19. Explain why a balloon shoots around the room when it is allowed to deflate.
20. Describe how a row boat is propelled through the water. Use the words ‘action force’ and ‘reaction force’ in your answer.