Newton's Second Law : Grade 11 Review

1. What is the net force required to give an automobile of mass 1600kg an acceleration of 4.5 m/s^2?
2. What is the acceleration of a wagon of mass 20kg if a horizontal force of 64N is applied to it (ignore friction)
3. What is the mass of a block of iron if a net force of 240N causes it to accelerate across a smooth horizontal surface at 2.5 m/s^2?
4. A 1.0 kilogram toy car is moving across a smooth floor with a velocity of 5.0m/s. An unbalanced force of 2.0N acts on the car for 4.0s. Determine the velocity of the car at the end of the interval in each of the following cases:
   a. If the force acts in the direction of the motion of the car.
   b. If the force acts in the opposite direction to the motion of the car.
5. An electron has a mass of 9.1x10^{-31}kg. Between the electrodes of a cathode ray tube, it moves a distance of 4.0mm, accelerated by a net electrical force of 5.6x10^{-15}N. Assuming that the electron started from rest, find its acceleration and its final velocity.
6. A bullet of mass 20g strikes a fixed block of wood at a speed of 320 m/s. The bullet embeds itself in the block of wood, penetrating to a depth of 6.0 cm. Calculate the average net force acting on the bullet while it is being brought to rest.
7. A 0.50 kg skateboard is at rest on a rough, level floor, on which two lines have been drawn 1.0m apart. A constant horizontal force is applied to the skateboard at the beginning of the interval and is removed at the end. The skateboard takes 8.5 s to cross the 1.0m distance and then it coasts for an additional 1.25m before coming to a rest. Calculate the force applied to the skateboard, and also the constant frictional force opposing its motion.
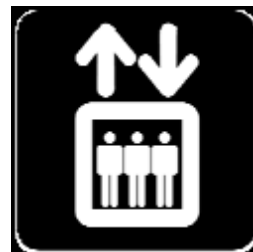
Answers :

1. 7200N   **2.** 3.2 m/s^2.   **3.** 96kg   **4. a.** 13 m/s,   **b.** -3.0 m/s
5. 6.2x10^{15} m/s^2, 7.0x10^{6}m/s **6.** 17000N   **7.** 2.5x10^{-2}N, 1.1x10^{-2}N

Elevator Problems

1. Loaded Elevator An elevator and its load have a combined mass of 1600 kg and experience a force of gravity of 15680 N. Find the tension in the supporting cable when the elevator, originally moving downward at 12 m/s, is brought to rest with constant acceleration in a distance of 42 m.

2. Elevator An elevator with a mass of 2840 kg (including passengers) is given an upward acceleration of 1.22 m/s^2 by a cable. (a) Calculate the tension in the cable, (b) What is the tension when the elevator is slowing at the rate of 1.22 m/s^2 but is still moving upward?

Answers : 1. 1.8x10^4 N; 2. (a) 31.3 kN; (b) 24.4 kN