PQ 8c Q

Q1

Calculate the momentum of the following.

(a) A 1600 kg truck moving at 7.0 m s^{-1} east.

(b) A 5.3×10^{-26} kg oxygen molecule moving west at 1.3×10^{3} m s^{-1}.

(c) A 1100 kg car being driven at 72 km h^{-1} south.

(d) A 2.5 kg bird flying north at 12.0 m s^{-1}.

(e) A 75 kg sprinter running south at 9.5 m s^{-1}.

Q2

Calculate the impulse needed to cause each of the following momentum changes.

(a) From 10.0 kg m s^{-1} W to 15 kg m s^{-1} W.
(b) From 0.6 kg m s^{-1} W to 15 kg m s^{-1} E.
(c) From 12.0 kg m s^{-1} S to 15 kg m s^{-1} N.
(d) From 10.0 kg m s^{-1} N to 15 kg m s^{-1} N.
(e) from 10 kg m s^{-1} W to 2.5 kg m s^{-1} W.
(f) If each change took 4.0 s, what force was involved?

Q3

A force of 18 N east acts on a 6.0 kg object for 4.5 s.
It was initially moving west at 15 m s^{-1}.

(a) Find the impulse of the force.
(b) Find the change in momentum of the object.
(c) Find the final momentum of the object.
(d) Find the final velocity of the object.

Q4

A toy car of mass 4.0 kg is struck horizontally by another car causing it to accelerate from 4.0 m s^{-1} to 10.0 m s^{-1} in 0.1 s. If the car was on a frictionless surface, calculate:

(a) Its change in momentum.

(b) The impulse applied to it.

(c) The average force applied to it.

Q5

A car of mass 800 kg accelerates from 12 m s^{-1} to 40 m s^{-1} in 7.0 s. Calculate:

(a) The impulse acting on the car.

(b) The average force on the car.

(c) The momentum of the car if the force acts on it for another 5 s.

Q6

As a result of being hit from behind by a toy truck, a 500 g toy car, initially at rest, rolls 12.0 m across a floor that applies a constant retarding force of 1.2 N to it. The car stops 2.0 s after being hit.

(a) If the truck was in contact with the car for 0.12 s, find the impulse given to the car.

(b) Find the momentum of the car just after being hit.

(c) Calculate the instantaneous speed of the car just after being hit.

(d) Calculate the average force applied to the car during the collision.

Q7

A toy car at rest of mass 250 g is hit by a toy truck and travels horizontally for 50.0 m in 2.0 s.

(a) Calculate the average speed of the car.

(b) Calculate its instantaneous speed just after being hit.

(c) Calculate the momentum of the car just after being hit.

(d) Find the impulse applied to the car.

(e) Calculate the average force the truck applied to the car if it was in contact for 0.02 s?

Q8

A toy truck has a mass of 500 g and hits a stationary toy car at 20.0 m s^{-1}. After impact the truck rebounds at 10 m s^{-1}. Calculate:

(a) The change in velocity of the truck.
(b) The change in momentum of the truck.
(c) The impulse of the truck on the car.
(d) The average force on the car if the collision lasted 0.05 s.
(e) The average force on the car if the collision lasted 0.01 s.

Q9

A force of 125 N acts to the left on a 6.0 kg toy truck. A second force of 45 N acts on the same truck to the right. As a result, the speed of the truck changes by 8.0 m s^{-1}. Find how long it takes for this speed change to occur.

Q10

The impulse applied to a toy car of mass 200 g at rest is 3.5 N s south. While the force acts on the car it moves 25 m.

(a) Find its change in velocity.
(b) What work is done on the car by the force?
(c) What is the acceleration of the car?
(d) How long does the force act on the car?
(e) What is its change in momentum?