Impulse Momentum Collisions in 1D Review of Physics 11.

1. What impulse is needed to accelerate a 15kg object from -6.0m/s to 14m/s?

2. How long would a 125N Force need to act on a 75kg object in order to accelerate it from rest to 11m/s?

3. A 7500N net force acts on an object for 6.0 minutes. The velocity of the object changes from 14m/s west to 41m/s east. a. Find the mass of the object.

b. What direction is the net force?

4. A collision occurs between an 8900kg truck and a 975kg Smart car. The truck experiences a force of 36000N left. What force does the Smart car experience?

The following questions (5-9 show the before and after of 1 dimensional collisions between 2 objects)

# Initial Final

5. vo1=12m/s vo2=0m/s

1 2 1 2

150g 250g v1=? v2=6.0m/s

6. vo1=12m/s vo2=3.0m/s

1 2 1 2

150g 250g v1=5.0m/s v2=?

7. vo1=12m/s vo2=3.0m/s v2=4.0m/s

1 2 1 2

150g 250g v1=?

8. vo1=12m/s vo2=3.0m/s (stuck together, perfectly inelastic collision)

1 2 1 2

150g 250g v=?

9.

vo1=6.0m/s vo2=4.0m/s (perfectly inelastic collision)

v=3.0m/s

1 2 1 2

2.0kg m2

Find m2.

10. A water balloon is filled with a mixture of sour cream, eggnog and used tea-bags. The balloon is dropped from rest and free falls for 12m. The magnitude of the change in the balloon’s momentum is 9.20kgm/s.

a. What direction is the change in momentum?

b. What direction is the impulse?

c. What is the magnitude of the impulse?

d. What force caused the change in momentum?

e. What force imparted the impulse to the balloon?

f. What is the mass of the balloon?

11. A 1600kg car travelling at 14m/s south, collides head-on with a 2500kg truck travelling north at 12m/s. The collision is “perfectly inelastic”, meaning the objects become stuck together during the collision.

A. Find the final velocity of the crumpled heap of car/truck after the collision.

B. Find the change of momentum of the car.

C. Find the change of momentum of the truck.

D. Compare the results of parts b. and c.

12. Identical constant forces push two identical objects A and B continuously, to the right, from a starting line to a finish line. Neglect friction. If A is initially at rest and B is initially moving to the right,

A.  Object A has the larger change in momentum.

B.  Object B has the larger change in momentum.

C.  Both objects have the same change in momentum

D.  Not enough information is given to decide.

13. Consider the following diagram. Showing the collision of objects A and B. The arrows show the velocity of each object before and after the collision. Assume the diagram is to scale.

A

B

Which arrow best shows the direction of the impulse from A onto B?

A B C D

Which arrow best shows the direction of the impulse from B onto A?

A B C D

14. Describe how it is possible for a 25.0g rock to have more momentum than a 1235000kg train.

15. In a performance test two cars take the same time to accelerate from rest up to the same speed. Car A has a mass of 1400 kg, and car B has a mass of 1900 kg. During the test, which car:

a. Has the greatest change in momentum?

b. Experiences the greatest impulse?

c. Is acted upon by the greatest net average force?

16. A 450g soccer ball is initially at rest. The ball is kicked and leaves the player’s foot at 20.0m/s. The ball is in contact with the player’s foot for 0.085s.

a. What is the magnitude of the change in the ball’s momentum?

b. What is the impulse imparted to the ball?

c. What average force does the ball experience?

17. A 32000kg bus is travelling at 80km/h north. The bus collides with a 260kg motorcycle traveling 160km/h south. Fill in the blanks with LESS THAN, MORE THAN, THE SAME AS.

a. the force on the bus is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the force on the motorcycle.

b. the change in momentum for the bus is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the change in momentum of the motorcycle.

c. The impulse on the bus is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the impulse on the motorcycle.

d. The acceleration of the bus is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the acceleration of the motorcycle.

e. The change in velocity of the bus is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the change in velocity of the motorcycle.

f. The general unpleasantness of the experience of the collision on the bus is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the general unpleasantness of the

experience of the collision on the motorcycle.