

Phys12 Vector Momentum/Collisions :

W.S. - 10

1 D and 2 D Problems

1) A 1.00 kg ball moves with a velocity of 1.00 m/s and collides head-on with a 2.00 kg ball initially at rest. The 2.00 kg ball bounces forward with a velocity of 0.667 m/s. Find the velocity of the 1.00 kg ball after the elastic (energy conserved) collision. Show that energy is conserved (to two sig figs).

2) A 5.00 kg ball moves with a velocity of 2.00 m/s and collides head-on with a 1.00 kg ball initially at rest. The 1.00 kg ball moves off in the forward direction with a velocity of 3.35 m/s. Find the velocity of the 5.00 kg ball after the elastic collision. Show that energy is conserved (to two sig figs).

3) If the collision in question 2) above is perfectly inelastic (balls stick together), find the final velocity of the pair. Show that energy is not conserved.

4) An object at rest explodes into three pieces. Two of the pieces have the respective momenta; [5 , 7] and [-2 , 4]. (Units are kg m/s) Find the momentum of the third piece.

5) An object with a momentum of [12 , 0], collides with a stationary object. The second object which was initially at rest, moves off with a momentum of [7 , 2]. Find the final momentum of the first object.

6) Two objects with respective momenta of [7 , 0] and [-5 , 9], collide and stick together. Find the final total momentum of the system.

Answers : 1) - 0.334 m/s, E (before) = E (after) = 0.50 J, 2) 1.33 m/s, E (before) = E (after) = 10. J, 3) 1.67 m/s, E (before) = 10.0 J, E (after) = 8.33 J, 4) [-3,-11] kg m/s, 5) [5,-2] kg m/s, 6) [2,9] kg m/s.