1. Two objects (A and B) collide. A has mass 2.0 kg and B has mass 3.0 kg. The velocities before the collision are $\mathbf{v}_{iA} = <15,30>$ m/s and $\mathbf{v}_{iB} = <-10,5>$ m/s. After the collision, $\mathbf{v}_{fA} = <-6,30>$ m/s. Find the final velocity of B and the change in kinetic energy in the collision.

Ans: -315 J

2. A helium atom ($m = 6.6465 \times 10^{-27}$ kg) collides elastically with an oxygen atom ($m = 2.6560 \times 10^{-26}$ kg) at rest. After the collision, the helium atom is observed to be moving with a velocity of 6.636×10^6 m/s in a direction at an angle of 84.7° relative to its original direction. The oxygen atom is observed to move at an angle of −40.4°. (a) Find the speed of the oxygen atom. (b) Find the speed of the helium atom before the collision.

Ans: (b) 8.376×10^6 m/s

3. An atom of mass $m_1 = m$ moves in the positive x direction with speed $v_1 = v$. It collides with and sticks to an atom of mass $m_2 = 2m$ moving in the positive y direction with speed $v_2 = 2v/3$. Find the resultant speed and direction of motion of the combination, and find the kinetic energy lost (as a fraction of the initial total kinetic energy) in this inelastic collision.

Ans: 53.1°; 51%