**Problem 1**

A 1000-kg two stage rocket is traveling at a speed of $5.00 \times 10^3$ m/s away from the Earth when a pre-designed explosion separates the rocket into two sections of 100 kg and 900 kg. (We assume that a loss of mass due to the explosion is negligible.) The 900-kg section moves in a direction perpendicular to the original line of motion with a speed of $1.00 \times 10^3$ m/s. Ignore any gravitational forces from the Earth and other planets.

(a) What is the speed and direction of the 100-kg section (relative to the original line of motion) after the explosion?

(b) How much energy was supplied by the explosion?

**Analysis - Visualization**

\[ \Delta K = K_f - K_i > 0 \]

\[ \text{Line of original motion} \]

\[ \text{Direction} \]

**Problem 2**

A 20.0-kg projectile is fired at an angle of 60.0° above the horizontal and with a speed of 240 m/s. At the highest point of its trajectory explodes into two fragments, one of which has a mass of 15.0 kg and falls vertically with an initial speed of 10.0 m/s. Neglect air resistance.

(a) How far from the point of firing does the other fragment strike if the terrain is level?

(b) How much energy is released during the explosion?

(c) Find the position $(x, y)$ of the center of mass system of two fragments at time of 10 seconds after the explosion.

**Analysis - Visualization**