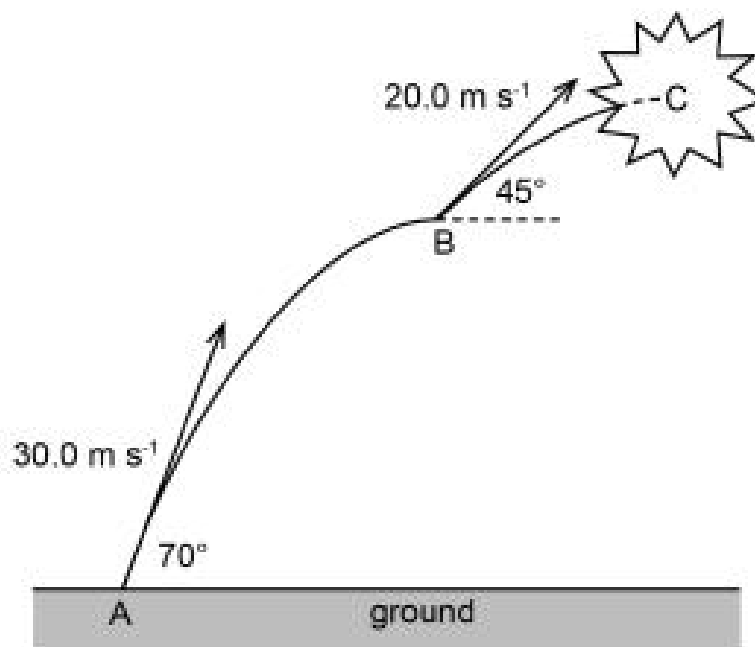


Question 11

(13 marks)

A firework rocket was launched into the air from the ground at point A with an initial velocity of  $30.0 \text{ m s}^{-1}$  at an angle of  $70.0^\circ$  to the horizontal. When the firework rocket reached its initial maximum height at point B, there was a second explosion that further propelled the upper part of the firework rocket with a new velocity of  $20.0 \text{ m s}^{-1}$  at an angle of  $45.0^\circ$  to the horizontal. This upper part of the firework rocket was propelled to a new maximum height at point C where the firework rocket exploded. Ignore all effects due to air resistance.



- (a) Determine the initial vertical velocity of the firework rocket.

(2 marks)

Answer \_\_\_\_\_  $\text{m s}^{-1}$

(b) Calculate the height of point B.

(3 marks)

Answer \_\_\_\_\_ m

(c) Calculate the total time it takes for the firework rocket to reach point C where it explodes.  
(5 marks)

- (d) Use the axes below to sketch a graph of vertical velocity against time of the firework from immediately after it is launched at point A until it reaches point C. Use appropriate values and ignore all effects due to air resistance. (3 marks)

