

**Rocket thrust: How high will the rocket go?**

A rocket whose mass is  $X$  kg sits on a launch pad (point A). At  $t = 0$  the engines are ignited and a thrust force of  $Y$  begins to lift the rocket upward. The engines burn for  $Z$  seconds and then shut off (point B). The rocket continues upward until it reaches its maximum altitude (point C). We will assume that the mass of the rocket remains constant as the fuel burns. We will also ignore the effects of air friction. Use  $g = 10 \text{ m/s}^2$

$X =$  \_\_\_\_\_ kg       $Y =$  \_\_\_\_\_ N       $Z =$  \_\_\_\_\_ sec

- a) Draw the force diagram for the rocket between the points A and B.
- b) Draw the force diagram for the rocket between the points B and C.

**Determine the following. Show work on a separate sheet..**

- c) the upward acceleration of the rocket.
  - d) the altitude of the rocket when the engine turns off (point B).
  - e) the velocity of the rocket when the engine turns off (point B).
  - f) the maximum height of the rocket from the ground (point C).
  - g) the total time it takes to reach that height.
- h) On the diagram below, draw a motion diagram for all the parts of the motions. Include acceleration vectors.
- i) Fill in the values.

