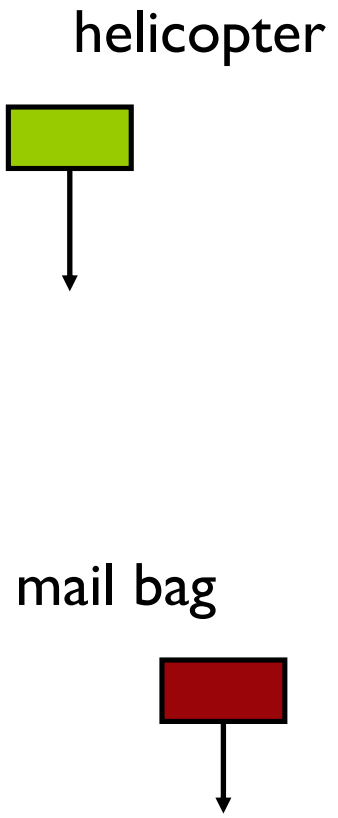
Problem 2.50

A helicopter descends at a rate of 1.5 m/s. A mailbag in the helicopter falls from the craft. After 2 seconds:

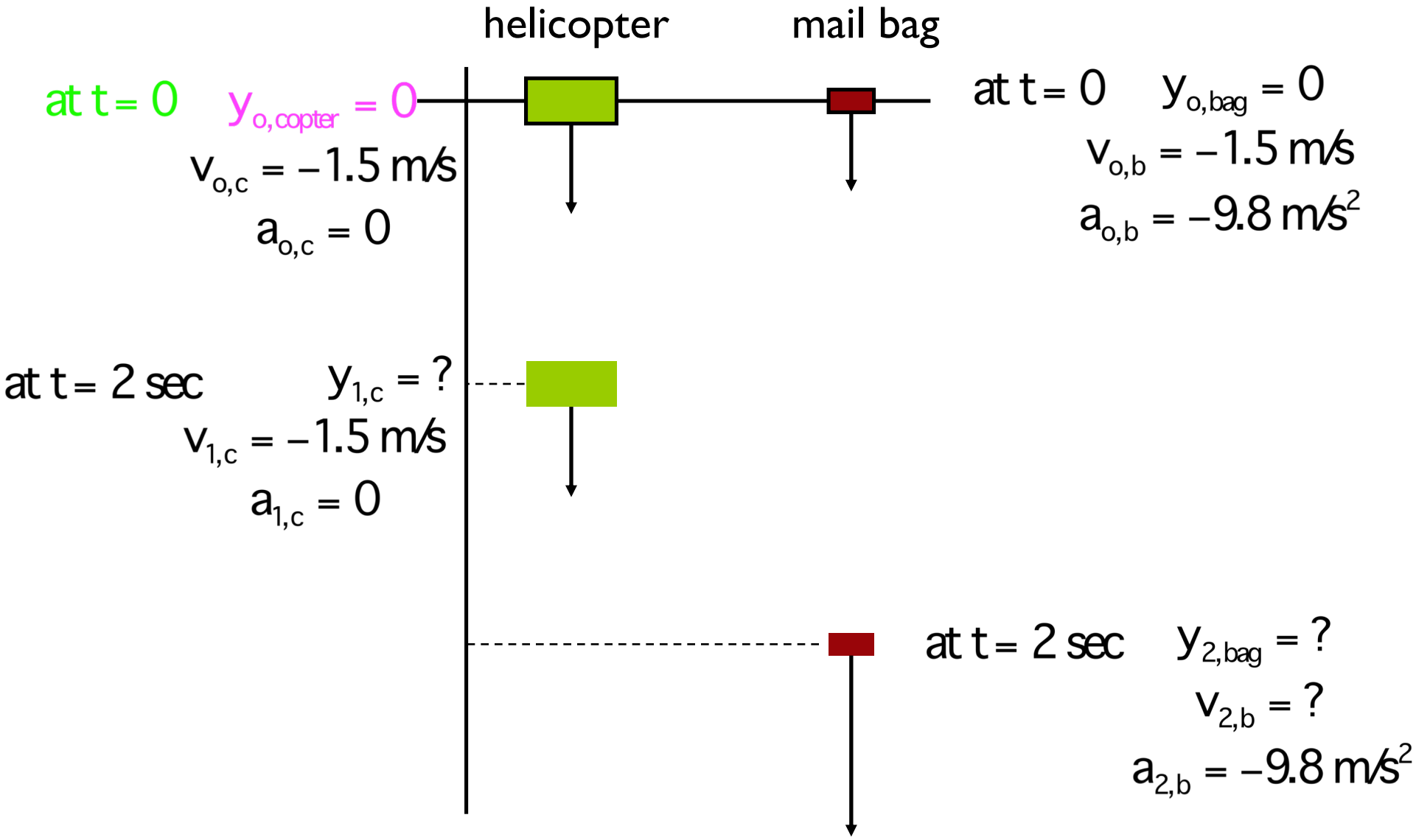
a.) How fast is the mailbag traveling?

b.) How far below the copter is the mailbag?

c.) How would Part a and b change if the copter had been rising?



Starting with a sketch:



a.) How fast is the mailbag traveling after 2 seconds??

b.) How far below the copter is the mailbag after 2 seconds?

a.) How fast is the mailbag traveling?

We're looking for the "final" velocity knowing the initial velocity, the acceleration and the time.

$$v_{2,b} = v_{o,b} + a_b t$$
$$= (-1.5\ m/s) + (-9.8\ m/s^2)(2\ sec)$$
$$= -21.1\ m/s$$

b.) How far below the copter is the mailbag after 2 seconds?

We're looking for the change of position of the mailbag knowing the "final" velocity from above and the initial velocity, the acceleration at the time required.

$$v_{1,b}^{\ 2} = v_{o,b}^{\ 2} + 2a$$
$$\Rightarrow \quad \Delta y = \frac{v_{1,b}^{\ 2} - v_{o,b}^{\ 2}}{2a}$$
$$\Rightarrow \quad \Delta y = \frac{(-21.1\ m/s)^2 - (-1.5\ m/s)^2}{2(-9.8\ m/s^2)}$$
$$= -22.6\ m$$

b.) How far below the copter is the mailbag after 2 seconds? (con't.)

But because the helicopter is descending during the 2 second period, we have to subtract the distance it travels during that time to get the net distance between the two after two seconds. That is"

$$\Delta x_{copter} = v_{copter} t$$
$$= (-1.5 \text{ m/s})(2 \text{ sec})$$
$$= 3 \text{ m}$$

So the net distance between the two after two seconds is: $22.6 - 3.0 = 19.6$ m