Quiz #2B

Clearly indicate (with a box) your answers to the following questions. SHOW ALL WORK.

1. A train has an initial speed of 32 miles/hr and slows down with an acceleration of $-1.2\ m/s^2$ until it comes to a stop. The acceleration stops when the train stops.

a) Will the train stop before reaching an intersection 72 meters away? Justify your answer.

b) During a 22-second time interval starting the moment the train begins to slow down, what is the average velocity of the train?

a) $\Delta x = ?$

$V_0 = 32 \frac{mi}{hr} = 14.3\ m/s$

$v = 0$

$a = -1.2\ m/s^2$

$t = ?$

Δx:

$v^2 = v_0^2 + 2a\Delta x$

$0^2 = (14.3)^2 - 2.4\,\Delta x$

$\Delta x = \frac{-14.3^2}{-2.4}$

$= 85.2\ m$

no, it doesn't stop

b) time to stop: $v = v_0 + at$

$0 = 14.3 - 1.2t$

$t = 11.9\ s < 22$

so $\Delta x_{tot} = 85.2\ m$

$t = 22\ s$

$\bar{v} = \frac{85.2}{22} = 3.9\ m/s$

2. Two rocks are thrown off the edge of the same cliff simultaneously. The first rock is thrown downward and strikes the ground 2.2 seconds after it was released.

The second rock is thrown upward with the same speed. $5.0\ m/s$

a) To what maximum height above the cliff does the 2nd rock reach?

b) How high is the cliff?

c) After how many seconds does the second rock hit the ground?

a) $\Delta y = ?$
$V_0 = 5.0\ m/s$
$V = 0$
$a = -9.8\ m/s^2$
$t = ?$

$V^2 = V_0^2 + 2a\Delta y$

$0 = 25 - 19.6\Delta y$

$\Delta y = \frac{-25}{-19.6} = \boxed{1.3\ m}$

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b) $\Delta y = ?$
$V_0 = -5.0\ m/s$
$V = ?$
$a = -9.8\ m/s$
$t = 2.2\ s$

$\Delta y = V_0 t + \frac{1}{2}at^2$

$= (-5.0)(2.2) - 4.9(2.2)^2$

$= -34.7\ m$

$\boxed{\text{cliff is } 35\ m \text{ high}}$

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c) $\Delta y = -34.7\ m$
$V_0 = 5.0\ m/s$
$V = ?$
$a = -9.8\ m/s^2$
$t = ?$

$\Delta y = V_0 t + \frac{1}{2}at^2$

$-34.7 = 5.0t - 4.9t^2$

$4.9t^2 - 5.0 - 34.7 = 0$

$t = \frac{5.0 \pm \sqrt{25 - 4(4.9)(-34.7)}}{9.8}$

$t = \frac{5.0 \pm 26.55}{9.8} \Rightarrow \boxed{t = 3.2\ s}$