Honors Physics Test - Ch. 2a -uniform acceleration -

Name WARD ____ 0

1. How many seconds does it take a radio message to reach Mars? The radio signals travel at a constant velocity of 2.99×10^8 m/s the whole trip. The distance to Mars is 2.28×10^{11} m.

Kinematics Equations (for constant "a")

missing	
a	$\Delta x = \frac{1}{2}(v_f + v_i)t$
Δx	$v_f = v_i + at$
v_f	$\Delta x = v_i t + \frac{1}{2}at^2$
t	$v_f^2 = v_i^2 + 2a\Delta x$
v_i	$\Delta x = v_f t - \frac{1}{2}at^2$

$V_i = 2.99 \times 10^8 \frac{m}{s}$

$V_f = 2.99 \times 10^8 \frac{m}{s}$

$\Delta X = 2.28 \times 10^{11} m$

$t = \_\_\_\_ s$

$\Delta X = \frac{1}{2}(V_f + V_i)t$

$\Delta X = Vt$

$t = \frac{\Delta X}{V}$

$= \frac{2.28 \times 10^{11} m}{2.99 \times 10^8 \frac{m}{s}}$

$\boxed{t = 763 s}$

2. A jet traveling 18.5 m/s accelerates to 136 m/s at an acceleration of 7.95 m/s^2. (a) Solve for the displacement using algebra without substituting numbers or units. (b) Substitute the values into part 'a' and solve for the displacement.

$V_i = 18.5 \frac{m}{s}$

$V_f = 136 \frac{m}{s}$

$a = 7.95 \frac{m}{s^2}$

$\Delta X = \_\_\_\_ m$

$V_f^2 = V_i^2 + 2a\Delta X$

a) $\boxed{\Delta X = \frac{V_f^2 - V_i^2}{2a}}$

$= \frac{(136 \frac{m}{s})^2 - (18.5 \frac{m}{s})^2}{2(7.95 \frac{m}{s^2})}$

b $\boxed{\Delta X = 1140 m}$

3. A ball hit the wall at 34.7 m/s and bounced back. If the collision lasted 4.85×10^{-3} seconds, and the ball's acceleration is 1.34×10^{4} m/s^2, at what velocity did it bounce back? (a) Solve for the velocity using algebra without substituting numbers or units. (b) Substitute the values into part 'a' and solve for the velocity.

$V_i = 34.7 \frac{m}{s}$

$t = 4.85 \times 10^{-3} s$

$a = -1.34 \times 10^{4} \frac{m}{s^2}$

$V_f = \_\_\_ \frac{m}{s}$

a) $\boxed{V_f = V_i + at}$

$V_f = 34.7 \frac{m}{s} - 1.34 \times 10^{4} \frac{m}{s^2} (4.85 \times 10^{-3} s)$

b) $\boxed{V_f = -30.3 \frac{m}{s}}$

4. A rapid transit car accelerates at 2.05 m/s^2 and covers 600 m in 10.3 s. What is its initial velocity? (a) Solve for the velocity using algebra without substituting numbers or units. (b) Substitute the values into part 'a' and solve for the velocity.

$a = 2.05 \frac{m}{s^2}$

$\Delta X = 600 m$

$t = 10.3 s$

$V_i = \_\_\_ \frac{m}{s}$

$\Delta X = V_i t + \frac{1}{2} a t^2$

$V_i t = \Delta X - \frac{1}{2} a t^2$

a) $\boxed{V_i = \frac{\Delta X - \frac{1}{2} a t^2}{t}}$

$V_i = \frac{600 m - 0.5 (2.05 \frac{m}{s^2})(10.3 s)^2}{10.3 s}$

b) $\boxed{V_i = 47.7 \frac{m}{s}}$

5. A train going 8 m/s accelerates at 0.15 m/s^2. How long does it take to cover 2500 meters?

$V_i = 8 \frac{m}{s}$

$a = 0.15 \frac{m}{s^2}$

$\Delta X = 2500 m$

$t = \_\_\_\_ s$

$\Delta X = V_i t + \frac{1}{2} a t^2$

use 2 equation method

$V_f^2 = V_i^2 + 2a\Delta X$

$V_f = \sqrt{V_i^2 + 2a\Delta X}$

$= \sqrt{(8 \frac{m}{s})^2 + 2(0.15 \frac{m}{s^2})(2500 m)}$

$V_f = \pm 28.5 \frac{m}{s}$

$t = \frac{\pm 28.5 \frac{m}{s} - 8 \frac{m}{s}}{0.15 \frac{m}{s^2}}$

$V_f = V_i + at$

$t = \frac{V_f - V_i}{a}$

$\boxed{t_1 = 137 s}$

$t_2 = -243 s$

(EC 5 pts) At the instant a traffic light turns green, a car starts from rest with a constant acceleration of 2.25 m/s^2. At the same instant, a truck going the same direction at a constant 22.0 m/s is next to the car. (a) How far from the starting point will the car catch the truck (be next to it)? (b) What will the car's velocity be at this point?

$V_{ic} = 0 \frac{m}{s}$

$a_c = 2.25 \frac{m}{s^2}$

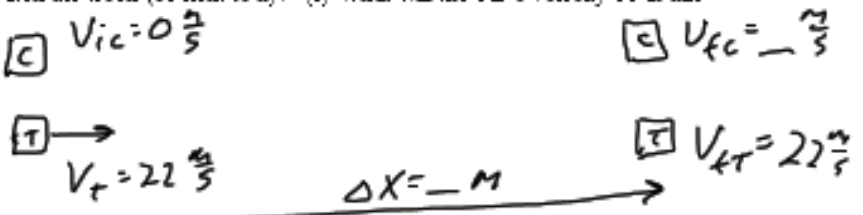
$V_T = 22 \frac{m}{s}$

$a_T = 0 \frac{m}{s^2}$

$\Delta X = \_\_ m$

$V_{fc} = \_\_ m$

This is one of several solutions. Find a better one.



$\Delta X_T = \Delta X_c$

$V_T t = \cancel{V_{ic}^0} + \frac{1}{2} a t^2$

$V_T = \frac{1}{2} a t$

$t = \frac{2V_T}{a}$

$= \frac{2(22 \frac{m}{s})}{2.25 \frac{m}{s^2}}$

$t = 19.6 s$

$\Delta X_T = V_T t$

$= 22 \frac{m}{s} (19.6 s)$

a) $\boxed{\Delta X_c = 431 m}$

$V_{fc} = \cancel{V_{ic}^0} + at$

$= 2.25 \frac{m}{s^2} (19.6 s)$

b) $\boxed{V_{fc} = 44.1 \frac{m}{s}}$