First Weekly Quiz Tonight, 45 Minutes, Due 11:59pm, Shows up 1:59pm

Potentially Useful Info (so you don't have to refer to the equation sheet):

$\Delta x = x_f - x_i$

$\bar{v} = \frac{\Delta x}{\Delta t}$

$\bar{a} = \frac{\Delta v}{\Delta t}$

$v_f^2 = v_i^2 + 2a\Delta x$

$v_f = v_i + at$

$\Delta x = v_i t + \frac{1}{2}at^2$

Constant acceleration equations

$\sin\theta = \frac{opp}{hyp}; \quad \cos\theta = \frac{adj}{hyp}; \quad \tan\theta = \frac{opp}{adj}$

Quadratics:

$ax^2 + bx + c = 0$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

g=9.8 m/s^2

1 kg = 2.2 pounds; 1 m = 3.281 ft; 1 in = 2.54 cm; 1 km = 1000 m

Speed of light: 3x10^8 m/s; 1 mile = 1609 meters

If I decide to curve the quiz grade, I will make this question worth something. Would you like to get free points if I decide to offer them? (If you don't answer this question, you won't get the curve if I decide to give it.)

○ Yes, of course

You must select Yes if you want a curve if I decide to give one!

Constant acceleration equations. Only use if acceleration constant (most problems)

Might have a problem you have to break into steps (e.g. before/after brakes)

Which formula to use?

Constant a or not

$$\bar{v} \equiv \frac{\Delta x}{\Delta t}$$

$$v = v_o + at$$

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

$$v_{avg} = \frac{v + v_o}{2}$$

$$\Delta x = v_o t + \frac{1}{2} a t^2$$

v = final velocity

$v_o = v_i$ = initial velocity

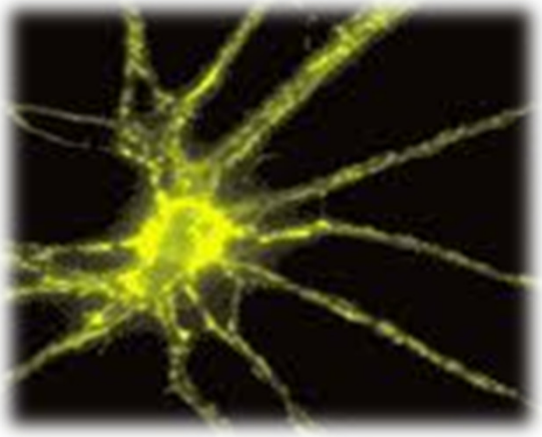
Pro Tip #3: List what you know and need to know in variable form

- 1 equation with one unknown is solvable.
- 2 equations with two unknowns is solvable.
  - Pro Tip # 4: Practice helps you pick best formulas!

Student Request from Practice Problems

21. A 50.0-g Super Ball traveling at 25.0 m/s bounces off a brick wall and rebounds at 22.0 m/s. A high-speed camera records this event. If the ball is in contact with the wall for 3.50 ms, what is the magnitude of the average acceleration of the ball during this time interval?

The speed of a nerve impulse in the human body is about 100 m/s. If you accidentally stub your toe in the dark, **estimate** the time it takes the nerve impulse to travel to your brain.



Tips: picture, positive direction, and list knowns and unknowns.

Use your listed variables to select a formula.

$$\bar{v} \equiv \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i} \qquad \bar{a} \equiv \frac{v_f - v_i}{t_f - t_i} = \frac{\Delta v}{\Delta t}$$

Average speed = distance / time

Δt = distance/speed = ~2 m / 100 m/s

= 0.02 s or 20 milliseconds

Acceleration

Q03

acceleration = change in **velocity** over some time

Consider the following situations:

- a car slowing down at a stop sign
- a ball being swung in a circle at constant speed
- a vibrating string (ex: plucked guitar string)
- a person driving down a straight section of highway at constant speed with her foot on the accelerator

In how many of the situations is the object accelerating?

A. 0 **B. 1** **C. 2** **D. 3** **E. 4**

Student Request from Practice Problems

13. T A person takes a trip, driving with a constant speed of 89.5 km/h, except for a 22.0-min rest stop. If the person's average speed is 77.8 km/h,

a. how much time is spent on the trip and

Answer

b. how far does the person travel?

Blue number means harder and it is harder. (Red number means super hard.)

Harder than anything on the quiz. Still want to do it?

Planning a Strategy

A certain car is capable of accelerating at a rate of 0.60 m/s^2. How long does it take for this car to go from a speed of 55 mi/h to a speed of 60 mi/h?

What are our pro tips?

Draw picture and frame. List the knowns & unknowns

Want: Δt Know: v_o, v_f, a

Make sure your knowns have correct units/signs.

$v = v_o + a\,\Delta t$ rearrange: $\Delta t = (v - v_o)/a$

Can we just plug in our numbers?

Will need to convert mi/h to what? (or m/s^2 to what?)

While could do either, I find easier to stick to SI units.

While chasing its prey in a short sprint, a cheetah starts from rest and runs 45 m in a straight line, reaching a final speed of 72 km/h. (a) Determine the cheetah's average acceleration during the short sprint, and (b) find its displacement at t = 3.5s.

Answer to clicker: The first 3 are accelerating