Tuesday, November 27/12
Science 10

Announcements

1. Check: Understanding Concepts - Page 473, #5-8
   Optional -> #9

2. Quiz - Chapter 12 Problems -> Thursday

3. Activity - Acceleration of a Cart -> Optional

4. Worksheet - Chapter 12 → H/W.

5. Electrical Nature of Matter
   - Matter
   - Atoms
   - Subatomic particles: neutron, proton and electron
   - Static Electricity
   - Law of Electric Charges
   - Three Ways to Charge Objects

$\vec{a} = \frac{\vec{v}_f - \vec{v}_i}{t}$ or $\vec{v}_f = \vec{v}_i + \vec{a}t$

$\Delta \vec{d} = \frac{(\vec{v}_i + \vec{v}_f)t}{2}$

$\Delta \vec{d} = \vec{v}_i t + \frac{1}{2}\vec{a}t^2$

4 to 5 Problems.

→ List variables.
→ Conversions?

→ Pick a formula
→ may have to rearrange

→ Substitute values (signs and units)

→ final answer (SD and units)

→ W.S. (give the direction)

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#6. South

$\vec{v}_i = -28\ m/s$

$t = 2.0\ ms$

$1000\ ms = 1\ s$

$2.0\ ms \times \frac{1\ s}{1000\ ms} = 0.0020\ s$

$\vec{v}_f = +46\ \frac{m}{s}$

$\Delta\vec{d} = ?$

$\Delta\vec{d} = \frac{(\vec{v}_i + \vec{v}_f)t}{2}$

$\Delta\vec{d} = \frac{\left(-28\ \frac{m}{s} + 46\ \frac{m}{s}\right)(0.0020\ s)}{2}$

$\Delta\vec{d} = +0.018\ m$

The displacement was 0.018 m [N].

Page 473 - Do #5-8, #9 Optional

Understanding Concepts

For questions 5 to 9, assume constant acceleration and calculate your answers from defining equations.

5. A dragster slows down from 28 m/s [N] to 13 m/s [N] in a time of 12 s using a parachute and brakes. Calculate the displacement during this acceleration.

6. A baseball pitcher throws the ball at 28 m/s [S] toward a batter. The ball is in contact with the bat for 2.0 ms and leaves the bat travelling at 46 m/s [N]. What is the displacement of the ball while in contact with the bat?

7. A golfer hits a golf ball sitting at rest on a tee. The ball leaves the club at 64 m/s after a displacement of 35 mm. For how long was the club in contact with the ball?

8. While driving along a highway at 25 m/s [N], a driver spots an animal crossing the road. She brakes sharply for 2.0 s. If the car's acceleration is 10 m/s^2 [S], what is the displacement of the car while braking?

☆ **9.** A speedboat travels at 6.0 m/s [E] for 90 s and then accelerates uniformly at 2.0 m/s^2 [E] for 5.0 s. Calculate the displacement of the speedboat.

Answer Key

1. $t = 2.0\,min = 120\,s$

$\vec{a} = +0.19\,m/s^2$

$\vec{v}_i = 0\,m/s$

$\vec{v}_f = ?$

$\vec{v}_f = \vec{v}_i + \vec{a}t$

$\vec{v}_f = \left(0.19\,\frac{m}{s^2}\right)(120\,s)$

$\vec{v}_f = +23\,m/s$

The final velocity was 23 m/s [E].

2. $\Delta\vec{d} = -115\,m$

$\vec{v}_i = -4.20\,m/s$

$\vec{v}_f = -5.00\,m/s$

$t = ?$

$\Delta\vec{d} = \left(\frac{\vec{v}_i + \vec{v}_f}{2}\right)t$

$2\Delta\vec{d} = (\vec{v}_i + \vec{v}_f)t$

$t = \frac{2\Delta\vec{d}}{\vec{v}_i + \vec{v}_f}$

$t = \frac{2(-115\,m)}{-4.20\,\frac{m}{s} - 5.00\,\frac{m}{s}}$

$t = 25.0\,s$

It took 25.0 s.

3. $\vec{v}_i = +186\,\frac{km}{h} = +51.7\,m/s$

$\vec{a} = -1.5\,\frac{m}{s^2}$

$\vec{v}_f = 0\,m/s$

$t = ?$

$\vec{v}_f = \vec{v}_i + \vec{a}t$

$t = \frac{-\vec{v}_i}{\vec{a}}$

$t = \frac{-(51.7\,\frac{m}{s})}{-1.5\,\frac{m}{s^2}}$

$t = 34\,s$

It took 34 s.

#4 $\vec{v}_i = 30.0 \frac{km}{h}$

$\vec{v}_f = 42.0 \frac{km}{h}$

$t = 30.0s \times \frac{1h}{3600s} = 0.00833h$

$\Delta\vec{d} = ?$

$$\Delta\vec{d} = \frac{(\vec{v}_i + \vec{v}_f)t}{2}$$

$$\Delta\vec{d} = \frac{\left(30.0\frac{km}{h} + 42.0\frac{km}{h}\right)(0.00833h)}{2}$$

$$\Delta\vec{d} = 0.300m$$

The displacement was 0.300 m, forward.

#5. $\vec{v}_i = -1.1 m/s$

$\vec{a} = -0.20\frac{m}{s^2}$

$t = 0.80s$

$\Delta\vec{d} = ?$

$$\Delta\vec{d} = \vec{v}_i t + \frac{1}{2}\vec{a}t^2$$

$$\Delta\vec{d} = \left(-1.1\frac{m}{s}\right)(0.80s) + \frac{1}{2}\left(-0.20\frac{m}{s^2}\right)(0.80s)^2$$

$$\Delta\vec{d} = -0.94m$$

The displacement was 0.94m [W].

6. $\Delta\vec{d} = +180.0km$

$\vec{v}_i = +10800\frac{km}{h}$

$\vec{v}_f = 0\frac{km}{h}$

$t = ?$

$$\Delta\vec{d} = \frac{(\vec{v}_i + \vec{v}_f)t}{2}$$

$$2\Delta\vec{d} = (\vec{v}_i + \vec{v}_f)t$$

$$t = \frac{2\Delta\vec{d}}{\vec{v}_i + \vec{v}_f}$$

$$t = \frac{2(180.0\frac{km}{h})}{10800\frac{km}{h} + 0}$$

$$t = 0.03335$$

It took 0.0333 s.

#7. $\Delta\vec{d} = +24m$

$\vec{a} = +1.4\frac{m}{s^2}$

$t = 3.0s$

$\vec{v}_i = ?$

$$\Delta\vec{d} = \vec{v}_i t + \frac{1}{2}\vec{a}t^2$$

$$\frac{\Delta\vec{d} - \frac{1}{2}\vec{v}_i t^2}{t} = \frac{\vec{v}_i t}{t}$$

$$\vec{v}_i = \frac{\Delta\vec{d} - \frac{1}{2}\vec{v}_i t^2}{t}$$

$$\vec{v}_i = \frac{24m - \frac{1}{2}\left(4.4\frac{m}{s^2}\right)(3.0s)^2}{3.0s}$$

$$\vec{v}_i = +5.9\frac{m}{s}$$

The initial velocity was 5.9 m/s [E].