Wednesday, November 21/12
Science 10

Announcements

1. Bell Work
2. Test - Chapter 11 - Make Arrangements to Write
3. Acceleration
4. Understanding Concepts - Page 465, #4, 5, 7 and 8 - HW P3 & P4

---

5. Displacement During Constant Acceleration
6. Understanding Concepts - Page 473, #5-8
   Optional -> #9

Bell Work - Nov. 21/12

Suppose a plane reaches its destination and touches down on the runway travelling 305 km/h [E]. If the plane takes 25 s to come to a complete stop, what is its acceleration?

$\vec{v}_i = +305\ \text{km/h}$ ←

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

$t = 25\ \text{s}$ ←

$\vec{a} = ?$ ←

$$\left[\ \vec{a} = \frac{\vec{v}_f - \vec{v}_i}{t} \qquad \vec{v}_f = \vec{v}_i + \vec{a}\,t\ \right]$$

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

$$\vec{a} = \frac{0\ \frac{\text{km}}{\text{h}} - \left(305\ \frac{\text{km}}{\text{h}}\right)}{25\ \text{s}}$$

$$\vec{a} = -12\ \frac{\frac{\text{km}}{\text{h}}}{\text{s}}\ \}$$

The acceleration of the airplane when landing is 12 (km/h)/s [W].

Page 462

Sample Problem 1

An airplane waits to receive clearance from the air-traffic controller before it is allowed to start accelerating down the assigned runway (**Figure 1**). Suppose the plane starts from rest and accelerates to a final velocity of 270 km/h [E] in a time of 32 s. Calculate the acceleration of the airplane. Assume that vectors to the east are positive.

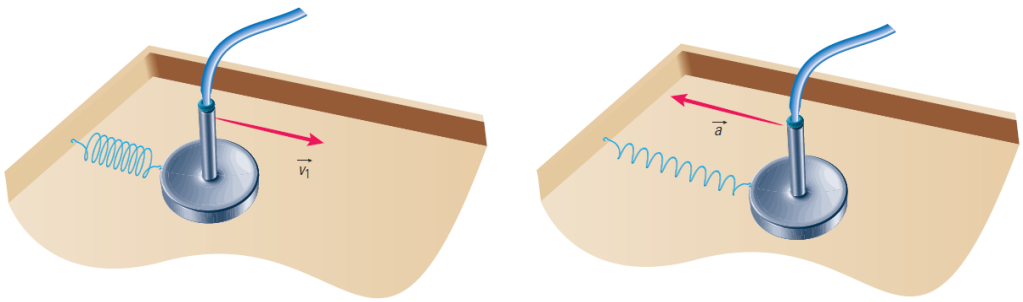
Page 463

Sample Problem 3

An air puck on an air table is attached to a spring. The puck is fired across the table at an initial velocity of 0.45 m/s [right] and the spring accelerates the air puck at an average acceleration of 1.0 m/s^2 [left]. What is the velocity of the air puck after 0.60 s?

Figure 2

The air puck is initially pushed across the table, thus stretching the spring.



Page 464

Sample Problem 4

A person throws a ball straight up from the ground. The ball leaves the person's hand with an initial velocity of 10.0 m/s [up]. The acceleration of the ball is 9.81 m/s^2 [down].

Assume that up is positive and down negative.

(a) What is the velocity of the ball after 0.50 s?

(b) What is the velocity of the ball after 1.50 s?

Page 465

Understanding Concepts

1. Compare the calculations of the scalar quantities, speed and acceleration, with the calculations of the corresponding vector quantities. What is the same and what is different?
2. You are riding your bicycle at a constant velocity west. If you decide to increase your velocity, in what direction is your acceleration?
3. While riding in a car at 90 km/h [N], the brakes are suddenly applied. In what direction is the acceleration?
4. A rabbit, eating in a field, scents a fox nearby and races off. It takes only 1.8 s to reach a top velocity of 7.5 m/s [N]. What is the rabbit's acceleration during this time?
5. A bungee jumper is falling at a velocity of 25 m/s [down] when the bungee cord just starts to stretch. After the cord stretches for 2.5 s, the velocity is 11 m/s [down]. Assume that the acceleration is constant.
   (a) What is the acceleration of the jumper?
   (b) What is the total time for the jumper to slow down from 25 m/s [down] to zero?
6. A spacecraft needs to alter its course. The retrorockets fire for 213 s to produce an acceleration of $-3.25\ m/s^2$ [forward].
   (a) What is the change in velocity of the spacecraft?
   (b) What is the significance of the negative sign of the change in velocity?
   (c) If the velocity of the spacecraft before the rockets fired was 2635 m/s [forward], what is the velocity after the rockets have fired for 213 s?
7. A supertanker coming west into port started accelerating 2.0 h before arriving. If the ship slowed at 25 km/h^2 [E] before coming to a stop, what was the initial velocity?
8. A car travelling at 26 m/s brakes and accelerates at $-10 m/s^2$ for 2.5 s. Does the car come to a stop? Support your answer with an appropriate calculation.

Making Connections

9. When you are inside a car you are moving at the same velocity as the car. If the car stops suddenly, for a while you will continue moving. Describe the motion of a driver with and without deployment of an airbag.