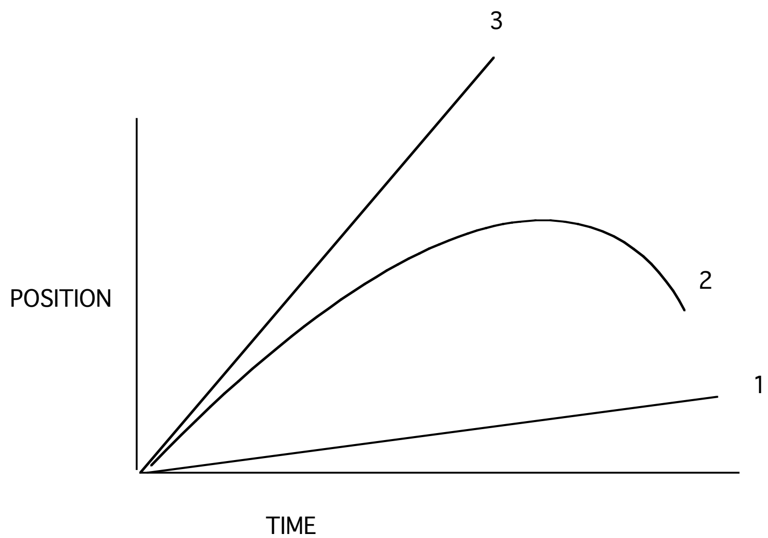
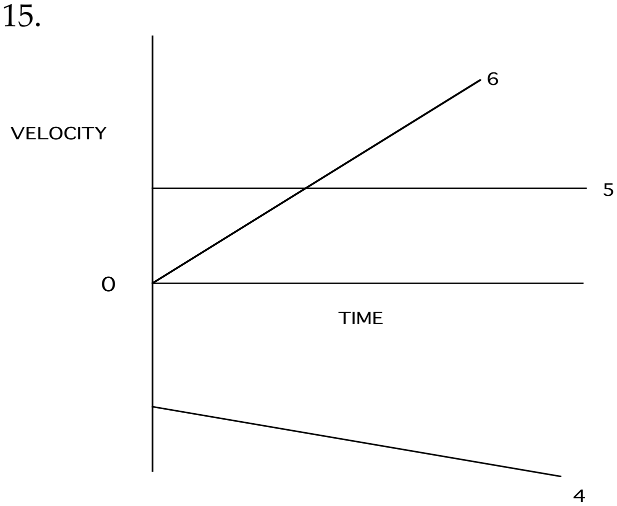
Physics with Health Science Applications.

Solutions to selected questions and problems in chapter 2.
Question 14, page 28



14 a) Curve 3 represents the largest velocity because it has the steepest slope on the position vs. time graph.
b) It appears that curve 3 has the largest initial velocity, because it has the steepest slope at 0 time.
c) Curve 2 has a nonzero value for acceleration-a changing slope on a position vs. time graph indicates a changing velocity. Curves 1 and 3 represent objects that move at constant velocity and therefore do not accelerate.

15.



15 a) Curve 6 has the largest acceleration because it has the steepest slope on the velocity vs. time graph.
b) Curve 6 has the smallest initial velocity-Zero.
c) All curves indicate a constant acceleration. Curve 4 is negative acceleration, curve 5 represents zero acceleration and curve 6 indicates positive acceleration.

1) 100m-125m= - 25m Therefore, the answer **is 25 m west**.

2) $$speed = \frac{\text{distance}}{\text{time}} = \frac{800\,km}{12\ hr} = 66.7\frac{km}{hr}$$

$$\text{velocity} = \frac{\text{displacement}}{\text{time}} = \frac{800}{12}\frac{\text{km}}{\text{hr}}\text{North} = 66.7\frac{\text{km}}{\text{hr}}\text{North}$$

4) $$a = \frac{\Delta V}{\Delta T} = \frac{V_2 - V_1}{\Delta T} = \frac{30\frac{m}{sec} - 0\frac{m}{sec}}{6\,sec} = 5\frac{m}{sec^2}\ \text{forward.}$$

5) $$a = \frac{\Delta V}{\Delta T} = \frac{V_2 - V_1}{\Delta T} = \frac{0\frac{m}{sec} - 10\frac{m}{sec}}{2.5\,sec} = -4\frac{m}{sec^2} =$$ **4 m/sec² backward**.

6) $$\text{speed} = \frac{\text{distance}}{\text{time}} = \frac{500\text{km}}{2.25\,\text{hr}} = 222\frac{\text{km}}{\text{hr}} = \frac{500\text{x}10^3\ \text{m}}{2.25\text{hr}\left(3600\frac{\text{sec}}{\text{hr}}\right)} = 61.7\frac{m}{sec}$$

15) $$V = V_o + at = \frac{10m}{sec} + 1.5\frac{m}{sec^2}(3\,sec) = 10\frac{m}{sec} + 4.5\frac{m}{sec} = 14.5\frac{m}{sec}$$

16) $$V = V_o + at = \frac{7.5m}{sec} - 1.5\frac{m}{sec^2}(2sec) = 7.5\frac{m}{sec} - 3\frac{m}{sec} = 4.5\frac{m}{sec}$$

17) $$\text{Displacement} = V_o t + \frac{1}{2}at^2 = 0 + \frac{1}{2}\left(\frac{4m}{sec^2}\right)(9\,sec)^2 = 162\ \text{meters}$$

29 Choosing the down direction as negative:

$$\text{Displacement} = V_o t + \frac{1}{2}at^2 = 0 + \frac{1}{2}\left(\frac{-9.8m}{sec^2}\right)(.18\,sec)^2 = -.159\ \text{meters}$$

The negative sign means that the aspirin is below the point of release, therefore we know that the aspirin was .159 meters above the table when it was dropped.

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30. Let's let negative indicate the down direction and positive indicate the up direction. The initial velocity V_0= - 7.5 m/s and the acceleration a = - 9.8m/s^2.

a) **After 1 sec. with an initial velocity of 7.5 m/s down:**

Dispacement =

$$V_ot+\frac{1}{2}at^2=-7.5\frac{m}{s}(1\,\mathrm{sec})+\frac{1}{2}\left(-9.8\frac{m}{\mathrm{sec}^2}\right)(1\,\mathrm{sec})^2 = -7.5m - 4.9m = -12.4m$$

Velocity $= V_o + at = -7.5\frac{m}{\mathrm{sec}} - 9.8\frac{m}{\mathrm{sec}^2}(1\mathrm{sec}) = -17.3\frac{m}{\mathrm{sec}}$

After 1 sec., with an initial velocity of 7.5 m/s down, the ball is **<u>12.4 meters below the balcony</u>** and is moving with a velocity of **<u>17.4 m/s down.</u>**

b) **After 2 seconds with an initial velocity of 7.5 m/s down:**

dispacement = $V_ot+\frac{1}{2}at^2=-7.5\frac{m}{s}(2\,\mathrm{sec})+\frac{1}{2}\left(-9.8\frac{m}{\mathrm{sec}^2}\right)(2\,\mathrm{sec})^2 = -15\,m - 19.6\,m = -34.6\,m$

Velocity $V = V_o + at = -7.5\frac{m}{\mathrm{sec}} - 9.8\frac{m}{\mathrm{sec}^2}(2\mathrm{sec}) = -27.1\frac{m}{\mathrm{sec}}$

After 2 sec., with an initial velocity of 7.5 m/s down, the ball is **<u>34.6 meters below the balcony</u>** and is moving with a velocity of **<u>27.1 m/s down.</u>**

Problem # 2.30 part 2 is similar to part 1 except the ball is thrown up instead of down. Therefore, we must use an initial velocity of + 7.5 m/s instead of **-** 7.5 m/s. If you don't make any mistakes you should find that:

After 1 sec., with an initial velocity of 7.5 m/s up, the ball is **<u>2.6 meters above the balcony</u>** and is moving with a velocity of **<u>2.3 m/s down.</u>**

After 2 sec., with an intial velocity of 7.5 m/s up, the ball is **<u>4.6 meters below the balcony</u>** and is moving with a velocity of **<u>12.1 m/s down.</u>**

2.31 The initial velocity is 0 m/s and the acceleration is 9.8 m/sec^2 down. If you take down as negative, you should get the following results:

Time (sec)	**Position (meters)**	**Velocity (m/sec)**
0	0	0
1	-4.9	-9.8
2	-19.6	-19.6
3	-44.1	-29,4
4	-78.4	-39.2