Homework 2 , chapter 2

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classical physics (210)
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chapter 2

Homework-2 [7, 17, 21, 24, 33, 38, 50, 60]

Q7] Total distance travelled is $116\ km + \frac{1}{2}(116\ km) = 174\ km$
also the displacement is
$116\ km - \frac{1}{2}(116\ km) = 58\ km$
The total time is $14.0s + 4.8s = 18.8s$.

a] Average speed $v_s = \frac{\text{distance}}{\text{time elapsed}} = \frac{174\ km}{18.8\ s} = \boxed{9.26\ m/s}$

b] Average velocity $= v_{avg} = \frac{\text{displacement}}{\text{time elapsed}} = \frac{58\ m}{18.8\ s}$
$\boxed{= 3.1\ m/s}$

Q17] Total distance travelled is $120m + \frac{1}{2}(120m) = 180m$,
and the displacement is $120m - \frac{1}{2}(120m) = 60m$
The total time is $8.4s + \frac{1}{3}(8.4s) = 11.2s$

a] Average speed $v_s = \frac{\text{distance}}{\text{time elapsed}} = \frac{180m}{11.2s} = \boxed{16\ m/s}$

b] Average velocity $= v_{avg} = \frac{\text{displacement}}{\text{time elapsed}} = \frac{60m}{11.2s} = \boxed{+5\ m/s}$

Q21] $\bar{a} = \Delta v / \Delta t$

$\Delta t = \frac{\Delta v}{\bar{a}} = \frac{110\ km/h - 80\ km/h}{1.8\ m/s^2} = \frac{30\ km/h \cdot \frac{1\ m/s}{3.6\ km/h}}{1.8\ m/s^2}$

$= 4.630s$

$= \boxed{5s}$

24] The initial velocity of the car is the average speed of the car before it accelarates.

$\bar{v} = \frac{\Delta x}{\Delta t} = \frac{110m}{5.0s} = 22m/s = v_0$

the final speed $v = 0$ & the time to stop is 4.0s.

$v = v_0 + at \rightarrow a = \frac{v - v_0}{t}$

$\frac{0 - 22m/s}{4.0s} = -5.5m/s^2.$

magnitude of the acceleration.

33] For the baseball $v_0 = 0$, $x - x_0 = 3.5m$

$v = 41m/s$

$v^2 = v_0^2 + 2a(x - x_0) \rightarrow a = \frac{v^2 - v_0^2}{2(x - x_0)} = \frac{(41m/s)^2 - 0}{2(3.5m)}$

$= \boxed{240m/s^2}$

38] The final v of car is 0. Initial velocity is found as

$v = 0$ and v_0

$v^2 = v_0^2 + 2a(x - x_0) \rightarrow v_0 = \sqrt{v^2 - 2a(x - x_0)}$

$= \sqrt{0 - 2(-4.00m/s^2)(85m)} = \boxed{26m/s}$

50] Choose +ve direction & take $y_0 = 0$ to be at the top of Emipre state. initial v is 0, $a = 9.80m/s^2$

a] $y - y_0 = v_0t + \frac{1}{2}at^2 \rightarrow t = \sqrt{\frac{2y}{a}} = \sqrt{\frac{2(380m)}{9.80m/s^2}}$

$= \boxed{8.8s}$

b] The final velocity is $v = v_0 + at = 0 + (9.80m/s^2)(8.806s)$

$= \boxed{86m/s}$

60] $y_0 = 0$ to be the height

$v_0 = 24.0 m/s$ $\quad a = -9.80 m/s^2$ $\quad y - y_0 = 13.0 m$

a] velocity can be found from

$v^2 = v_0^2 + 2a(y-y_0) = 0$

$v = \pm\sqrt{v^2 + 2ay} = \pm\sqrt{(24.0 m/s)^2 + 2(-9.80 m/s^2)(13.0 m)}$

$\boxed{v = 17.9 m/s}$

b] The time to reach that height can be $y = y_0 + v_0 t + \frac{1}{2}at^2$

$t^2 + \frac{2(24.0 m/s)}{-9.80 m/s^2} t + \frac{2(-13.0 m)}{-9.80 m/s^2} = 0 \rightarrow t^2 - 4.898 + 2.653 = 0$

$\boxed{t = 4.28 s, 0.620 s}$

c] Total 2 types at which object reaches the particular height :-

one way up ($t = 0.620 s$) and another at way down ($t = 4.28 s$)