Chapt 1 - 9, 19, 25, 37 Due Apr 12

Chapt 2 - 5, 6, 11, 19, 29, 41, 47, 68

9.) $3.80 - 3.35\,g = .45g$

$$\#\text{ atoms} = \frac{.45\,g}{197\,g/\text{mole}} \quad 6.02\times10^{23}\text{ atoms}/\text{mole} = 1.375\times10^{21}\text{ atoms lost}$$

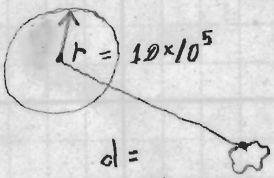
$$50\,yr \times \frac{365.25\text{ days}}{\text{year}} \times \frac{24\text{ hours}}{\text{day}} \times \frac{3600\text{ sec}}{hr} = 1.58\times10^{9}\text{ secs in 50 years}$$

$$= \boxed{8.7\times10^{11}\text{ atoms}/s}$$

19) $$\frac{1}{32}\frac{\text{inch}}{\text{day}} \quad \frac{2.54\text{ cm}}{\text{inch}} \times \frac{1\text{ day}}{24^\circ} \quad \frac{1^\circ}{3600\,s} \quad \frac{1\,m}{100\text{ cm}} \quad \frac{10^9\text{ nm}}{1\,m} = \boxed{9.2\text{ nm}/s}$$

25) $$\frac{23.94\,g \quad 1\,kg/1000\,g}{2.10\text{ cm}^3 \quad \left(\frac{1\,m}{100\text{ cm}}\right)^3} = \frac{23.94}{2.10}\;\frac{10^6}{10^3} = \boxed{1.14\times10^{4}\;\frac{kg}{m^3}}$$

37)



$d = 2\times10^6$

$$\frac{25\text{ cm}}{1.0\times10^5} = \frac{d_{model}}{2\times10^6}$$

$$d_{model} = 25\text{ cm}\;\frac{2\times10^6}{1\times10^5} = 25\text{ cm}\times 20 = 500\text{ cm} = \boxed{5.0\,m}$$

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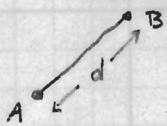
5)



$$t_1 = \frac{d}{5.00} \qquad t_2 = \frac{d}{3.00}$$

$$\langle s\rangle = \frac{2d}{t_1+t_2} = \frac{2d}{\frac{3d+5d}{15}} = \frac{2d\;15}{8d} = \frac{15}{4} = \boxed{3.75\text{ m/s}}$$

$\langle\text{velocity}\rangle = 0$ because net displacement $= 0$

6) $x = 3t^2$ $\quad t=3 \Rightarrow x = 3\cdot9 = 27\text{ m}$

$t = 3+\delta t \Rightarrow x = 3(3+\delta t)^2 = 3(9+6\delta t+\delta t^2) = 27+18\delta t+3\delta t^2$

$$\frac{x(t+\delta t) - x(t)}{\delta t} = \frac{27+18\delta t+3\delta t^2-27}{\delta t} = \frac{18\delta t+3\delta t^2}{\delta t}$$

$$= 18 + 3\delta t \qquad \lim_{\delta t\to0}(18+3\delta t) = \boxed{18\text{ m/s}}$$

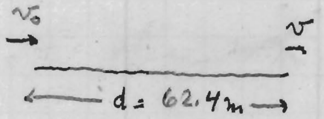
11) $\Delta v = v_f - v_i = -22 - (25) = -47\ m/s$

$\Rightarrow a = \dfrac{\Delta v}{\Delta t} = \dfrac{-47}{3.50\times10^{-3}} = \boxed{-1.34\times10^{4}\ m/s^2}$

19) $v^2 = v_0^2 + 2ad \Rightarrow a = \dfrac{v^2 - \cancel{v_0^2}^{\,0}}{2d} = \dfrac{(10.97\times10^3)^2}{2(220)} = \boxed{2.74\times10^{5}\ m/s^2}$

which is about $\boxed{28,000\ g\,!}$

29)



$t = 4.20\ s$

$v = v_0 + at$

$v^2 = v_0^2 + 2ad \Rightarrow \cancel{v^2} = (v-at)^2 + 2ad = \cancel{v^2} - 2vat + a^2t^2 + 2ad$

$\Rightarrow 2vat = a^2t^2 + 2ad$

$v = \dfrac{a^2t^2}{2at} + \dfrac{2ad}{2at} = \dfrac{at}{2} + \dfrac{d}{t} = \dfrac{(-5.6)(4.2)}{2} + \dfrac{62.4}{4.2}$

$= \boxed{3.1\ m/s}$

41) 1 mile into the air. $\frac{1}{2}at^2 = h$ (solve for time to fall, then double it)

$t = \left(\frac{2h}{g}\right)^{1/2}$. Total time $= 2\left(\frac{2h}{g}\right)^{1/2}$ and this is worth \$1.00

$= 2\left(\dfrac{2\ 1609}{9.8}\right)^{1/2} = 36.24$ $\quad \dfrac{3600}{36.24}\times \$1.00 = \$99.34\ /hr\,!$

Not bad... but probably no benefits

47) $\cancel{v^2}^{\,0} = v_0^2 + 2ad \Rightarrow 0 = v_0^2 - 2gh$

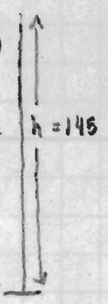
$\cancel{v}^{\,0} = v_0 + at \qquad 0 = v_0 - gt$

$\Rightarrow g^2t^2 = 2gh$

$h = \dfrac{gt^2}{2} = \dfrac{(9.8)(3)^2}{2} = \boxed{44.1\ m}$

$v_0 = 9.8\ 3 = \boxed{29.4\ m/s}$

68)



$h = \frac{1}{2}gt^2$

$\Rightarrow t = \left(\frac{2h}{g}\right)^{1/2} = \boxed{5.44\ s}$

$\frac{1}{2}g(5.18)^2 = \boxed{131.5\ m}$

$v = \cancel{v_0}^{\,0} + gt = \boxed{50.76\ m/s}$

remaining distance $= 145 - 131.5 = 13.5\ m$

$\cancel{v}^{\,0\,2} = v_0^2 + 2ad$

$\Rightarrow a = \dfrac{-v_0^2}{2d} = \dfrac{(50.76)^2}{2(13.5)} = \boxed{95.4\ m/s^2}$ $(\sim 10g)$