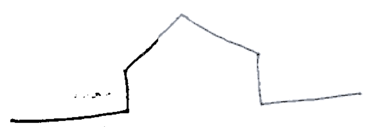
James J. Griffin
301-405-6115

Hw Set 12: Ch 15: Q 11, 31, 53; Ex 11, 17, 23;
Ch 23: Q 4, 9; Ex 1, 6.

15: Q11 It takes 60 seconds for the seconds hand to go around once it has a time period of 60 s. Its frequency = $\frac{1}{\text{period}} = \frac{1}{60}$ Hz = 0.017 Hz.

15: Q31



15: Q53 There would be a maximum or an anti node at the mid point, because two maxima, or two minima arrive there at the same time

15: Ex11. $T = 2\pi\sqrt{\frac{L}{g}} = 2\pi\sqrt{\frac{5\,m}{10\,m/s^2}} = 4.44$ sec

15: Ex17. $v = \lambda f = (25\text{ cm})(3\text{ Hz}) = (0.25\text{ m})(3\text{ Hz}) = \boxed{0.75\text{ m/s} = v}$

[NOTE Ex. 22 was assigned in place of 23, by error, in F04.]

15: Ex23 The standing-wavelengths correspond to an integer no. of half wave lengths between the posts; therefore

$\frac{\lambda_1}{2} = 3m \Rightarrow \lambda_1 = 6m$; $\frac{2\lambda_2}{2} = 3 \Rightarrow \lambda_2 = 3m$; $\lambda_3 = \frac{6}{3} = 2m$; $\lambda_4 = \frac{6}{4} = 1.5m$.

and $\frac{5\lambda_5}{2} = 3 \Rightarrow \lambda_5 = \frac{6}{5} = 1.2\,m$.

15: Ex 22 $f\cdot\lambda = v \Rightarrow f = \frac{2\,m/sec}{0.8m} = \frac{1}{T} = 2.5/sec \Rightarrow \boxed{T = \frac{1\,sec}{2.5} = 0.4\,sec}$

James J. Griffin
301-405-6115

Ch 23: Q 4, 9; Ex 1, 6

23 Q 4. Since Cl is in Col 7 of the periodic table (inside front cover), its chemistry will resemble that of F, Br, I, and At, all of which lie in Column 7.

23 Q 9. Sample (a) contains elements A & B, but NOT C.
No, because every line in (a) occurs in either A or B

23: Ex 1 Cathode rays consist of free electrons. Therefore

$$\frac{\text{charge}}{\text{mass}} = q/m = -e/m_e = \frac{-1.6\times10^{-19}\,C.}{9.11\times10^{-31}\,kg} = -1.76\times10^{11}\,\frac{C}{kg}$$

23: Ex 6 Nucleus is about 10^{-15} m across $\approx r_N$
Atom is about 10^{-10} " " $\approx r_A$. $\Big\} \Rightarrow \frac{r_A}{r_N} = 10^5 = 100{,}000$ [Cf p 490 line 1.]

Then if r_A is scaled up to 10 cm, r_N would be scaled up to $R = 10\,cm \times 10^5 \simeq 10^6\,cm \simeq 10^4\,m$ $\boxed{\simeq 10\,km}$

{As an order of magnitude estimate, this is in agreement with any value in the range $3\,km < R < 30\,km$.}

Note added 12/7/05:

The Above solution is based on the problem posed in the 4th edition of our text where the nucleus was represented by a ball of 10 cm. radius. In the 5th edition the nucleus is modelled by a ball which is 1 cm across, 20X smaller. Then our model nucleus has a radius of 0.5 cm, so that our model atom has a radius 10^5X larger: $R = 0.5\times10^5\,cm = 500\,m = 0.5\,km$. (Note that the scaling ratio $r_A/r_N = 10^5$ remains the same.)

end of HW # 12