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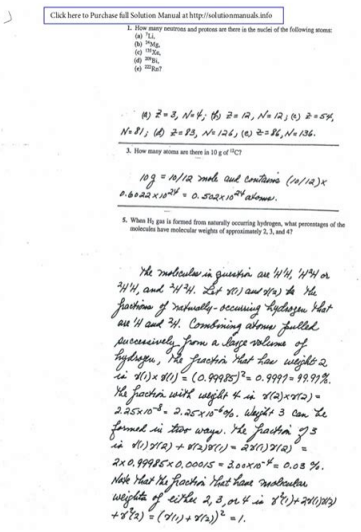
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1. How many neutrons and protons are there in the nuclei of the following atoms:
(a) $^{7}_{3}Li$,
(b) $^{24}_{12}Mg$,
(c) $^{235}_{92}U$,
(d) $^{209}_{83}Bi$,
(e) $^{226}_{88}Ra$?

(a) $Z=3$, $N=4$; (b) $Z=12$, $N=12$; (c) $Z=92$, $N=81$; (d) $Z=83$, $N=126$; (e) $Z=88$, $N=136$.

3. How many atoms are there in 10 g of ^{12}C?

$10\,g = 10/12$ mole and contains $(10/12)\times 6.022\times10^{23} = 0.502\times10^{24}$ atoms.

5. When H_2 gas is formed from naturally occurring hydrogen, what percentages of the molecules have molecular weights of approximately 2, 3, and 4?

The molecules in question are $^1H^1H$, $^1H^2H$ or $^2H^1H$, and $^2H^2H$. Let $x(1)$ and $x(2)$ be the fractions of naturally-occurring hydrogen that are ^1H and ^2H. Combining atoms [illegible] successively, form a large volume of hydrogen, the fraction that has weight 2 is $x(1)\times x(1) = (0.99985)^2 = 0.9997 = 99.97\%$. The fraction with weight 4 is $x(2)\times x(2) = 2.25\times10^{-3} = 2.25\times10^{-4}\%$. Weight 3 can be formed in two ways. The fraction of 3 is $x(1)x(2) + x(2)x(1) = 2x(1)x(2) = 2\times0.99985\times0.00015 = 3.00\times10^{-4} = 0.03\%$. Note that the fraction that have molecular weights of either 2, 3, or 4 is $x^2(1)+2x(1)x(2)+x^2(2) = (x(1)+x(2))^2 = 1$.

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