Chapter 3-Multiple Choice Review Key

1. $$\frac{55.8\text{ g Fe}}{1\text{ mol Fe}}\times\frac{1\text{ mol Fe}}{6.02\times10^{23}\text{ atoms Fe}}=9.28\times10^{-23}\text{ g(/atom)}$$

2. All are molar mass or Avogadro's number except B.

3. $$1.00\text{ ng Mg}\times\frac{1\times10^{-9}\text{ g}}{1\text{ ng}}\times\frac{1\text{ mol Mg}}{24.3\text{ g Mg}}\times\frac{6.02\times10^{23}\text{ atoms Mg}}{1\text{ mol Mg}}=2.48\times10^{13}\text{ atoms Mg}$$

4. $$5.54\text{ g F}_2\times\frac{1\text{ mol F}_2}{38.0\text{ g F}_2}\times\frac{2\text{ mol F}}{1\text{ mol F}_2}\times\frac{6.02\times10^{23}\text{ atoms F}}{1\text{ mol F}}=1.76\times10^{23}\text{ atoms F}$$

5. $$97.6\text{ g Al}\times\frac{1\text{ mol Al}}{27.0\text{ g Al}}=3.58\text{ mol}$$

6. $$171\text{ g CF}_4\times\frac{1\text{ mol CF}_4}{88.0\text{ g CF}_4}=1.94\text{ mol CF}_4$$

7. No quantities except B are as much as 2 moles.

8. $$6.0\text{ g Na}_3\text{N}\times\frac{1\text{ mol Na}_3\text{N}}{83\text{ g Na}_3\text{N}}\times\frac{3\text{ mol Na}}{1\text{ mol Na}_3\text{N}}\times\frac{6.02\times10^{23}\text{ atoms Na}}{1\text{ mol Na}}=1.3\times10^{23}\text{ atoms Na}$$

9. The average molar mass of B is closer to the mass of B-11, so it is more abundant.

10. $$\left.\begin{array}{l}\frac{76.0\%\text{ C}}{100\%\text{ cmpd}}\times\frac{284.5\text{ g cmpd}}{1\text{ mol cmpd}}\times\frac{1\text{ mol C}}{12.0\text{ g C}}=18\text{ mol C/mol cmpd}\\ \frac{12.8\%\text{ H}}{100\%\text{ cmpd}}\times\frac{284.5\text{ g cmpd}}{1\text{ mol cmpd}}\times\frac{1\text{ mol H}}{1.01\text{ g H}}=36\text{ mol H/mol cmpd}\\ \frac{11.2\%\text{ C}}{100\%\text{ cmpd}}\times\frac{284.5\text{ g cmpd}}{1\text{ mol cmpd}}\times\frac{1\text{ mol O}}{16.0\text{ g O}}=2\text{ mol O/mol cmpd}\end{array}\right\}\quad C_{18}H_{36}O_2$$

11. $PCl_3 + 3\ H_2O \rightarrow H_3PO_3 + 3\ HCl$

12. $$V=\pi(d/2)^2\ell,\text{ so }\ell=\frac{4V}{\pi d^2}=\frac{4\left(\text{mass}\times\frac{1}{\text{Density}}\right)}{\pi\left(1.00\text{ mm}\times\frac{1\text{ cm}}{10\text{ mm}}\right)^2}=\frac{4\left(1.00\text{ mol Au}\times\frac{197\text{ g Au}}{1\text{ mol Au}}\times\frac{1\text{ cm}^3\text{ Au}}{17.0\text{ g Au}}\right)}{\pi(0.100\text{ cm})^2}\times\frac{1\text{ m}}{100\text{ cm}}=14.8\text{ m}$$

13. The isotopes are all from the same element, so must have the same number of protons.

14. Mo is the only element whose average atomic mass falls near the middle of the range of isotope masses, where the approximate weighted average lies.

15. All isotopes have the same number of protons, and since mass # A = atomic # Z + Number of neutrons, the difference in mass number is due to different numbers of neutrons. Thus, peak D, with the highest mass number, has the highest number of neutrons.