CHEM 1050 Homework
Exam #5 Assignment-Solutions
Alan D. Earhart

8.1 a. Kinetic energy is proportional to temperature. If temp goes up, kinetic energy must also go up. Average molecular speed is proportional to the kinetics energy.
b. In a gas, the volume is mainly extra space unlike that for liquids and gases.

8.5 a, d, e

8.6 c, e

8.10 Pressure and volume are inversely proportional. One goes up, the other goes down. When you move to a higher altitude, the pressure exerted on the outside of the bag decreases and the volume in the bag increases.

8.12 a. C b. B c. A

8.18 a. $V_2 = \frac{P_1 V_1}{P_2}$ $\left(\frac{0.80\ \text{atm}}{1}\right)\left(\frac{25\ \text{mL}}{1}\right)\left(\frac{1}{0.40\ \text{atm}}\right) = 50.\ \text{mL}$

b. $V_2 = \frac{P_1 V_1}{P_2}$ $\left(\frac{0.80\ \text{atm}}{1}\right)\left(\frac{25\ \text{mL}}{1}\right)\left(\frac{1}{2.00\ \text{atm}}\right) = 10.\ \text{mL}$

8.23 a. C b. A c. B

8.24 a. larger b. smaller c. larger

8.28 b. $V_2 = \frac{V_1 T_2}{T_1}$ $\left(\frac{0.500\ \text{L}}{1}\right)\left(\frac{425\ \text{K}}{1}\right)\left(\frac{1}{291\ \text{K}}\right) = 0.730\ \text{L}$

c. $V_2 = \frac{V_1 T_2}{T_1}$ $\left(\frac{0.500\ \text{L}}{1}\right)\left(\frac{261\ \text{K}}{1}\right)\left(\frac{1}{291\ \text{K}}\right) = 0.448\ \text{L}$

8.29 a. $P_2 = \frac{P_1 T_2}{T_1}$ $\left(\frac{1200\ \text{Torr}}{1}\right)\left(\frac{273.15\ \text{K}}{1}\right)\left(\frac{1}{428\ \text{K}}\right) = 770\ \text{Torr}$

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8.34 b. $V_2 = \dfrac{P_1 V_1 T_2}{P_2 T_1}$

$P_1 = 1.20$ atm $\quad V_1 = 735$ mL $\quad T_1 = 385$ K

$P_2 = 0.55$ atm $\quad V_2 = ?$ $\quad T_2 = 348$ K

$$\left(\frac{1.20\ \text{atm}}{1}\right)\left(\frac{735\ \text{mL}}{1}\right)\left(\frac{348\ \text{K}}{1}\right)\left(\frac{1}{0.55\ \text{atm}}\right)\left(\frac{1}{385\ \text{K}}\right) = 1200\ \text{mL}$$

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5.1 a. An alpha particle.
b. A positron
c. A gamma ray.

5.2 a. An electron
b. A proton.
c. A neutron.

5.4 a. $^{127}_{53}\text{I}$, $^{125}_{53}\text{I}$, $^{130}_{53}\text{I}$
b. The numbers of protons and electrons are the same but the number of neutrons are different.

5.6

Medical Use	Atomic Symbol	Mass Number	Number of Protons	Number of Neutrons
Cancer Treatment	$^{131}_{55}\text{Cs}$	131	55	76
Brain Scan	$^{99}_{43}\text{Tc}$	99	43	56
Blood Flow	$^{141}_{58}\text{Ce}$	141	58	83
Bone Scan	$^{85}_{38}\text{Sr}$	85	38	47
Lung Function	$^{133}_{54}\text{Xe}$	133	54	79

5.8 a. $^{111}_{49}\text{In}$ b. $^{103}_{46}\text{Pd}$ c. $^{131}_{56}\text{Ba}$ d. $^{82}_{37}\text{Rb}$

5.10 a. hydrogen-1 b. chlorine-81 c. gamma ray d. iron-59
e. positron

5.12 1. c
2. b
3. a

5.13 a. $^{208}_{84}\text{Po} \rightarrow {}^{4}_{2}\text{He} + {}^{204}_{82}\text{Pb}$ b. $^{232}_{90}\text{Th} \rightarrow {}^{4}_{2}\text{He} + {}^{228}_{88}\text{Ra}$
c. $^{251}_{102}\text{No} \rightarrow {}^{4}_{2}\text{He} + {}^{247}_{100}\text{Fm}$ d. $^{220}_{86}\text{Rn} \rightarrow {}^{4}_{2}\text{He} + {}^{216}_{84}\text{Po}$

5.16 a. $^{44}_{19}\text{K} \rightarrow {}^{0}_{-1}\text{e} + {}^{44}_{20}\text{Ca}$ b. $^{59}_{26}\text{Fe} \rightarrow {}^{0}_{-1}\text{e} + {}^{59}_{27}\text{Co}$
c. $^{42}_{19}\text{K} \rightarrow {}^{0}_{-1}\text{e} + {}^{42}_{20}\text{Ca}$ d. $^{141}_{56}\text{Ba} \rightarrow {}^{0}_{-1}\text{e} + {}^{141}_{57}\text{La}$

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5.20 a. ${}^{11}_{6}\mathrm{C} \rightarrow {}^{11}_{5}\mathrm{B} + {}^{0}_{+1}\mathrm{e}$, positron emission

b. ${}^{35}_{16}\mathrm{S} \rightarrow {}^{35}_{17}\mathrm{Cl} + {}^{0}_{-1}\mathrm{e}$, beta emission

c. ${}^{90}_{38}\mathrm{Sr} \rightarrow {}^{90}_{39}\mathrm{Y} + {}^{0}_{-1}\mathrm{e}$, beta emission

d. ${}^{209}_{83}\mathrm{Bi} \rightarrow {}^{205}_{81}\mathrm{Tl} + {}^{4}_{2}\mathrm{He}$, alpha emission

e. ${}^{80}_{40}\mathrm{Zr} \rightarrow {}^{80}_{39}\mathrm{Y} + {}^{0}_{+1}\mathrm{e}$, positron emission

5.23 1. c 2. a, d 3. B

5.26 8 kBq = 8000 Bq 8000 Bq = 8000 disintergrations/s
15 mCi = 0.015 Ci

$$\left(\frac{0.015\ Ci}{1}\right)\left(\frac{3.7x10^{10}\ \text{disintegrations/s}}{1\ Ci}\right) = 5.6x10^{8}\ \text{disintegrations/s}$$

15 mCi is a greater amount.

5.30 a. 1
b. 3
c. 2

5.34 a. one half-life has elapsed so half of it remains, 50. mg
b. 5 h 30 min or 330 min, three half-lives have elapsed, 25 mg

5.29 a. 40.0 mg b. 20.0 mg c. 3 half-lives, 10.0 mg d. 4 half-lives, 5.0 mg

5.39 The splitting of large nuclei into smaller nuclei with the release of A LOT of energy.

5.40 When you bombard a nucleus with a neutron, more neutrons are produced along with smaller nuclei. These additional neutrons bombard the product nuclei and the process continues.

5.43 a. fission b. fusion c. fission d. fusion