CHM1033 Exercises Test 2 Mod 7-8 2 Extra Credit Points Name Key

1. What is the minimum protection needed for each of the following radiations?

a. α Paper b. β Clothing, Metal c. γ Lead Sheet

2. Identify the symbol that corresponds to:

a. $^{4}_{2}He$ α b. $^{0}_{-1}e$ β

3. Complete the following nuclear reactions:

a. $^{22}_{11}Na + \alpha \longrightarrow {}^{27}_{13}Al$

b. $^{40}_{19}K + \beta \longrightarrow {}^{40}_{18}Ar$

c. $^{243}_{95}Am \longrightarrow \alpha + {}^{239}_{93}Np$

d. $^{90}_{38}Sr \longrightarrow {}^{90}_{39}Y + \beta$

$^{32}_{12}Mg \longrightarrow {}^{32}_{13}Al + \beta$

f. $^{187}_{75}Re \longrightarrow \beta + {}^{187}_{76}Os$

2. Solve the following (Show all your work):

a. Tritium dating is used to verify the age of a vintage wine. Tritium has a half life of 12.5 years. If the wine contains one quarter of the tritium level of a sample of ordinary water, then how old is it?

t	0	12.5	25	25yrs.
amount	1	1/2	1/4	

b. What fraction of tritium should remain in a 50 year old bottle of wine?

t	0	12.5	25	50	1/8
amount	1	1/2	1/4	1/8	

c. The mass of Fe-59 in a sample decreases from 20.0 g to 5.00 g in 6 months. What is the half life of Fe-59?

t	0	3months	6months	3months
amount	20.0g	10.0g	5.00g	

d. K-38 decays by positron emission to Ar-38. K-38 has a half life of 7 minutes. How long will it take a 200 mg sample of K-38 to be reduced to 25 mg?

t	0	7min	14min	21min	21min
amount	200mg	100mg	50mg	25mg	

e. Th-230 has a half life of 22 minutes. How much Th-230 will be left after 132 minutes if initially the sample weighed 480 grams?

t	0	22min	44min	66min	88min
amount	480g	240g	120g	60g	30g

3. Convert: (Show all units and conversion factors for and b)

a. 7.89 atm to mm of Hg

$7.89\,atm \times \frac{760\,mmHg}{1\,atm} = 5996\,mmHg$

b. 345 torr to atm

$345\,torr \times \frac{1\,atm}{760\,torr} = .454\,atm$

c. -45°C to K

$-45°C + 273 = 228K$

d. 25K to °C

$25K - 273 =$

100min 132min
15g 7½g
7½g

4. If the volume of 1 mole of a gas at 273K and 1 atm in a balloon is 22.4 L, what will the volume be if:
   a. The temperature is reduced to one third of the initial temperature. 7.47 L

   b. The pressure is quadrupled. 5.6 L

   b. 4 additional moles of gas are introduced into the balloon. 112 L

5. Indicate what kind of relationship (directly proportional, **DP**, or inversely proportional, **IP**) exists between each of the following variables:
   a. pressure and volume IP b. pressure and temperature DP
   c. volume and moles DP d. temperature and moles IP

6. What is the partial pressure of gas B in a mixture of gases A, B, C, and D if the total pressure is 699 torr and 150 torr of each of the other gases, A, C, and D present?

$$150\ torr + P_B + 150\ torr + 150\ torr = 699\ torr$$

$$P_B = 699\ torr - 150\ torr - 150\ torr - 150\ torr$$

$$P_B = 249\ torr$$