RDCH 702 Last Name:_____
Quiz 4
Assigned 2 November 15 First Name:_____
Due 9 November 15
Post questions to the blog (http://rdch702.blogspot.com/2015/11/fall-2015-quiz-4-radiation-interaction.html)

Quiz Topics
Lecture 7 Radiation Interactions and Lecture 8 Accelerators and Isotope Product

Use the lecture notes, chart of the nuclides, table of the isotopes, and web links to answer the following questions.

1. (30 Points) Please provide the maximum mass (mg) of the radionuclide permissible for research in the UNLV radiochemistry laboratories based on the conditions below.

Radionuclide	Rad Safety Level	Condition	Mass (mg)
^{99}Tc	2	In solution for UV-Visible spectroscopy	_____
^{99}Tc	3	Non-airborne in Fume hood	_____
^{99}Tc	3	Airborne in Fume hood	_____
^{235}U	3	Non-airborne in Fume hood	_____
^{238}U	3	Non-airborne in Fume hood	_____
^{238}U	4	Airborne in glove box	_____
^{238}U	4	Non-airborne in glove box	_____
^{237}Np	3	Non-airborne, fume hood	_____
^{243}Am	3	Non-airborne, fume hood	_____
^{239}Pu	3	Non-airborne in glove box	_____

2. (10 Points) When is breathing zone air-sampling (BZA) needed for Rad Safety Level 3 work?

_____

3. (10 Points) Who else must be with you in the laboratory for level 4 work?

4. (15 Points) Answer the following questions on annual limit on intake (ALI). Note the units.

   4.1. What is the total body dose used to determine an ALI _____ Sv

   4.2. What is the total body dose used to determine an ALI _____ Rem

   4.3. ^{243}Am ingestion ALI _____ µCi

   4.4. ^{243}Am ingestion ALI _____ Bq

   4.5. ^{243}Am inhalation ALI _____ µCi

   4.6. ^{243}Am inhalation ALI _____ Bq

   4.7. ^{243}Am ingestion ALI _____ g

5. (10 Points) Calculate the dose from 500000 Bq of ^{241}Am at 0.050 m.

   5.1. _____ Sv/second

   5.2. _____ Rem/second

6. (10 Points) Provide the most likely route for photon energy loss given the following conditions.

   6.1. Gamma from ^{60}Co with Cu _____

   6.2. Gamma from ^{60}Co with Cu _____

   6.3. Gamma from ^{99m}Tc with Pb _____

   6.4. Gamma from ^{99m}Tc with Al _____

   6.5. Gamma from ^{18}F with Ni _____

7. (15 Points) What is the relationship between the energy (E) of a particle and the conditions for the acceleration of the particle in a cyclotron? Use the equation $\omega = \frac{V}{R} = \frac{qB}{m}$ with mass m, charge q, velocity V, magnetic field B and radius R.

❒ $E = \frac{qBR}{m}$ ❒ $E = \frac{m}{qBR}$ ❒ $E = \frac{qBR}{\sqrt{m}}$ ❒ $E = 2\frac{q^2B^2R^2}{\sqrt{m}}$

❒ $E = 0.5\frac{q^2B^2R^2}{m}$ ❒ $E = 2\frac{q^2B^2R^2}{m}$ ❒ $E = 0.5\frac{q^2BR^2}{m}$ ❒ $E = 0.5\frac{q^2RB^2}{m}$