

RDCH 702

Last Name: \_\_\_\_\_

Quiz 4

Assigned 5 November 18

First Name: \_\_\_\_\_

Due 12 November 18

2nd Due date: 15 November 18

Quiz Topics

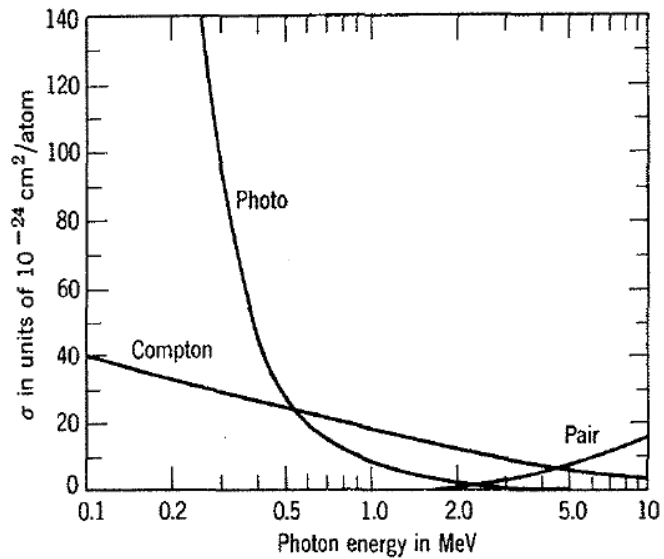
Lecture 7 Radiation Interactions and Lecture 8 Accelerators and Isotope Product

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

- (5 Points) Radiation is detected by its interaction with matter. The total number of ion produced is proportional to energy. In air how much energy is dissipated for each ion pair formed? \_\_\_\_\_ eV
- (10 Points) Select the electron backscatter coefficients for the following elements.

Element	C	Tc	W	Fe	Cl
backscatter coefficient	_____	_____	_____	_____	_____

- (15 Points) Photons can interact with matter through 3 reactions, Compton scattering, photoelectric effect, and pair production. Use the figure below to select the primary method of the interaction with Pb for photons due to main gamma decay from the following isotopes.



3.1. <sup>99m</sup>Tc \_\_\_\_\_

3.2. <sup>126</sup>Sb \_\_\_\_\_

3.3. <sup>95</sup>Zr \_\_\_\_\_

3.4. <sup>60</sup>Co \_\_\_\_\_

3.5. <sup>239</sup>Np \_\_\_\_\_

3.6. <sup>208</sup>Tl \_\_\_\_\_

4. (10 Points) What is the typical annual background dose to the US public?

- 2.4 Sv     2.4 mSv     6.24 mSv     6.24 rem     350 mSv     350 mrem     6.24 mrem

5. (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)
<sup>99</sup> Tc	2	In solution for UV-Visible spectroscopy	_____
<sup>99</sup> Tc	3	Non-airborne in Fume hood	_____
<sup>99</sup> Tc	3	Airborne in Fume hood	_____
<sup>235</sup> U	3	Non-airborne in Fume hood	_____
<sup>238</sup> U	3	Non-airborne in Fume hood	_____
<sup>238</sup> U	4	Airborne in glove box	_____
<sup>238</sup> U	4	Non-airborne in glove box	_____
<sup>237</sup> Np	3	Non-airborne, fume hood	_____
<sup>243</sup> Am	3	Non-airborne, fume hood	_____
<sup>239</sup> Pu	3	Non-airborne in glove box	_____

6. (10 Points) When is breathing zone air-sampling (BZA) needed for Rad Safety Level 3 work?

\_\_\_\_\_

7. (10 Points) Who else must be with you in the laboratory for level 4 work?

\_\_\_\_\_

8. (10 Points) Answer the following questions on annual limit on intake (ALI). Note the units.

8.1. What is the total body dose used to determine an ALI \_\_\_\_\_ Sv

8.2. What is the total body dose used to determine an ALI \_\_\_\_\_ Rem