

**QUESTION 7**

You are a consultant RSO for two manufacturing companies. The Alpha Company uses Plutonium-239 in a nitrate solution. The Beta Company uses I-131 for medical research. Your contract stipulates that you use ICRP-30/26 concepts and models. Spills occur at each of these facilities and result in the data given below.

**GIVEN**

	Alpha Company- Pu-239	Beta Company- I-131
Inhalation intake amount	5 ALI (non-stochastic)	5 ALI (non-stochastic)
Approximate effective half-life	50 years	8 days
Organ that the non-stochastic ALI is based on:	Bone surfaces	Thyroid
Organ tissue weighting factor:	0.03	0.03

**POINTS**

- 10**    A.    Calculate the Committed Dose Equivalent(CDE) to the following organs and their contribution to the respective Committed Effective Dose Equivalents (CEDE). **Show all work.**
1. The Alpha Company worker's bone surface.
  2. The Beta Company worker's thyroid.
- 20**    B.    The physician treating the worker from the Beta Company proposes to remove the workers thyroid to preclude the likelihood of thyroid cancer later in life. Is removal of the thyroid a prudent action? **Justify your answer.**
- 15**    C.    Both workers develop solid tumor cancer 1 year later and are suing the respective companies, claiming the cancers were caused by the spill. In court, the respective attorneys claim that, the worker received a dose that is 5 times the annual limit, therefore it is likely that the cancer was caused by the spill. Provide 3 arguments to challenge the validity of this statement. **Number your responses. Only the first three will be graded.**

- D. The day that the spill occurs in the Alpha Company, the worker's physician administers the chelating agent DTPA.
- 25**                    1. Why is the chelation appropriate for one of the exposures and not the other?
- 15**                    2. List 3 factors that most determine the effectiveness of DTPA. **Number your responses. Only the first three will be graded.**
- 15**    E.    For calculating doses resulting from inhalation of transuranics, the ICRP 66 respiratory tract model is more sophisticated than the ICRP 30 model. Name three (3) of the changes in the transuranic ICRP 66 lung model (relative to ICRP 30). **Number your responses. Only the first three will be graded.**