

QUESTION 12

An endocrinologist has referred a patient to a nuclear medicine physician for treatment of Graves' disease. The nuclear medicine physician administers a small amount of ^{123}I to determine the 24 hour uptake and to perform imaging. The physician plans to treat the condition with ^{131}I .

GIVEN

- 24 hour thyroid uptake in the patient = 60%
- Thyroid mass in the patient = 100 g
- Thyroid mass in Reference Man = 20 g
- Absorbed Dose per Unit Cumulative Activity ('S' factor) for thyroid as source and target organ = $1.57 \times 10^{-3} \text{ mGy MBq}^{-1} \text{ s}^{-1}$
- Assume contribution from all other source organs, to the thyroid (target organ) is negligible
- Effective half-life in the patient's thyroid = 5 d
- Physical half-life of ^{131}I = 8.03 d

POINTS

- 40** A. The nuclear medicine physician has decided to give a dose of 70 Gy to the thyroid. Calculate the ^{131}I activity (MBq) that needs to be administered to the patient to deliver the prescribed dose.
- 30** B. Suppose the patient above, was administered 1480 MBq. Calculate the cumulative external dose to his spouse under the following conditions:
- Sleeping arrangements: distance is 1 meter;
 - The thyroid is the only source of exposure;
 - Time spent in the vicinity (1 meter) of the spouse, over a period of 24 hours = 8 hours;
 - Specific Gamma-ray Dose Equivalent Constant at 1 meter
= $7.647 \times 10^{-5} \text{ mSv h}^{-1} \text{ MBq}^{-1}$.
- 10** C. Assume the dose equivalent to the patient's spouse is 2.5 mSv. Is the licensee in compliance with the radiation limits of 10CFR35 if the patient is released from the hospital immediately after administration? **Justify your answer.**
- 20** D. Give four general precautionary measures that you would suggest to a patient treated for the condition of Graves' disease upon release from the hospital. **Number your responses. Only the first four will be graded.**