QUESTION 3

The following questions concern external dosimetry.

15 A. A worker works in a mixed radiation field which includes beta particles, gamma photons, alpha particles and thermal and mixed energy fast neutrons. The absorbed dose from external sources in the work environment was reported as 30 mrad beta, 70 mrad gamma, 90 mrad thermal neutron and 25 mrad mixed fast neutron. Calculate the ICRP 60 Equivalent Dose in mrem. **Show all work.**

5 B. A 26 year old worker had a lifetime dose of 32 rem. Compare this worker's lifetime dose to the recommendations of NCRP 91.

5 C. A radiation worker recorded the following doses over the past 4 years:

Year	Dose (rem)
1	1
2	3
3	4
4	2

According to ICRP 60, what is the maximum recommended dose for this worker in year 5?

Given the information in the following table, construct a dosimeter to measure the effective dose equivalent for each of the following workers specified in Parts D and E. Clearly state the number of the chips to be included in the dosimeter and limit the number of chips to a maximum of four. **Provide justification for your selections.**

Chip	Material	Thickness	Cover
1	^{7}LiF	0.38 cm	100 mg cm^{-2} copper and 200 mg cm^{-2} plastic
2	^{7}LiF	0.38 cm	1000 mg cm^{-2} plastic
3	^{7}LiF	0.15 cm	7 mg cm^{-2} mylar
4	^{6}LiF	0.38 cm	300 mg cm^{-2} plastic
5	^{7}LiF	0.38 cm	300 mg cm^{-2} plastic
6	^{6}LiF	0.38 cm	300 mg cm^{-2} plastic and Cd filter

10 D. A laboratory worker using a Pu/Be neutron source.

10 E. An X-ray Technologist

5 F. A portable meter (i.e. BF_3) could be used to determine the neutron dose equivalent to an individual with **(Match with the most appropriate statement)**:

1. knowledge of the neutron spectrum so that the proper RBE can be determined.
2. knowledge of the relationship between the neutron energy spectrum and the energy of the neutron calibration source, the ratio of gamma and neutron fluence rates, and the individual's stay-time.
3. the magnitude of the dose equivalent due to photons to be subtracted from the total dose equivalent (i.e., the meter is "zeroed") and application of a neutron energy correction.
4. knowledge of how the instrument responds to the spectrum as compared to the neutron calibration source as well as the individual's stay-time.
5. near laboratory conditions controlling temperature, humidity, neutron energy, and fluence rate.