

Name \_\_\_\_\_ Block \_\_\_\_\_ Date \_\_\_\_\_

## ***Calculating Estimated Radiation Dose***

### Activity #1

#### **Introduction/Background**

We are exposed to radiation everyday from many different sources including both natural and man-made. For example, we are exposed to radon, a radioactive gas in the air; from radioactive potassium in our food and water; from uranium, radium, and thorium in the earth's crust; and from cosmic rays. These sources of radiation are called natural or background radiation. In the U.S. We are exposed to an average of 300 millirems of natural radiation each year (a millirem is a unit of measure for exposure to radiation). This accounts for, on average, about 82% of our total annual exposure.

The remaining 18% (approximately 60 millirems) comes from man-made sources. Man-made radiation sources include medical x-rays, smoke detectors, lantern mantels, nuclear medicines, building materials, tobacco products, televisions, and the nuclear fuel cycle.

The average American is exposed to a total of about 360 millirems per year from both natural and man-made radiation sources.

#### **Directions**

1. Using the dose calculation chart, identify the man-made and natural sources of radiation.
2. Use the dose calculation chart to calculate your estimated annual radiation dose. Take note which radiation comes from natural sources and from man-made sources?

## **Estimate Your Annual Radiation Dose Calculation Chart**

### **Section 1: Cosmic Radiation**

My elevation (in feet):

0-1000 ft (28 mrem)	5001 – 6000 ft (55 mrem)
1001 – 2000 ft (31 mrem)	6001 – 7000 ft (66 mrem)
2001 – 3000 ft (35 mrem)	7001 – 8000 ft (79 mrem)
3001 – 4000 ft (41 mrem)	above 8000 ft (96 mrem)
4001 – 5000 ft (47 mrem)	

**Section 1 Total:** \_\_\_\_\_ mrem

### **Section 2: Terrestrial Radiation**

In the U.S., I live closest to:

Atlantic Coast (23 mrem)	Plateau of Colorado (90 mrem)
Gulf of Mexico (23 mrem)	Pacific Coast (46 mrem)
Midwest (46 mrem)	Alaska (46 mrem)
Hawaii (46 mrem)	

My house is made of:

Brick (7 mrem)	Wood (2 mrem)
Stone (7 mrem)	Other (2 mrem)
Concrete (7 mrem)	

**Section 2 Total:** \_\_\_\_\_ mrem

### **Section 3: Lifestyle**

In a year, I typically fly in a jet airplane:

0 – 1000 miles (0.5 mrem)	5001 – 6000 miles (5.5 mrem)
1001 – 2000 miles (1.5 mrem)	6001 – 7000 miles (6.5 mrem)
2001 – 3000 miles (2.5 mrem)	7001 – 8000 miles (7.5 mrem)
3001 – 4000 miles (3.5 mrem)	more than 8000 miles (8.5 mrem)
4001 – 5000 miles (4.5 mrem)	

I typically smoke cigarettes:

I don't smoke. (0 mrem)	1 ½ packs per day (1500 mrem)
½ pack per day (500 mrem)	2 packs per day (2000 mrem)
1 pack per day (1000 mrem)	

**Section 3 Total:** \_\_\_\_\_ mrem

#### **Section 4: Lifestyle II**

**Check whichever apply and add the total the amount of radiation for this section:**

- ☐ I have porcelain crowns or false teeth. (0.07 mrem)
- ☐ I use gas lantern mantles when I go camping. (0.003 mrem)
- ☐ I wear a luminous LCD watch. (0.06 mrem)
- ☐ I go through the X-ray bag check machines at the airport. (0.002 mrem)
- ☐ I watch TV. (1 mrem)
- ☐ I use a computer monitor or similar video terminal. (1 mrem)
- ☐ I have a smoke detector. (0.008 mrem)
- ☐ I wear a plutonium-powered pacemaker. (100 mrem)
- ☐ I usually share a bed with someone. (1 mrem)
- ☐ I live within 50 miles of a nuclear reactor (pressurized water reactor). (0.009 mrem)
- ☐ I live within 50 miles of a coal-fired power plant. (0.03 mrem)

**Section 4 Total :** \_\_\_\_\_ mrem

#### **Section 5: Medical**

**I have had the following medical procedures in the past year:**

- ☐ Diagnostic X-rays (e.g., upper and lower G.I., chest) (16 mrem)
- ☐ Dental X-rays (2 mrem)
- ☐ Nuclear medicine procedure (e.g., thyroid scan) (100 mrem)

**Section 5 Total :** \_\_\_\_\_ mrem

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**Results:**

**Add all Section Totals:** \_\_\_\_\_ mrem

**Add 300 mrem to your total:** \_\_\_\_\_ mrem

\*200 mrem is the average amount of radiation due to exposure to radon gas and approximately 100 mrem of radiation is due to internal radiation sources that comes from elements in your body.

**Compare your total of the average annual radiation dosage of 360 mrem.**

**Conclusion Questions:**

1. Which factors are the most dangerous? Does that surprise you? Explain.
2. The United States limits the annual radiation dose to 500 mrem. Compare it to your results. What changes could you make to reduce your radiation exposure, if necessary?
3. Why is it useful to monitor how many x-rays you receive annually?
4. What are some lifestyle changes that could reduce a person's exposure to ionizing radiation?