Shedding Light on Nuclear Radiation Episode 2: Alpha Radiation Name:

Part A:

1. Radioactive substances that emit alpha radiation are called ____________ ______________________.

Part B:

2. Fill in the table below.

Isotopes of Uranium, U			
Isotope	**Atomic Number, Z**	**Mass Number, A**	**Abundance (%)**
uranium-234			
uranium-235			
uranium-238			

3. Briefly describe an alpha particle.

4. Write down the nuclear equation for the alpha decay of U-238.

$$\begin{matrix} \textit{mass number} \rightarrow \\ \textit{atomic number} \rightarrow \end{matrix} \quad {}^{?}_{?}? \ \square \ {}^{?}_{?}? + {}^{4}_{2}\alpha \qquad (\alpha = alpha)$$

5. Why are alpha particles deadly to living cells?

6. Why are alpha particles generally harmless when they are emitted from a source outside of the body?

7. Complete the following nuclear equations. You will need a periodic table.
   (mass number = number of protons + neutrons) (atomic number = number of protons)
   (a) Bismuth-213 is an alpha emitter that is used in certain specialized cancer treatments.

   $${}^{213}_{?}\text{Bi} \ \square \ {}^{?}_{?}? + {}^{4}_{2}\alpha$$

   (b) Plutonium-238 is an alpha emitter that is used as a heat source in space probes.

   $${}^{?}_{?}? \ \square \ {}^{?}_{?}? + {}^{?}_{?}?$$

   (c) Neptunium-237 is an alpha emitter that is used as a raw ingredient in the production of Pu-238.

   $${}^{?}_{?}? \ \square \ {}^{?}_{?}? + {}^{?}_{?}?$$

   (d) Americium-241 is an alpha emitter that is used in many types of smoke alarms.

   $${}^{?}_{?}? \ \square \ {}^{?}_{?}? + {}^{?}_{?}?$$

   (e) Polonium-210 is an alpha emitter used in some devices to eliminate static electricity in processes such as rolling paper, manufacturing sheet plastics, and spinning synthetic fibres.

   $${}^{?}_{?}? \ \square \ {}^{?}_{?}? + {}^{?}_{?}?$$

Part C:

8. What is an RTG? Give an example of where you might find one.

9. How are cancer cells different to normal healthy cells?

10. Briefly describe the use of radium-223 in the treatment of certain types of bone cancer.

11. Alpha radiation is a type of “ionizing radiation”. What is ionizing radiation?