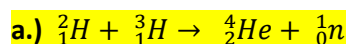


Nuclear Power Quiz

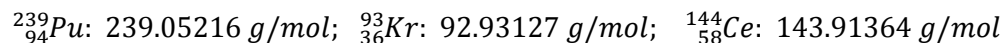
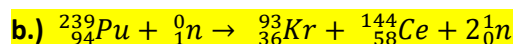
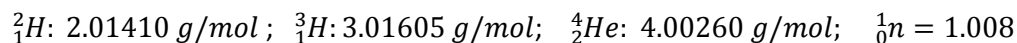
1. Mass energy can be expressed as

$$E = \Delta mc^2$$

where Δm is the change in mass during a fission or fusion reaction, in kg, and c is the speed of light in meters/sec. When mass is lost, the reaction is exothermic (heat is released). If mass is gained, the reaction is endothermic (heat is absorbed). Calculate the energy changes associated with the reactions below. Label each reaction as fission or fusion, and as endothermic or exothermic. Assume 1 mol of each. Refer to slides 15 and 16 of the nuclear power lecture for help.



*The atomic masses of the isotopes above are:



2. Write out the following nuclear reactions.

a.) The Lead-213 isotope (Pb) undergoes beta decay to Bismuth-213 (Bi). Show this process (refer to slide 8)

b.) Polonium-213 (Po) undergoes alpha decay to lead-210 (Pb). Show this process.

3. What causes an isotope to become radioactive?

4. Why are radioactive isotopes harmful to human life?

5. Imagine that many years ago, 1000 g of a radioactive material was trapped beneath the earth. The half-life of this material is 10,000 years. Then, you discover this reserve of material and find that 62.5 g of the material is left. Calculate the number of years that this material was trapped.

6. What purpose do control rods serve in the core of a nuclear reactor?

7. Explain nuclear reprocessing. Why is it useful?

8. Why is Zirconium used as the outer casing of fuel rods?

our opinion (Fully express your answers. There is no right or wrong answer, but justify your response.)

A. Is the Yucca Mountain project a good idea?

B. Should we continue to use nuclear power?