1) In a conventional explosion, when each molecule of high explosive chemically reacts, it produces about $4 \times 10^{-18}$ J (joules) of energy. If each molecule of high explosive weighs as much as a single uranium 235 atom, and each uranium atom releases about $4 \times 10^{-11}$ J in a fission explosion, what is the ratio between the number of joules of energy produced by one kg of uranium 235 in a nuclear fission explosion and the energy produced by a kg of high explosive blowing up? Your answer should be a unitless ratio (energy from uranium) ÷ (energy from high explosive).

Answer:

Solution:

Take 1 kg capable of splitting uranium-235. To calculate contained therein cores (equal to the number of atoms), it is necessary to divide the mass of all substances on its molar mass and multiply by Avogadro’s number $N_A = 6.02 \cdot 10^{23}$ 1/mol:

$$N = \frac{6.02 \cdot 10^{23} \left( \frac{1}{\text{mol}} \right)}{0.235 \text{ (kg)}} = 2.56 \cdot 10^{24} \text{ (atoms)}$$

The energy produced by one kg of uranium 235

$$E_{1kg}^U = 2.56 \cdot 10^{24} \cdot 4 \cdot 10^{-11} = 1.016 \cdot 10^{14} \text{ (J)}$$

If each molecule of high explosive weighs as much as a single uranium 235 atom the energy produced by a kg of high explosive blowing up

$$E_{1kg}^{HEB} = 2.56 \cdot 10^{24} \cdot 4 \cdot 10^{-18} = 1.016 \cdot 10^{7} \text{ (J)}$$

So

$$\frac{E_{1kg}^U}{E_{1kg}^{HEB}} = \frac{1.016 \cdot 10^{14} \text{ (J)}}{1.016 \cdot 10^{7} \text{ (J)}} = 10^{7}$$

Answer: $10^{7}$

2) Label as true each of the following processes that are considered destructive to cells of a living organism (like you!). Label as false if they are not considered significantly destructive to cells of a living organism.

a) A slow neutron combines with a Hydrogen nucleus in a living cell. Hint: this one is more difficult than the others. Think about what must happen during and after they combine.

True

Explanation: The new nucleus is unstable and will emit radiation later.

Answer (either True, the process is considered destructive to cells of a living organism; or False, the process is considered significantly destructive to cells of a living organism) and Explanation:
b) A highly energetic beta particle goes through the cell and interacts with many electrons and protons.
   True
   Explanation:
   Beta radiation is more penetration power. Odometer beta-particles in the air can reach several meters and a few centimeters of tissue. Since running electrons with 4Mev in air is 17.8 m, and 2.6 cm of tissue.

   Answer (either True, the process is considered destructive to cells of a living organism; or False, the process is considered significantly destructive to cells of a living organism) and Explanation:

c) A highly energetic neutron passes through the cell without hitting any nuclei.
   False
   Explanation: For fast neutrons to 90% of the energy lost by elastic tissue interaction. In this crucial scattering of neutrons by protons. Further energy release occurs as a result of ionization of the medium recoil protons.

   Answer (either True, the process is considered destructive to cells of a living organism; or False, the process is considered significantly destructive to cells of a living organism) and Explanation:

d) The cell absorbs 10,000 photons that each have 0.1 eV (electron Volts) of energy.
   False
   Explanation: Photons relating to the infrared region of the spectrum. Therefore, the destructive effect they will not bring. 0.1eV is a low energy. photons, which do cause damage have an energy of a few eV

   Answer (either True, the process is considered destructive to cells of a living organism; or False, the process is considered significantly destructive to cells of a living organism) and Explanation:

e) An atomic nucleus, produced by fission explosion, has a 10,000 year half-life for alpha tunneling decay. This fission by-product is absorbed into a living cell. Recall that an alpha particle is two protons and two neutrons, which is simply a Helium nucleus.
   False
   Explanation: With a 10,000 year half life, the increased risk in cancer is sligh

   Answer (either True, the process is considered destructive to cells of a living organism; or False, the process is considered significantly destructive to cells of a living organism) and Explanation: