

Uždavinių sprendimas. Radioaktyvumas.

1. Raskite ${}^7_3\text{Li}$ branduolio ryšio energiją, tenkančią vienam nukleonui.

$$m_p = 1,6726 \cdot 10^{-27} \text{ kg}$$

$$\Delta E = \Delta m \cdot c^2$$

$$m_n = 1,6749 \cdot 10^{-27} \text{ kg}$$

$$\Delta \square = (\square \cdot m_p + \square \cdot m_n - m_b) \cdot c^2$$

$$c = 3 \cdot 10^8 \text{ m/s}$$

$$\Delta \square = (\square \cdot 1,6726 \cdot 10^{-27} \text{ kg} + \square \cdot 1,6749 \cdot 10^{-27} \text{ kg} -$$

$$m_b({}^7_3\text{Li}) = 11,6466 \cdot 10^{-27} \text{ kg}$$

$$- 11,6466 \cdot 10^{-27} \text{ kg}) = \square \cdot 10^{-27} \text{ kg}$$

$$N = \square$$

$$Z = \square$$

$$\Delta E = \square \cdot 10^{-27} \text{ kg} \cdot \square \cdot 10^{16} = \square \cdot 10^{\square} \text{ J}$$

$$E_1 = \Delta E / \square; \quad E_1 = \square \cdot 10^{\square} \text{ J} / \square = \square \cdot 10^{\square} \text{ J}$$

2. Kokia mažiausia energija gali azoto ${}^{14}_7\text{N}$ branduolį suskaldyti į protonus ir neutronus?

$$m_p = 1,6726 \cdot 10^{-27} \text{ kg}$$

$$\Delta E = \Delta m \cdot c^2$$

$$m_n = 1,6749 \cdot 10^{-27} \text{ kg}$$

$$\Delta \square = (\square \cdot m_p + \square \cdot m_n - m_b) \cdot c^2$$

$$c = 3 \cdot 10^8 \text{ m/s}$$

$$\Delta \square = (\square \cdot 1,6726 \cdot 10^{-27} \text{ kg} + \square \cdot 1,6749 \cdot 10^{-27} \text{ kg} -$$

$$m_b({}^{14}_7\text{N}) = 23,2451 \cdot 10^{-27} \text{ kg}$$

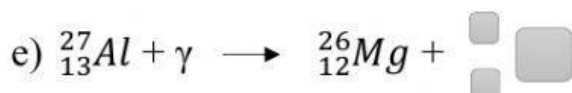
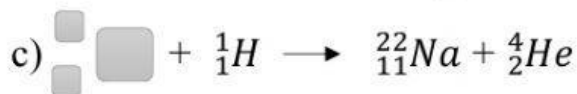
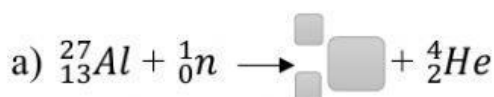
$$- 23,2451 \cdot 10^{-27} \text{ kg}) = \square \cdot 10^{-27} \text{ kg}$$

$$N = \square$$

$$Z = \square$$

$$\Delta E = \square \cdot 10^{-27} \text{ kg} \cdot \square \cdot 10^{16} = \square \cdot 10^{\square} \text{ J}$$

3. Parašykite šių branduolinių reakcijų lygčių trūkstamus žymenis:

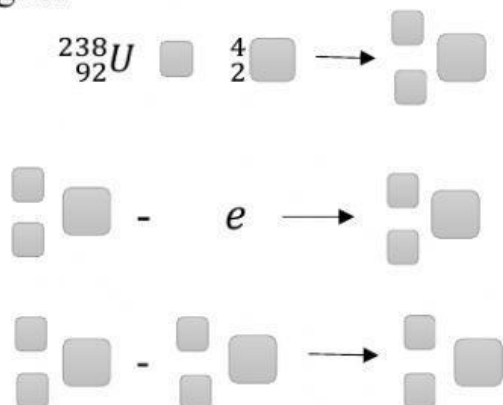


4. Kokio elemento branduolyje yra :

a) 3 protonai ir 4 neutronai;

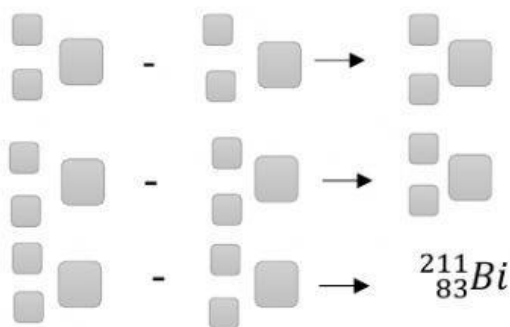
b) 5 protonai ir 6 neutronai.

5. Kuo virs ${}^{238}_{92}\text{U}$ po vieno α skilimo ir dviejų β skilimų? Parašykite reakcijų lygtis.



6. Izotopo ${}^{211}_{83}\text{Bi}$ branduolys atsirado iš kito branduolio po vieno α skilimo ir vieno β skilimo. Koks buvo pirminis branduolys? Parašykite reakcijų lygtis.

1 H Hydrogen Sun and Stars	2 He Helium Balloons
3 Li Lithium Batteries	4 Be Beryllium Emeralds
5 B Boron Sports Equipment	6 C Carbon Basis of Life's Molecules
7 N Nitrogen Protein	8 O Oxygen Air
9 F Fluorine Toothpaste	10 Ne Neon Advertising Signs
11 Na Sodium Salt	12 Mg Magnesium Chlorophyll
13 Al Aluminum Airplanes	14 Si Silicon Stone, Sand, and Soil
15 P Phosphorus Bones	16 S Sulfur Eggs
17 Cl Chlorine Swimming Pools	18 Ar Argon Light Bulbs
19 K Potassium Fruits and Vegetables	20 Ca Calcium Shells and Bones
21 Sc Scandium Bicycles	22 Ti Titanium Aerospace
23 Cr Chromium Stainless Steel	24 Mn Manganese Earthmovers
25 Fe Iron Steel Structures	26 Co Cobalt Magnets
27 Ni Nickel Coins	28 Cu Copper Electric Wires
29 Zn Zinc Brass Instruments	30 Ga Gallium Light-Emitting Diodes (LEDs)
31 Ge Germanium Semiconductor Electronics	32 As Arsenic Poison
33 Se Selenium Copiers	34 Br Bromine Photography Film
35 Kr Krypton Flashlights	36 Rb Rubidium Global Navigation
37 Sr Strontium Fireworks	38 Y Yttrium Lasers
39 Zr Zirconium Chemical Pipelines	40 Nb Niobium Mag Lev Trains
41 Mo Molybdenum Cutting Tools	42 Tc Technetium Radioactive Diagnosis
43 Ru Ruthenium Electric Switches	44 Rh Rhodium Searchlight Reflectors
45 Pd Palladium Pollution Control	46 Ag Silver Jewelry
47 Cd Cadmium Paint	48 In Indium Liquid Crystal Displays (LCDs)
49 Sn Tin Plated Food Cans	50 Sb Antimony Car Batteries
51 Te Tellurium Thermoelectric Coolers	52 I Iodine Disinfectant
53 Xe Xenon High-Intensity Lamps	54 Cs Cesium Atomic Clocks
55 Ba Barium X-Ray Diagnosis	56 La Lanthanum Telescope Lenses
57-71 Praseodymium, Neodymium, Promethium, Samarium, Europium, Gadolinium, Terbium, Dysprosium, Holmium, Erbium, Thulium, Ytterbium, Lutetium	72 Hf Hafnium Nuclear Submarines
73 Ta Tantalum Mobile Phones	74 W Tungsten Lamp Filaments
75 Re Rhenium Rocket Engines	76 Os Osmium Pen Points
77 Ir Iridium Spark Plugs	78 Pt Platinum Labware
79 Au Gold Jewelry	80 Hg Mercury Thermometers
81 Tl Thallium Low-Temperature Thermometers	82 Pb Lead Weights
83 Bi Bismuth Fire Sprinklers	84 Po Polonium Anti-Static Brushes
85 At Astatine Radioactive Medicine	86 Rn Radon Surgical Implants
87 Fr Francium Laser Atom Traps	88 Ra Radium Luminous Watches
89-103 Actinium, Thorium, Protactinium, Uranium, Neptunium, Plutonium, Americium, Curium, Berkelium, Californium, Einsteinium, Fermium, Mendelevium, Nobelium, Lawrencium	104 Rf Rutherfordium Radioactive Waste
105 Db Dubnium Nuclear Power	106 Sg Seaborgium Radioactive Waste
107 Bh Bohrium Nuclear Weapons	108 Hs Hassium Smoke Detectors
109 Mt Meitnerium Mineral Analyzers	110 Ds Darmstadtium Radioactive Waste
111 Rg Roentgenium Mineral Analyzers	112 Cn Copernicium Radioactive Waste
113 Nh Nihonium Mineral Analyzers	114 Fl Flerovium Mineral Analyzers
115 Lv Livermorium Mineral Analyzers	116 Ts Tennessine Mineral Analyzers
117 Og Oganesson Mineral Analyzers	118 Og Oganesson Mineral Analyzers



7. Radioaktyviojo elemento aktyvumas per 8 paras sumažėjo 4 kartus.
Apskaičiuokite to elemento skilimo pusamžį.

8. **Išskiriama** ar **sugeriamo** energija, vykstant šiai branduolinei reakcijai?



$$E = m \cdot c^2$$

$$m_n = 1,6749 \cdot 10^{-27} \text{ kg}$$

$$E({}^2_1H) = \text{ } \cdot 10^{-27} \text{ kg} \cdot \text{ } \cdot 10^{\text{ }} (\text{m/s})^2 =$$

$$c = 3 \cdot 10^8 \text{ m/s}$$

$$= \text{ } \cdot 10^{\text{ }} \text{ J}$$

$$m_b({}^2_1H) = 3,3432 \cdot 10^{-27} \text{ kg}$$

$$m_b({}^3_1H) = 5,0067 \cdot 10^{-27} \text{ kg}$$

$$E({}^1_0n) = \text{ } \cdot 10^{-27} \text{ kg} \cdot \text{ } \cdot 10^{\text{ }} (\text{m/s})^2 =$$

$$= \text{ } \cdot 10^{\text{ }} \text{ J}$$

$$E({}^3_1H) = \text{ } \cdot 10^{-27} \text{ kg} \cdot \text{ } \cdot 10^{\text{ }} (\text{m/s})^2 = \text{ } \cdot 10^{\text{ }} \text{ J}$$

Sudedame kairiosios pusės energijas

$$E(\text{kairioji}) = \text{ } \cdot 10^{\text{ }} \text{ J}$$

Palyginam abiejų pusių energijas

$$E(\text{kairioji}) \text{ } E(\text{dešinioji})$$

Šios reakcijos metu energija yra