Nuclear equations worksheet answers key free pdf free pdf

Last updated31 October 2017Worksheet for pupils to fill in the correct numbers to balance nuclear decay equations. For the reaction [latex]_6^{14}\text{C}\;{\longrightarrow}\;_7^{14}\text{N}\;+\;\text{?}[/latex], if 100.0 g of carbon reacts, what volume of nitrogen gas (N2) is produced at 273K and 1 atm? It decays, emitting α particles: [latex]_{84}^{212}\text{Po}\;{\longrightarrow}\;_{82}^{208}\text{Pb}\;+\;_2^4\text{He}[/latex] The first nuclide to be prepared by artificial means was an isotope of oxygen, 17O. Complete each of the following equations by adding the missing species: (a) [latex]_{13}^{27}\text{Al}\;+\;_2^4\text{He}\;{\longrightarrow}\;\text{?}\;+\;_0^1\text{n}[/latex] (b) [latex]_{94}^{239}\text{Pu}\;+\;\text{?}\;{\longrightarrow}\;_{96}^{242}\text{Cm}\;+\;_0^1\text{n}[/latex] (c) [latex]_7^{14}\text{N}\;+\;_2^4\text{He}\;{\longrightarrow}\;\text{?}\;+\;_1^1\text{H}[/latex] (d) [latex]_{92}^{235}\text{U}\;{\longrightarrow}\;\text{?}\;+\;_{55}^{135}\text{Cs}\;+\;4_0^1\text{n}[/latex] Complete each of the following equations: (a) [latex]_3^7\text{Li}\;+\;\text{?}\;{\longrightarrow}\;2_2^4\text{He}[/latex] (b) [latex]_6^{14}\text{C}\;{\longrightarrow}\;_7^{14}\text{N}\;+\;\text{?}[/latex] (c) [latex]_{13}^{27}\text{Al}\;+\;_2^4\text{He}\;{\longrightarrow}\;\text{?}\;+\;_0^1\text{n}[/latex] (d) [latex]_{96}^{250}\text{Cm}\;{\longrightarrow}\;\text{?}\;+\;_{38}^{98}\text{Sr}\;+\;4_0^1\text{n}[/latex] Write a balanced equation for each of the following nuclear reactions: (a) the production of 17O from 14N by α particle bombardment (b) the production of 14C from 14N by neutron bombardment (c) the production of 233Th from 232Th by neutron bombardment (d) the production of 239U from 238U by [latex]_1^2\text{H}[/latex] bombardment Technetium-99 is prepared from 98Mo. Molybdenum-98 combines with a neutron to give molybdenum-99, an unstable isotope that emits a β particle to yield an excited form of technetium-99, represented as 99Tc*. Due to the much larger energy differences between nuclear energy shells, gamma rays emanating from a nucleus have energies that are typically millions of times larger than electromagnetic radiation emanating from electronic transitions. The most common are protons, neutrons, positrons (which are positively charged electrons), alpha (α) particles (which are high-energy helium nuclei), beta (β) particles (which are high-energy electrons), and gamma (γ) rays (which compose high-energy electromagnetic radiation). One of the many reactions involved was: [latex]_{92}^{235}\text{U}\;+\;_0^1\text{n}\;{\longrightarrow}\;_{35}^{87}\text{Ba}\;+\;_{57}^{146}\text{La}\;+\;3_0^1\text{n}[/latex] Nuclei can undergo reactions that change their number of protons, number of neutrons, or energy state. Write the equations for each of these nuclear reactions. Nuclear reactions also follow conservation laws, and they are balanced in two ways: The sum of the mass numbers of the reactants equals the sum of the mass numbers of the products. 4 days In order to continue enjoying our site, we ask that you confirm your identity as a human. It was made by Ernest Rutherford in 1919 by bombarding nitrogen atoms with α particles: [latex]_7^{14}\text{N}\;+\;_2^4{\alpha}\;{\longrightarrow}\;_8^{17}\text{O}\;+\;_1^1\text{H}[/latex] James Chadwick discovered the neutron in 1932, as a previously unknown neutral particle produced along with 12C by the nuclear reaction between 9Be and 4He: [latex]_4^9\text{Be}\;+\;_2^4\text{He}\;{\longrightarrow}\;_6^{12}\text{C}\;+\;_0^1\text{n}[/latex] The first element to be prepared that does not occur naturally on the earth, technetium, was created by bombardment of molybdenum by deuterons (heavy hydrogen, [latex]_1^2\text{H}[/latex]), by Emilio Segre and Carlo Perrier in 1937: [latex]_1^2\text{H}\;+\;_{42}^{97}\text{Mo}\;{\longrightarrow}\;2_0^1\text{n}\;+\;_{43}^{97}\text{Tc}[/latex] The first controlled nuclear chain reaction was carried out in a reactor at the University of Chicago in 1942. (a) Calculate its binding energy per atom in millions of electron volts. When a nuclear reaction occurs, the total mass (number) and the total charge remain unchanged. Thank you very much for your cooperation. alpha particle ([latex]{\alpha}[/latex] or [latex]_2^4\text{He}[/latex] or [latex]_2^4{\alpha}[/latex]) high-energy helium nucleus; a helium atom that has lost two electrons and contains two protons and two neutrons antimatter particles with the same mass but opposite properties (such as charge) of ordinary particles beta particle ([latex]{\beta}[/latex] or [latex]_{-1}^0\text{e}[/latex] or [latex]_{-1}^0{\beta}[/latex]) high-energy electron gamma ray ([latex]{\gamma}[/latex] or [latex]_0^0{\gamma}[/latex]) short wavelength, high-energy electromagnetic radiation that exhibits wave-particle duality nuclear reaction change to a nucleus resulting in changes in the atomic number, mass number, or energy state positron ([latex]_{+1}^0{\beta}[/latex] or [latex]_{+1}^0\text{e}[/latex]) antiparticle to the electron; it has identical properties to an electron, except for having the opposite (positive) charge Nuclear Chemistry By the end of this section, you will be able to: Identify common particles and energies involved in nuclear reactions Write and balance nuclear equations Changes of nuclei that result in changes in their atomic numbers, mass numbers, or energy states are nuclear reactions. For example, an alpha particle is a helium nucleus (He) with a charge of +2 and a mass number of 4, so it is symbolized [latex]_2^4\text{He}[/latex]. If the atomic number and the mass number of all but one of the particles in a nuclear reaction are known, we can identify the particle by balancing the reaction.   Figure 1. The subscripts and superscripts are necessary for balancing nuclear equations, but are usually optional in other circumstances. Many ThanksEmpty reply does not make any sense for the end userReport this resourceto let us know if it violates our terms and conditions. Note that positrons are exactly like electrons, except they have the opposite charge. The mass of the atom [latex]_9^{19}\text{F}[/latex] is 18.99840 amu. A balanced chemical reaction equation reflects the fact that during a chemical reaction, bonds break and form, and atoms are rearranged, but the total numbers of atoms of each element are conserved and do not change. Our customer service team will review your report and will be in touch. This works because, in general, the ion charge is not important in the balancing of nuclear equations. You will need the 'One Stroke Script' font from .Tes classic free licenceSelect overall rating(no rating)Your rating is required to reflect your happiness.Write a reviewUpdate existing reviewIt's good to leave some feedback.Something went wrong, please try again later.My students really liked this - a real sense of achievement :) Empty reply does not make any sense for the end userExcellent, thank youEmpty reply does not make any sense for the end userEmpty reply does not make any sense for the end userEmpty reply does not make any sense for the end userVery useful. 2 grams 3. Solution The nuclear reaction can be written as: [latex]_{12}^{25}\text{Mg}\;+\;_2^4\text{He}\;{\longrightarrow}\;_1^1\text{H}\;+\;_{\text{Z}}^{\text{A}}\text{X}[/latex] where A is the mass number and Z is the atomic number of the new nuclide, X. Chapter 21. Balancing Equations for Nuclear Reactions The reaction of an α particle with magnesium-25 ([latex]_{12}^{25}\text{Mg}[/latex]) produces a proton and a nuclide of another element. Chemistry End of Chapter Exercises Write a brief description or definition of each of the following: (a) nucleon (b) α particle (c) β particle (d) positron (e) γ ray (f) nuclide (g) mass number (h) atomic number Which of the various particles (α particles, β particles, and so on) that may be produced in a nuclear reaction are actually nuclei? Thus, the product is [latex]_{13}^{28}\text{Al}[/latex]. What is the equation for this reaction? Identify the new nuclide produced. Alpha particles ([latex]_2^4\text{He}[/latex], also represented by the symbol [latex]_2^4{\alpha}[/latex]) are high-energy helium nuclei. Protons ([latex]_1^1\text{p}[/latex], also represented by the symbol [latex]_1^1\text{H}[/latex]) and neutrons ([latex]_0^1\text{n}[/latex]) are the constituents of atomic nuclei, and have been described previously. For example, when a positron and an electron collide, both are annihilated and two gamma ray photons are created: [latex]_{-1}^0\text{e}\;+\;_{+1}^0\text{e}\;{\longrightarrow}\;{\gamma}\;+\;{\gamma}[/latex] As seen in the chapter discussing light and electromagnetic radiation, gamma rays compose short wavelength, high-energy electromagnetic radiation and are (much) more energetic than better-known X-rays that can behave as particles in the wave-particle duality sense. Many different particles can be involved in nuclear reactions. The ground state of 99Tc then emits a β particle. Gamma rays are produced when a nucleus undergoes a transition from a higher to a lower energy state, similar to how a photon is produced by an electronic transition from a higher to a lower energy level. For instance, we could determine that [latex]_8^{17}\text{O}[/latex] is a product of the nuclear reaction of [latex]_7^{14}\text{N}[/latex] and [latex]_2^4\text{He}[/latex] if we knew that a proton, [latex]_1^1\text{H}[/latex], was one of the two products. Positrons ([latex]_{+1}^0\text{e}[/latex], also represented by the symbol [latex]_{+1}^0{\beta}[/latex]) are positively charged electrons (“anti-electrons”). No Text Content! oe-1 beta particle Half-life problems – Answers 1. [latex]_{53}^{125}\text{I}\;+\;_{-1}^0\text{e}\;{\longrightarrow}\;_{52}^{125}\text{Te}[/latex] Following are the equations of several nuclear reactions that have important roles in the history of nuclear chemistry: The first naturally occurring unstable element that was isolated, polonium, was discovered by the Polish scientist Marie Curie and her husband Pierre in 1898. (b) Calculate its binding energy per nucleon. Although many species are encountered in nuclear reactions, this table summarizes the names, symbols, representations, and descriptions of the most common of these. They are the most common example of antimatter, particles with the same mass but the opposite state of another property (for example, charge) than ordinary matter. When antimatter encounters ordinary matter, both are annihilated and their mass is converted into energy in the form of gamma rays (γ)—and other much smaller subnuclear particles, which are beyond the scope of this chapter—according to the mass-energy equivalence equation E = mc2, seen in the preceding section. This excited nucleus relaxes to the ground state, represented as 99Tc, by emitting a γ ray. As with chemical reactions, nuclear reactions are always balanced. To describe a nuclear reaction, we use an equation that identifies the nuclides involved in the reaction, their mass numbers and atomic numbers, and the other particles involved in the reaction. The sum of the charges of the reactants equals the sum of the charges of the products. Beta particles ([latex]_{-1}^0{\beta}[/latex], also represented by the symbol [latex]_{-1}^0\text{e}[/latex]) are high-energy electrons, and gamma rays are photons of very high-energy electromagnetic radiation. Because the sum of the mass numbers of the reactants must equal the sum of the mass numbers of the products: [latex]25\;+\;4 = \text{A}\;+\;1,\;\text{or}\;\text{A} = 28[/latex] Similarly, the charges must balance, so: [latex]12\;+\;2 = \text{Z}\;+\;1,\;\text{and}\;\text{Z} = 13[/latex] Check the periodic table: The element with nuclear charge = +13 is aluminum. 8.75 grams 4. A balanced nuclear reaction equation indicates that there is a rearrangement during a nuclear reaction, but of subatomic particles rather than atoms. Example 1 shows how we can identify a nuclide by balancing the nuclear reaction. Many entities can be involved in nuclear reactions. 12.5 grams 2. Check Your Learning The nuclide [latex]_{53}^{125}\text{I}[/latex] combines with an electron and produces a new nucleus and no other massive particles. The most common are protons, neutrons, alpha particles, beta particles, positrons, and gamma rays, as shown in Figure 1.

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