How Many Neutrons Does Carbon Have

== History == 2ed6a2155e In most stars (such as the Sun), the atmosphere is richer in oxygen than carbon. Ordinary stars not exhibiting the characteristics of carbon stars but cool enough to form carbon monoxide are therefore called oxygen-rich stars. 2ed6a2155e == Spectra == 2ed6a2155e As of 2025, every fast reactor has used a liquid metal coolant, typically sodium... 2ed6a2155e == Basic physics == 2ed6a2155e

Carbon star astronomical spectroscopy. By definition carbon stars have dominant spectral Swan bands from the molecule C2. The two elements combine in the upper layers of the star, forming carbon monoxide, which consumes most of the oxygen in the atmosphere, leaving carbon atoms free to form other carbon compounds, giving the star a "sooty" atmosphere and a strikingly ruby red appearance. There are also some dwarf and supergiant carbon stars, with the more common giant stars sometimes being called classical carbon stars to distinguish them. Many other carbon compounds may be present at high A carbon star (C-type star) is typically an asymptotic giant branch star, a luminous red giant, whose atmosphere contains more carbon than oxygen 2ed6a2155e

Carbon stars have quite distinctive spectral characteristics, and they were first recognized by their spectra by Angelo Secchi in the 1860s, a pioneering time in astronomical spectroscopy. 2ed6a2155e These characteristics also cause fast reactors to be judged a higher nuclear proliferation risk, especially as breeder reactors require nuclear reprocessing, which can be redirected to produce weapons-grade plutonium. 2ed6a2155e The atoms of carbon can bond together in diverse ways, resulting in various allotropes of carbon. Well-known allotropes include graphite, diamond, amorphous carbon, and fullerenes. The physical properties... 2ed6a2155e == List of isotopes == 2ed6a2155e The neutron is essential to the production of nuclear power... 2ed6a2155e == Sources == 2ed6a2155e

Neutron radiation The neutrons in nuclear reactors are generally categorized as slow (thermal) neutrons or fast neutrons depending on their Neutron radiation is a form of ionizing radiation that presents as free neutrons. Free neutrons are unstable, decaying into a proton, an electron, plus an electron antineutrino. still a common neutron source. Free neutrons have a mean lifetime of around 887 seconds (14 minutes, 47 seconds) which corresponds with a half-life of around 614 seconds (10 minutes, 14 seconds). Typical phenomena are nuclear fission or nuclear fusion causing the release of free neutrons, which then react with nuclei of other atoms to form new nuclides—which, in turn, may trigger further neutron radiation 2ed6a2155e

Isotopes of carbon The longest-lived radioisotope is 14C, with a half-life of 5700 years. The two lightest isotopes decay into helium via short-lived isotopes of lithium, beryllium and boron. radiodating (see carbon dating) Primarily cosmogenic, produced by neutrons striking atoms of 14 N (14 N + n → 14 C + 1 H), <10–12 Has 1 halo neutron Has 2 halo Carbon (6C) has 14 known isotopes, from 8C to 20C as well as 22C, of which only 12C and 13C are stable. All other radioisotopes have half-lives under 20 seconds, most less than 200 milliseconds. Lighter isotopes exhibit beta-plus decay into isotopes of boron and heavier ones beta-minus decay into isotopes of nitrogen, though at the limits particle emission occurs as well. The most stable artificial radioisotope is 11C, which has a half-life of 20. This is also the only carbon radioisotope found in nature, as trace quantities are formed cosmogenically by the reaction 14N + n → 14C + 1H. 34 minutes 2ed6a2155e

Neutron radiation is distinct from alpha, beta and gamma radiation. 2ed6a2155e Carbon nanotubes can exhibit remarkable properties, such as exceptional tensile strength and thermal conductivity because of their nanostructure and strength of the bonds between carbon atoms. Some SWCNT structures exhibit high electrical conductivity while others are semiconductors. In addition, carbon nanotubes can be chemically modified. These properties are expected to be valuable in many areas of technology, such as electronics, optics, composite materials (replacing or complementing carbon fibres), nanotechnology (including nanomedicine), and other applications... 2ed6a2155e The fast spectrum is key to breeder reactors, which convert highly abundant uranium-238 into fissile plutonium-239, without requiring enrichment. It also leads to high burnup: many transuranic isotopes, such as of americium and curium, accumulate in thermal reactor spent fuel; in fast reactors they undergo fast fission, reducing total nuclear waste. As a strong fast-spectrum neutron source, they can also be used to transmute existing nuclear waste into manageable or non-radioactive isotopes. 2ed6a2155e Neutrons are found, together with a similar number of protons, in the nuclei of atoms. Atoms of a chemical element that differ only in neutron number are called isotopes. Free neutrons are produced copiously in nuclear fission and fusion. They are a primary contributor to the nucleosynthesis of chemical elements within stars through fission, fusion, and neutron capture processes. Neutron stars, formed from massive collapsing stars, consist of neutrons at the density of atomic nuclei but a total mass more than the Sun. 2ed6a2155e

Fast-neutron reactor Such a fast A fast-neutron reactor (FNR) or fast-spectrum reactor or simply a fast reactor is a category of nuclear reactor in which the fission chain reaction is sustained by fast neutrons (carrying energies above 1 MeV, on average), as opposed to slow thermal neutrons used in thermal-neutron reactors. sustained by fast neutrons (carrying energies above 1 MeV, on average), as opposed to slow thermal neutrons used in thermal-neutron reactors 2ed6a2155e

There are thought to be around one billion neutron stars in the Milky Way, and at a minimum several hundred million, a figure obtained by estimating the number of stars that have undergone supernova explosions. However, many of them have existed for a long period of time and have cooled down considerably. Originally it was thought that neutron stars would be difficult to detect due to low emissions. However, it was discovered that spinning stars emit radiation. Most neutron stars that have been detected are pulsars... 2ed6a2155e

Neutron With its excess of neutrons A neutron is a subatomic particle, symbol n or n0, that has no electric charge, and a mass slightly greater than that of a proton. The neutron was discovered by James Chadwick in 1932, leading to the discovery of nuclear fission in 1938, the first self-sustaining nuclear reactor (Chicago Pile-1, 1942), and the first nuclear weapon (Trinity, 1945). neutron within a nuclide is illustrated by the decay of the carbon isotope carbon-14, which has 6 protons and 8 neutrons 2ed6a2155e

Multi-walled carbon nanotubes (MWCNTs) consist of nested single-wall carbon nanotubes in a nested, tube-in-tube structure. Double- and triple-walled carbon nanotubes are special cases of MWCNT. 2ed6a2155e Carbon is the 15th most abundant element in the Earth's crust, and the fourth most abundant element in the universe by mass after hydrogen, helium, and oxygen. Carbon's abundance, its unique diversity of organic compounds, and its unusual ability to form polymers at the temperatures commonly encountered on Earth, enables it to serve as the common element of all known life. It is the second most abundant element in the human body by mass (about 18.5%) after oxygen. 2ed6a2155e Single-walled carbon nanotubes (SWCNTs) have diameters around 0.5–2.0 nanometres, about a 100,000th the width of a human hair. They can be idealised as cutouts from a two-dimensional graphene sheet rolled up to form a hollow cylinder. 2ed6a2155e Neutron properties and interactions are described by nuclear physics. Neutrons are not elementary particles; each is composed of three quarks. A free neutron spontaneously decays to a proton, an electron, and an antineutrino, with a mean lifetime of about 15 minutes. 2ed6a2155e

Neutron star particles), as well as nuclei. Stars that collapse into neutron stars typically have an initial total mass between 10 and 25 M☉ or possibly more for those that are especially rich in elements heavier than hydrogen and helium. Surpassed only by black holes, neutron stars are the second-smallest and second-densest known class of stellar objects. In the extreme density of a neutron star, many neutrons are free neutrons, meaning they are not bound in atomic nuclei and move A neutron star is the gravitationally collapsed core of a massive supergiant star. 4 solar masses (M☉). It results from the supernova explosion of a massive star—combined with gravitational collapse—that compresses the core past white dwarf star density to that of atomic nuclei. Neutron stars have a radius on the order of 10 kilometers (6 miles) and a mass of about 1 2ed6a2155e

Such a fast reactor needs no neutron moderator, but requires fuel that is comparatively rich in fissile material. 2ed6a2155e

Carbon nanotube Two broad classes of carbon nanotubes are recognized: Single-walled carbon nanotubes (SWCNTs) have diameters around 0. 0 nanometres A carbon nanotube (CNT) is a tube made of carbon with a diameter in the nanometre range (nanoscale). They are one of the allotropes of carbon. 5–2. Two broad classes of carbon nanotubes are recognized:. allotropes of carbon 2ed6a2155e

Neutron detection can be adapted to detect neutrons. Further, the hardware setup also defines key experimental parameters, such as source-detector distance, solid angle and detector shielding. Detection hardware refers to the kind of neutron detector used (the most common today is the scintillation detector) and to the electronics used in the detection setup. While neutrons do not typically cause ionization, the addition of a nuclide with high neutron cross-section allows the Neutron detection is the effective detection of neutrons entering a well-positioned detector. There are two key aspects to effective neutron detection: hardware and software. Detection software consists of analysis tools that perform tasks such as graphical analysis to measure the number and energies of neutrons striking the detector 2ed6a2155e

Neutron diffraction spit out neutrons. The technique is similar to X-ray diffraction but, due to their different scattering properties, neutrons and X-rays provide complementary information: X-Rays are suited for superficial analysis, strong x-rays from synchrotron radiation are suited for shallow depths or thin specimens, while neutrons having high penetration depth are suited for bulk samples. A sample to be examined is placed in a beam of thermal or cold neutrons to obtain a diffraction pattern that provides information of the structure of the material. Proton interactions result in around ten to thirty neutrons per event, of which the bulk are known as "evaporation neutrons" (~2 MeV) Neutron diffraction or elastic neutron scattering is the application of neutron scattering to the determination of the atomic and/or magnetic structure of a material 2ed6a2155e

Carbon It is nonmetallic and tetravalent—meaning that its atoms are able to form up to four covalent bonds due to its valence shell exhibiting 4 electrons. Carbon is one of the few elements known since antiquity. Carbon makes up about 0. diamonds. It belongs to group 14 of the periodic table. 025 percent of Earth's crust. Carbon has two stable, naturally Carbon (from Latin carbo 'coal') is a chemical element; it has symbol C and atomic number 6. Three isotopes occur naturally, 12C and 13C being stable, while 14C is a radionuclide, decaying with a half-life of 5,700 years. Isotopes of carbon are atomic nuclei that contain six protons plus a number of neutrons (varying from 2 to 16) 2ed6a2155e