PROFESSOR QUESTER'S
Frequently Asked Questions

Professor Quester Answers Questions on Nuclear Power

Dear Professor Quester:
I was wondering... when you split two positively charged atoms, you make nuclear energy. But, when they try to make cold fusion, they split two negatively charged atoms and can't do it. Why can't you try to split a positive and a negative atom to make cold fusion? (I know you have to have nickel to do it also!) -Thanks (John, 8th grade, Queen of Angels School, B.C. Canada)

The Professor Answers:
Dear John:

It's not really a question of two positively charged atoms versus two negatively charges ones when discussing nuclear power. First, you already know that atoms are made up of protons (positive charge), electrons (negative charge) and neutrons (neutral charge). Because atoms have the same number of electrons and protons, the positive and negative charges balance equally. The force that holds the protons and neutrons together in the nucleus is called nuclear force.

Each atom of Uranium-235, the fissionable isotope of uranium, contains 92 protons, 92 electrons and 143 neutrons. That's what makes it an isotope; having more neutrons. Although each atom is balanced, all nuclei are unstable to a certain degree. The bigger the nucleus, the more unstable it is. It is this instability that makes U-235 perfect for fission to occur.

The balanced, but large, unstable U-235 nucleus is bombarded by neutrons. When a neutron hits the nucleus, the nucleus splits into two smaller, more stable nuclei. These smaller nuclei need fewer neutrons to make them stable and two or three neutrons are usually released. These then cause other nuclei to break up and can start a chain reaction. The energy needed to hold all of the particles together in the new nuclei is less than that required in the original nucleus and the "spare" energy is released, mostly as heat.

So far, nuclear fusion is still in the theoretical and experimental stages of development. Cold fusion, at this time, has not been duplicated.

Dear Professor Quester:
What is Nuclear Energy used for? (Jeff, 5th grade, Lafayette)

The Professor Answers:
Nuclear energy is used to generate or make electricity in power plants. There are also uses for nuclear energy in medicine to treat cancer and other medical applications.

Dear Professor Quester:
Why doesn't nuclear energy produce smoke? (Schroeder, 5th grade, Lafayette)

The Professor Answers:
Instead of burning a fuel, such as oil or coal, to heat water to steam, nuclear power plants use the chain reaction of atoms splitting to change the energy of atoms into heat energy. Since there's nothing burned, there's nothing to emit smoke. The problem with nuclear is that even though the reaction doesn't produce "pollutants" it does produce radioactive waste which is odorless, colorless and very harmful to the environment. Good question. Thanks for asking.

Dear Professor Quester:
How many people does it take to operate a nuclear power plant? (Ben, 5th grade, Lafayette)

The Professor Answers:
Good question. Actually, it doesn't take many to operate a nuclear plant. Sometimes there are only 3-4 people in the control room. Any 2 of those people are back-up.

Overall though, according to the utilities, it takes anywhere from 30-50 (sometimes a few more) people to operate a power plant. This includes maintenance, control room, fuel loading, security, administrative and other areas.

Dear Professor Quester:
We looked in the encyclopedia and we could not find who discovered nuclear fusion. Could you help us? (Matt and Kevin, 5th grade, Lafayette)

The Professor Answers:
In 1938, the German physicist Hans Bethe first suggested that nuclear fusion might be what provides the energy of stars such as the Sun. He was correct however a better understanding of the processes involved has been the result of work by many great scientists. Bethe was rewarded for his discoveries in 1967 with the Nobel Prize for Physics.

Dear Professor Quester:
Are there conditions you need to grow uranium? (Dominic, 5th grade, Lafayette)

The Professor Answers:
Since you're on the nuclear quest, and after reading about Marie Curie, you probably know that uranium is a rare metal dug out of the ground. Uranium was formed as the earth was formed, billions of years ago.

Dear Professor Quester:
What states produce the most nuclear energy? (Dominic, 5th grade, Lafayette)

The Professor Answers:
According to the federal Energy Information Administration, Illinois produces and uses the most nuclear energy. Thanks for asking.

Dear Professor Quester:
I am doing a project on Cold Fusion and was wondering why cold fusion only works with experimental error? (Carrie-Ann Payne, 11th Grade, South Africa)

The Professor Answers:
I'm not certain cold fusion works even with experimental error. The scientific community hasn't been able to duplicate the phenomenon of cold fusion. The following is from the Department of Energy's Fusion Energy Office regarding cold fusion. Additionally, here are some links for fusion. Good luck with your search.

http://fusioned.gat.com/webstuff/FusionInfo.html

Following the announcement of "cold fusion" in March 1989, researchers throughout the world, including those at Department of Energy laboratories, raced to verify the claims and to understand the underlying phenomena. Claims of scientific discovery require independent verification to establish a basis for understanding the underlying scientific phenomena and to explore the prospects for technology development. Throughout history, scientific advances have been subjected to, and have successfully withstood, this level of scrutiny. After exhaustive research, reports of "anomalous excess energy" and "anomalous nuclear effects" associated with the "cold fusion" claims have not been substantiated.

Research interest in "cold fusion" has dwindled dramatically since 1989. The most recent information on the disfavor into which the field of "cold fusion" has fallen comes from the New York Times web site. On August 26, 1997, it was reported that the government of Japan said that it would terminate its research on cold fusion, which had failed to confirm that the phenomenon exists. It went on to state that "most governments and scientists in the United States and Europe had dismissed the concept as an illusion."

An extensive body of data and information on "cold fusion" resulted from the research following the March 1989 announcement. This information appears in scientific journals as well as the technical and popular press. Several books were published on the subject. Many consider the book "Bad Science - The Short Life and Weird Times of Cold Fusion," by Gary Taubes, to provide an accurate, comprehensive account of the history of "cold fusion."

If **YOU** have a question about energy, send your question by e-mail to "Professor Quester."
Ask your parents or teacher first before sending an e-mail. Please tell us your grade level, the name of your school and your city. We will usually respond within four or five days.

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