

## Discussion Question Answer Key

### Fred Begay: A Physicist by 3 Names

1. Why did Fred Begay go by 3 different names in his life time?
  - a. Fred Begay is native American. He has his Navajo name, the name he was assigned in school, and the legal name he chose as an adult in his professional career.
2. What inspired Begay to go into physics?
  - a. The book he found that explained how rainbows worked. A question his elders in the Navajo tribe could not answer to his satisfaction
3. What were Begay's research interests?
  - a. Sources of high energy gamma rays and solar neutrons. He also did work in controlled thermonuclear fusion power
4. What does it mean to be a thermonuclear process?
  - a. A process so hot, it creates a plasma where nuclei and electrons can roam freely
5. What are the two methods scientists have used to make plasmas hot enough to fuse? What are the differences between the two?
  - a. Magnetic confinement and internal confinement.
  - b. Magnetic confinement used a magnetic field to hold a hot plasma, while internal confinement uses a cold solid pellet inside a tube that is energized with lasers into a plasma for a short period of time.
6. What is the main reason fusion reactors may not be viable?
  - a. Fusion reactors require more energy to run than they put out at the current moment in time.
7. Why do scientists predict that there is deuterium on the moon?
  - a. The solar wind may have build up huge deposits on the side of the moon that is constantly facing the sun.
8. Why are fusion reactors safe? Are they a danger to the environment?
  - a. Because they are not a bomb. If something goes wrong in the reaction, it will simply cool down and shut off, not explode. They are radioactive, but the amount of material produced will not be enough to affect the environment according to predictions.
9. What is the NIF breakthrough discussed in the article?
  - a. They could produce twice as much energy as they put into the fuel pellet they were using. They effectively made a star in a lab.
10. Does this mean that fusion is commercially viable now?
  - a. No, the NIF development still doesn't override the amount of energy required to run the reactor as a whole, and therefore is still not commercially viable. But it is on its way