**Science Alliance**

The year is 2273 A.D. Over two hundred years ago, the countries of planet Earth decided to stop competing in a space race and cooperate with one another to explore space. The planet's nations created an organization called the Earth Space Alliance, now simply called the Alliance.

In the time that has passed since the end of the twentieth century, many fields of science have developed to highly sophisticated levels. Man has improved space travel and can now explore vast portions of the galaxy in a relatively short time. The science of nuclear physics has also progressed. Small-scale nuclear fission and low-temperature nuclear fusion have both been perfected and are now parts of people's daily lives.

In the year 2273, you and your partner have served the Alliance for years as astronauts while crisscrossing the galaxy in your spacecraft Star Dancer. Your next mission for the Alliance is to explore Selene, the largest moon of the fourth planet in the Dakar system, in search of rare or new isotopes to use as raw materials for nuclear reactions. You are the first exploration team to Selene since its discovery three years ago by an Alliance reconnaissance ship.

As you enter orbit, the craft's computer screen lights up with atmospheric information and recommendations. Selene's atmosphere, consisting of 75% nitrogen, 21% oxygen, and 4% argon, is similar to Earth's so that breathing suits are unnecessary. The average surface temperature is 40° C (104° F) and the shuttle computer recommends that you wear a lightweight suit containing a circulating cooling system. You and your partner dress accordingly. Each of you carries an equipment pack, containing the following items:

--Beta particle shield (protects you from beta particles) Alpha particle shield (protects you from alpha particles)

--Gamma radiation shield (protects you from gamma radiation)

--Two of these shields may be used at once, but not all three.

--Beta gun (shoots beta particles at various rates)

--Alpha gun (shoots alpha particles at various rates)

--Neutron gun (shoots neutrons at various rates)

--Portable atom splitter (nicknamed "Splitter," it can produce small scale fission reactions)

--Fusion box (nicknamed the "Box," it can produce low-temperature fusion reactions)

--Radioactivity neutralizer (nicknamed the "Rad Newt," it can reduce the radioactivity of most isotopes to safe levels)

-Geiger counter (detects and identifies radiation)

--Canisters of pressurized gas (helium, chlorine, argon, hydrogen, oxygen, neon, fluorine, nitrogen, radon) and a face mask attachment

--Element samples (0.25 kg samples of the following elements: Th-232, Th-234, Pb-204, Pb-208, U-235, and U-238)

Good luck and good hunting

1) Your shuttle craft, the Star Dancer SCl, lands in the center of a desert of hard rock covered by a thin layer of red silt. The moon's atmosphere, filled with large volumes of dust particles gives the sky a dark orange color. In the afternoon sky, the star Dakar burns brightly like a small, bright ball of pale blue fire. You settle down to work. Using your Geiger counter, you detect a strong source of radiation one kilometer to the west. Upon reaching the spot, you find the rare element eimerium, named after a famous schoolteacher from the twentieth century. You know that the isotope symbol for the element is 286/110 Ei. To temporarily neutralize its radioactivity, you punch in the proper setting for the element's atomic number, mass number, and number of neutrons in you Rad Newt computer. What three numbers do you put into the computer:

Atomic number: Mass number: Neutron number:

2) As you successfully neutralize the eimerium and store it in a white, rectangular backpack made of lightweight plastics and aluminum, your Geiger counter alerts you to another source of radiation two kilometers to the north. A flashing, red light on the counter warns you of dangerous radiation levels in that direction. The Geiger counter's reading suggests high levels of negative particles accompanied by large amounts of energy. How do you protect yourself?

3) After taking the proper precautions to protect yourself, you and your partner hike to the radiation source and find another rare element known to Earth as pattenium (310/115 Pn), named after the notorious space pirate who accidentally discovered it. Pattenium is far too unstable to transport in its present form, so you send it through an accelerated decay chain using your low-temperature fusion box as an energy source. What element must you put into the first chamber of the Box to begin the fusion process?

Where can you find this element?

4) With the correct element in the chamber, the fusion box produces large quantities of radiation and energy, safely contained within the Box's structure. You place a sample quantity of pattenium (310/115 Pn) into the second chamber. You want the energy and radiation from the fusion box to change the pattenium into gayleium (302/112 Gy), a stable and usable radioactive material. Your fusion box will monitor the decay of the pattenium inside it, and you know that 12attenium always emits an alpha particle. You must punch the sequence and type of decay you want the pattenium to undergo into the computer. The Box will shut off when the original pattenium has turned into gayleium. Name the decay reactions pattenium must undergo to turn into gayleium.

5) The Box's computer shuts down at the correct moment. You have successfully changed the pattenium into gayleium, and you store the new element in your pack.

You decide to camp for the night at the base of a high mountain. When you get to the high mountain, your Geiger counter picks up high levels of positively charged particles and energy coming from the soil. How can you protect yourself?

6) Once you have properly protected yourself from the radiation, you set up your climate-controlled tent, watch a brilliant sunset, and then settle down for the night.

The next morning, you pack up your camp and begin climbing the steep mountain. You soon realize that the atmosphere on Selene thins out much more quickly at high altitudes than it does on Earth. You find it difficult to breathe and climb the mountain simultaneously. What can you do to make hiking easy?

7) You can breathe much easier now, and due to Selene's lower force of gravity, you reach the mountaintop in only a few hours. Your Geiger counter suddenly registers high levels of radiation. After putting on your gamma shield you notice that it produces a glowing violet color that surrounds your entire body. Following the source of the radiation, you find an unknown element not found on the periodic table. In order for your microcomputer to figure out what type radiation the element emits, you must send a stream of particles through a sample of the material. Each particle must have a mass of four atomic mass units (u). What action do you take?

8) You discover that the element emits beta particles at a very slow rate. You need to know what element this new material becomes after totally undergoing beta decay. To speed the decay process, you use your portable atom splitter to supply the necessary energy and radiation. What fuel should you use in the Splitter and where can you get it?

9) You have chosen the correct fuel, but you need to send a stream of particles through the fuel chamber to start the fission process. What do you do?

10) You have chosen the correct particles as well, but you must supply the correct amount of energy. If you supply too little energy, the reaction will fail; if you supply too much, you might cause a small nuclear explosion. You want to create 1E 15 Joules of energy. (Hint: a Joule is a unit of energy equal to kg $m^2/s^2$). Using Einstein's formula Energy = mass x $c^2$ (hint: c = speed of light or 3 E 8 m/s) find the number of kilograms of fuel you should use.

11) You start a successful reaction and discover another new element. In its pure form, a small amount of this element produces tremendous amounts of usable energy. Congratulations, this is the type of energy source Earth has been seeking two centuries. With this discovery, you and your partner have earned a place in the history books. Decide upon a name for your new element.

12) You need to shield your new element with a very stable isotope to transport it back to Earth. What element should you place around your discovery?

Congratulations on a successful mission. Return to Earth for a hero's welcome. Your discovery has made you the most famous astronauts in the Alliance.

This article/lab was first seen in “The Science Teacher” I think. The author’s name has been lost over the years, but his idea was wonderful. To that teacher that created this, GREAT WORK.