Castle Mendeleev

A Voyage of Imagination

History of Dmitri Menedeleev:

On the evening of February 17, 1869, at the University of St. Petersburg in St. Petersburg, Russia, Dmitri Menedeleev was writing a chapter in his soon to be famous textbook on chemistry. On separate cards, he had written the properties of each of the known elements. Shuffling the cards, Mendeleev realized that if he arranged the elements in order of their atomic masses, there was a trend in properties that repeated itself several times. Thus the periodic law and table were born, although only 63 elements had been discovered at that time

In 1871, Mendeleev published a second version of his periodic table. One of the interesting features of this table was that it left spaces for elements not yet discovered and allowed Mendeleev to predict the properties of these elements with remarkable accuracy, even suggesting the geographic regions in which minerals containing the element could be found.

Mendeleev's table as it stood at the time of his death in 1907, contained three pairs of elements, including cobalt, nickel, argon, tellurium, and iodine, which were out of order with respect to atomic weight. Henry G. J. Mosley solved the puzzle in 1910 when his x-ray studies showed that the true order depends on the number of protons in the nucleus, not the weight. We call the number of protons the "atomic number" and now state the periodic law as: *when elements are arranged in the order of their atomic numbers, their chemical and physical properties show repeatable trends.*

The Game:

You and your friends have been magically transported inside an 18-room castle built by the famous chemist Dmitri Mendeleev. each room is entirely made from one of the elements of the first three rows of the periodic table. No element is repeated. each element will appear in the state (solid, liquid, or gas) it retains at room temperature.

You do not know where in the castle you have been transported. A holographic image of Mendeleev will accompany you on your journey, giving you clues to help you identify the element and determine which room you are in. each time you identify the element a room is made of, you will be transported to another room. Once you travel through all of the rooms, you will find your way out of Castle Mendeleev. Good Luck!

Room 1

You and your friends have suddenly materialize into a room made entirely out of a shiny metallic solid. A wooden door is set into one wall. A shimmering hologram appears before you. It is an old man with long brown hair and a full beard streaked with gray hairs. Wearing a full-length nineteenth-century topcoat is Dmitri Mendeleev himself. In a crisp, intelligent voice, the scientist syas, "This room has been constucted of a strong, lightweight, corrosion-resistent metal composed of atoms containing 3 valence electrons and thirteen protons. it is the most abundant metal in the earth's crust." What element is this room made of? Carve its symbol into the wooden door to escape to the next room.

Valence (number) electrons - electron(s) in the outer orbit of an atom that will either be gained, lost, or shared when combining with another atom to form a compound.

Room 2

The next room you find yourselves in is made of a clear life-giving gas. Suddenly Mendeleev appears again, saying, "This element is a non-metallic, diatomic gas that comprises about 20% of normal air. It combines with most other elements to form oxides." What symbol would you carve into the door of this room?

Diatomic - compound consisting of two atoms of the same element. (ex: O_2, H_2)

Room 3

Next, you and your friends are transported to a room made from a green-yellow gas that immediately begins to burn your nostrils and your throat. You reach into your backpacks for gas masks to protect yourselves from these noxious fumes. For the third time a hologram of Mendeleev speaks to you through the shifting gas. "This diatomic gas is a halogen." What element surrounds you?

Halogens - nonmetal elements that combine to form salts; are located near the far right side of the Periodic Table of Elements

Diatomic - compound consisting of two atoms of the same element. (ex: O_2, H_2)

Room 4

In the next room you find yourselves surrounded by bright yellow crystals. As you remove the gas masks, the old chemist, tinted yellow by the light reflecting off the crystals, appears yet again. “The atoms of this element have 6 valance electrons.” Carve the symbol of the correct element in the room’s door.

Valence (number) electrons - electron(s) in the outer orbit of an atom that will either be gained, lost, or shared when combining with another atom to form a compound.

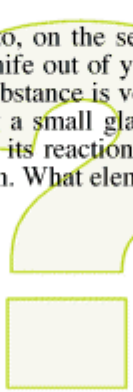
Room 5

You are now in a room made of a clear gas, located in one of the towers of the Castle Mendeleev. Trying to talk to your friends, your voice sounds high-pitched and squeaky, like Mickey Mouse. The hologram tells you, “The atoms of this element are also molecules.” What element is this room made of?

Molecule - smallest part of a compound

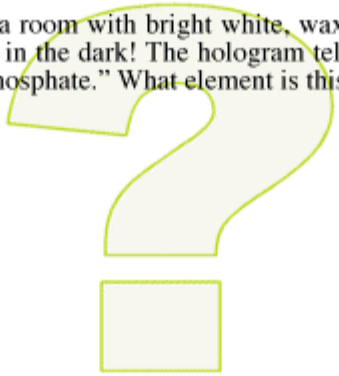
Room 6

The sixth room you are transported to, on the second floor of the building, is made of a silver-grey metallic solid. Taking a knife out of your backpack, you are able to cut a piece of it off with the blade because the substance is very soft. A portion of the element touches your hand, burning your skin. Filling a small glass beaker with water from your canteen, you drop the substance in to observe its reaction with water. It momentarily floats on the water before causing a small explosion. What element is this?



Room 7

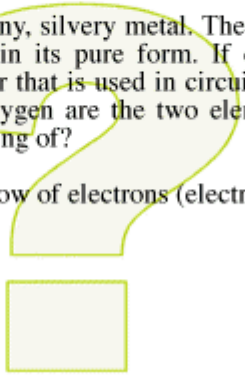
Next, you are transported to a room with bright white, waxy walls. When you turn off the lights, the entire room glows in the dark! The hologram tells you, "This element occurs in teeth and bones as calcium phosphate." What element is this room comprised of?



Room 8

You are now in a room made of a shiny, silvery metal. The image of Mendeleev reappears to say, "This element appears here in its pure form. If combined with traces of other elements it becomes a semi-conductor that is used in circuits of electronic devises such as calculators and computers. It and oxygen are the two elements that make sand but not diamonds." What element is he speaking of?

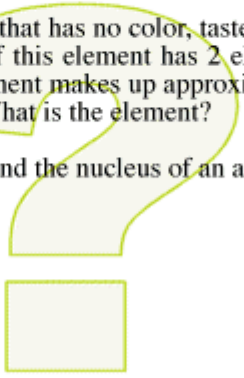
Semi-conductor - easily transfer the flow of electrons (electricity)



Room 9

The ninth room is composed of a gas that has no color, taste, or odor. A transparent image of the chemist tells you, "An atom of this element has 2 electrons in its first shell and 5 electrons in its second shell. This element makes up approximately 80% of normal air and can be used to make laughing gas." What is the element?

Electron shell - orbit of electrons around the nucleus of an atom



Room 10

The next room you are transported to is made of a soft white material. The nineteenth-century chemist states, "The atoms of this element have low electron affinity and will replace hydrogen atoms when placed into water. This room is on the second floor of my castle." Which element is this?

Electron affinity - force that attracts chemical elements to other elements and keeps them joined (bonded) together

Room 11

Next, you are transported to a room in the corner of Castle Mendeleev. The room is made of a thick, inert gas. Mendeleev flickers into view to tell you, "This element is used to fill light bulbs. The atoms of this element have 8 electrons in their third shell." Carve the correct symbol into the door.

Inert gas - inactive; ex. He, Ne; do not actively combine with other elements

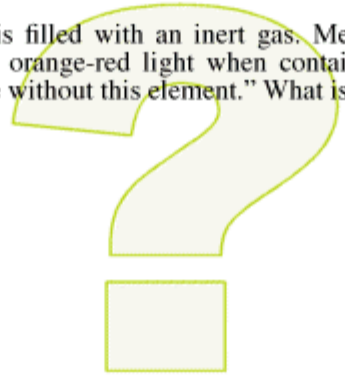
Room 12

After escaping from room eleven you materialize into a room made of a solid substance. Mendeleev's image appears in front of you and says, "This element is the basic unit for all living things. Without it, jewelers would go broke, gas stations would go out of business, and every breath you exhale would be incomplete. The element has two isotopes, one has 6 neutrons and the other has 8 neutrons." What element is this room constructed of?

Isotope - atoms of an element that have a different than normal number of electrons

Room 13

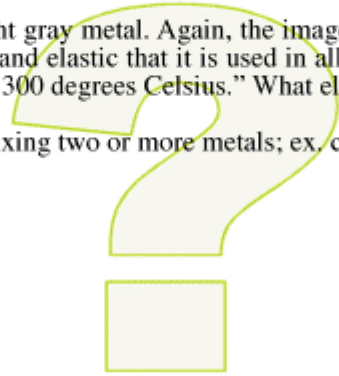
The next room you enter is filled with an inert gas. Menveleev appears, telling you, "This gas emits a brilliant orange-red light when contained in a discharge tube. Las Vegas wouldn't be the same without this element." What is the element?



Room 14

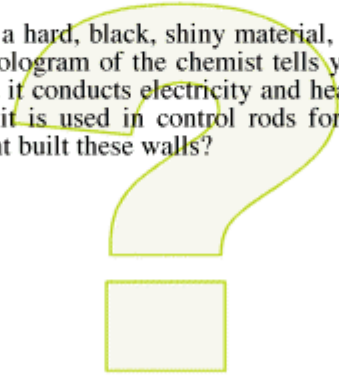
This room is made of a light gray metal. Again, the image of Mendeleev speaks. "This element is so strong, hard, and elastic that it is used in alloys to reinforce other metals. Its melting point is nearly 1300 degrees Celsius." What element is this room made of?

Alloy - a metal made by mixing two or more metals; ex. copper + zinc ----> brass



Room 15

The next room is made of a hard, black, shiny material, and then suddenly it changes to a brown powder. The hologram of the chemist tells you the atoms of this element have 2 electron shells, and it conducts electricity and heat very poorly. But because it readily absorbs neutrons, it is used in control rods for atomic reactions in nuclear power plants. What element built these walls?



Room 16

The sixteenth room you enter is nade of a greenish-yellow gas. The image of Mendeleev tells you, “The atoms of this element have high electron affinity. When one combines it with sodium, it can help reduce tooth decay. It also reacts with hydrocarbons to form Teflon and Freon.” What element is he speaking of?

High electron affinity - easily attracts electrons of other elements

Hydrocarbons - compounds consisting of the elements carbon and hydrogen

Room 17

Next, you have been transported to a room on the first floor of the Castle Mendeleev that is made of a white solid. The hologram of Dmitri Mendeleev reappears, shifting before you like a milky ghost, speaking before you once more. “This element is widely used in aerospace industries in alloys with other metals. It burns brilliantly in air. The atoms of this element form positive ions. One of its atoms will combine with one oxygen atom to form a compound.” The walls of this room are comprised of what element?

Alloy - a metal made by mixing two or more metals; ex. copper + zinc ----> brass

Ion - a charged particle; the result of an atom either gaining or losing electrons

Room 18

You finally find yourself in the second tower of Castle Mendeleev. The room is made of a transparent gas. This element is the simplest and lightest of all the elements. It is the most abundant element in the Universe. What element is it?