Atom

"Atom is the basic building block of all matter and chemistry. Atoms can combine with other atoms to form molecules but cannot be divided into smaller parts by ordinary chemical processes. Most of the atom is empty space. The rest consists of three basic types of subatomic particles: protons, neutrons, and electrons, figure 1. The protons and neutrons form the atom's central nucleus. (The ordinary hydrogen atom is an exception; it contains one proton but no neutrons.) As their names suggest, protons have a positive electrical charge, while neutrons are electrically neutral—they carry no charge; overall, then, the nucleus has a positive charge. Circling the nucleus is a cloud of electrons, which are negatively charged. Like opposite ends of a magnet that attract one another, the negative electrons are attracted to a positive force, which binds them to the nucleus. The nucleus is small and dense compared with the electrons, which are the lightest charged particles in nature. The electrons circle the nucleus in orbital paths called shells, each of which holds only a certain number of electrons. An ordinary, neutral atom has an equal number of protons (in the nucleus) and electrons (surrounding the nucleus). Thus the positive and negative charges are balanced. Some atoms, however, lose or gain electrons in chemical reactions or in collisions with other particles. Ordinary atoms that either gain or lose electrons are called ions. If a neutral atom loses an electron, it becomes a positive ion. If it gains an electron, it becomes a negative ion.

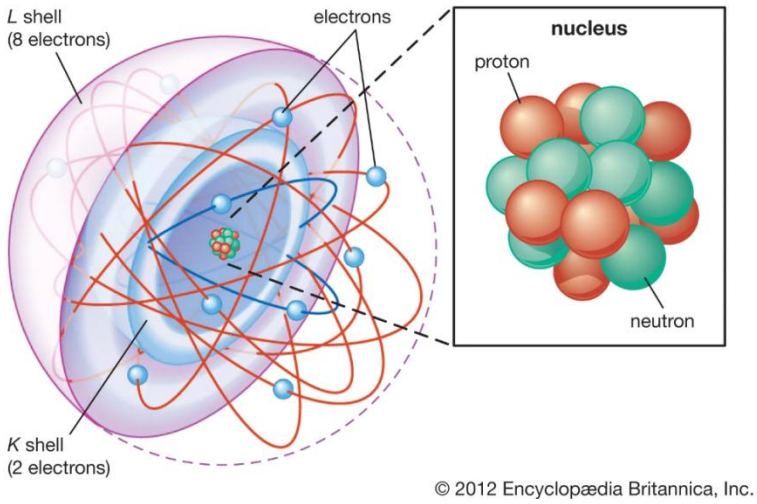

Figure 1: Atom structure

More than 90 types of atoms exist in nature, and each kind of atom forms a different chemical element. Chemical elements are made up of only one type of atom—gold contains only gold atoms, and neon contains only neon atoms-and they are ranked in order of their atomic number (the total number of protons in its nucleus) in a chart called the periodic table, figure 2. Accordingly, because an atom of iron has 26 protons in its nucleus, its atomic number is 26 and its ranking on the periodic table of chemical elements is 26. Because an ordinary atom has the same number of electrons as protons, an element's atomic number also tells how many electrons its atoms have, and it is the number and arrangement of the electrons in their orbiting shells that determines how one atom interacts with another. The key shell is the outermost one, called the valence shell. If it is complete, or filled with the maximum number of electrons for that shell, the atom is stable, with little or no tendency to interact with other

atoms. But atoms with incomplete outer shells seek to fill or to empty such shells by gaining or losing electrons or by sharing electrons with other atoms".

Trefil, James et al. "atom". *Encyclopedia Britannica*.

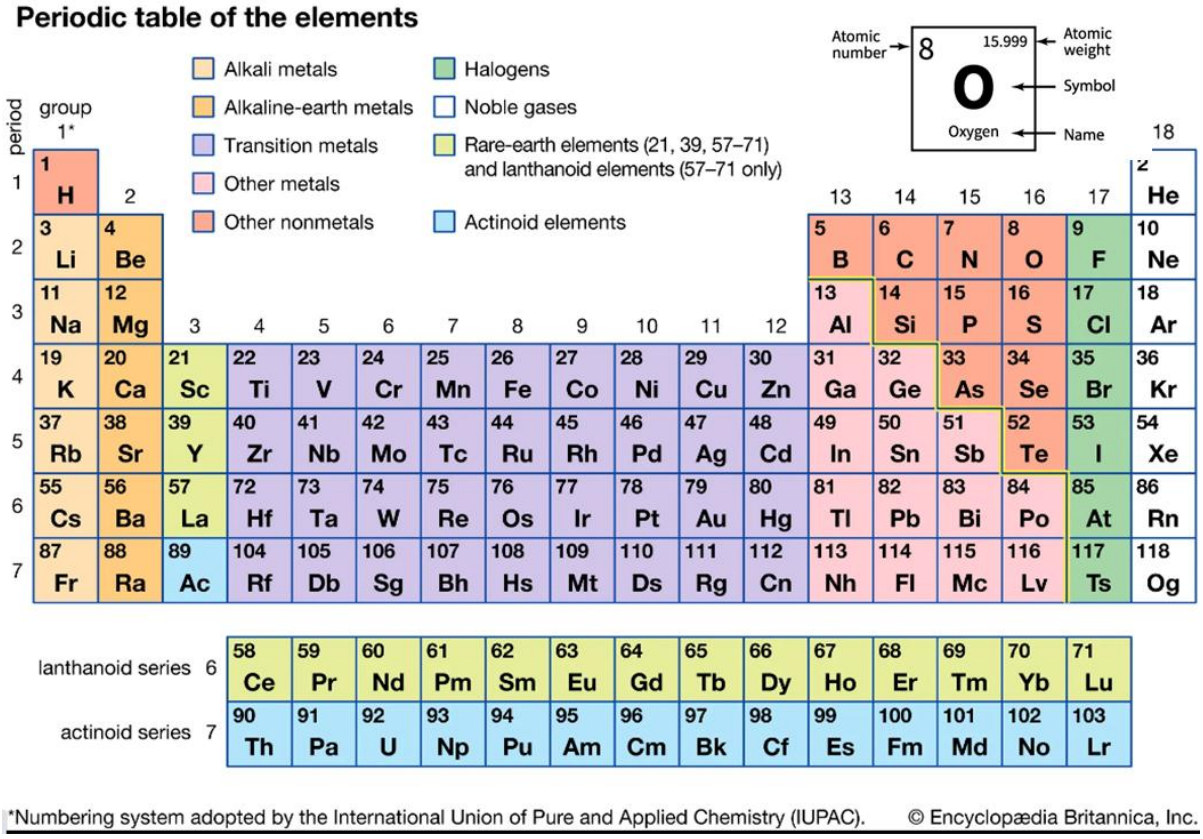

Figure 2: Periodic table

Part 1: Text comprehension

Exercise 1: Find words in the text corresponding to the definitions below (from Oxford dictionary).

1. "The smallest particle of a chemical element that can exist".
2. "A small, positively charged particle of matter found in the atoms of all elements".
3. "A subatomic particle of about the same mass as a proton but without an electric charge, present in all atomic nuclei except those of ordinary hydrogen".
4. "A region surrounding the atomic nucleus containing a specific number of electrons".
5. "A stable subatomic particle with a charge of negative electricity, found in all atoms and acting as the primary carrier of electricity in solids".
6. "A list of all the chemical elements, arranged according to their atomic number".

7. "A simple chemical substance that consists of atoms of only one type".
8. "The number of protons in the nucleus of an atom, which is characteristic of a chemical element".
9. "An atom or a molecule with a positive or negative electric charge caused by its losing or gaining of one or more electrons".

Exercise 2: Find in the text words that are closest in meaning to the following.

Fundamental: Crash:

Earn: Classified:

Organization: Interconnect:

Exercise 3: Find in the text words that are opposite in meaning to the following.

Separate: Abnormal:

Full: Repel:

Unfinished: Avoid:

Exercise 4: Find what the underlined pronouns in the following sentences refer to.

1. If it gains an electron, it becomes a negative ion.
2. If it is complete, or filled with the maximum number of electrons for that shell, the atom is stable.

Exercise 5: Choose the correct answer.

1. The center of an atom is called the:

a. Nucleus b. Neutron c. Shell d. Centre

2. The sub-atomic particles found in the center of an atom are:

a. Electrons and neutrons b. Protons and electrons

c. Protons and neutrons d. Protons and nucleus

3. The charge of the nucleus is:

a. Positive b. Negative c. Neutral d. Positive and negative

4. The periodic table is arranged by:

a. Mass number b. Electron number c. Atomic mass d. Atomic number

5. What information does the atomic number of an element tell you?

a. The number of protons and neutrons in its nucleus.

b. The number of electrons in its nucleus.

c. The number of electrons and neutrons in its nucleus.

d. The number of protons that it has in its nucleus.

6. If an element has an atomic number of 7 and a mass number of 14, what is the name of this element?

a. Lithium b. Nitrogen c. Silicon d. Neon

7. An atom contains 11 protons and 12 neutrons in its nucleus. Which of the following statements is/are correct? (i) This atom has an atomic number of 12. (ii) Its mass number is 23. (iii) This atom has 12 electrons. (Note: mass number in the sum of protons and neutrons)

a. Statement (i) only b. Statement (ii) only

c. Statements (i) and (iii) d. Statements (ii) and (iii)

8. "Sub-atomic particle" is the name given to

a. the tiny particles found outside the nucleus. b. the tiny particles found inside the nucleus.

c. particles found in a nuclear submarine. d. the tiny particles found inside an atom.

9. How many protons are there in an atom of sodium which has an atomic number of 11 and a mass number of 23?

a. 34 b. 12 c.11 d.23

References:

Trefil, James , Bertsch, George F. and McGrayne, Sharon Bertsch. "atom". Encyclopedia Britannica, 17 Feb. 2024, https://www.britannica.com/science/atom.

https://www.sciencequiz.net/newjcscience/jcchemistry/atomstruct/atomicstmc1a.htm