

## TOPIC

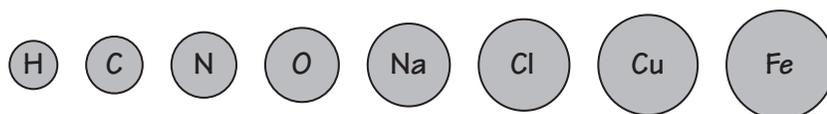
# 4 ATOMS AND MOLECULES

## 4.1 STUDY NOTES

### LEARNING OUTCOME

(a) Explain what an atom is and state that it is the smallest particle of an element.

- An **atom** is the **smallest particle of an element**. Atoms of an element are all identical. For example, one atom of hydrogen would be identical to all other atoms of hydrogen. However, it would be different from an atom of oxygen or an atom of iron.
- Atoms are **extremely small** and cannot be seen even with a powerful microscope. An atom has an average size of 0.0000000001 m. A bacterium is about 10,000 times bigger than an atom and a blood cell 100,000 times bigger. Take a deep breath. You have just breathed in approximately 100,000 million, million, million atoms!
- As there are more than 100 different atoms (more than 100 elements), scientists use **chemical symbols** to represent atoms. The chemical symbol is usually the first or first and second letters of its name (sometimes Latin name). Atoms are often represented as circles and the larger the atom, the bigger the circle. Some chemical symbols used with circles are:



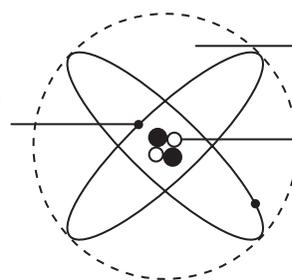
Circles used to represent atoms

### LEARNING OUTCOME

(b) Describe an atom as an electrically neutral particle made up of a positively charged nucleus (protons and neutrons) with negatively charged electrons moving around this nucleus.

- An atom is a neutral particle and it is made up of three **sub-atomic particles**: **proton**, **neutron** and **electron**.
- An atom is mostly empty space with a small, central positively charged **nucleus**. Moving **around the nucleus** in fixed paths or orbits are the negatively charged **electrons**. Electrons are much smaller than the other two sub-atomic particles.

Negatively charged electron in fixed orbit around nucleus.



Atom consists mostly of empty space.

Positively charged nucleus made up of 2 protons and 2 neutrons tightly packed together.

Structure of a helium atom