

DATE: 16/8/2024

Friday

Topic:- "Chemical Bonding"

Give short answer.

State octet and duplet rules.

Octet Rule

Atoms tend to have bonds to have eight ($\bar{e}$) in their valence shell.

The rule only follows s and p electrons.

Molecules such as oxygen, nitrogen and halogens follow the octet rule.

Duplet Rule

Atoms like hydrogen and helium tend to form bonds to have two electrons in their valence shell.

They attain electronic configuration like helium.

Hydrogen, helium and lithium follow the duplet rule.

Explain formation of covalent bond between two nitrogen atoms.

Definition:

Covalent bond is a bond formed when atoms share electrons. In the formation of covalent bond

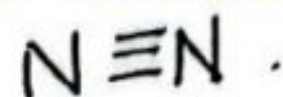
between two nitrogen atoms, each nitrogen atom shares three of its

Explanation:

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electrons with the other, resulting in a triple bond. Triple bond is a type of covalent bond where three pairs of electrons are shared. This sharing allows each nitrogen atom to achieve a stable octet configuration.



iii) How does Al form cation?

Definition: Cation is a positively charged ion formed by losing electrons. **Explanation:** Aluminum forms a cation by losing three (e^-) from its valence shell, resulting in an Al^{3+} ion. This loss of electrons allows aluminum to achieve a stable electronic configuration similar to the nearest noble gas, neon.

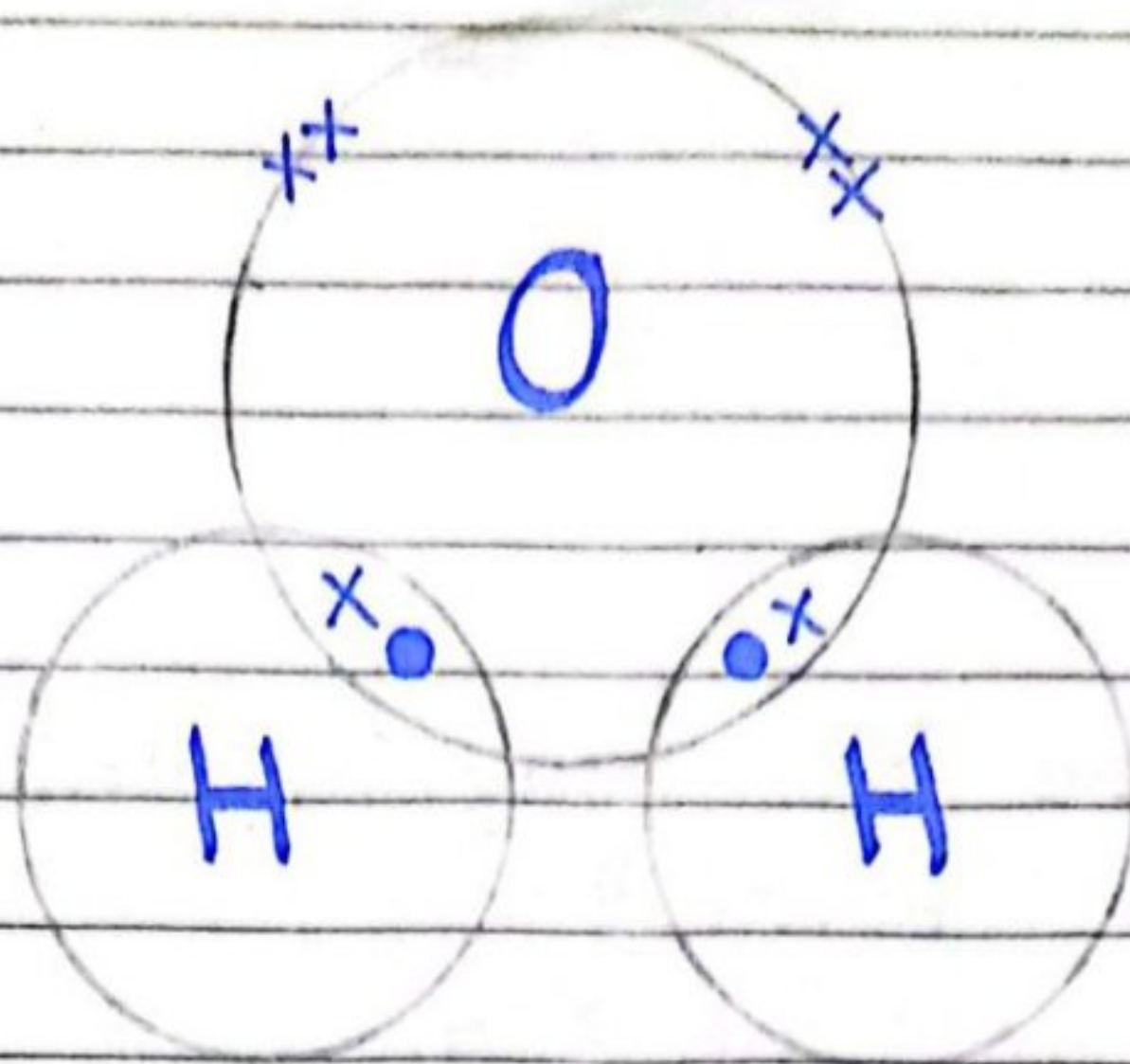
iv) How does O form anion?

Definition: Anion is a negatively charged ion formed by gaining electrons. **Explanation:** Oxygen forms an anion by gaining two electrons in its valence shell, resulting in an O^{2-} ion. This gain of electrons allows oxygen to achieve a stable octet configuration.

v) Draw electron cross and dot structure for H_2O molecule.

Oxygen has two lone pairs of electrons, and it shares one electron each hydrogen atom, forming

two covalent bonds.



3:- Describe the importance of noble gas electronic configuration.

Noble gas electronic configuration is a stable electron arrangement which is similar to that of noble gas. Noble gas electronic configurations are important because they represent a stable arrangement of electrons. which keeps the atom less reactive.

Atoms tend to achieve this stable configuration through bonding, either by gaining or losing or sharing electrons. This stability results in lower energy and higher chemical stability, making noble gas configuration highly desirable for atoms.

4:- Explain how elements attain stability?

Elements attain stability by achieving a full valence shell of electrons,

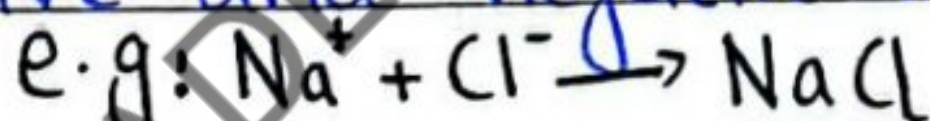
similar to the noble gases. They can do this by:

1. losing electrons to form cations.
2. Gaining electrons to form anions.
3. Sharing electrons to form covalent bonds.

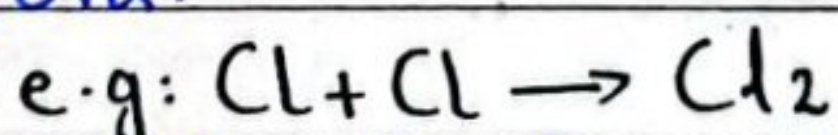
Q5:- Describe the way in which bonds may be formed.

Bonds may be formed in three primary ways:

1. **Ionic Bonds:** formed when electrons are transferred from one atom to another, resulting in the formation of positive and negative ions.



2. **Covalent Bonds:** formed when two atoms share one or more pairs of electrons.



3. **Metallic Bonds:** formed between metal atoms where electrons are shared in a "sea of electrons" that are free to move around, and are attracted by the positive nuclei with same strength.

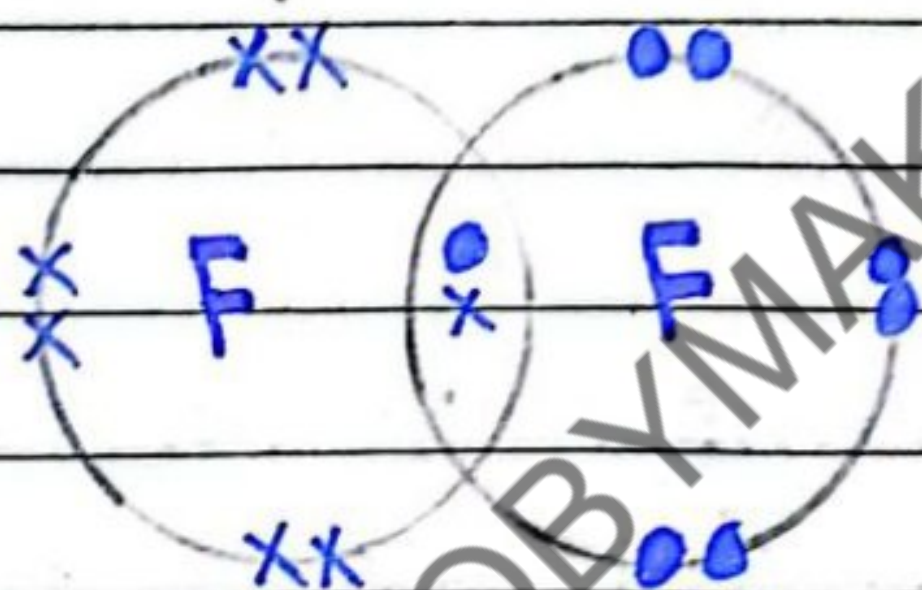
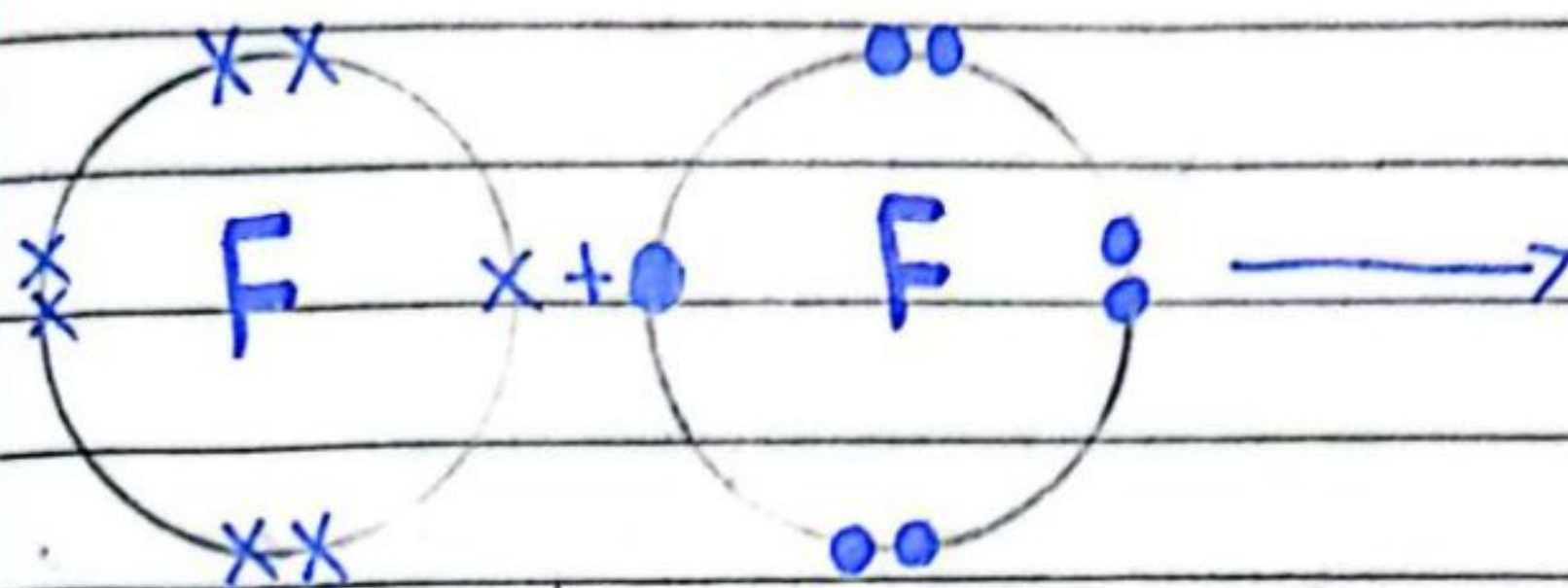
Q6:- Describe the formation of covalent bond between two non-metallic elements.

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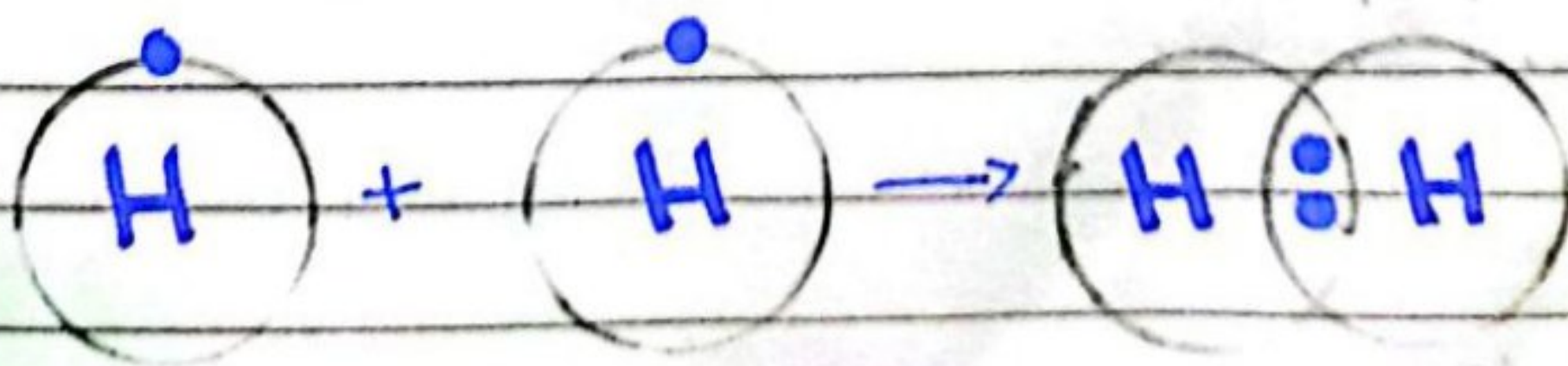
covalent bond between two non-metallic elements forms when they

share electrons to achieve a stable valence electron configuration. For example, in a molecule of Fluorine two fluorine atoms share an electron pair and achieve electron configuration of Ne.

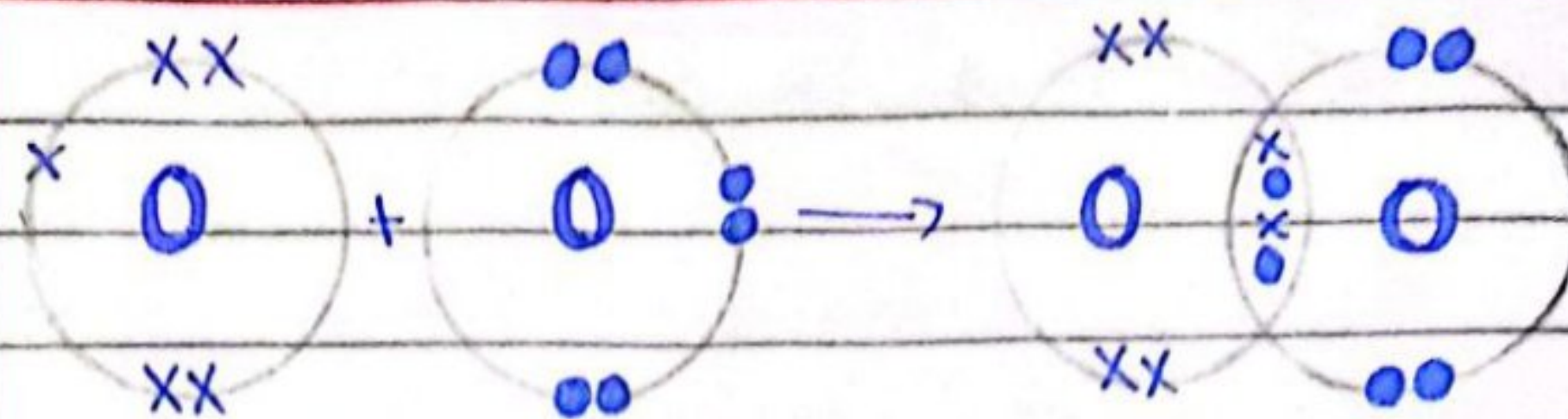


Q7: Explain with examples single, double and triple covalent bond

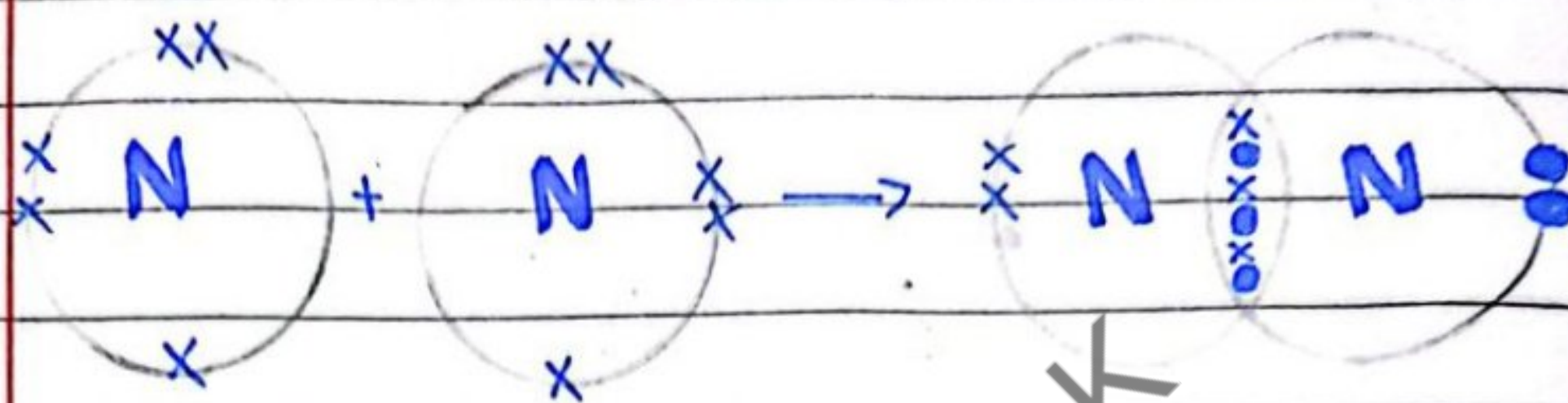
1. **Single Covalent Bond:** Involves the sharing of one pair of electrons.
Example: H_2 (hydrogen molecule).



2. **Double Covalent Bond:** Involves the sharing of two pairs of electrons.
For example O_2 (Oxygen molecule).



Triple Covalent bond: Involves the sharing of three pairs of electrons. For example: N_2 (Nitrogen molecule).



Q8:- Find the number of valence electrons in the following atoms using the periodic table:

a) **Boron:**

Boron have 3 valence electrons.

b) **Neon:**

Neon have 8 valence electrons.

c) **Rubidium:**

Rubidium have 1 valence electrons.

d) **Barium:**

Barium have 2 valence electrons.

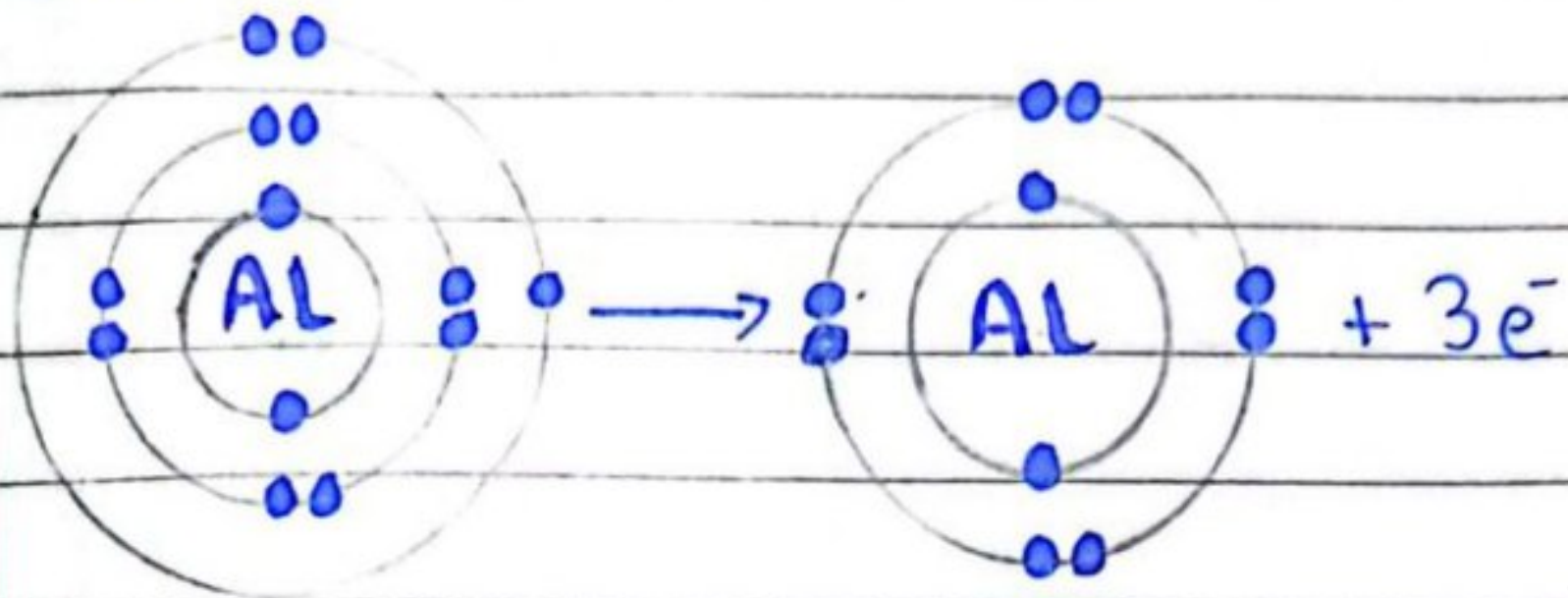
Galaxy A51 **e) Arsenic:**

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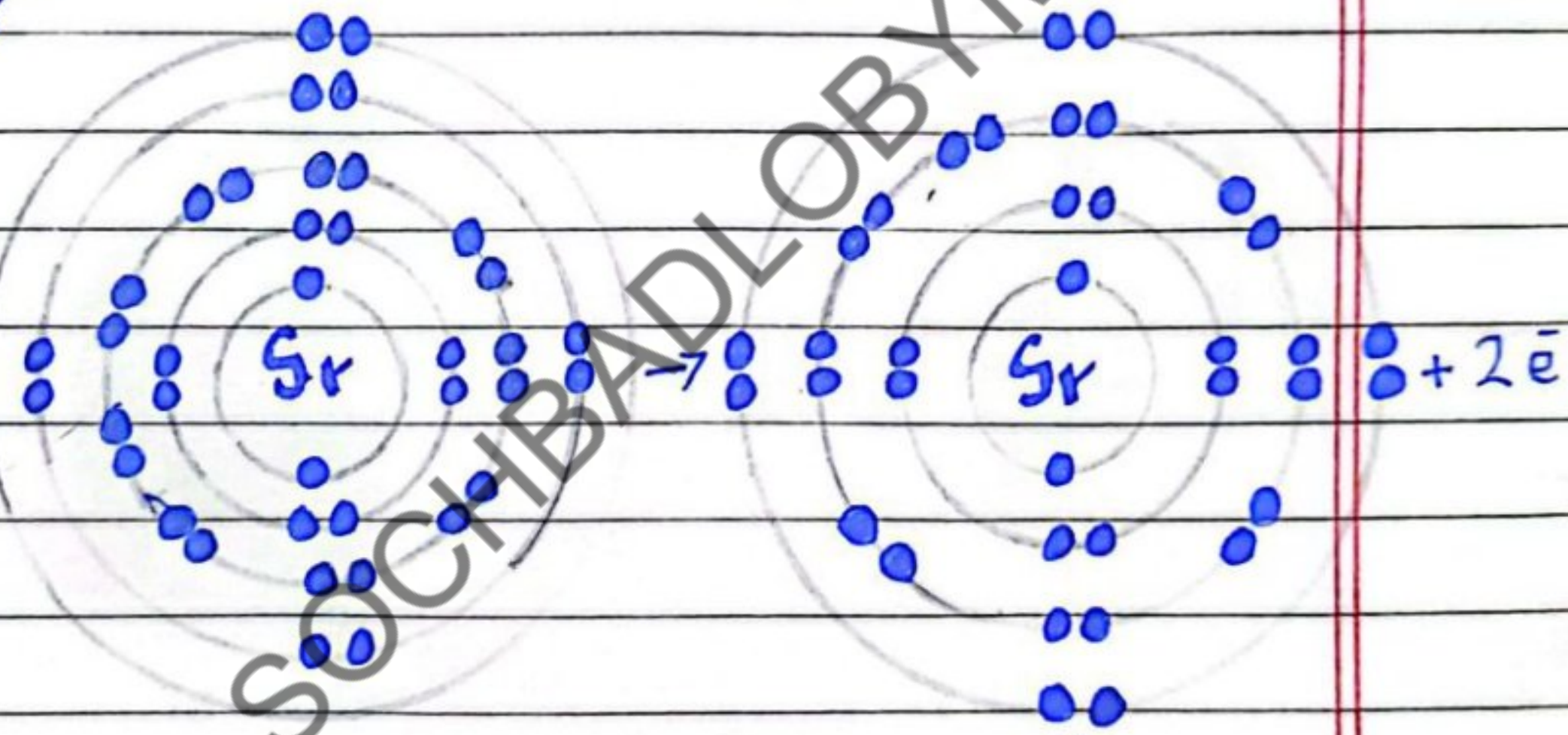
Arsenic have 5 valence electrons.

19:- Represent the formation of cations for the following metal atoms using electron dot structure.

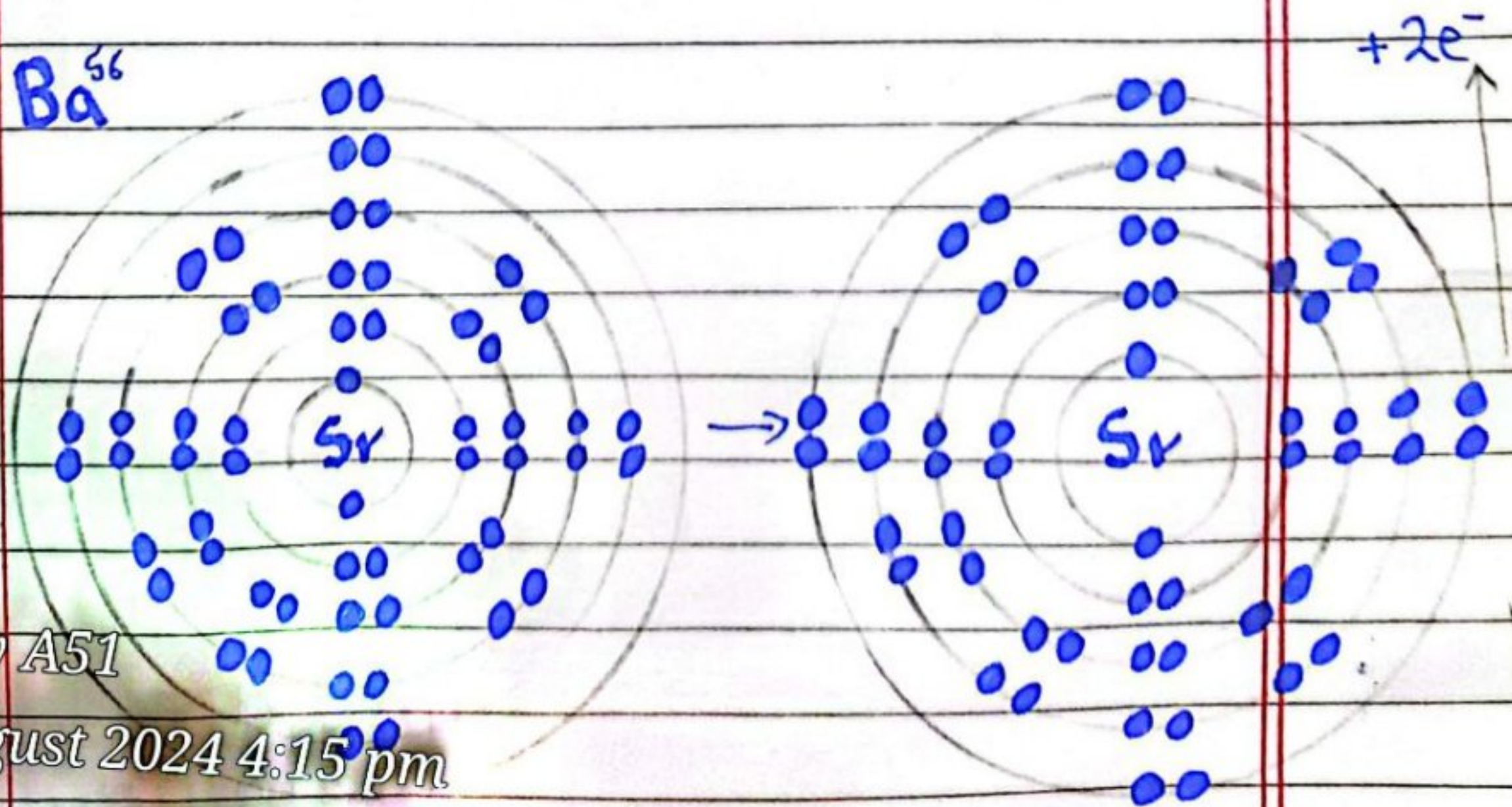
a) Al^{13}



b) Sr^{38}



c) Ba^{56}



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Q10:- A sample of sulphur from a volcano was analysed to give the following composition of isotopes.

a) Define the term isotopes.

Isotopes are atoms of the element whose nuclei have the same atomic number but different mass number, means same no. of proton but different no. of neutron.

b) Define the term relative atomic mass.

Relative atomic mass is the weighted average of the atomic masses of its isotopes and also taking into account their natural abundance.

c) Calculate the relative atomic mass of sulphur.

The relative atomic mass of sulphur can be calculated using the given isotopic abundances and respective masses:

$$S = \left(\frac{95.0}{100 \times 32} \right) + \left(\frac{0.76}{100 \times 33} \right) + \left(\frac{4.22}{100 \times 34} \right)$$

$$S = 32.0884$$

d) Complete the following table.

Done on textbook.

e) Where will you place S in the periodic table.

Sulphur is placed in Group VIA, Period 3 of the periodic table. It's a non-metal.

f) How many electrons S will lose or gain to acquire stable configuration.

Sulphur tends to gain 2 electrons to achieve a stable configuration, resulting in the formation of Sulfide ion (S^{2-}).

g) How many atoms are there in 0.3 mole of sulphur.

The number of atoms in one mole is approximately 6.022×10^{23} atoms

The number of sulphur atoms in 0.3 mole is:

$$0.3 \times 6.022 \times 10^{23} \\ = 1.8066 \times 10^{23}$$

Q11: An atom has atomic number 9 and mass number 19.

a) State the number of protons and neutrons in the nucleus of this atom.

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Number of protons = 9 (atomic no.)
Number of neutrons = mass no. - atomic no.

$$= 19 - 9$$

$$= 10$$

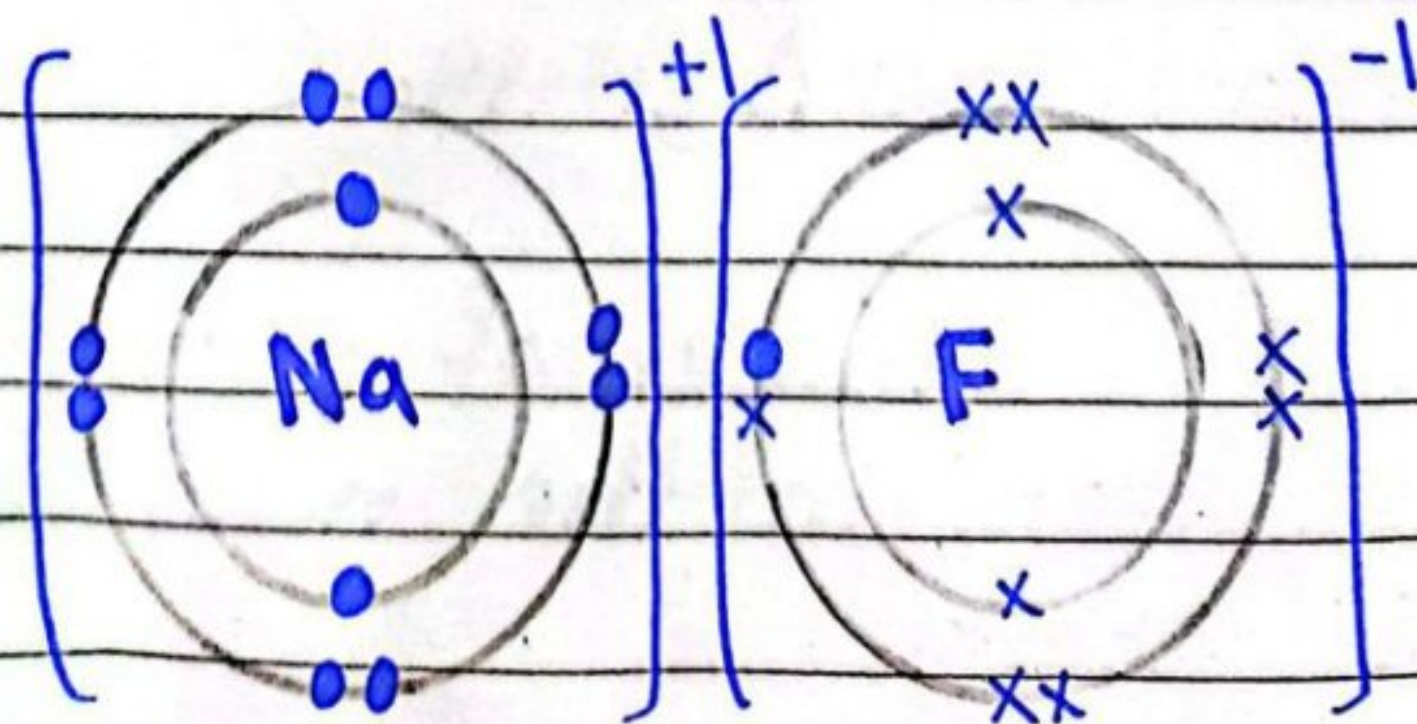
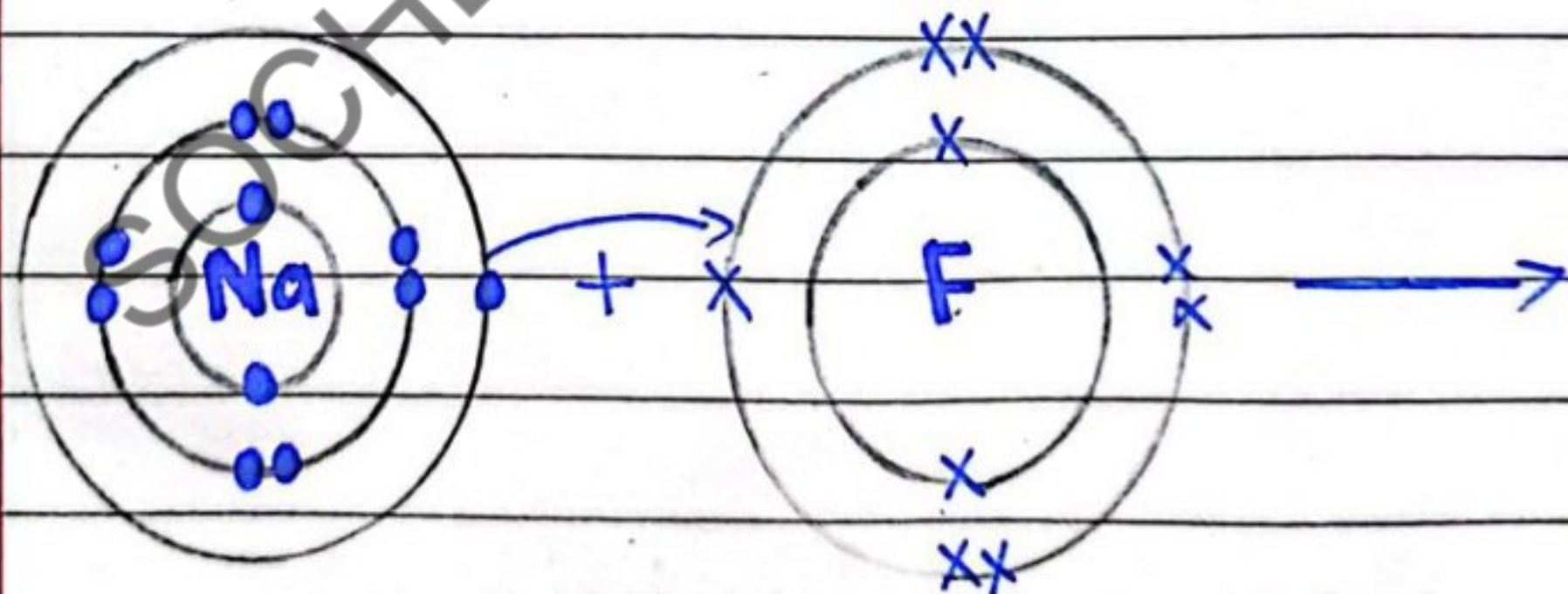
b) State the number of electrons in this atom.

In a neutral atom, the number of electrons is equal to the number of protons. Therefore,

Number of Electrons = 9

c) Show with electron cross-dot diagram, the formation of ions by this atom.

The element with atomic number 9 is fluorine. It tends to gain one electron to achieve a stable configuration.



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d) Write electronic configuration

$1s^2, 2s^2, 2p^5$

e) Point out its group in the periodic table.

Flourine is in Group VII A of the periodic table. This group is also known as the halogens.

f) Point out its Period in the periodic table.

Flourine is in the period 2 of the periodic table