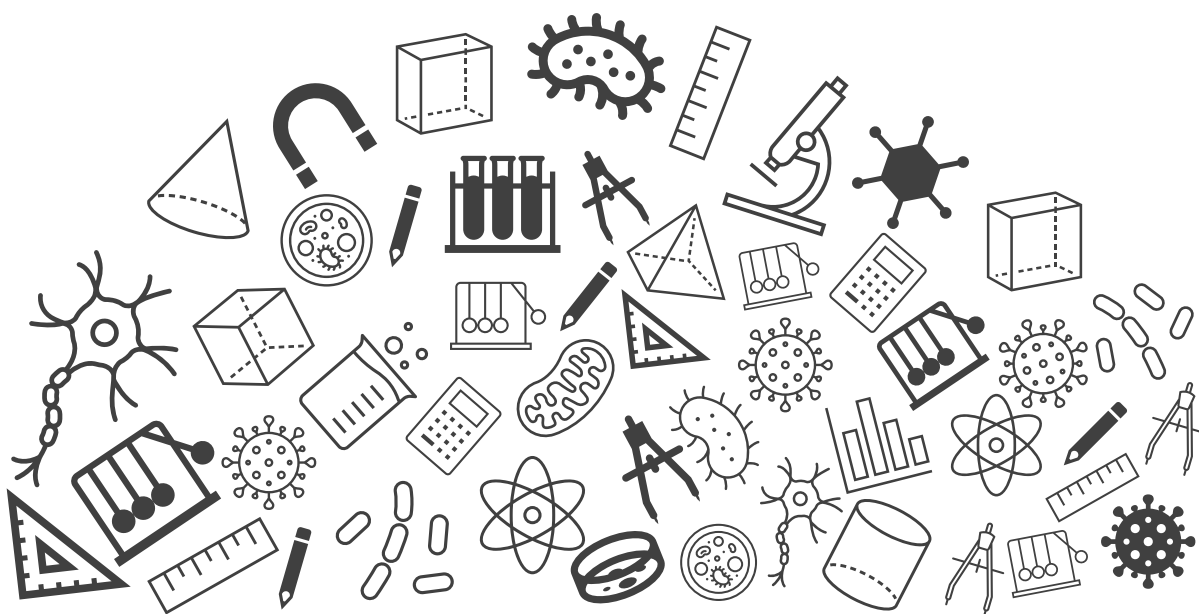


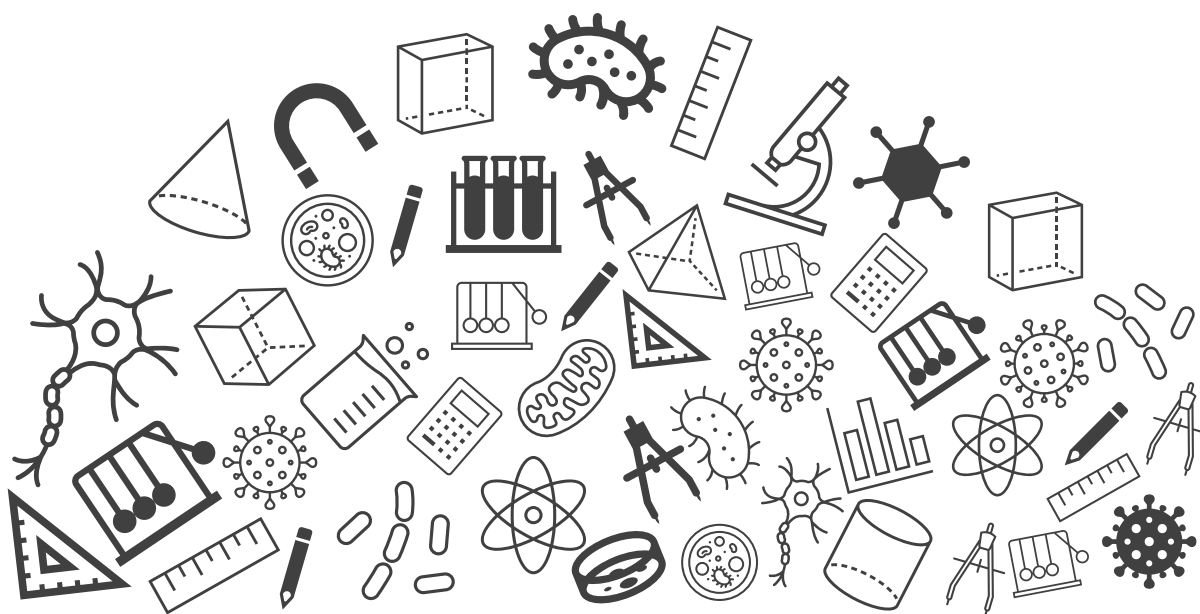


Grade 09





Structure of The Atom



Structure of the Atom

Topic : Exam Important Questions

1. State the postulates of Thomson's atomic model.

[2 Marks]

Solution:

Postulates of Thomson's atomic model are:

1) An atom consists of a positively charged sphere with electrons embedded in it.

[1 Mark]

2) An atom as a whole is electrically neutral because the negative and positive charges are equal in magnitude.

[1 Mark]

2. Rutherford proposed that the positive charge and most of the mass of an atom is concentrated in an extremely small volume.

This conclusion is based on which observation of his experiment?

[1 Mark]

Rutherford observed that a very small fraction of the α -particles were deflected by 180° , indicating that all the positive charge and mass of the gold atom were concentrated in a very small volume within the atom.

[1 Mark]

3. What are the various letters used by Bohr to represent the electron shells in an atom?

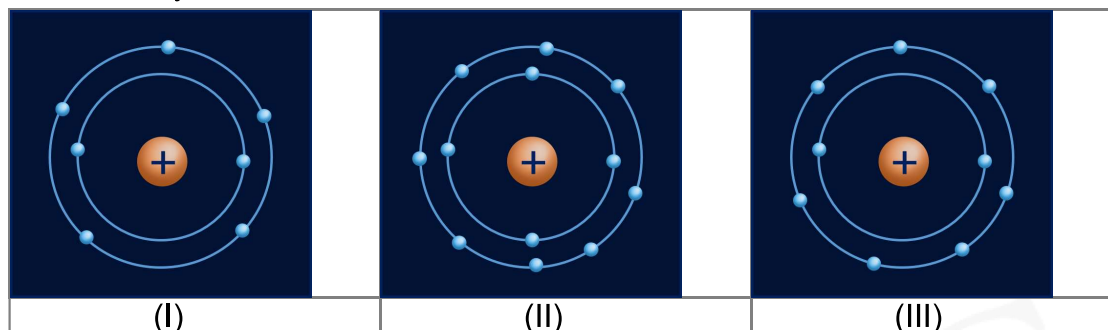
[1 Mark]

According to Bohr, only certain special orbits known as discrete orbits of electrons, are allowed inside the atom. These orbits or shells are represented by the letters K, L, M, N, and so on.

[1 Mark]

Structure of the Atom

4. Which of the following representation of atomic model is incorrect with respect to Bohr-Bury scheme?



Explain giving reasons.

[3 Marks]

According to Bohr-Bury scheme, the maximum number of electrons present in a shell is given by the formula $2n^2$, where 'n' is the orbit number. Therefore, the K shell ($n=1$) will have a maximum of 2 electrons and the L shell ($n=2$) will have a maximum of 8 electrons.

In representation (I), K-shell has 2 electrons and L-shell has 5 electrons. So, it is a correct representation with respect to Bohr-Bury scheme.

[1 Mark]

In representation (II), K-shell has 4 electrons and L-shell has 8 electrons. So, it is an incorrect representation with respect to Bohr-Bury scheme, since K-shell cannot have 4 electrons.

[1 Mark]

In representation (III), K-shell has 2 electrons and L-shell has 7 electrons. So, it is a correct representation with respect to Bohr-Bury scheme.

[1 Mark]

Structure of the Atom

5. The outermost shell of an atom of the element X contains 1 electron. What would be the valency and the charge on the ion formed, if this electron is removed from the outermost shell?

[2 Marks]

To achieve the octet configuration, the atom of the element X can lose 1 electron from its outermost shell.

Therefore, its valency is 1.

[1 Mark]

If 1 electron is removed from the atom, then one electron will be less than the number of protons. So, there will be one proton extra than the electrons. Therefore, a positive charge (+1) is created on the ion.

[1 Mark]

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6. Define valency by taking examples of silicon and oxygen.

[3 Marks]

Solution:

Valency of an element is defined as the number of electrons gained/lost/shared by an atom to achieve the octet configuration. In other words, valency can be defined as the combining capacity of that element.

If the number of valence electrons of the atom is less than or equal to four, then the valency of that element is equal to the number of valence electrons.

On the other hand, if the number of valence electrons of the atom is greater than four, then the valency of that element is obtained by subtracting the number of valence electrons from eight.

[2 Marks]

For example, the atom of silicon has 4 valence electrons, since its atomic number is 14 and electronic configuration is 2, 8, 4.

Thus, the valency of silicon is four.

[0.5 Marks]

Moreover, the atom of oxygen has 6 valence electrons, since its atomic number is 8 and electronic configuration is 2, 6.

Thus, the valency of oxygen is $8 - 6 = 2$.

[0.5 Marks]

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7. Observe the following table:

Name of element	Symbol	Number of protons	Number of neutrons	Number of electrons
Oxygen	O	8	8	8
Sulphur	S	16	16	16

With the help of table, find out the mass number of oxygen and sulphur atom.

[2 Marks]

Mass number = Number of protons + Number of neutrons

From the table:

Number of protons in the oxygen atom = 8

Number of neutrons in the oxygen atom = 8

Mass number of oxygen = $8 + 8 = 16$

[1 Mark]

Number of protons in the sulphur atom = 16

Number of neutrons in the sulphur atom = 16

Mass number of sulphur = $16 + 16 = 32$

[1 Mark]

Structure of the Atom

8. A) What are isotopes? Give two examples of isotopes of elements.

[2 Marks]

B) Give any three applications of isotopes.

[3 Marks]

A) Isotopes are defined as atoms of the same element, having the same atomic number but different mass numbers.

[1 Mark]

Examples of isotopes:

a) ${}^{12}_6\text{C}$ and ${}^{14}_6\text{C}$

b) ${}^{35}_{17}\text{Cl}$ and ${}^{37}_{17}\text{Cl}$

[1 Mark]

B) Applications of a few isotopes are:

a) An isotope of uranium is used as fuel in nuclear reactors.

b) An isotope of cobalt is used in the treatment of cancer.

c) An isotope of iodine is used in the treatment of goitre.

[3 Marks]