

Structure of Atom — Assignment 1

Class 11 Chemistry · Topic-wise question bank covering every concept of the chapter · Narayan Gurukul Academy

Instructions: (1) Attempt all questions. This worksheet walks through every concept of the chapter, topic by topic.
(2) The interactive MCQ version of these questions (with instant answer reveal) is available on the notes page.
(3) Universal values: $g = 10 \text{ m/s}^2$ unless stated. Give answers with correct SI units.

Subatomic Particles and Atomic Numbers

MCQ Questions (choose the correct option)

- The atomic number of an element is the number of
 - protons
 - neutrons
 - nucleons
 - electrons plus neutrons
- Isotopes of an element have the same
 - atomic number but different mass numbers
 - mass number but different atomic numbers
 - number of neutrons
 - number of nucleons
- The mass number of an atom is the number of
 - protons plus neutrons
 - protons only
 - electrons only
 - neutrons only
- Isobars are atoms with the same
 - mass number but different atomic numbers
 - atomic number
 - number of neutrons
 - number of electrons

1 Mark Questions

- Define atomic number.
- Define mass number.
- What are isotopes?

2 Mark Questions

- Define atomic number and mass number and give the number of protons and neutrons in ^{37}Cl . (Ans: 17 protons, 20 neutrons)
- Distinguish between isotopes and isobars with one example each.

3 Mark Questions

- Explain subatomic particles and define atomic number and mass number. Distinguish between isotopes and isobars with examples.
- Write the complete symbol of an atom and explain how the number of electrons, protons and neutrons is obtained from it.

Atomic Models — Thomson and Rutherford

MCQ Questions (choose the correct option)

1. Rutherford's alpha-particle scattering experiment led to the discovery of the
 - (A) nucleus
 - (B) electron
 - (C) neutron
 - (D) orbital
2. The main drawback of Rutherford's model is that it could not explain
 - (A) the stability of the atom
 - (B) the charge of the electron
 - (C) the mass of the proton
 - (D) the existence of isotopes
3. According to Thomson's model, the atom is a
 - (A) sphere of positive charge with electrons embedded
 - (B) nucleus with orbiting electrons
 - (C) cloud of electrons
 - (D) set of orbitals
4. In Rutherford's model, the electrons revolve around the nucleus in
 - (A) circular orbits
 - (B) orbitals
 - (C) nuclear shells
 - (D) a random way

1 Mark Questions

1. What did Rutherford's alpha-particle scattering experiment show?
2. State the main drawback of Rutherford's model.
3. According to Thomson's model, how are electrons arranged?

2 Mark Questions

1. Describe Thomson's model of the atom and state its limitations.
2. State the conclusions drawn from Rutherford's alpha-particle scattering experiment.

3 Mark Questions

1. Describe Rutherford's alpha-particle scattering experiment and state the conclusions drawn from it.
2. Explain Rutherford's nuclear model and discuss its drawbacks.

Bohr's Model of the Atom

MCQ Questions (choose the correct option)

1. According to Bohr, the angular momentum of an electron in an allowed orbit is
 - (A) an integral multiple of $h/2\pi$
 - (B) continuous
 - (C) zero

- (D) an integral multiple of h
2. The energy of an electron in the n th Bohr orbit of hydrogen is proportional to
- (A) $-1/n^2$
 - (B) $-n^2$
 - (C) $1/n$
 - (D) n
3. The radius of the n th Bohr orbit is proportional to
- (A) n^2
 - (B) n
 - (C) $1/n$
 - (D) $1/n^2$
4. Bohr's model successfully explained the spectrum of
- (A) the hydrogen atom
 - (B) helium
 - (C) lithium
 - (D) all atoms

1 Mark Questions

1. State Bohr's quantisation condition for angular momentum.
2. Write the expression for the energy of the electron in the n th Bohr orbit.
3. Which atom's spectrum did Bohr's model explain successfully?

2 Mark Questions

1. State the postulates of Bohr's model of the hydrogen atom.
2. The radius of the first Bohr orbit is $0.53 \text{ \AA}$. Find the radius of the second orbit. (Ans: $2.12 \text{ \AA}$)

3 Mark Questions

1. State the postulates of Bohr's model and derive the expression for the radius of the n th orbit.
2. State Bohr's postulates and derive the expression for the energy of the electron in the n th orbit of the hydrogen atom.

Quantum Numbers and Orbitals

MCQ Questions (choose the correct option)

1. The principal quantum number decides the
 - (A) size and energy of the orbital
 - (B) shape of the orbital
 - (C) orientation of the orbital
 - (D) spin of the electron
2. The azimuthal quantum number decides the
 - (A) shape of the orbital
 - (B) size of the orbital
 - (C) orientation of the orbital
 - (D) spin of the electron
3. The number of orbitals in a d subshell is

- (A) 5
 - (B) 3
 - (C) 1
 - (D) 7
4. The magnetic quantum number gives the
- (A) orientation of the orbital in space
 - (B) size of the orbital
 - (C) shape of the orbital
 - (D) spin of the electron

1 Mark Questions

1. Which quantum number decides the shape of an orbital?
2. How many orbitals are present in a p subshell?
3. What does the spin quantum number represent?

2 Mark Questions

1. Define the four quantum numbers and state what each represents.
2. Write the possible values of the magnetic quantum number for a d orbital.

3 Mark Questions

1. Explain the four quantum numbers and state the information given by each.
2. Explain the concept of an orbital and describe the shapes of s and p orbitals.

Electronic Configuration — Aufbau, Pauli and Hund

MCQ Questions (choose the correct option)

1. The Aufbau principle states that electrons are filled in
 - (A) increasing order of orbital energy
 - (B) decreasing order of orbital energy
 - (C) random order
 - (D) the order of atomic number
2. Pauli's exclusion principle states that no two electrons can have the same
 - (A) set of all four quantum numbers
 - (B) spin
 - (C) orbital
 - (D) principal quantum number
3. Hund's rule states that electrons occupy degenerate orbitals
 - (A) singly, with parallel spins, first
 - (B) in pairs first
 - (C) with opposite spins
 - (D) randomly
4. The electronic configuration of sodium ($Z = 11$) is
 - (A) $1s^2 2s^2 2p^6 3s^1$
 - (B) $1s^2 2s^2 2p^6 3s^2$
 - (C) $1s^2 2s^2 2p^5$

(D) $1s^2 2s^2 2p^6 3p^1$

1 Mark Questions

1. State the Aufbau principle.
2. State Pauli's exclusion principle.
3. State Hund's rule.

2 Mark Questions

1. State the Aufbau principle and write the electronic configuration of chlorine ($Z = 17$).
2. State Pauli's exclusion principle and Hund's rule with one example each.

3 Mark Questions

1. Explain the Aufbau principle, Pauli's exclusion principle and Hund's rule and use them to write the electronic configuration of chromium ($Z = 24$).
2. Using the rules of electronic filling, write the electronic configurations of nitrogen and oxygen, justifying each step.

de Broglie and Heisenberg Uncertainty

MCQ Questions (choose the correct option)

1. The de Broglie wavelength of a particle is given by
 - (A) h/mv
 - (B) mv/h
 - (C) hmv
 - (D) $h/(m+v)$
2. Heisenberg's uncertainty principle states that the product of the uncertainties in position and momentum is
 - (A) greater than or equal to $h/4\pi$
 - (B) equal to zero
 - (C) less than h
 - (D) exactly h
3. The de Broglie hypothesis shows that matter has
 - (A) wave as well as particle nature
 - (B) only particle nature
 - (C) only wave nature
 - (D) neither nature
4. The uncertainty principle is significant for
 - (A) small particles like electrons
 - (B) large bodies
 - (C) stationary bodies
 - (D) only photons

1 Mark Questions

1. State the de Broglie relation.
2. State Heisenberg's uncertainty principle.
3. Why is the uncertainty principle significant only for microscopic particles?

2 Mark Questions

1. State the de Broglie hypothesis and write the expression for the de Broglie wavelength.
2. State Heisenberg's uncertainty principle and explain its significance.

3 Mark Questions

1. State the de Broglie hypothesis and Heisenberg's uncertainty principle, and explain how they support the concept of an orbital.
2. Derive the relation for the de Broglie wavelength of an electron accelerated through a potential V and state Heisenberg's uncertainty principle.