

BATCH

EX

1.

STRUCTURE OF ATOM

CONTENTS

S. NO.	DETAIL	PAGE NO.
1.	DPPs (DAILY PRACTICE PROBLEMS)	
	• CONCEPT BASED	03 – 11
	• NCERT EXEMPLAR BASED	12 – 14
	• PREVIOUS YEARS NTSE QUESTIONS	15 – 17
2.	MODULE EXERCISES	
	• EXERCISE – I	18 – 21
	• EXERCISE – II	22 – 23
3.	ANSWER KEY	26 – 27

STRUCTURE OF ATOM**Concepts : *Introduction to Atom and cathode ray experiment***

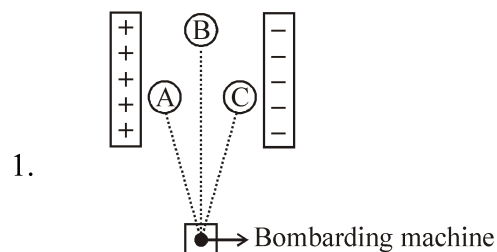
1. Who among the following developed the CRT (Cathode Ray Tube)?
(A) Charles Darwin (B) Ferdinand Barun (C) Thomas Alva Edison (D) None of the above
2. The inside of the cathode ray tube is coated with what material ?
(A) Aluminium (B) Sulphur powder (C) Phosphorus (D) None of the above
3. Which of the following is disadvantage of Cathode Ray Tube ?
(A) It runs at highest pixel ratio (B) It is less expensive than any other display technology
(C) It is very large, heavy and bulgy. (D) None of the above
4. Which of the following statement is correct about CRT ?
(A) High voltage current is used in CRT.
(B) Cathode rays diffracted when magnetic field is applied .
(C) They can't penetrate through this metal plates.
(D) Both (A) and (B)
5. Canal rays experiment is done by-
(A) Eugen Galdstein (B) J.J. Thomson (C) E. Rutherford (D) None of these
6. Canal rays is also called-
(A) Negative rays (B) Anode rays (C) Cathode rays (D) Gamma rays
7. For the better result which gas is used in CRT -
(A) Hydrogen gas (B) Helium gas (C) Oxygen gas (D) Neon gas
8. Which Indian sage propounded the idea of atom ?
(A) Maharishi Kanad (B) C. V. Raman (C) Democritus (D) Vasistha
9. The pressure applied in CRT Experiment-
(A) 760 mm Hg (B) 10^{-3} mmHg (C) 1 mm Hg (D) None of the above
10. Which of the following is not correct about anode rays ?
(A) Anode rays are also called canal rays.
(B) Andoe rays do not originate from the anode.
(C) Particles in the anode rays always carry the same charge and same mass.
(D) Protons are nothing but ionized hydrogen atoms.
11. The value of e/m ratio is -
(A) 1.23×10^9 C/kg (B) 1.76×10^{13} C/kg (C) 1.23×10^{11} C/kg (D) 1.76×10^{11} C/kg

STRUCTURE OF ATOM**Concepts : Fundamental Particles of an Atom, Atomic models**

- Which of the following statements is true ?
(A) A proton is 1837 times heavier than an electron.
(B) A proton is $1/1837$ times heavier than an electron.
(C) A proton is $1/1837$ times lighter than an electron.
(D) Proton has the same mass as an electron.
- The mass of a proton is-
(A) 1.00728 amu (B) 1.673×10^{-24} gm (C) 1.673×10^{-27} kg (D) all of these
- A proton is usually represented as-
(A) ${}_1^1\text{p}$ (B) H^+ (C) ${}_0^1\text{n}$ (D) Both (A) and (B)
- A neutron is represented as-
(A) ${}_0^0\text{n}$ (B) ${}_1^1\text{n}$ (C) ${}_0^1\text{n}$ (D) ${}_{-1}^1\text{n}$
- The discovery of neutron took very late because :
(A) Neutrons are present in the nucleus (B) Neutrons are fundamental particles
(C) Neutrons are chargeless (D) None of these
- When alpha particles are allowed to strike thin metal foil, most of them go straight through the foil because-
(A) alpha particles are much heavier than electrons.
(B) alpha particles are positively charged.
(C) most part of the atom is empty.
(D) alpha particles move with high velocity.
- Rutherford's scattering experiment is related to the size of -
(A) nucleus (B) atom (C) electron (D) neutron
- Rutherford performed his alpha scattering experiment using-
(A) silver (B) gold (C) mercury (D) diamond
- The radius of an atomic nucleus is of the order-
(A) 10^{-10} cm (B) 10^{-13} cm (C) 10^{-15} cm (D) 10^{-8} cm
- The protons and neutrons are collectively called-
(A) deuterons (B) positrons (C) mesons (D) nucleons

STRUCTURE OF ATOM

Concepts : *Atomic model of an atom, thomson model, Rutherford model, Bohr's model*



three particles 'A', 'B' and 'C' bombarded through electrical field then 'B' may be –

1. (A) Positive charge (B) Electron (C) Neutron (D) α -particle
2. In Thomson model red part of watermelon is compared with-
(A) Positive charge (B) Electron (C) Both A and B (D) None of these
3. α -particle is –
(A) Positive charged (B) Negative charged (C) Neutron (D) None of these
4. Number of electrons in α -particle is –
(A) 1 (B) 2 (C) 0 (D) 4
5. Representation of α -particle is –
(A) ${}^4_2\text{He}$ (B) ${}^4_2\text{He}^{+1}$ (C) ${}^4_2\text{He}^{+2}$ (D) ${}^2_1\text{He}^{+1}$
6. Rutherford model also known as–
(A) Plum–pudding model (B) Water–melon model
(C) Planetary model (D) None of the
7. According to Rutherford experiment size of atom is with respect to size of nucleus is –
(A) 10^{-5} (B) 10^3 (C) 10^5 (D) 10^4
8. If electron jump from 2nd orbit to 5th orbit then energy –
(A) released (B) required (C) neither lose nor gain (D) none of these
9. Which shell have higher energy in the following –
(A) 1 (B) 2 (C) 3 (D) 4
10. The force of attraction between the nucleus and the electron is equal to (According to Bohr's model)
(A) Electrostatic force (B) Nuclear force (C) Centrifugal force (D) Weak vanderwall's force
11. Which of the following is correct about thomson's model of atom ?
(A) The positive charge is present in the centre and electrons are present around it to neutralize the positive charge.
(B) It is a sphere of positive charge in which electrons were embedded. The number of electrons are sufficient to

neutralize the positive charge.

(C) It is a sphere of negative charge and positive charges were present on the boundary of the sphere to neutralize the negative charge.

(D) None of the above

12. Which of the following is not correct about Rutherford's model of atom ?

(A) The whole mass of the atom is concentrated in the nucleus and electrons have negligible mass.

(B) The electrons present around the nucleus are called planetary electrons.

(C) Electrons do not fall into the nucleus because the electrons are revolving around the nucleus creating a centrifugal force.

(D) Revolving electrons do not lose energy and continue to revolve in the same orbit.

13. Which of the following is not correct about Bohr's model ?

(A) Electrons are revolving around the nucleus in stationary states.

(B) Energies of 1st, 2nd, 3rd, 4th shell are in the order : $E_1 > E_2 > E_3 > E_4$.

(C) Ground state of an atom means a state of the atom with lowest energy.

(D) Electrons absorb only discrete amounts of energy to jump from one shell to another shell and not any energy.

14. Which of the following statements are correct ?

(i) Rutherford's model cannot explain the stability of the atom.

(ii) Bohr's orbits are called stationary states because electrons present in these orbits are stationary.

(iii) Electrons absorb only discrete values of energy and not any value.

(iv) The mass of the atoms is concentrated in the nucleus.

(A) (i), (ii) and (iii)

(B) (i), (ii) and (iv)

(C) (i), (iii) and (iv)

(D) (i), (ii), (iii) and (iv)

15. Which of the following observation of Rutherford's scattering experiment does not match correctly with the result concluded ?

Observation	Result
(i) Most of the α -particles pass through undeflected.	Atom has large empty space inside.
(ii) Some α -particles are deflected through small/large angle.	Presence of a positively charged body in the atom.
(iii) Some α -particles are deflected back.	Atom has a heavy body inside.
(iv) Very few α -particles are deflected back.	The size of the heavy body is not so small.

STRUCTURE OF ATOM

Concepts : Atomic Structure and Electronic configuration & Quantum Numbers

- Which of the following has the same number of protons, electrons & neutrons ?
 (A) $^{54}_{27}\text{X}$ (B) $^{55}_{27}\text{X}^{+1}$ (C) $^{54}_{26}\text{X}$ (D) $^{55}_{28}\text{X}^{+}$
- An isotone of $^{76}_{32}\text{Ge}$ is -
 (A) $^{78}_{34}\text{Se}$ (B) $^{77}_{34}\text{Se}$ (C) $^{78}_{33}\text{Se}$ (D) $^{77}_{32}\text{Ge}$
- A deuteron contains -
 (A) A neutron & a positron (B) A neutron & a proton
 (C) A neutron & 2 protons (D) 2 neutrons & a proton
- Pick out the isoelectronic structures from the following -
 (I) CH_3^{+} (II) H_3O^{+} (III) NH_3 (IV) CH_3^{-}
 (A) I and II (B) III and IV (C) I and III (D) II, III, IV
- An atom which has a mass number of 14 & 8 neutrons is an -
 (A) Isotope of oxygen (B) Isobar of oxygen (C) Isotope of carbon (D) Isobar of carbon
- A p-orbital can accommodate upto -
 (A) 4 electrons (B) 2 electrons (C) 6 electrons (D) 3 electrons
- The different subshells in an atom are represented as -
 (A) s, p, d, f (B) S, P, D, F (C) 1, 2, 3, 4 (D) All of these
- Alpha-particles that come closer to nuclei in Rutherford's alpha particle scattering experiment-
 (A) are deflected more (B) are deflected less
 (C) make more collisions (D) None of these
- The number of subshells in the second energy level is -
 (A) 4 (B) 11 (C) 9 (D) 2
- The number of orbitals in the fourth energy level is -
 (A) 4 (B) 16 (C) 32 (D) 9
- The total number of orbitals in 3rd orbit is :
 (A) 3 (B) 5 (C) 4 (D) 9
- Which of the following has more number of unpaired electron ?
 (A) Zn^{+} (B) Fe^{2+} (C) Ni^{2+} (D) Cu^{+}
- The number of vacant orbitals in the valence shell of an element with atomic number 14 is :
 (A) 2 (B) 4 (C) 1 (D) 6

STRUCTURE OF ATOM

Concepts : *Atomic number and mass number, representation of element calculation of no. of e^- , p^+ and n , electronic configuration*

- Atomic number of neutral atom is equal to –
 (A) number of protons (B) number of electrons (C) number of neutrons (D) Both A and B
- Element which atomic number and mass number is same –
 (A) Sodium (B) Potassium (C) Hydrogen (D) Carbon
- Correct representation of potassium is –
 (A) $^{19}_{39}\text{K}$ (B) $^{31}_{15}\text{P}$ (C) $^{15}_{31}\text{P}$ (D) $^{39}_{19}\text{K}$
- Calculate the number of electron, protons, and neutrons in K^+ ion if mass number is '39' -
 (A) 19, 20, 18 (B) 18, 19, 20 (C) 18, 20, 15 (D) 11, 15, 17
- Which subatomic particle is similar to H^+ ion -
 (A) Proton (B) Electron (C) Neutron (D) α -particle
- Calculate number of maximum electrons in 2nd excited shell –
 (A) 2 (B) 8 (C) 18 (D) 32
- Number of electron present in L-shell for Calcium atom is –
 (A) 2 (B) 6 (C) 8 (D) 18
- Number of electron present in M-shell for Boron atom is –
 (A) 2 (B) 3 (C) 0 (D) 6
- Correct electronic configuration for Calcium is –
 (A) 2, 8, 10 (B) 2, 6, 8, 4 (C) 2, 8, 8, 2 (D) 2, 8, 6, 4
- The number of electrons, protons and neutrons in oxide ion (O^{2-}) are respectively ($\text{O} : Z = 8, A = 16$)
 (A) 8, 8, 8 (B) 10, 8, 8 (C) 8, 10, 8 (D) 8, 8, 19
- Which of the distribution of electrons of chlorine atom is represented as ($\text{Cl} : Z = 17, A = 35$)
 (A) $\begin{matrix} \text{K} & \text{L} & \text{M} \\ 2 & 8 & 8 \end{matrix}$ (B) $\begin{matrix} \text{K} & \text{L} & \text{M} \\ 2 & 8 & 7 \end{matrix}$ (C) $\begin{matrix} \text{K} & \text{L} & \text{M} \\ 2 & 10 & 5 \end{matrix}$ (D) $\begin{matrix} \text{K} & \text{L} & \text{M} \\ 2 & 9 & 6 \end{matrix}$
- Which of the following statements are correct ?
 (i) Na^+ , O^{2-} and F^- are isoelectronic.
 (ii) All isotopes of hydrogen are isotonic.
 (iii) ^{40}Ar and ^{40}Ca are called isobars.
 (iv) Co-60 isotope is used in the treatment of cancer.
 (A) (i), (ii), (iii) (B) (i), (iii), (iv) (C) (ii), (iii), (iv) (D) (i), (ii), (iii), (iv)

STRUCTURE OF ATOM
Concepts : Introduction, electrical nature of matter, charged particles in matter

- Electron name given by–
 (A) J.J. Thomson (B) Faraday (C) G.J. Stoney (D) Rutherford
- Cathode rays when passed through electric field it attract towards -
 (A) Positive (B) Negative (C) Passed straight (D) None of these
- Canal rays carry –
 (A) Positive charge (B) Negative charge (C) Neutral (D) All of these
- Mass of electron is with respect to hydrogen atom–
 (A) 1837 times (B) same (C) 1/1837 times (D) All of these
- Representation of subatomic particle electron is –
 (A) ${}^0_{+1}e$ (B) 1_0e (C) ${}^0_{-1}e$ (D) 1_0n
- 'e/m' ratio of the particles which taken in the tube do not depends on nature of the gas in case of –
 (A) Cathode rays (B) Canal rays (C) Both (D) None of these
- ${}^9_4\text{Be} + {}^4_2\text{He} \longrightarrow {}^{12}_6\text{C} + x$
 in this 'x' is –
 (A) α – particle (B) β – particle (C) electron (D) Neutron
- Only element which have zero neutron is –
 (A) Helium (B) Carbon (C) Hydrogen (D) Lithium
- Iron forms two oxides, FeO (A) and Fe_2O_3 (B). The number of electrons present in Fe of A and Fe of B and O of A and O of B will be respectively (Given atomic numbers : Fe = 26, O = 8)
 (A) 24, 23, 10, 10 (B) 24, 24, 10, 12 (C) 23, 23, 10, 12 (D) 23, 24, 10, 10
- An ion M^{3+} contains 10 electrons and 14 neutrons. The atomic number and mass number of the element are
 (A) 13, 24 (B) 13, 27 (C) 7, 21 (D) 10, 24
- An ion X^{2-} contains 10 electrons and 8 neutrons. The atomic number and mass number of the element are
 (A) 10, 18 (B) 8, 16 (C) 10, 16 (D) 8, 18
- Total number of neutrons present in the three well known isotopes of hydrogen is
 (A) 0 (B) 1 (C) 2 (D) 3

STRUCTURE OF ATOM

Concepts : *Valence electrons, valency, variable valency, isotopes, isobars, isotones, isoelectronic, Aufbau principle*

- Number of valence electron present in 'Mg⁺' is–
 (A) 1 (B) 2 (C) 0 (D) 8
- Valency of 'He' is–
 (A) 0 (B) 1 (C) 2 (D) 3
- Variable valency shown by tin is –
 (A) +3, +5 (B) +1, +2 (C) +2, +4 (D) +1, +3
- Calculate average atomic mass of Boron if two isotopes are $^{10}_5\text{B}$ (20%) and $^{11}_5\text{B}$ (80%)
 (A) 10.5 (B) 10.2 (C) 10.6 (D) 10.8
- Calculate Number of electron in 'Y' if 'X' and 'Y' are isotopes $^9_{17}\text{X}$ and $^c_b\text{Y}^{-1}$:
 (A) 17 (B) 18 (C) 19 (D) Can't calculate
- Isotopes have same –
 (A) Atomic Number (B) Mass Number (C) Number of electron (D) Number of neutron
- Which of the following is isobar–
 (A) $^{39}_{19}\text{K}, ^{40}_{20}\text{Ca}$ (B) $^{39}_{19}\text{K}, ^{40}_{18}\text{Ar}$ (C) $^{40}_{18}\text{Ar}, ^{40}_{20}\text{Ca}$ (D) $^{23}_{11}\text{Na}, ^{24}_{12}\text{Mg}$
- Which of the following is isoelectronic :
 (A) $(\text{NH}_4)^+, \text{NH}_3$ (B) NH_3, Na^+ (C) CH_4, Ne (D) All of these
- Which of the following is isotones–
 (A) $^{23}_{11}\text{Na}, ^{24}_{12}\text{Mg}$ (B) $^{10}_5\text{B}, ^{12}_6\text{C}$ (C) $^{14}_7\text{N}, ^{16}_8\text{O}$ (D) $^{40}_{18}\text{Ar}, ^{40}_{20}\text{Ca}$
- Arrange following according to increasing energy level.
 2s, 2p, 3p, 4s
 (A) $2s < 2p < 4s < 3p < 4p$ (B) $2s < 2p < 3p < 4s < 4p$
 (C) $2s < 2p < 4s < 4p < 3p$ (D) $4p > 4s > 3p > 2p > 2s$
- U–235 isotopes is used as -
 (A) Fuel in nuclear reactors (B) Treatment of goitre
 (C) Treatment of cancer (D) None of these

STRUCTURE OF ATOM**Concepts : Assertion-Reason Type Questions**

Two statements are given - one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (ft), (c) and (d) as given below :

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A)

(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of the Assertion (A)

(C) Assertion (A) is true but Reason (R) is false.

(D) Assertion (A) is false but Reason (R) is true.

1. Assertion: No two atoms have same number of neutrons.
Reason: No two atoms have same number of protons.
2. Assertion: Rutherford's model of atom cannot explain the stability of the atom.
Reason: Revolving electron loses energy in the form of radiations.
3. Assertion: No current flows between the electrodes of the discharge tube if the gas inside is taken at atmospheric pressure even when high voltage is applied.
Reason: No ionization of the gas takes place at atmospheric pressure.
4. Assertion: When a mica cross is placed in the path of cathode rays, no shadow is produced at the back.
Reason: Cathode rays are stopped by the mica cross.
5. Assertion: Anode rays originate from anode in a discharge tube.
Reason: Cathode rays ionize the gas present in the discharge tube.
6. Assertion: If we take a thin foil of aluminium in place of a thin foil of gold in Rutherford's scattering experiment, it makes no difference.
Reason: Both gold and aluminium are metals.
7. Assertion: The energy of electrons keeps on decreasing when we move inwards starting from outer shells.
Reason: The electron revolving around the nucleus follows a spiral path as it keeps on losing energy due to attraction by the nucleus in the center of the atom.
8. Assertion: An electron can absorb only discrete amounts of energy to jump to outer shells.
Reason: Different shells are stationary states.
9. Assertion: Number of protons present in the atom of an element is a fixed number but number of neutrons is not fixed.
Reason: Neutron is a neutral particle.
10. Assertion: Positive ions have greater number for protons than the neutral atom.
Reason: Protons are positively charged particles.

STRUCTURE OF ATOM**Concepts : NCERT Exemplar Based**

1. Which of the following correctly represent the electronic distribution in the Mg atom?
(A) 3, 8, 1 (B) 2, 8, 2 (C) 1, 8, 3 (D) 8, 2, 2
2. Rutherford's 'alpha (α) particles scattering experiment' resulted in to discovery of
(A) Electron (B) Proton (C) Nucleus in the atom (D) Atomic mass
3. The number of electrons in an element X is 15 and the number of neutrons is 16. Which of the following is the correct representation of the element?
(A) $^{31}_{15}\text{X}$ (B) $^{31}_{16}\text{X}$ (C) $^{16}_{15}\text{X}$ (D) $^{15}_{16}\text{X}$
4. Dalton's atomic theory successfully explained :
(i) Law of conservation of mass (ii) Law of constant composition
(iii) Law of radioactivity (iv) Law of multiple proportion
(A) (i), (ii) and (iii) (B) (i), (iii) and (iv) (C) (ii), (iii) and (iv) (D) (i), (ii) and (iv)
5. Which of the following statements about Rutherford's model of atom are correct?
(i) considered the nucleus as positively charged
(ii) established that the α -particles are four times as heavy as a hydrogen atom
(iii) can be compared to solar system
(iv) was in agreement with Thomson's model
(A) (i) and (iii) (B) (ii) and (iii) (C) (i) and (iv) (D) only (i)
6. Which of the following are true for an element?
(i) Atomic number = number of protons + number of electrons
(ii) Mass number = number of protons + number of neutrons
(iii) Atomic mass = number of protons = number of neutrons
(iv) Atomic number = number of protons = number of electrons
(A) (i) and (ii) (B) (i) and (iii) (C) (ii) and (iii) (D) (ii) and (iv)
7. In the Thomson's model of atom, which of the following statments are correct?

(i) the mass of the atom is assumed to be uniformly distributed over the atom

(ii) the positive charge is assumed to be uniformly distributed over the atom

(iii) the electrons are uniformly distributed in the positively charged sphere

(iv) the electrons attract each other to stabilise the atom

(A) (i), (ii) and (iii) (B) (i) and (iii) (C) (i) and (iv) (D) (i), (iii) and (iv)

8. Rutherford's α -particle scattering experiment showed that

(i) electrons have negative charge

(ii) the mass and positive charge of the atom is concentrated in the nucleus

(iii) neutron exists in the nucleus

(iv) most of the space in atom is empty

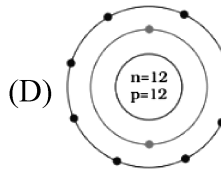
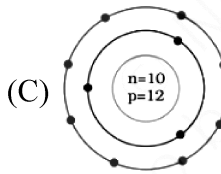
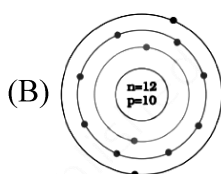
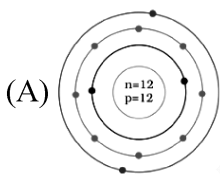
Which of the above statements are correct?

(A) (i) and (iii) (B) (ii) and (iv) (C) (i) and (iv) (D) (iii) and (iv)

9. The ion of an element has 3 positive charges. Mass number of the atom is 27 and the number of neutrons is 14. What is the number of electrons in the ion?

(A) 13 (B) 10 (C) 14 (D) 16

10. Identify the Mg^{2+} ion from the Fig.4.1 where, n and p represent the number of neutrons and protons respectively.



11. In a sample of ethyl ethanoate ($\text{CH}_3\text{COOC}_2\text{H}_5$) the two oxygen atoms have the same number of electrons but different number of neutrons. Which of the following is the correct reason for it?

(A) One of the oxygen atoms has gained electrons

(B) One of the oxygen atoms has gained two neutrons

(C) The two oxygen atoms are isotopes

(D) The two oxygen atoms are isobars.

12. Elements with valency 1 are

(A) always metals (B) always metalloids (C) either metals or non-metals (D) always non-metals

13. The first model of an atom was given by

- (A) N. Bohr (B) E. Goldstein (C) Rutherford (D) J.J. Thomson
14. An atom with 3 protons and 4 neutrons will have a valency of
(A) 3 (B) 7 (C) 1 (D) 4
15. The electron distribution in an aluminium atom is
(A) 2, 8, 3 (B) 2, 8, 2 (C) 8, 2, 3 (D) 2, 3, 8
16. Which of the following in Fig. 4.2 do not represent Bohr's model of an atom correctly?
(A) (i) and (ii) (B) (ii) and (iii) (C) (ii) and (iv) (D) (i) and (iv)
17. Which of the following statement is always correct?
(A) An atom has equal number of electrons and protons.
(B) An atom has equal number of electrons and neutrons.
(C) An atom has equal number of protons and neutrons.
(D) An atom has equal number of electrons, protons and neutrons.
18. Atomic models have been improved over the years. Arrange the following atomic models in the order of their chronological order
(i) Rutherford's atomic model
(ii) Thomson's atomic model
(iii) Bohr's atomic model
(A) (i), (ii) and (iii) (B) (ii), (iii) and (i) (C) (ii), (i) and (iii) (D) (iii), (ii) and (i)

STRUCTURE OF ATOM

Concepts : NTSE problem stage-1 (Previous Years)

1. K, L and M shell of an atom have 2, 8 and 5 electrons respectively. The number of electrons in its p-orbitals is-

[Raj. NTSE Stage-I/05]

(A) 6
(B) 7
(C) 8
(D) 9
2. The electronic configuration of Cu^{2+} ($Z = 29$) ion is

[Raj. NTSE Stage-I/07]

(A) $[\text{Ar}]3d^{10} 4s^0$
(B) $[\text{Ar}] 3d^{10} 4s^1$
(C) $[\text{Ar}] 3d^9 4s^0$
(D) $[\text{Ar}]3d^7 4s^2$
3. Structure of nucleus of three atoms A, B and C are given below-

[Delhi NTSE Stage-I/13]

(a) Has 90 protons and 146 neutrons.

(b) Has 92 protons and 146 neutrons.

(c) Has 90 protons and 148 neutrons based on the above data, Which of these atoms are isotopes and which are isobars ?

(A) (a) and (c) are isotopes (b) and (c) are isobars

(B) (a) and (b) are isotopes (a) and (c) are isobars

(C) (b) and (c) are isobars (a) and (b) are isotops

(D) (a) and (c) are isotops (a) and (b) are isobars
4. Which of the following will have equal number of electrons ?

[Delhi NTSE Stage-I/13]

(A) Cl and Br
(B) Na^+ and Mg^{2+}
(C) Ar and Ne
(D) Mg^{2+} and Ca^{2+}
5. When two atoms combines to form molecule then :

[M.P. NTSE Stage-I/13]

(A) Energy is released

(B) Energy is absorbed

(C) Energy is neither released nor absorbed

(D) Energy may either be released or absorbed
6. The electronic structure of four elements a, b, c, d respectively are :

[M.P. NTSE Stage-I/13]

$1s^2$
 $1s^2, 2s^2, 2p^2$
 $1s^2, 2s^2, 2p^5$
 $1s^2, 2s^2, sp^6$

The tendency to form electrovalent bond will be largest in

(A) a
(B) b
(C) c
(D) d
7. Which statement is correct about a proton ?

[M.P. NTSE Stage-I/13]

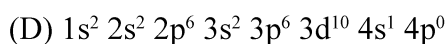
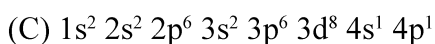
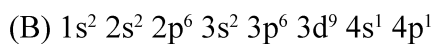
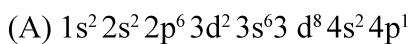
(A) It is nucleus of deuterium

(B) It is ionised hydrogen molecule.

(C) It is ionised hydrogen atom

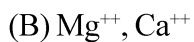
(D) It is α -particle
8. Electronic configuration of copper (atomic No. Cu – 29) is :

[Karnataka NTSE Stage-I/13]



9. Which of the following pair is isoelectronic ?

[Maharashtra NTSE Stage-I/13]



10. False statement for second period elements is -

[Raj. NTSE Stage-I/14]

(A) Change in number of electrons produces ions

(B) Number of protons and electrons are equal in neutral atom

(C) Number of neutrons is less than the number of protons in atom

(D) Change in the number of neutrons in atom produces isotopes

11. Neutron less neutral atom is :

[Raj. NTSE Stage-I/14]



12. Which of the following do not represent Electronic configuration correctly ? [Maharashtra NTSE Stage-I/15]



(a)



(b)



(c)



(d)

(A) (a) and (b)

(B) (b) and (d)

(C) (b) and (c)

(D) (a) and (d)

13. Structure of nuclei of three atoms X, Y and Z are as follows :

[M.P. NTSE Stage-I/15]

(1) X has 90 Protons and 146 Neutrons

(2) Y has 92 Protons and 146 Neutrons

(3) Z has 90 Protons and 148 Neutrons.

Which of the following statement is correct based on above data

(A) X and Z are isotopes ; Y and Z are isobars.

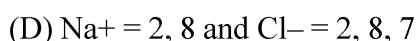
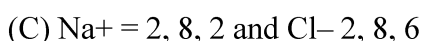
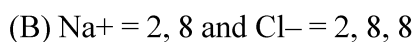
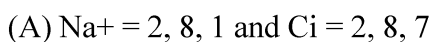
(B) X and Y are isotopes; X and Z are isobard

(C) Y and Z are isobard ; X and Z are isobars.

(D) Y and Z are isobars ; X and Z are isobars.

14. What are the electronic configuration of Na^+ and Cl^- ions ?

[Delhi NTSE Stage-I/15]



15. Number of which among the following is same in Al^{+3} and F^- ?

[Raj. NTSE Stage-I/17]

(A) Proton

(B) Neutron

(C) Atomic mass

(D) Electron

16. Chlorine atom does not differ from the chloride ion in which of the following context ?

[W.B. NTSE Stage-I/17]

(A) Electron

(B) Volume

(C) Proton

(D) Chemical Reactivity

17. Which of the following group below represents a set of isoelectronic species ? **[W.B. NTSE Stage-I/17]**
 (A) N^{3-} , F^- , Na^+ (B) Na , Ca^{2+} , Mg^{2+} (C) Be , Al^{3+} , Cl^- (D) K^+ , Na^+ , Al^{3+}
18. Which is the correct answer, if $n = 4$ (where n is number of shell) then number of orbitals and electrons present in this shell of atom ? **[Delhi NTSE Stage-I/17]**
 (A) 16, 32 (B) 32, 16 (C) 32, 32 (D) 16, 16
19. What is the correct electronic configuration of Cr ? (At No. 24) **[Delhi NTSE Stage-I/17]**
 (A) $[\text{Ar}]4s^13d^5$ (B) $[\text{Ar}]4s^23d^4$ (C) $[\text{Ar}]4s^03d^6$ (D) None of these
20. Radioactive isotope used in the treatment of cancer disease is : **[Raj. NTSE Stage-I/19]**
 (A) Iodine - 131 (B) Cobalt - 60 (C) Sodium-24 (D) Chlorine - 37
21. If electronic configuration of an atom is 2, 8, 7, then atomic number of the atom will be- **[M.P. NTSE Stage-I/19]**
 (A) 15 (B) 16 (C) 17 (D) 18
22. Which will have electronic configuration 2, 8, 2 ? **[M.P. NTSE Stage-I/19]**
 (A) Na (B) Mg (C) Al (D) Si
23. Which element have two shells and both these shells are fulfilled with electrons. **[M.P. NTSE Stage-I/19]**
 (A) S (B) Ne (C) N (D) He
24. How many valence electrons are present in Cl^- ion ? **[Haryana NTSE Stage-I/19]**
 (A) 5 (B) 6 (C) 7 (D) 8
25. Assertion (A) : Isotopes are electrically neutral. **[Andhra Pradesh NTSE Stage-I/19]**
 Reason (R) : Isotopes are species with same mass number but different atomic number.
 (A) Both (A) and (R) are true and (R) is the correct explanation to (A)
 (B) (A) is true, but (R) is false
 (C) Both (A) and (R) are true, but (R) is not the correct explanation to (A)
 (D) (A) is false but (R) is true

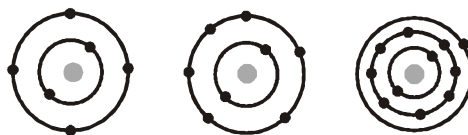
EXERCISE – I

ONLY ONE CORRECT TYPE

1. Which of the following statements is true ?
(A) A proton is 1837 times heavier than an electron.
(B) A proton is $1/1837$ times heavier than an electron.
(C) A proton is $1/1837$ times lighter than an electron.
(D) Proton has the same mass as an electron.
2. The mass of a proton is -
(A) 1.00728 amu (B) 1.673×10^{-24} gm
(C) 1.673×10^{-27} kg (D) All of these
3. The discovery of neutron became very late because:
(A) Neutron are present in the nucleus
(B) Neutrons are fundamental particles
(C) Neutron are chargeless
(D) None of these
4. Neutrons are present in all atoms except
(A) H (B) C
(C) He (D) Ne
5. When alpha particles are allowed to strike thin metal foil, most of them go straight through the foil because -
(A) Alpha particles are much heavier than electrons.
(B) Alpha particles are positively charged.
(C) Most part of the atom is empty.
(D) Alpha particles move with high velocity.
6. Rutherford's scattering experiment is related to the size of -
(A) Nucleus (B) Atom
(C) Electron (D) Neutron
7. Rutherford performed his alpha scattering experiment using -
(A) Silver (B) Gold
(C) Mercury (D) Diamond
8. The radius of an atomic nucleus is of the order -
(A) 10^{-10} cm (B) 10^{-13} cm
(C) 10^{-15} cm (D) 10^{-8} cm
9. The protons and neutrons are collectively called -
(A) Deuterons (B) Positrons
(C) Mesons (D) Nucleons
10. In Rutherford's experiment, circular screen is coated with :
(A) Gold (B) Lead
(C) Silver Sulphide (D) Zinc Sulphide
11. Which model is also known as Planetary Model :
(A) Thomson's Model (B) Rutherford's Model
(C) Bohr's Model (D) Both (B) & (C)
12. An α – particle contains :
(A) 4 positive charge & 2 mass unit
(B) 2 positive charge & 4 mass unit
(C) 2 positive charge & 2 mass unit
(D) 4 positive charge & 4 mass unit
13. A deuteron contains -
(A) A neutron & a positron.
(B) A neutron & a proton.
(C) A neutron & 2 protons.
(D) 2 neutrons & a proton.
14. An atom which has a mass number of 14 & 8 neutrons is an -
(A) Isotope of oxygen (B) Isobar of oxygen
(C) Isotope of carbon (D) Isobar of carbon

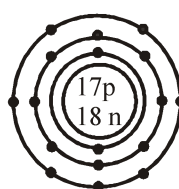
15. Many elements have non- integral masses because-
- (A) They have isobars.
 (B) Their isotopes have non - integral masses.
 (C) They have isotopes.
 (D) The constituents neutrons, protons & electrons combine to give fractional masses.
16. The formula that gives the maximum number of electrons in a particular shell is -
- (A) n^2 (B) $2n^2$
 (C) $2n$ (D) $\frac{n^2}{2}$
17. The different subshells in an atom are represented as -
- (A) s, p, d, f (B) S,P,D,F
 (C) 1,2,3,4 (D) All of these
18. Which of the following has the greatest mass ?
- (A) Electron (B) Proton
 (C) Neutron (D) Hydrogen cation
19. Alpha-particles that come closer to nuclei in Rutherford's alpha particle scattering experiment -
- (A) Are deflected more
 (B) Are deflected less
 (C) Make more collisions
 (D) None of these.
20. The number of subshells in the second energy level is -
- (A) 4 (B) 11
 (C) 9 (D) 2
21. When electron jumps from L to K shell :
- (A) Energy is released
 (B) Energy is absorbed
 (C) Energy is sometimes released and sometimes absorbed
 (D) Energy is neither absorbed nor released.

22. Bohr advanced the idea of :
- (A) Stationary electrons
 (B) Stationary nucleus
 (C) Stationary orbits
 (D) Elliptical orbits
23. What will be the valency of an atom if its outermost shell contains four electrons?
- (A) 8 (B) 4
 (C) 2 (D) 6
24. Schematic atomic structures of three elements are given below.

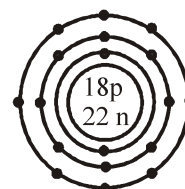


Which of the following is the correct formula of the compound formed by the given three elements?

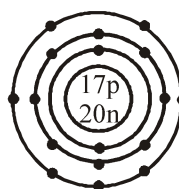
- (A) Na_3PO_4 (B) Na_2CO_3
 (C) Na_2SO_4 (D) Na_2SO_3
25. Vivek was given few models of atoms representing their structures. He was asked to choose one pair of isotopes and one pair of isobars.



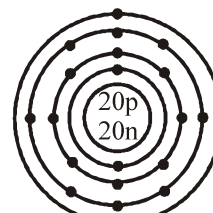
(i)



(ii)



(iii)



(iv)

Which of the following options contains the correct pairs?

Isotopes

Isobars

- | | |
|-------------------|----------------|
| (A) (i) and (ii) | (iii) and (iv) |
| (B) (i) and (iv) | (ii) and (iii) |
| (C) (i) and (iii) | (ii) and (iv) |
| (D) (ii) and (iv) | (i) and (iii) |

PARAGRAPH TYPE QUESTION

PARAGRAPH # 1

Ramnik is a student of class 9. One day he was studying a chapter of chemistry in the class along with other students. The teacher, Mr. Bhagi, told the students that the scientists James Chadwick, J.J. Thomson and E Goldstein had discovered three subatomic particles P, Q and R, respectively. He gave the characteristics of all these particles, their locations and arrangements in the atom. Mr. Bhagi also described the contributions of scientists Ernest Rutherford and Neils Bohr in this regard. After completing the discussion on this chapter, Mr. Bhagi asked Ramnik to answer the following questions :

26. What is the name of particle P ? What is the nature of charge on it ?
 (A) Proton, positive charge
 (B) Electron, negative charge
 (C) Both (A) and (B)
 (D) Neutron, no charge
27. What is the name of particle Q ? What is the nature of charge on it ?
 (A) Proton, positive charge
 (B) Electron, negative charge
 (C) Both (A) and (B)
 (D) Neutron, no charge
28. Which of the particles P, Q and R is not present in an ordinary hydrogen atom ?
 (A) P
 (B) Q
 (C) both P and Q
 (D) none of these

PARAGRAPH # 2

Naveen is a student of class IX in a city school. His uncle Ram Dev who lives in a village is not keeping good health. He has a tumour in his body. Ram Dev has come to city along with his son Ramesh for treatment. Naveen accompanied them to the most famous hospital for medical check-up and treatment. When Ram Dev told the person at the reception desk that he had a tumour, he was asked to go to the oncology department of the hospital. The special doctor (called oncologist) examined the tumour of Ram Dev carefully. He then removed some tissue from the tumour and sent it for 'biopsy', so as to find whether the tumour was malignant or not. The result of biopsy showed that the tumour was malignant. The doctor told Ram Dev that he had come to the hospital at the right time due to which his disease had been detected at an early stage and can be cured successfully. The doctor then recommended radiotherapy for Ram Dev. Naveen had come to know of the term radiotherapy while studying the uses of radioactive isotopes in his class. So, as soon as doctor talked of radiotherapy, Naveen could make out what disease his uncle was suffering from. He also shared his knowledge of this disease with his uncle and his son.

29. What do you think is the disease Ram Dev is suffering from ?
 (A) Cancer
 (B) Polio
 (C) Malaria
 (D) Biopsy
30. Which radioactive isotope is usually used in the treatment of this disease by radiotherapy ? How does it work ?
 (A) ^{60}Co
 (B) ^{23}Na
 (C) ^{19}F
 (D) ^{131}I

31. What is an isotope species having
- (A) Same atomic number different mass no.
 - (B) Same atomic no., same mass no.
 - (C) Same atomic no, different mass no.
 - (D) Different atomic no, same mass no.

MATCH THE COLUMN TYPE

32. **Column - I** **Column - II**

- | | |
|--------------|---------------|
| (P) Proton | 1. Thomson |
| (Q) Electron | 2. Goldstein |
| (R) Neutron | 3. Rutherford |
| (S) Nucleus | 4. Chadwick |

- (A) P-4, Q-3, R-2, S-1
- (B) P-1, Q-2, R-3, S-4
- (C) P-2, Q-1, R-4, S-3
- (D) P-2, Q-1, R-3, S-4

33. **Column - I** **Column - II**

- | | |
|---------------------|------------|
| (P) Mass number | 1. A |
| (Q) Atomic number | 2. $A - Z$ |
| (R) No. of neutrons | 3. K shell |
| (S) 2 Electrons | 4. Z |

- (A) P-1, Q-2, R-3, S-4
- (B) P-1, Q-4, R-2, S-3
- (C) P-2, Q-1, R-3, S-4
- (D) P-4, Q-1, R-2, S-3

EXERCISE – II

VERY SHORT ANSWER TYPE

1. What is the absolute mass of the proton ?
2. What will be the charge on an atom with mass number one and atomic number one ?
3. Neutrons can be found in all atomic nuclei except in one case. Which is the atomic nucleus and what does it consists of ?
4. Which fact is proved by the following observation in Rutherford's scattering experiment that very few alpha particles are deflected back ?
5. Give one important application of Iodine - 131 isotope.
6. What is a valence shell ? How many electrons can be present in valence shell ?
7. Why are Bohr's orbits called stationary states ?
8. Why are anode rays also called canal rays ?
9. What would you conclude from the observation that cathode rays rotate a light paddle wheel placed in their path ?
10. What characteristic feature is seen in the configurations of chemically inactive elements ?

SHORT ANSWER TYPE

1. Justify the statement 'atomic number of an element is equal to the number of electrons in a neutral atom only and not in anion'.
2. What is the difference between electrovalency and covalency ?
3. A nucleus is represented by A_ZX . Identify the possible elements with such a nucleus.
4. What is electronic configuration of Al^{3+} ?
5. Given that the percentage abundance of the isotope ${}^{20}_{10}Ne$ is 90% and that of the isotope ${}^{22}_{10}Ne$ is 10%, calculate average mass of neon.

LONG ANSWER TYPE

1. Answer the following :
 - (a) Are there elements with the same number of electrons, protons and neutrons? Give few examples.
 - (b) An ion M^{3+} contains 10 electrons and 14 neutrons. What is the atomic number and mass number of the element M? Name the element.
2. Define valency. How is it calculated for various elements ?
3.
 - (a) State two key points of Bohr's atomic model.
 - (b) How did Neils Bohr explain the stability of atom ?
4.
 - (a) What are octet and duplet rules? How do elements attain octet ?
 - (b) Explain the formation of a cation. Give its main characteristics.
5.
 - (a) What are isotones? Explain with examples.
 - (b) List some important uses of isotopes.

TRUE AND FALSE TYPE

1. Electrons are found in the nucleus.
2. The elements on the periodic table are arranged by the number of neutrons.
3. Mass of electrons are larger than protons.
4. Nucleus was discovered by Rutherford.
5. Valency of chlorine atom is two.

FILL IN THE BLANKS TYPE

1. The number of protons in the nucleus of an atom is called its _____.
2. The total number of protons and neutrons in the nucleus of an atom is called its _____.
3. The maximum number of electrons that can go into the M shell is _____.
4. The anode rays obtained from hydrogen gas consist of particles called _____.
5. Almost all the mass of an atom is concentrated in a small region of space called the _____.

NUMBRICAL TYPE QUESTIONS

- $^{23}_{11}\text{Na}$ contains -
 (A) 22 protons (B) 22 neutrons
 (C) 12 neutrons (D) None of these
- Which of the following has the same number of protons, electrons & neutrons ?
 (A) $^{54}_{27}\text{X}$ (B) $^{55}_{27}\text{X}^{+1}$
 (C) $^{54}_{26}\text{X}$ (D) $^{55}_{28}\text{X}$
- An isotones of $^{76}_{32}\text{Ge}$ is -
 (A) $^{77}_{32}\text{Ge}$ (B) $^{77}_{33}\text{As}$
 (C) $^{77}_{34}\text{Se}$ (D) $^{79}_{34}\text{Se}$
- Pick out the isoelectronic from the following –
 (I) CH_3^+ (II) H_3O^+
 (III) NH_3 (IV) CH_3^-
 (A) I and II (B) III and IV
 (C) I and III (D) II, III, IV
- The number of electrons in carbon and fluorine are respectively
 (A) 6, 9 (B) 9, 6
 (C) 4, 7 (D) 8, 8

Space for Notes :

Space for Notes :

ANSWER KEY

DPP-01

- | | | | | | | |
|------|------|-------|-------|------|------|------|
| 1. B | 2. C | 3. C | 4. D | 5. A | 6. B | 7. A |
| 8. A | 9. B | 10. C | 11. D | | | |

DPP-02

- | | | | | | | |
|------|------|-------|------|------|------|------|
| 1. A | 2. D | 3. A | 4. C | 5. C | 6. C | 7. A |
| 8. B | 9. B | 10. D | | | | |

DPP-03

- | | | | | | | |
|-------|------|-------|-------|-------|-------|-------|
| 1. C | 2. A | 3. A | 4. C | 5. C | 6. C | 7. C |
| 8. B | 9. D | 10. C | 11. B | 12. D | 13. B | 14. B |
| 15. D | | | | | | |

DPP-04

- | | | | | | | |
|------|------|-------|-------|-------|-------|------|
| 1. A | 2. A | 3. B | 4. D | 5. C | 6. B | 7. A |
| 8. A | 9. B | 10. D | 11. A | 12. A | 13. B | |

DPP-05

- | | | | | | | |
|------|------|-------|-------|-------|------|------|
| 1. D | 2. C | 3. D | 4. B | 5. A | 6. B | 7. C |
| 8. C | 9. C | 10. B | 11. B | 12. B | | |

DPP-06

- | | | | | | | |
|------|------|-------|-------|-------|------|------|
| 1. A | 2. A | 3. A | 4. C | 5. B | 6. A | 7. D |
| 8. C | 9. A | 10. B | 11. B | 12. D | | |

DPP-07

- | | | | | | | |
|------|------|-------|-------|------|------|------|
| 1. A | 2. A | 3. C | 4. D | 5. B | 6. A | 7. C |
| 8. C | 9. A | 10. B | 11. A | | | |

DPP-08

- | | | | | | | |
|------|------|-------|------|------|------|------|
| 1. D | 2. A | 3. A | 4. D | 5. D | 6. D | 7. C |
| 8. A | 9. B | 10. D | | | | |

DPP-09

- | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|
| 1. B | 2. C | 3. A | 4. D | 5. A | 6. D | 7. A |
| 8. B | 9. B | 10. D | 11. C | 12. C | 13. D | 14. C |
| 15. A | 16. C | 17. A | 18. C | | | |

DPP-10

- | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|
| 1. D | 2. C | 3. A | 4. B | 5. D | 6. C | 7. C |
| 8. D | 9. C | 10. C | 11. A | 12. C | 13. A | 14. B |
| 15. D | 16. C | 17. A | 18. A | 19. A | 20. B | 21. C |
| 22. B | 23. B | 24. D | 25. B | | | |

Answer Key

EXERCISE-I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	D	C	A	C	A	B	B	D	D	B	B	B	C	C
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
B	A	C	A	D	A	C	B	B	C	D	B	A	A	A
31	32	33												
A	C	B												

EXERCISE – II

TRUE/FALSE TYPE

1. F 2. F 3. F 4. T 5. F

FILL IN THE BLANKS

1. Atomic number 2. Mass number 3. 18 4. Protons 5. Nucleus

NUMBRICAL TYPE

1. C 2. A 3. B 4. D 5. A

SELF PROGRESS ASSESSMENT FRAMEWORK

(CHAPTER : STRUCTURE OF THE ATOM)

CONTENT	STATUS	DATE OF COMPLETION	SELF SIGNATURE
Theory			
DPP-1			
DPP-2			
DPP-3			
DPP-4			
DPP-5			
DPP-6			
DPP-7			
DPP-8			
DPP-9			
DPP-10			
Exercise - I			
Exercise - II			
Revision - 1			
Revision - 2			
Remark			

NOTES :

1. In the status, put “completed” only when you have thoroughly worked through this particular section.
2. Always remember to put down the date of completion correctly. It will help you in future at the time of revision.