

PAPER 01 FOR 2025 ADVANCED LEVEL CHEMISTRY

Part 01

- Answer **all** the questions.
- In each of the questions 1 to 10, pick one of the alternatives from I-V which is **correct** or **most appropriate** and mark your response.

01. British chemist who invented the cathode ray tube,

- I. John Dalton
- II. Sir William Crookes
- III. J. J. Thomson
- IV. Robert Millikan
- V. Henri Becquerel

02. The equation used to calculate the energy of a photon,

- I. $E = \frac{c}{\lambda}$
- II. $E = \frac{hc}{\lambda}$
- III. $E = \frac{h}{mv}$
- IV. $E = \frac{\lambda}{hc}$
- V. $E = \frac{h}{p}$

03. What is the correct order of line series in the line spectrum of hydrogen as it increases in wavelength?

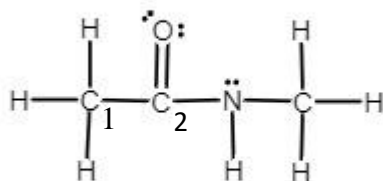
- I. Balmer series, Lyman series, Paschen series, Brackett series, Pfund series
- II. Lyman series, Balmer series, Paschen series, Brackett series, Pfund series
- III. Pfund series, Brackett series, Paschen series, Balmer series, Lyman series
- IV. Lyman series, Balmer series, Brackett series, Paschen series, Pfund series
- V. Lyman series, Balmer series, Paschen series, Pfund series, Brackett series

04. How is the **dative covalent bond** formed in a molecule or an ion?

- I. Complete removal of electrons from an atom to form cations and acceptance of electrons by another atom to form anions.
- II. Sharing a pair of electrons between two atoms in which each atom contributes one electron.
- III. Large numbers of metallic cations are stabilized by a cloud of many electrons.
- IV. Sharing of an electron pair between two atoms in which both electrons are given by one atom.
- V. Sharing a pair of electrons between two atoms.

05. Number of valence shell electrons in POCl_3 ,
- | | |
|--------|---------|
| I. 28 | III. 32 |
| II. 30 | IV. 33 |
06. How many repulsion units are there on the central atom of 'S' in SO_3 ?
- | | |
|--------|-------|
| I. 6 | IV. 2 |
| II. 4 | V. 0 |
| III. 3 | |
07. Which of the following equations can be used to calculate the formal charge on an atom in a molecule or polyatomic ion?
- Number of bonds - Number of valence electrons in the atom + Number of electrons in lone pairs
 - Number of valence electrons in the atom - Number of bonds + Number of electrons in lone pairs
 - Number of valence electrons in the atom - Number of electrons in lone pairs + Number of bonds
 - Number of valence electrons in the atom - Number of electrons in lone pairs + Number of bonds
 - None of the above equation.
08. Which of the following statements regarding the oxidation number of an atom/ion is **false**?
- The sum of the oxidation numbers of all the atoms in an ion is equal to zero.
 - The oxidation number is used to determine the number of electrons transferred between atoms/ions in compounds and molecules.
 - The sum of the oxidation numbers of all the atoms in a compound is equal to zero.
 - The oxidation number describes the charge that an atom would have if all bonds are considered to be ionic with no covalent component.
 - The oxidation number of an atom in a covalent compound is found by assigning the electrons shared by atoms to the particular atom.
09. What is the oxidation number of the central atom (C) in tetrachloromethane (CCl_4)?
- | | |
|--------|--------|
| I. -4 | IV. +1 |
| II. -1 | V. +4 |
| III. 0 | |
10. The chemical formulas of sodium hydrogen carbonate, potassium permanganate, tetraphosphorus hexoxide, and sulfurous acid according to IUPAC rules are,
- | | |
|---|--|
| I. $\text{KMnO}_4, \text{NaHCO}_3, \text{P}_4\text{O}_6, \text{H}_2\text{SO}_3$ | IV. $\text{NaHCO}_3, \text{KMnO}_4, \text{H}_2\text{SO}_3, \text{P}_4\text{O}_6$ |
| II. $\text{NaHCO}_3, \text{KMnO}_4, \text{P}_4\text{O}_6, \text{H}_2\text{SO}_3$ | V. $\text{H}_2\text{SO}_3, \text{KMnO}_4, \text{P}_4\text{O}_6, \text{NaHCO}_3$ |
| III. $\text{NaHCO}_3, \text{P}_4\text{O}_6, \text{KMnO}_4, \text{H}_2\text{SO}_3$ | |

iii. Complete the given table based on the Lewis dot-dash structure given below.



	C ₁	C ₂	N
VSEPR pairs around the atom			
Electron pair geometry around the atom			
Shape around the atom			
Hybridization of the atom			
Oxidation number of the atom			

iv. Identify the atomic/hybrid orbitals involved in the formation of σ bonds between the two atoms given below.

C ₁ -H	C ₁	H.....
C ₁ -C ₂	C ₁	C ₂
C ₂ -O	C ₂	O.....
C ₂ -N	C ₂	N.....
N-H	N.....	H.....

v. Identify the atomic orbitals involved in the formation of Π bonds between the two atoms given below.

C ₂ -O	C ₂	O.....
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C. State whether the following statements are **true** or **false**.

- The boiling point of HCHO is higher than that of HCOOH.
- Shape of the SOCl₂ is trigonal pyramid.
- The covalent character of KBr is lower than that of KCl.
- Mg²⁺ has 6 electrons that have quantum number l=0.