

Chemistry 2026

Term Paper 01



Chemistry I

One hour

Instructions:

- Answer **all** the questions.
- **Use of calculators is not allowed.**
- Write your **Index Number** in the space provided in the answer sheet.
- In each of the questions **1** to **25**, pick one of the alternatives from (1), (2), (3), (4), (5) which is **correct** or **most appropriate** and mark your response on the answer sheet with a cross (×) in accordance with the instructions given on the back of the answer sheet.

Index Number:

Universal gas constant $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$

Avogadro constant

$N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$

Planck's constant $h = 6.626 \times 10^{-34} \text{ J s}$

Velocity of light

$C = 3 \times 10^8 \text{ m s}^{-1}$

01) The scientists related to the concept of atomic energy levels, and finding the $\frac{e}{m}$ ratio of an electron, respectively, are given by

01. Max Planck, Robert Millikan
02. Max Planck, Robert Knox
03. Niels Bohr, Ernest Rutherford
04. Niels Bohr, J. J. Thomson
05. Albert Einstein, Robert Millikan

02) What is the quantum number associated with the sub-energy level of an atomic orbital?

01. l
02. m_l
03. n and l
04. n and m_l
05. l and m_l

03) What is the De Broglie wavelength of an electron that travels at a speed of $1 \times 10^3 \text{ m s}^{-1}$ and has a mass of $9.1 \times 10^{-28} \text{ g}$?

01. $7.28 \times 10^{-10} \text{ m}$
02. $7.28 \times 10^{-7} \text{ m}$
03. $7.28 \times 10^{-12} \text{ m}$
04. $6.03 \times 10^{-9} \text{ m}$
05. $6.03 \times 10^{-12} \text{ m}$

04) The most acceptable Lewis structure for the cyanide ion could be,

01. $:\bar{C} \equiv N:$
02. $:\ddot{C} - \ddot{N}:$
03. $:\text{C} = \ddot{N}^-$
04. $:\bar{C} = \ddot{N}^-$
05. $:\overset{2-}{\bar{C}} \equiv \overset{+}{N}$

05) Which of the following statements regarding isotopes and nuclides is false?

01. The isotopes of a certain element have similar chemical properties.
02. Different nuclides can belong to the same element.
03. Some nuclides that are stable can have a n/p ratio less than one.
04. Some of the elements that are present in the periodic table do not have isotopes.
05. Some nuclides do not contain protons.

- 06) The number of moles of Na^+ in 1.24 g of $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$.
(Na=23, S=32, O=16, H=1)
01. 10^2 02. 10^{-1} 03. 10 04. 10^{-2} 05. 10^{-3}
- 07) During $\text{X(g)} + \text{e}^- \longrightarrow \text{X}^-(\text{g})$, the highest amount of heat is released by
01. Be 02. C 03. N 04. O 05. S
- 08) When the molecules NO_2 , N_2O_2 , NH_3 , N_2H_4 , and NO are arranged in the decreasing order of the oxidation numbers of nitrogen (N), the correct answer would be,
01. $\text{NO}_2 > \text{N}_2\text{O}_2 > \text{NH}_3 > \text{N}_2\text{H}_4 > \text{NO}$
02. $\text{NO}_2 > \text{N}_2\text{O}_2 = \text{NO} > \text{N}_2\text{H}_4 > \text{NH}_3$
03. $\text{NO}_2 > \text{N}_2\text{O}_2 = \text{NO} > \text{NH}_3 > \text{N}_2\text{H}_4$
04. $\text{N}_2\text{O}_2 > \text{NO}_2 > \text{NH}_3 > \text{NO} > \text{N}_2\text{H}_4$
05. $\text{N}_2\text{O}_2 > \text{NH}_3 > \text{NO} > \text{NO}_2 > \text{N}_2\text{H}_4$
- 09) How many moles of H^+ are present in 300 cm^3 of a 0.01 M (mol dm^{-3}) HCl acid solution (Assume complete dissociation of the acid).
01. 0.01 02. 0.0015 03. 0.015 04. 0.003 05. 0.005
- 10) Which of the following statements is true?
01. The ionic radius of a negative ion and a positive ion is smaller compared to a neutral atom.
02. Metallic bonds are formed by placing the bond electron pairs common to both atoms.
03. The polarizing power of a cation increases when the size increases and the charge decreases.
04. Dative bonds can be formed between Lewis acids and Lewis bases.
05. The reducing ability increases when moving from left to right of a period.
- 11) The electron pair geometry and shape around central atom of a simple molecule could have is correctly shown in
01. Tetrahedral and T-shaped
02. Octahedral and see-saw
03. Trigonal bipyramidal and linear
04. Trigonal planar and trigonal pyramidal
05. Trigonal bipyramidal and tetrahedral
- 12) The number of atoms in 0.0120 g of carbon is, (C=12)
01. 10^3 03. 6.022×10^{21} 05. 10^{-3}
02. 6.022×10^{20} 04. 6.022×10^{23}
- 13) The **false** statement regarding hybridization is,
01. Overlapping of orbitals is not mandatory for the formation of bonds.
02. The two orbitals that overlap when forming a pi bond must be un-hybridized orbitals.
03. Overlapping of hybrid orbitals always forms sigma bonds.
04. Overlapping of unhybridized orbitals always forms pi bonds.
05. Lone pair electrons can be present within hybrid orbitals.

14) When 0.50 mol of BaCl_2 solution was mixed with 100 mL of water. The concentration of BaCl_2 will be,

01. 0.15 03. 0.5 05. Cannot
02. 0.2 04. 0.7 calculate

15) What is the concentration of Na^+ in the 200 cm^3 solution prepared by dissolving 6.7 g of pure $\text{Na}_2\text{C}_2\text{O}_4$ in water. (Na=23, C=12, O=16)

01. 0.025 02. 0.05 03. 0.10 04. 0.25 05. 0.50

- For each of the questions **16** to **20**, one or more responses out of the four responses (a), (b), (c), and (d) given is/are correct. Select the correct response/responses. In accordance with the instructions given on your answer sheet, mark

(1)	(2)	(3)	(4)	(5)
Only (a) and (b) are correct	Only (b) and (c) are correct	Only (c) and (d) are correct	Only (d) and (a) are correct	Any other number or combination of responses is correct

16) Cathode ray particles,

- are negatively charged.
- travel in straight lines.
- are attracted towards the N-magnetic pole.
- are attracted towards the S-magnetic pole.

17) Which of the following statements/statement concerning the Si atom of the SiF_6^{2-} anion are/is true?

- It is octahedrally surrounded by F atoms.
- There are 6 electrons in its valence shell.
- There are 14 electrons in its valence shell.
- There are 12 electrons in its valence shell.

18) The fluoride ion has the same electronic structure as the,

- Cl^-
- Oxygen atom
- O^{2-}
- Ne

19) Which of the following statements regarding the polarization of ions is/are false?

- As the anion becomes larger, the polarizability increases.
- Small cations with high charges have high polarizing power.
- As the polarizing power increases, a compound gets a greater covalent tendency.
- As the radius of a cation increases, its polarizing power increases.

20) Which of the following statement/statements about α particle is/are true?

- α particles have a higher penetrating power than β particles.
- α particles have a higher ionizing power than β particles.
- α particles produce helium gas.
- α particles are not deflected by a magnetic field.

- In question Nos. 21 to 25, two statements are given in respect of each question. From the Table given below, select the response out of the responses (1), (2), (3), (4), and (5) that **best** fits the two statements and mark appropriately on your answer sheet.

Response	First statement	Second statement
(1)	True	True, and correctly explains the first statement
(2)	True	True, but it does not explain the first statement
(3)	True	False
(4)	False	True
(5)	False	False

	First statement	Second statement
21)	The first ionization energy of Li is less than that of K.	Since Li has few electrons, the electronic repulsion of it is less.
22)	NaCl(s) does not conduct electricity, but an aqueous solution of NaCl does.	Na and Cl atoms in NaCl(s) form Na^+ and Cl^- ions when dissolved in water.
23)	The emission spectrum of the H atom and the emission spectrum of the Li atom are very closely similar.	H and Li atoms have only one electron in each of their outermost energy levels.
24)	Compared to NO_3^- , the electronegativity of the N atom of NO_2^+ is higher.	Although the N atom of NO_3^- shows sp^2 hybridization, NO_2^+ shows sp hybridization.
25)	All molecules made of homologous atoms are non-polar.	Atoms of the same element always share the same electronegativity.