



ཤེས་རིག་ལྟན་ལག་།
སུ་རྟིག་ཐང་འབྲིང་རིམ་སློབ་གྲྭ་གོང་མ།



**MOTITHANG HIGHER SECONDARY SCHOOL
THIMPHU THROMDE**

“Every child is **inspired** to learn and **empowered** with **wisdom** to excel in life”

MIDTERM EXAMINATION-2019

Subject: Chemistry

Full Marks:100

Invigilator's Initial:

Class: XI Science

Name:

Class: Section Roll No.:

Writing Time: 3hrs
Date: 25th June 2019

READ THE FOLLOWING INSTRUCTION CAREFULLY

1. **Do not** write for the first **fifteen minutes**. This time is to be spent reading the questions. After having read the questions, you will be given **two hours** to answer all questions.
2. In this paper, there are two sections: **A and B**. Section **A** is compulsory. You are expected to attempt any **six** questions from section **B**.
3. The intended marks for questions or parts of questions, are given in the brackets [].
4. Read the directions to each question carefully and write **all** your answers in the space provided in the question booklet itself.
5. This question booklet contains 19 **pages**. Check whether all the pages are there or not.

For chief markers and markers use only

| Section | A | | | | | B | | | | | | Total | |
|---------------------|----|----|----|----|----|----|----|----|----|----|----|-------|--------------------------------|
| Question. No. | 1a | 1b | 1c | 1d | 1e | 2 | 3 | 4 | 5 | 6 | 7 | 100 | Chief Marker's Signature |
| Marks | 15 | 5 | 5 | 5 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | | |
| Award | | | | | | | | | | | | | |
| Changes | | | | | | | | | | | | | |
| Marker's initial | | | | | | | | | | | | | |

Section A (40 marks)

Compulsory: Attempt All the questions

Question 1

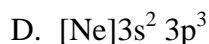
(a) *Each question below is followed by four possible choices of answers. Choose the correct answer and circle it.* [15]

The electronic configuration of three elements A, B and C are given below. Answer the question (i) to (iv) on the basis of these configurations.

- A $1s^2 2s^2 2p^6$
 B $1s^2 2s^2 2p^6 3s^2 3p^3$
 C $1s^2 2s^2 2p^6 3s^2 3p^5$

- (i) Stable form of A may be represented by the formula
 A. A
 B. A₂
 C. A₃
 D. A₄
- (ii) Stable form of C may be represented by
 A. C
 B. C₂
 C. C₃
 D. C₄
- (iii) The molecular formula of the compound formed from B and C will be
 A. BC
 B. B₂C
 C. BC₂
 D. BC₃
- (iv) The bond between B and C will be
 A. Ionic
 B. Covalent
 C. Hydrogen
 D. Coordinate
- (v) The oxidation number of S in S₈, S₂F₂, H₂S respectively, are:
 A. 0, +1 and -2
 B. +2, +1 and -2
 C. 0, +1 and +2
 D. -2, +1 and -2
- (vi) Which of the following statement(s) is/are not true about the following reaction.

$$2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$$
 A. Potassium is undergoing oxidation
 B. Chlorine is undergoing reduction
 C. Oxygen is reduced
 D. None of the species are undergoing oxidation or reduction
- (vii) Which of the following species have tetrahedral geometry?
 A. BeF₂
 B. SO₂
 C. NH₃
 D. CH₄
- (viii) The type of hybrid orbitals of nitrogen in NO₂, NO₃⁻ and NH₄⁺ respectively are expected to be
 A. Sp, sp³ and sp²
 B. Sp, sp² and sp³
 C. Sp², sp and sp³
 D. Sp², sp³ and sp
- (ix) The ionic radii of N³⁻, O²⁻, F⁻, Na⁺
 A. N³⁻ > O²⁻ > F⁻ > Na⁺
 B. N³⁻ > Na⁺ > F⁻ > O²⁻
 C. Na⁺ > F⁻ > O²⁻ > N³⁻
 D. O²⁻ > F⁻ > Na⁺ > N³⁻
- (x) Identify the pairs, which are not of isotopes?
 A. $^{12}_6\text{X}$, $^{13}_6\text{Y}$
 B. $^{35}_{17}\text{X}$, $^{37}_{17}\text{Y}$
 C. $^{14}_6\text{X}$, $^{14}_7\text{Y}$
 D. ^8_4X , ^8_5Y
- (xi) Which of the following elements will gain one electron more readily in comparison to other elements of their group?
 A. S (g)
 B. Na (g)
 C. O(g)
 D. Cl(g)
- (xii) Amongst the elements with the following electronic configuration, which one of them have the highest ionization energy?
 A. [Ne]3s² 3p²
 B. [Ar]3d¹⁰ 4s² 4p³



(xiii) Two atoms are said to be isobar if

- A. They have same atomic number but different mass number
 B. They have same number of electron but different number of neutrons
 C. Sum of the number of protons and neutrons is same but number of proton is different
 D. They have same number of neutrons but different number of electrons

(xiv) Which of the following properties of atom could be explained correctly by Thomas Model of atom?

- A. Overall neutrality of atom
 B. Spectra of Hydrogen atom
 C. Position of electrons, protons and neutrons in atom
 D. Stability of atom

(xv) The charge/size ratio of a cation determines its polarizing power. Which one of the following sequences represents the increasing order of the polarizing power of the cationic species, K^+ , Ca^{2+} , Mg^{2+} , Be^{2+} ?

- A. $\text{Ca}^{2+} < \text{Mg}^{2+} < \text{Be}^{2+} < \text{K}^+$
 B. $\text{Mg}^{2+} < \text{Be}^{2+} < \text{K}^+ < \text{Ca}^{2+}$
 C. $\text{Be}^{2+} < \text{K}^+ < \text{Ca}^{2+} < \text{Mg}^{2+}$
 D. $\text{K}^+ < \text{Ca}^{2+} < \text{Mg}^{2+} < \text{Be}^{2+}$

(b) Match the items of column A with the items in column B. Rewrite the correct pairs in the space provided below. [5]

| Column A | Column B |
|--|--|
| (i) SF_6 | (a) An orbital can have maximum of two electrons of opposite spins |
| (ii) Soluble in non-polar solvent but insoluble in polar solvent | (b) An orbital can have two electrons of same spin |
| (iii) Sp^3 | (c) Sp^3d hybridization |
| (iv) Pauli's Exclusion principle | (d) sp^3d^2 hybridisation |
| (v) Z_{eff} | (e) Ionic compound |
| | (f) Covalent compound |
| | (g) Repulsive force |
| | (h) Attractive fore |
| | (i) Trigonal |
| | (j) Tetrahedral |

Answer:

| Column A | Column B |
|--|----------|
| (i) SF_6 | |
| (ii) Soluble in non-polar solvent but insoluble in polar solvent | |
| (iii) Sp^3 | |
| (iv) Pauli's Exclusion principle | |
| (v) Z_{eff} | |

(c) Correct the following statements by changing the UNDERLINED WORDS ONLY. [5]

- i. A covalent bond between two similar atoms, which have the zero electro-negativity difference, is called polar covalent bond.

.....
ii. The formation of an anion from a neutral atom is favoured by high ionization potential.

.....
iii. Oxidation number of hydrogen is +1 except in metal oxide.

.....
iv. A weak bond that is formed between hydrogen having slight positive charge and an electronegative atom having slight negative charge is called a covalent bond.

.....
v. The elements containing 1 or 2 electrons in their s-orbital of their outer most shell belong to p-block.

.....
(d) Fill in the blanks using suitable word(s). [5]

i. For the formation of a hydrogen bond, the electro-negativity of the atom attached to hydrogen should be.....

ii. Dipole moment of a diatomic molecule is the product of and

iii. Whenever an atom is converted to anion energy is.....

iv. The elements after uranium are unstable and have short half-life periods, these elements are called.....

v. Ca^{2+} ion has a smaller ionic size than K^+ ion because it has..... ionization potential

(e) Answer the following questions [10]

(i) Explain the term 'covalency'. How will you account for the fact that phosphorous shows a variable covalency of 3 and 5? [2]

.....
.....
.....
.....
.....

(ii) The H-Cl bond is covalent polar and its dipole moment is 1.0 D. From this information compute the ionic character of H-Cl, if the bond length is 127×10^{-12} m. [2]

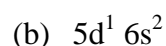
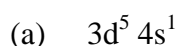
.....
.....
.....
.....
.....

.....
.....
.....
(iii) Give reason why H₂S is a gas and H₂O is liquid even though both S and O belong to the same group in the period table? [1]

.....
.....
.....
(iv) Explain why atoms with half-filled and completely filled orbitals have greater stability. [1]

.....
.....
.....
(v) Explain why ionization energy of magnesium is more than that of both Na and Al? [1]

.....
.....
.....
(vi) The outer electronic configurations of some elements are given below:



State to which block of the periodic table each of these elements belong. [1]

.....
.....
.....
(vii) Why CaSO₄ is less soluble than MgSO₄. [1]

.....
.....
.....
(viii) Give reason why radius of sodium cation is less than sodium atom. [1]

(d) Explain why does the electron affinity of the atom increase from left to right along a row in the periodic table? [1]

.....
.....
.....
.....
.....
.....

Question 3

(a) Which of the following orbitals namely, 2s, 1p, 3p, 3f are possible? Give reason. [2]

.....
.....
.....
.....
.....

(b) Define Hybridisation. [1]

.....
.....
.....

(c) What are quantum numbers? What information do they give? [2]

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

(d) Mention the four factors favouring the formation of ionic bond. [2]

.....
.....
.....
.....
.....

(e) How will you explain the deviation from the octet rule in the case of following molecules? Illustrate with the help of suitable electronic dot structure. [2]

(i) BF_3

.....
.....
.....
.....
.....

.....
.....
.....
(ii) PCl_5
.....
.....
.....
.....
.....
.....
.....
.....
.....

(f) What is the maximum number of 4d electrons having spin quantum number $-\frac{1}{2}$? [1]
.....
.....

Question 4

(a) Explain why all d-block elements are not transition elements while all transition elements belong to d-block.? [2]
.....
.....
.....
.....

(b) The solubility of the carbonates of all alkali metals increases while those of the alkaline earth metals decreases from top to bottom in their respective group. Explain why? [2]
.....
.....
.....
.....
.....
.....
.....
.....
.....

(c) Justify the following statements:
The three electrons present in 2p subshells of nitrogen remain unpaired. [1]
.....
.....
.....
.....
.....
.....
.....
.....

(i) In potassium, the 19th electron enters into 4s subshell instead of 3d subshell. [1]
.....
.....
.....

.....
.....
(c) Explain the contribution of Rutherford's model in establishing the picture of atom? [2]
.....
.....
.....
.....
.....
.....
.....
.....
.....

(d) Write two differences between metallic bond and ionic bond? [2]
.....
.....
.....
.....

Question 5

(a) Describe a proton, a neutron and an electron in terms of relative charge. [3]
.....
.....
.....
.....
.....

(b) An atom having mass number 19 and number has 10 neutrons. What is the atomic number of the atom? [1]
.....
.....
.....
.....

(c) S and p-block elements show anomalous behavior. Explain with two examples. [2]
.....
.....
.....

(d) How would you explain the fact that first ionization enthalpy of sodium is lower than that of magnesium but its second ionization enthalpy is higher than that of sodium? [3]
.....
.....
.....

.....
.....
(e) Explain London forces? [1]

.....
.....
.....
.....

Question 6

(a) What is the oxidation number of oxygen in H_2O_2 ? [1]

.....
.....

(b) How does oxidation number differ from valency of an atom? What is the oxidation number of: [3]

(i) N in NH_3 (ii) S in K_2SO_4

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

(c) In the following reaction indicate which one is oxidized and which one is reduced?

(i) $Mg + 2HCl = MgCl_2 + H_2$? [1]

.....
.....
.....
.....

(ii) Define covalent radius and van der Waal's radius? Which of the two is greater? [3]

.....
.....
.....
.....
.....
.....
.....
.....
.....

(d) Which of the following pairs of element would have higher electron affinity? Explain.

(i) N or O [1]

.....

(ii) F or Cl

[1]

Question 7

(a) Give reasons for the following:

i. Ethyne molecule is linear

[1]

ii. Covalent bonds are directional bonds while ionic bonds are non-directional.

[1]

iii. Water molecule has a bent structure and where as carbon dioxide have molecule have liner structure.

[1]

(b) “The dipole moment of NH_3 is more than NF_3 ”. Justify?

[3]

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
(c) Explain the factors that determine the shapes of molecules. [2]

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
(d) Explain the shape of CH₄ on the basis of orbital overlap. [2]

Question 8

(a) Explain why CO₂ and CCl₄ having polar bond and the molecule as a whole is non polar? [2]

(b) Give reason for the following?

(i) Beryllium fluoride BeF_2 have net dipole 0 [1]

.....
.....
.....
.....
.....

(ii) Water is more viscous than ethyl alcohol. [1]

.....
.....
.....
.....
.....

(iii) The dipole moment of LiH is 1.964×10^{-29} cm and interatomic distance between Li and H is 1.654 Å. Calculate the percentage of ionic character of in the bond? [2]

.....
.....
.....
.....
.....
.....
.....
.....
.....

(iv) Draw Lewis structure for the following molecules:

1) H_2S [1]

2) HCOOH [1]

3) CO_3^{2-} [1]

(c) Name one compound in each which oxidation number of:

[1]

(i) Oxygen is +2

.....

(ii) Hydrogen is -1

.....

Give your best!