CHEMISTRY   **Max. Marks: 80**

SECTION – I
(SINGLE CORRECT CHOICE TYPE)

This section contains **7 multiple choice questions.** Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct

1.   Which of the following triads have approximately equal size

   A) Na^+, Mg^{2+}, Al^{3+} (iso electronic)

   B) F^-, Ne, O^{2-} (iso electronic)

   C) Mn^+, Fe^{2+}, Cr (iso electronic)

   D) Fe, Co, Ni

2.   In which of the following the first member has more dipolemoment than the

   second one

   A) $CHCl_3, CH_3Cl$ B) H_2O, H_2O_2

   C) CH_3Cl, CH_3F D) NF_3, NCl_3

3.   Arrange the following in the increasing order of their covalent character

   I) $GeCl_2$ II) $GeCl_4$ III) $SnCl_2$ IV) $SnCl_4$ V) $PbCl_2$ VI) $PbCl_4$

   A) $GeCl_2 < GeCl_4 < SnCl_2 < SnCl_4 < PbCl_2 < PbCl_4$

   B) $PbCl_2 < SnCl_2 < GeCl_2 < PbCl_4 < SnCl_4 < GeCl_4$

   C) $PbCl_2 < SnCl_2 < GeCl_2 < PbCl_4 < SnCl_4 < GeCl_4$

   D) $PbCl_2 < GeCl_2 < SnCl_2 < SnCl_4 < GeCl_4 < PbCl_4$

4.   Which of the following is **CORRECT** about the elements in a group

      A) With increase in atomic size, ionisation energy increases

      B) With increase in atomic size electron affinity increases

      C) With increase in atomic size, metallic character increases

      D) With increase in atomic size electro negativity increases

5.   Knowing that size of $Na^+ > Mg^{2+}$ and $S^{2-} > Cl^-$ predict which compound will be

      least soluble in a polar solvent.

      A) MgS B) Na_2S C) $MgCl_2$ D) $NaCl$

6.   In a metallic crystal the

      A) Valence electrons remain within the fields of influence of their own kernels

      B) Valence electrons constitute a sea of mobile electrons

      C) Valence electrons are localised between the two kernels

      D) Kernels as well as the electrons move rapidly

7.   Which of the following statements is **WRONG**?

A) Melting and boiling points of H_2O_2 are greater than water

B) Dipolemoment of H_2O_2 is greater than water

C) Dihedral angle of H_2O_2 in gas phase is more than in solid phase

D) H_2O_2 is a strong oxidising agent in acid medium than in alkaline medium

SECTION – II
(MORE THAN ONE TYPE)

This section contains 4 **multiple choice questions**. Each question has four choices a), b), c), d) out of which **ONE OR MORE** may be correct.

8.   Electronegativity of an atom depends on

A) Type of hybridisation of the atom

B) The number and nature of the atoms to which it is bonded

C) Charge on the ion or oxidation state of the atom

D) Effective nuclear charge

9. Select the **CORRECT** statements

   A) On Pauling scale, the difference in EN of two atoms A and B in S.I units is

   $(EN_A - EN_B) = 0.1017 \sqrt{\Delta_{A-B}}$

   B) On Pauling scale, the difference in EN of two atoms A and B in k.cal mol^{-1} is

   $(EN_A - EN_B) = 0.208 \sqrt{\Delta_{A-B}}$

   C) Mulliken's EN values one scaled down to match the Pauling value by dividing

   $\left(\dfrac{IE + EA}{2}\right)$ in eV by 2.8

   D) Mulliken's EN values are scaled down to match the Pauling value by

   multiplying $\left(\dfrac{IE + EA}{2}\right)$ in eV by 2.8

10. Intermolecular hydrogen bonding increases the enthalpy of vapourization of a liquid due to the
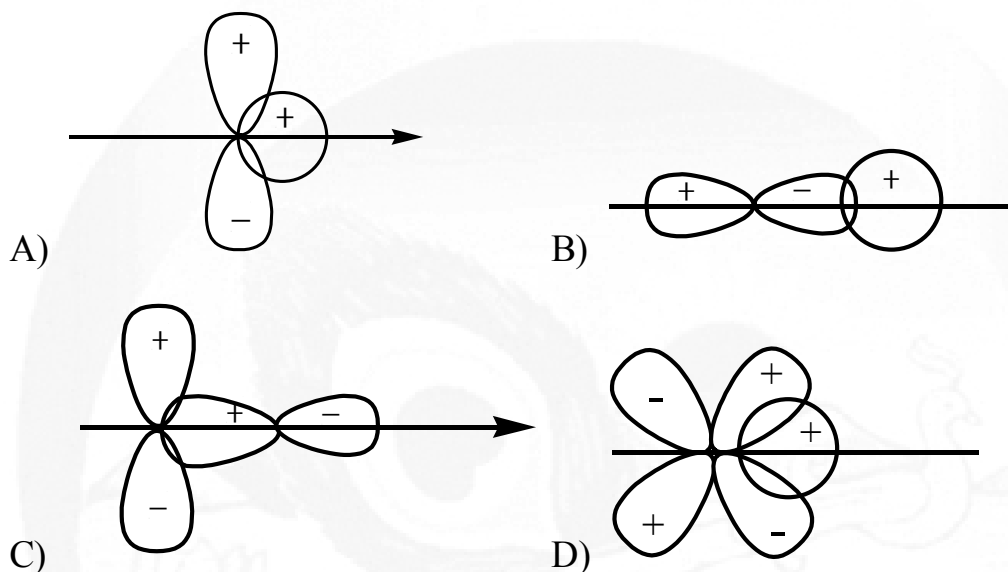
    A) Decrease in the attraction between molecules

    B) Increase in the attraction between molecules

    C) Decrease in the molar mass of unassociated molecules

    D) Increase in the effective molar mass of hydrogen bonded molecules

11.   Which of the following is a zero overlap which leads to nonbonding

A)

B)

C)

D)

SECTION – III
(PARAGRAPH TYPE)

This section contains 2 **paragraphs.** Each of these questions has four choices a), b), c) and d) out of which ONLY ONE is correct

Paragraph for Questions Nos. 12 to 14

If a small amount of energy is supplied to an atom, then an electron may be

promoted to higher energy level but if the amount of energy supplied is

sufficiently large, the electron may be completely removed. The energy required

to remove the most loosely bound electron from an isolated gaseous atom is called

ionization energy. The ionization energy for the group 2 elements show that the first ionization energies almost double the value for the corresponding group – I elements. This is because the increase in nuclear charge results in a small size. The ionization energy also depends on the type of electron which is removed from s-p-, and f-sub orbitals

12.   The ionization energy of the orbital in the same shell

A)s>p>d>f   B) s>d>p>f   C) f>d>p>s   D) s=p=d=f

13.   The second ionization energy is higher for

A)Mg   B) Al   C) Na   D) Si

14.   Which of the following is correct?

A) ionization energy of noble gas is highest in respective period

B) ionization energy of group – I metals is lowest in respective period

C) Ionization energies of Al and Ga are nearly same

D) All the above are correct

Paragraph for Questions Nos. 15 to 16

When hybridization involving d-orbitals are considered then all five d-orbitals are not degenerate, rather $d_{x^2-y^2}, d_{z^2},$ and d_{xy}, d_{yz}, d_{zx} form two different sets of orbitals and orbitals of appropriate set is involved in the hybridization

15. In sp^3d^2 hybridization, which set of d-orbitals is involved?

     A) $d_{x^2-y^2}, d_{z^2}$ B) d_{z^2}, d_{xy} C) d_{xy}, d_{yz} D) $d_{x^2-y^2}, d_{xy}$

16. Molecule having trigonal bipyramidal geometry and sp^3d hybridization, d-orbitals involved is

     A) d_{xy} B) d_{yz} C) $d_{x^2-y^2}$ D) d_{z^2}

SECTION – IV
INTEGER TYPE

(This section contains **7 questions.** The answer to each question is a single digit integer ranging from 0 to 9. The correct digit below the question number in the ORS is to be bubbled)

17. The conversion of gaseous atoms K and F to K^+ and F^- absorbs 0.85 eV of energy. If the IE and $\left(\Delta_{eg}H^o\right)$ of K and F have magnitudes in the ratio 7:6, what is the approximate electron gain enthalpy $\left(\Delta_{eg}H^o\right)$ of fluorine (Magnitude only, neglecting sign)

18. How many of the following liberate oxygen from H_2O_2 during their interaction with H_2O_2.

    $KMnO_4$ (acid medium), $K_2Cr_2O_7$ (acid medium), MnO_2 (acid medium), O_3, HOCl,

    $KMnO_4$ (alkaline medium), Cl_2, PbO_2, I_2 (basic medium)

19. Find the number of molecules/ions in which d-orbitals are involved in π-bonding in their tetrahedral structures

    $SO_3^{2-}, SO_4^{2-}, ClO_4^-, ClO_2^-, XeO_3, XeF_4, XeO_4, IF_4^-, ICl_4^+, SiF_4, SNF_3$

20. Total number of lone pairs of electrons in a molecule of phosgene $(COCl_2)$ is

21. In the formation of XeF_8^{2-}, the total number of orbitasl of Xe involved in hybridisation is (other than complexes)

22. Maximum possible electron pairs that can present around a central atom in a simple molecule is (other than complexes)

23. How many the molecules or ions are hyper valent

    $SF_6, PCl_5, IF_7, XeF_6, XeO_4, XeO_3, XeF_2, I_3^-$.