MANAVA BHARATI
INDIA INTERNATIONAL SCHOOL

MID-TERM EXAMINATION (2016-17)
Class XI – Chemistry

Time allowed: 3 hours **Maximum Marks : 60**

Important instructions:
1. All questions are compulsory.
2. Q.No. 1 to 8 are very short answer type questions and carry 1 mark each.
3. Q. No. 9 to14 are short answer type questions carrying 2 marks each.
4. Q.No. 15 to24 are short answer type questions carrying 3 marks each.
5. Q.No. 25 and 26 are long answer type questions carrying 5 marks each.

1. Convert 5839 A^0 into nm.
2. How many electrons are present in 16 g of methane ?
3. An element 'A' has the configuration $1s^2 2s^2 2p^6 3s^1$ and the element 'B' has the configuration $1s^2 2s^2 2p^4$. Give the formula of the compound formed.
4. Give values of n , l , m and s for an unpaired electron in Cu (29).
5. Write the general electronic configuration of the element present in the third period and seventeenth group of the periodic table.
6. From the following nuclei, choose the isotopes and isobars :
   (i) 8p+8n (ii) 8p+9n (iii) 18p+22n (iv) 20p+20n
7. Which combination will lead to π molecular orbitals (bonding and nonbonding both)
   (i) 2px-2py (ii) 2pz+2pz (iii) 2s+2pz (iv) 2py+2py
8. Can Dalton's law of partial pressure be applied to a gaseous mixture of CO and O_2? If not why?
9. Calculate the mass of a photon of wavelength 3.6 A^0.
10. Which out of NH_3 and NF_3 has higher dipole moment and why ?
11. Deduce the shape of water molecule on the basis of VSEPR theory.
12. Write molecular orbital configuration of O_2. Predict its magnetic behaviour and bond order.
13. Account for the following:
    (i) BF_3 has a zero dipole moment although B—F bonds are polar
    (ii) The structure of NH_3 molecule is pyramidal.

14. Calculate the temperature of 4 mole of a gas occupying 5 dm^3 at 3.32 bar.
15. What is Kc for the following equilibrium when the equilibrium concentration of each substance is: $[SO_2] = 0.60$ M , $[O_2] = 0.82$ M and $[SO_3] = 1.90$ M ?
    $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$
16. Calcium carbonate reacts with aqueous HCl to give $CaCl_2$ and CO_2 according to the reaction :
    $CaCO_3(s) + HCl(aq) \longrightarrow CaCl_2(aq) + CO_2(g) + H_2O$
    What mass of $CaCO_3$ is required to react completely with 25 ml of 0.75 M HCl?
    (Ca = 40 , Cl = 35.5 , O = 16 , H=1)
17. Calculate the percentage of Cu and Cl in the sample of CuCl. (Cu = 63.5 u , Cl = 35.5 u)
18. (i) State Heisenberg's uncertainty principle.
    (ii) An electron has a velocity of 50 m/s , accurate upto 99.99 %. Calculate the uncertainty in locating its position.
19. The atomic mass of a metal is 56. Calculate the empirical formula of its oxide containing 70% metal.
20. Calculate the molecular mass of the following : (i) $(COOH)_2.2H_2O$ (ii) Na_2SO_4 (iii) $CaSO_4$
    (C= 12 , H = 1 , Na = 23 , S = 32 , O =16 , Ca = 40)
21. Give reason for the following:
    (i) electron gain enthalpy of noble gas is almost zero.
    (ii) Na and Mg^+ has the same number of electrons but removal of electron from Mg^+ requires more energy.
    (iii) First ionisation enthalpy of boron is slightly less than that of beryllium.

22. What is hydrogen bond ? What are the two types of hydrogen bond ? Explain with suitable example. Give two consequences of hydrogen bond.

23. Write three important postulates of kinetic theory of gases. What are the two postulates of the theory are defective .Explain.

OR

What are the different types of molecular speed ? Explain each by giving mathematical expression. What is the relation between the different types of speed?

24. (a) Define Charle's law .
(b) A certain amount of gas occupies a volume of 400 ml at 17°C. To what temperature should it be heated so that the volume is reduced to half.

OR

(a) What is ideal gas ? Write equation of state for the ideal gas.
(b) Calculate the mass of 0.120 dm^3 of N_2 at 150°C and 0.987 bar pressure.

25. (a) Which of the following represent ground state configurations and which are excited state configurations : (i) $1s^2 2s^2 2p^4$ (ii) $1s^2 2s^2 2p^6 3s^1 3p^1$ (iii) $1s^2 2s^2 2p^6 3s^2 3p^4$
(b) How many unpaired electrons are present in Co2+
(c) What is the hybrid state of central atom in the following : IF_5 and CO_2
(d) Out of H_2O and H_2S which is more polar and why ? (1+1+1+2)

OR

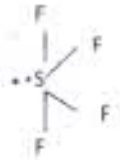
(a) Find out the value of each equilibria from the value of Kp
(i) $2NOCl\ (g) \rightleftharpoons 2NO\ (g) + Cl_2(g)$, Kp = 1.8 x 10 -2 at 500 K
(ii) $CaCO_3\ (s) \rightleftharpoons CaO\ (s)\ CO_2\ (g)$, Kp = 167 at 1073 K

(b) Calculate the pH of 0.4 g of NaOH dissolved in water to give 200 ml of solution. (3+2)

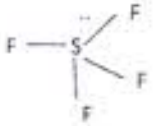
26. (i) Which of the following orbitals are degenerate ? $3d_{xy}$, $4d_{xy}$, $3d_{z2}$, $3d_{yz}$, $4d_{yz}$, $4d_{z2}$
(ii) Wavelength of different radiations are given below: $\Lambda_{(A)}$ = 300 nm , $\Lambda_{(B)}$ = 300μm, $\Lambda_{(C)}$ = 3nm , $\Lambda_{(D)}$ = 30 A^0 .Arrange these radiations in the increasing order of their energies.
(iii) The electronic configurations of valence shell of Cu is $3d^{10}\ 4s^1$ and not $3d^9\ 4s^2$. How is this configuration explained ?
(iv) Out of electron and proton which one will have a higher velocity to produce matter waves of the same wavelength ? Explain.
(v) Chlorophyll present in green leaves of plants absorbs light at 4.62×10^{14} Hz. Calculate the wavelength of radiation.

OR

(i) Explain the formation of sigma and pi bonds with the help of orbital diagram.
(ii) Sigma bond is stronger than pi bond. Explain.
(iii) Why is that in the SF_4 molecule, the lone pair of electrons occupies an equatorial position in the overall trigonal pyramidal arrangement in preference to an axial position.



Equatorial position of Lone pair



axial position of lone pair

(iv) The dipole moment of hydrogen halides decreases from HF to HI . Explain
H—F (1.78 D) , H—Cl (1.07 D) , H — Br (0.79 D) , H—I (0.38D) (2+1+1+1)