INDIAN SCHOOL SOHAR
FIRST TERM EXAM - 2013
CHEMISTRY

STD: XI   Marks: 70

Date: 23-09-13   Time: 3Hrs

Instructions:

1. **All questions are compulsory.**
2. **Question nos. 1-8 are very short answer questions and carry one mark each.**
3. **Question nos. 9-18 are short answer questions and carry two marks each.**
4. **Question nos. 19-27 are also short answer questions and carry three marks each.**
5. **Question nos. 28-30 are long answer questions and carry five marks each.**
6. **Use log tables if necessary. Calculators are not allowed.**

1. Draw the plot of PV vs P for ideal gas and real gas.

2. What is the shape of the molecule whose central atom has 3 bond pair and 2 lone pair of electrons?

3. Why is formula mass used for ionic compounds instead of molecular mass?

4. Based on Fajan's rule, arrange the following cations in the decreasing order of their polarizing power : Na^+, Mg^{2+}, Al^{3+}

5. Why is the effect of Heisenberg's uncertainty principle significant only for the motion of microscopic objects?

6. Why do liquids boil at lower temperature at higher altitudes?

7. Aluminium (Z=13) loses electron successively to form Al^+, Al^{2+} and Al^{3+} ions. Which step will have highest ionization enthalpy and why?

8. Arrange the following carbocations in the increasing order of their stability.

    $(CH_3)_3C$, $(CH_3)_2 CH$, CH_3CH_2 , CH_3

9. Explain the shape and bond angle in NH_3 using VSEPR theory.

10. Explain the following with an example:
     a) Inductive effect   b) Hyperconjugation

11. a) Write the bondline formula of 4-methyl-hex-4-en-2-ol.
     b) Which of the two : $O_2NCH_2CH_2O^-$ or $CH_3CH_2O^-$ is more stable and why?

12. Write the electronic configuration of N_2 molecule. Determine its bond order.
                              (OR)
     Explain the formation of molecular orbitals taking H_2 as an example.

13. Calculate the amount of Na_2CO_3 present in 250ml of 0.2M solution. What is the amount of HCl required to react with this solution? Also calculate the volume of CO_2 evolved. (At mass of H = 1, C =12, O =16, Na = 23, Cl = 35.5)

14. Calculate the energy associated with 1st orbit of He^+. What is the radius of this orbit in nm ?

15. Which of the following species will have the largest and the smallest size? Account for your answer. Mg, Mg^{2+}, Al, Al^{3+} (At no: Mg=12, Al=13)

16. Pressure of 1g of an ideal gas A at 27^0c is 2bar. When 2g of another ideal gas B is introduced in the same flask at the same temperature, the pressure becomes 3bar. Find a relationship between their molecular mass.

17. a) Using the ideal gas equation, show that at a given temperature, density of a gas is proportional to its pressure.
    b) At 0^oc, the density of a certain oxide of a gas at 2bar is same as that of nitrogen at 5 bar. What is the molecular mass of the oxide?

18. The wavelength of the first spectral line of Balmer series is $6500A^o$. What is the wavelength of the second spectral line of Balmer series?

19. Write the IUPAC name for the following compounds:

    a) CH_3- CH_2-$\underset{|}{C}H$-CH_2-COOH   b) CH_3-CH-CH_2-CH-CH_3 c) CH_3-CH_2-CH_2-$\overset{CH_3}{\underset{CH_3}{C}}$-$COCH_3$
                OH NH_2 OH

20. a) What is photoelectric effect?
    b) The threshold frequency for the ejection of electron from potassium metal is $5.3x10^{14}s^{-1}$. Will the photon of radiation having energy $3.3x10^{-19}J$ cause ejection of electron ? Justify. ($h=6.6 \times 10^{-34}$ JS)

21. Select from each group, the species which has
    a) smallest radius : O, O^-, O^{2-} b) largest ionization enthalpy : Mg, P, Ar
    c) largest electron gain enthalpy : F, Cl, Br

22. Account for the following:
    a) Bond angle in H_2O is 104.5^o though O undergoes sp^3 hybridisation.
    b) Boiling point of H_2O is abnormally high
    c) Dipole moment of BF_3 is zero but NH_3 is 1.46D.

23. a) What is sp^3 hybridisation?
    b) Explain the shape and bond angle in methane using hybridization.
                        (OR)
    Define dipole moment. Write any 2 applications of dipole moment giving examples.

24.Two flasks A and B have equal volume. Flask A contains H_2 at 300K while flask B contains equal mass of CH_4 at 600K.

    a) Which flask contains more number of molecules and how many times more?
    b) In which flask is the pressure greater and how many times greater?

25. a) State Dalton's law of partial pressure.
    b) What is the pressure exerted by a mixture containing 3.2g of methane and 4.4g of
       CO_2 in 9l flask at 27°c? (Atomic mass of H=1, C=12, O=16, R=8.314JK^{-1}mol^{-1})

26. a) Define mole.
    b) Calculate the total number of moles present in a mixture containing 5.6Lt of CO_2
       and 2.24Lt of SO_2.

27. Explain why?
      a) Nitric acid is added to sodium extract before adding silver nitrate in the detection
         of halogens?
      b) Organic liquid vaporizes at a temperature below its boiling point in steam distillation.
      c) Alkyl groups act as electron donors when bonded to a Π system.

28. a) How is the presence of nitrogen detected in organic compounds? Explain.
    b) Write the principle involved in steam distillation and give one example for it.
    c) What kind of isomerism is shown by the following pairs of compounds?
        i) n-propyl chloride and isopropyl chloride   ii) Propanal and acetone
        iii) methoxy propane and ethoxy ethane

                                        (OR)

    a) Differentiate between electrophile and nucleophile giving examples.
    b)Write the resonance structures of Aniline.
    c) Write the structure of   i) 2-chloro-3-hydroxypentanal   ii) 5-oxohexanoic acid

29. Account for the following:
      i) C-O bond is polar but CO_2 is non polar.
      ii) Acetic acid exists as a dimer
      iii) Dipole moment of NH_3 is more than NF_3
      iv) O_2^{2-} is diamagnetic while O_2^- is paramagnetic.
      v) Bonding molecular orbitals are more stable than antibonding molecular orbital.
                                        (OR)

    a) Draw the structure for the following:
        i) SF_4 ii) NH_4^+ c) H_3O^+
    b) Write three important conditions required for the linear combination of atomic orbitals to
       form molecular orbitals.

 30. a) What is an ideal gas?
     b) Why do gases deviate from ideal behaviour at low temperature and high pressure?
     c) Calculate the number of moles of a gas occupying 5dm^3 at 3.32 bar and 500K.
          (R = 0.083 bar dm^{3}K^{-1}mol^{-1})

                                        (OR)

    a) Write the Van der Waal's equation for n moles of a gas.
    b) What is compressibility factor? Draw a plot of Z vs pressure for H_2, N_2, CH_4 and CO_2.
    c) What is meant by   i) viscosity ii) surface tension? Explain the effect of temperature on
       them.
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