INDIAN SCHOOL SOHAR
SECOND TERM TEST 2017-2018
CHEMISTRY

Class : XI   **Time : 3.00 Hrs.**
Date : 30.11.2017   **Max. Marks : 70**

General Instructions:

  (i)   All questions are compulsory.
  (ii)   Question numbers 1 and 5 are very short answer questions carrying 1 mark each.
  (iii)   Question numbers 5 to 10 are short answer questions carrying 2 marks each.
  (iv)   Question numbers 11 to 22 are also short answer questions carrying 3 marks each.
  (v)   Question numbers 23 is a value based question carrying 4 marks.
  (vi)   Question numbers 24 and 26 are long answer questions carrying 5 marks each.
  (vii) Use log tables, if necessary. Use of calculator is not allowed.

Constants Required:

$R = 8.314 \, JK^{-1}mol^{-1} = 0.0821 \, LatmK^{-1}mol^{-1} = 0.083 \, LbarK^{-1}mol^{-1}$

$h = 6.626 \times 10^{-34} \, Js; \quad m_e = 9.1 \times 10^{-31} \, kg; \quad N_A = 6.02 \times 10^{23} \, atom/mol$

Molar mass of $C = 12 \, gmol^{-1}$; $O = 16 \, gmol^{-1}$; $N = 14 \, gmol^{-1}$; $Na = 23 \, gmol^{-1}$; $H = 1 \, gmol^{-1}$

---

1. What is the minimum product of uncertainty in position and uncertainty in momentum of a moving electron?

2. State Charles' Law.

3. What is the group number, period and block of the element with atomic number 40?

4. Out of NH_3 and N_2 which will have (i) larger value of 'a' , (ii) larger value of 'b'?

5. On certain humid day, the mole fraction of water vapour in air at 25^0C is 0.287. If the total pressure of air is 0.977 bar, calculate the partial pressure of $H_2O_{(g)}$ in air.

6. At 0^0C, the density of a gaseous oxide at 2 bar is the same as that of nitrogen at 5 bar. What is the molecular mass of the oxide?

7. 45.4L of N_2 reacted with 22.7L of O_2 and 45.4L of N_2O was formed. Which law is being obeyed in this reaction? Write the statement of the law.

8. CO_2 and SO_2 are both triatomic molecules. Do they have same dipole moment? Justify your answer.

<div align="center">OR</div>

NH_3 and NF_3 both have pyramidal structure with almost similar polarity of individual bonds but dipole moment of NH_3 is much higher than NF_3. Give reason.

9. The density of 3 molal solution of NaOH is $1.11 \, gmL^{-1}$. Calculate the molarity of the solution.

10. The variation of pressure with volume of the gas at different temperatures can be graphically represented as shown in figure. On the basis of this graph answer the following questions:
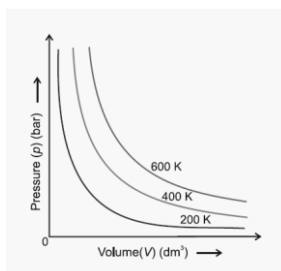
      (i) How will the volume of a gas change if its pressure is increased at constant temperature?

      (ii) At a constant pressure, how will the volume of a gas change if the temperature is increased from 200K to 400 K.

11. What do you understand by the terms (i) limiting agent, (ii) molar solution?

12. Predict the dipole moment of:
    (i)   A molecule AX_4 with a square planar geometry.
    (ii)   A molecule AX_5 with trigonal bipyramidal geometry.
    (iii)   A molecule AX_3 with pyramidal shape.

13. Give MO configurations of following species: (a) O_2^- (b) F_2 (c) N_2

14. A microscope using suitable photons is employed to locate an electron in an atom within a distance of $0.1A^0$. What is the uncertainty involved in the measurement of its velocity. Mass of electron $= 9.1 \times 10^{-31}$kg.

15. Write the IUPAC names of the following compounds:
    (i) $(CH_3)_2\text{-}C=CH_2$ (ii) $(CH_3)_2\text{-}CH\text{-}CH_2\text{-}Cl$ (iii) $(CH_3)_3\text{-}C\text{-}OH$
    (ii) $HO\text{-}CH_2\text{-}CH=CH\text{-}CH_2\text{-}OH$ (iv) $(CH_3)_2\text{-}CH\text{-}CH_2\text{-}CH\text{-}(CH_3)_2$
    (iii) $HC{\equiv}C\text{-}CH_2\text{-}CH_2\text{-}CH(Cl)\text{-}CHO$

    OR

    Write the structural formula of the following compounds:
    (i)   But-2-en-1-ol   (ii)   2-Aminoethanol   (iii)   Oct-3,5-diene
    (ii)   2-Chloro-3-methylbutane (v)   5-Bromoheptanoic acid

16. Energy of the electron in hydrogen atom is given by the expression, $E_n = \frac{1.313 \times 10^6}{n^2}$
    (a) Calculate the amount of energy required to promote electron from the first energy level to the third energy level.
    (b) What will be the ionisation energy of hydrogen?

17. A gas cylinder having a volume of 25.0L contains a mixture of butane, $(CH_3(CH_2)_2CH_3)$ and isobutane $((CH_3)_3CH$ in the ratio of 3:1 by moles. If the pressure inside the cylinder is 6.78×10^6 Pa and the temperature is 298 K. Calculate the number of molecules of each gas assuming ideal behaviour. (1atm = 101325 Pa).

18. The following data are given for three different gases. Indicate whether each behaves as an ideal or non-ideal gas:
    (i)   1 mole of CO_2 gas has a volume 1.2L at 40^0C and a pressure of 19.7 atm.
    (ii)   0.113 g of Ar occupies a volume of 1.25L at 0^0C and 5.05×10^{-2} atm.

19. The excluded volume for O_2 gas is 0.0318 Lmol^{-1}, which is also four times the actual volume of molecules. Calculate the radius of O_2 molecule.

20. (a) BCl_3 is planar but anhydrous $AlCl_3$ is tetrahedral. Why?
    (b) How does bond energy change from N_2^- to N_2^+ and why?
    (c) On the basis of molecular orbital theory what is similar between
        (i) F_2, O_2^{2-} (ii)   CO, NO, NO^+

21. (a) What is total number of sigma and pi bonds in the following molecules? (i) C_2H_2 (ii) C_2H_4
    (b) Considering x-axis as the inter-nuclear axis, which out of the following will form a sigma bond? (i) 1s and1s   (ii)   1s and $2p_x$ (iii) $2p_y$ and $2p_y$ (iv)   1s and 2s
    (c) Which hybrid orbitals are used by the carbon atoms in the following molecules?
        (i) $CH_3\text{-}CH_3$ (ii) $CH_3\text{-}CH=CH_2$ (iii) $CH_3\text{-}CH_2\text{-}OH$ (iv) $CH_3CH=O$

22. (a) Pressure of 1g of an ideal gas A at 27^0C is found to be 2 bar. When 2g of another ideal gas B is introduced in the same flask at same temperature, the pressure becomes 3 bar. Find the relationship between their molecular masses.
    (b) Calculate the volume occupied by 8.8g of CO_2 at 31.1^0C and 1 bar pressure.

23. In class XI, Saurabh has friendship with Ashish similar kind of student, that is, both of them are good sportsmen and fond of studies. They equally share their skills with each other and remain happy in each other's company.

    (i) Compare this type of friendship with type of chemical bond.

    (ii) Should we make friendship with students who bunk classes? Give reason.

    (iii) Why do people having similar taste make friendship?

24. (a) Account for the following:

    (i) Be has slightly higher value of ionization enthalpy than that of boron(B).

    (ii) The ionization enthalpy of Na^+ is more than that of Ne although they have same configuration.

    (iii) Electron gain enthalpy of Cl is more negative than that of F.

    (b) Which of the following pairs of elements would have a more negative electron gain enthalpy?

    (i)   O or F

    (ii)   Br or Cl

<div align="center">OR</div>

    (a) A student reported the radii of Cu, Cu^+ and Cu^{2+} as 96pm, 122 pm and 72 pm respectively. Do you agree with the reported values? Justify the answer.

    (b) Would you expect the first ionisation enthalpies for two isotopes of the same element to be the same or different? Justify your answer.

    (c) An element belongs to third period of p-block elements. It has 4 electrons in its outer most shell. Predict its group. How many unpaired electrons does it have?

25. (a) Explain the following:

    (i)   Vapour pressure increases with increase in temperature.

    (ii)   Diethyl ether has higher vapour pressure than ethyl alcohol at a given temperature.

    (iii)   Vapour pressure of a liquid does not depend upon shape of the vessel in which the liquid is contained.

    (b) What is the effect of pressure on (i) boiling point; (ii) density of a liquid?

<div align="center">OR</div>

    (a) Explain the terms:

    (i)   Absolute zero   (ii)   Boyle's Temperature   (iii)   Kelvin Scale.

    (b) Why do real gases deviate from ideal behaviour? Write van der Waals' equation of state for

    (i)   One mole of real gas   (ii)   n mole of real gas.

26. Give the points of similarities and differences between Valence Bond Theory and Molecular Orbital Theory.

<div align="center">OR</div>

    (a) Arrange the following compounds in the increasing order of bond length of O-O bond. O_2, $O_2^+(AsF_6)^-$, KO_2. Explain on the basis of ground state electronic configuration of dioxygen in these molecules.

    (b) Using VSEPR theory draw the molecular structures of (i) XeF_4 (ii) PCl_5 (iii) BrF_5