Code : 043

DELHI PUBLIC SCHOOL SURAT
CHEMISTRY (THEORY)

Roll No. | | | **Class : XI**

Marks : 70 ***Time Allowed : 3 Hrs***

***Instructions*:**
1. All questions are compulsory.
2. Q.No.1 to 5 are very short answer questions, carrying 1 mark each.
3. Q.No. 6 to 10 are short answer questions carrying 2 marks each.
4. Q.No. 11 to 22 are also short answer questions carrying 3 marks each.
5. Q.No. 23 is long answer question carrying 4 marks.
6. Q.No. 24 to 26 are long answer question carrying 5 marks .
7. No overall choice is given.
8. Use of Calculators is not allowed. However if required use of Log tables is permitted.

1. Consider the reaction, $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g) + 189.4$ kJ. Indicate the direction in which the equilibrium will shift when : i) temperature is decreased ii) pressure is increased. **[1]**

2. What is enthalpy change and internal energy change in a cyclic process? **[1]**

3. Why are alkali metals used as reducing agents? **[1]**

4. Name and write the formulae of two important constituents of cement. **[1]**

5. Predict the products of electrolysis of an aqueous solution of $CuCl_2$ with platinum electrodes. [**1]**

6. A sample of NaOH weighing 4 g is dissolved in a 250 mL of water. What is the molarity of the solution? **[2]**

7. Among the second period elements the actual ionization enthalpies are in the order of : Li < B < Be < C < O < N < F < Ne. Explain why : Be has higher Δ_iH than B. O has lower Δ_iH than N and F? [**2]**

8. For the reaction:
$2A(g) + B(g) \rightarrow 2D(g)$
$\Delta H^\circ = -10.5$KJ and $\Delta S^\circ = -44.1\ JK^{-1}\ mol^{-1}$ Calculate ΔG° for the reaction and predict whether the reaction may occur spontaneously. [2]

9. What is meant by bond order? Calculate the bond order of O_2^-. **[2]**

10. Would you expect the second electron gain enthalpy of O as positive, more –ve or less –ve than the first. Justify your answer**.** **[2]**

11. i) Although geometries of NH_3 and H_2O molecules are distorted tetrahedral, bond angles in water is less than that of ammonia. Discuss.
ii) Describe the shapes of sp, sp^2 and sp^3 orbitals. **[3]**

12. i) How many electrons in an atom may have the following quantum numbers?
a) n=4, m= -1/2 .
b) n=3, l=0.
ii) We do not see a car moving as a wave on the road. Why? **[3]**

13. i) What is the number of photons of light with a wavelength of 4000 pm that provide 1 J of energy?
ii) State Hund's rule of maximum multiplicity? **[3]**

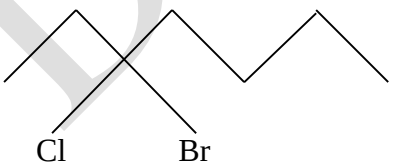
14. i) Calculate the number of moles of carbon atoms and hydrogen atoms in three moles of ethane.
ii) Determine the empirical formula of an oxide of iron which has 69.9% iron and 30.1% dioxygen by mass.(Fe = 56). [**1+2=3]**

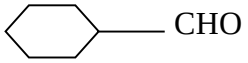
15. i) Density of gas is found to be 5.46g/dm^3 at 27˚C at 2 bar pressure. What will be its density at STP?
ii) Critical temperature for CO_2 and CH_4 are 31.1˚C and -81.9˚C respectively. Which of these has stronger intermolecular forces and why? [**2+1=3]**

16. Calculate the enthalpy change for the process :
$CCl_4(g) \rightarrow C(g) + 4Cl(g)$.
And Calculate bond Enthalpy of C-Cl in $CCl_4(g)$.
$\Delta vapH^\circ (CCl_4) = 30.5$ KJ/mol
$\Delta_f H^\circ (CCl_4) = -135$ KJ/mol
$\Delta_a H^\circ_{(c)} = 715.0$ KJ/mol
$\Delta_a H^\circ (Cl_2) = 242$ KJ/mol**.** **[3]**

17. i) Find the oxidation state of P in NaH_2PO_4 .
ii) Complete and balance the following equation.
$MnO_4^- + I^- \rightarrow MnO_2 + I_2$ (basic medium) **[1+2]**

18. i) Write IUPAC names of following:
(a)



(b) 

ii) Write bond line formula of isopropyl alcohol**.** **[2+1=3]**

19. i) What effect does branching of an alkane chain has on its boiling point?

ii) Why benzene is extra ordinary stable though it contains three double bonds?
iii) Why Nitro-benzene doesn't undergo Friedel-Craft alkylation? **[1+1+1=3]**

20. a) Name two phenomenon which can be explained on the basis of surface tension.
b) What is compressibility factor? What is the significance of the van der Waal's constants 'a' and 'b'. **[3]**

21. i) Arrange the following : HCl, HBr, HI, HF in order of their decreasing reactivity towards alkenes.
ii) How ethylene can be converted into ethane?
iii) Why is wurtz reaction not preferred for the preparation of alkanes containing odd number of carbon atoms? **[1+1+1=3]**

22. i) Draw structure of $BeCl_2$ (vapour).
ii) Complete the following:
a) $KO_2 + H_2O \rightarrow$
b) $Na(s) + H_2O \rightarrow$ **[1+2=3]**

23. Arrange the following :
i) CaH_2 , BeH_2 and TiH_2 in order of increasing electrical conductance ?
ii) H-H, D-D and F-F in order of increasing bond dissociation enthalpy.
iii) NaH, MgH_2 and H_2O in order of increasing reducing property?
iv) Write equation for water gas shift reaction. **[4]**

24. i) Draw the resonance structure for $CH_3{-}CH{=}CH{-}CH_3$. (**Using curve arrow notation**).
ii) State the principle of chromatography.
iii) In sulphur estimation 0.157 g of an organic compound gave 0.4813g of $BaSO_4$. What is the percentage of sulphur in the organic compound? (molar mass of $BaSO_4$ = 233) **[2+1+2=5]**

25. i) Give reasons:
a) Which is the most stable form of carbon?
b) Lead is known not to form PbI_4.
c) B-F bond length in BF_3 (130pm) and BF_4^- (143pm) differ.
ii) What happens when :
a) Borax is heated strongly.
b) CO is being heated with ZnO? **[3+2=5]**

26. a) Equilibrium constant Kc for the reaction :
$N_2(g) + 3H_2(g) <-> 2NH_3(g)$ at 500K is 0.061.
At particular time analysis shows that composition of the reaction mixture is 3.0 mo/L N_2, 2.0 mol/L H_2, and 0.50 mol/L NH_3. Is the reaction at equilibrium? If not in which direction does the reaction tend to proceed to equilibrium and why?
b) What is meant by conjugate acid base pair? Find the conjugate acid/base for the following : HNO_2, CN^-.

[3+2]

END OF EXAMINATION