

**TOP 10+ LAQ****TOTAL MARKS : 2 x 8 = 16**

1. What are the postulates of Bohr's Model of hydrogen atom? Discuss the importance of this model to explain various series of line spectra in hydrogen atom.
2. What are the postulates of Bohr's model of hydrogen atom? Write the limitations of Bohr's theory. Differentiate between emission and absorption spectra.
3. How are the quantum numbers  $n$ ,  $l$  and  $m_l$  arrived at? Explain the significance of these quantum numbers.
4. Define atomic orbital. Explain the shapes of  $s, p, d$  orbitals with the help of diagrams.
5. What is periodic property? How the following properties vary in a group and a period?  
Explain: (i) Atomic radius                      (ii) Electron gain enthalpy  
                    (iii) Electro negativity              (iv) Ionisation enthalpy
6. Define  $IE_1$  and  $IE_2$ . Why is  $IE_2 > IE_1$  for a given atom?  
Discuss the factors that effect IE of an element.
7. Write an essay on  $s, p, d$  and  $f$  block elements.
8. What is hybridisation? Explain different types of hybridisation involving  $s$  and  $p$  orbitals.
9. Give an account of VSEPR Theory and its applications.
10. Given Molecular orbital Energy diagram of (a)  $N_2$                       (b)  $O_2$ .  
Calculate the respective bond order. Write the magnetic nature of  $N_2$  and  $O_2$  molecules.
11. a) Describe the methods of preparation of ethane.  
b) Explain the chemical properties of ethane with equations.
12. a) Describe 2 methods of preparation of ethylene  
b) Write the reactions for ethylene with  
i) Ozone              ii) Hypohalous acid              iii) Cold and dil. alk  $KMnO_4$               iv)  $O_2$
13. a) Give two methods of preparation of acetylene.  
b) How does acetylene react with water and ozone?
14. a) How do we get benzene from acetylene? Give the corresponding equation.  
b) Explain halogenation, alkylation, acylation, nitration and sulphonation of benzene.

# TOP 25 SAQ

TOTAL MARKS : 6 x 4 = 24

1. Explain the structure of  $\text{PCl}_5$  molecule /  $\text{sp}^3\text{d}$  hybridisation with an example.
2. Explain the structure of  $\text{SF}_6$  molecule /  $\text{sp}^3\text{d}$  hybridisation with an example.
3. Explain the structure of Ethylene.
4. Explain the formation of coordinate covalent bond with example.
5. State Fajan's rules with suitable examples.
6. Define dipole moment? Why the dipole moment of  $\text{BF}_3$  molecule is zero.
  
7. Give the important postulates of kinetic molecular theory of gases.
8. State and explain Graham's law of diffusion.
9. Deduce (a) Boyle's law (b) Charles's law from kinetic gas equation
10. State Dalton's law and derive Dalton's law from kinetic gas equation.
  
11. State and explain "Hess law of constant heat summation" with example.
12. Define heat capacity? What are  $C_p$  and  $C_v$ ? Show that  $C_p - C_v = R$ .
13. State Le-Chatelier's principle and apply the same to the following equilibrium  
 $\text{N}_{2(g)} + 3\text{H}_{2(g)} \rightleftharpoons 2\text{NH}_{3(g)} ; \Delta H = -192 \text{ KJ}$
14. State and explain Le Chatelier's principle and apply it to following equilibrium  
 $2\text{SO}_{2(g)} + \text{O}_{2(g)} \rightleftharpoons 2\text{SO}_{3(g)} \Delta H = 189 \text{ KJ}$
15. Derive the relation between  $K_p$  &  $K_c$  for the equilibrium reaction.  
a)  $\text{N}_{2(g)} + 3\text{H}_{2(g)} \rightleftharpoons 2\text{NH}_{3(g)}$       b)  $2\text{SO}_{2(g)} + \text{O}_{2(g)} \rightleftharpoons 2\text{SO}_{3(g)}$
16. Explain the Bronsted-Lowry acid-base theory with example.
17. State and explain Salt hydrolysis.
  
18. Write a few lines on the utility of hydrogen as a fuel.
19. What is Hardness of water? How is hardness of water removed by Permutit Process (or) ion exchange method or Calgon method?
20. Write any four reducing properties of hydrogen peroxide. Give equations.
21. Explain with suitable examples, the following  
i) Electron deficient    ii) Electron-precise and    iii) Electron-rich hydrides
  
22. Explain the structure of diborane.
23. Write an essay on the preparation and chemical activities of diborane.
24. Explain Borax bead test with suitable examples.
25. Explain the differences in properties of diamond and graphite on the basis of their structures.

**TOP 45 VSAQ**

TOTAL MARKS : 9 x 2 = 18

1. State Graham's law of diffusion.
2. State Dalton's law of partial pressures.
3. Which gas diffuses faster among  $N_2$ ,  $O_2$ ,  $CH_4$  gases? Why?
4. Describe the important uses of quick lime.
5. Why are alkali metals not found in the free state in nature?
6. Describe the important uses of Caustic Soda (or) Sodium Hydroxide.
7. Describe the important uses of sodium carbonate.
8. What is Plaster of Paris?
9. What is the importance of  $Ca^{+2}$  in the functioning of the cell?
10. Why are IA group elements called as "alkali metals"?
11. What is plaster of Paris? Mention its uses.
12. Why is gypsum added to cement?
13. Why does  $BF_3$  behave as a Lewis acid?
14. Explain the inert pair effect.
15. Give the formula of borazine. What is its common name?
16. Give the formulae of (a) Borax (b) Colemanite
17. How does Graphite function as a lubricant?
18. Graphite is a good conductor. Explain.
19. Why is diamond hard?
20. What is allotropy? Give the crystalline allotropes of carbon.
21. What are silicones? Give the uses of silicones.
22. Name any two man-made silicates.
23. Give the use of  $CO_2$  in photosynthesis.
24. Why is CO poisonous?
25. What is meant by Dry ice? Give its application.
26. Give the hybridisation of carbon in diamond and fullerene.
27. What is 'producer gas'? How is producer gas prepared?
28. How is water gas prepared?
29. What is Synthesis gas?
30. What is Chemical Oxygen Demand (COD)?
31. What is Biochemical Oxygen Demand (BOD)?
32. Which oxides cause acid rain? and What is its pH value?
33. Define Reservoir, sink and speciation.
34. What happens when holes are formed in the ozone layer?  
(or) Mention the harmful effects caused due to depletion of the ozone layer
35. Name two important sinks for carbon dioxide.
36. What is the Greenhouse effect?
37. Acid rains are harmful. Why? Name two adverse effects caused by acid rains.
38. What happens when Fluorides are present in water?
39. Define pollutant and Contaminant.

40. Give two examples each for position and functional isomerism.

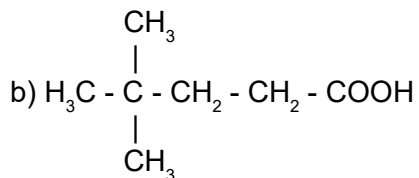
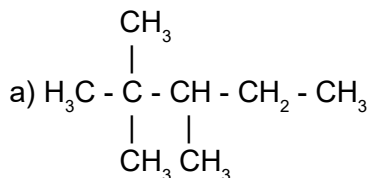
41. Give the structural formulae of the following compounds.

a) 2, 3-dimethyl butane                      b) 2-methyl but-1-ene

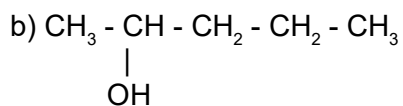
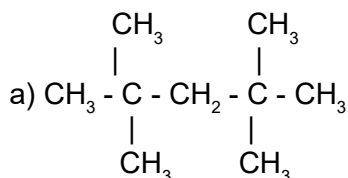
42. Write the structural formulae of the following compounds:

a) 3,4,4,5-Tetramethyl heptane    b) 2-Methyl-1-butene

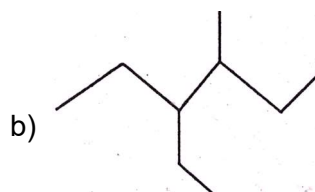
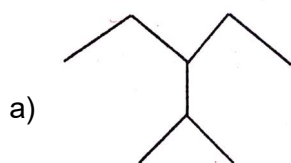
43. Write IUPAC names of the following:



44. Write IUPAC names of the following :



45. Write the IUPAC names of the following compounds.



## TOP 20 PROBLEMS 4 & 2 MARKS

1. A carbon compound contains 12.8% carbon, 2.1% hydrogen, 85.1% bromine. The molecular weight of compound is 187.9. Calculate the molecular formula.
2. A carbon compound on analysis gave the following percentage composition, carbon 14.5%. Hydrogen 1.8% Chlorine 64.46%. Oxygen 19.24%. Calculate the empirical formula.
3. Balance the following redox equation in acidic medium of ion-electron method.  

$$\text{Fe}^{2+}_{(aq)} + \text{CO}_2\text{O}^{2-}_{7(aq)} \rightarrow \text{Fe}^{3+}_{(aq)} + \text{Cr}^{3+}_{(aq)}$$
4. Balance following equation in Basic medium by ion-electron method.  

$$\text{MnO}_4^- + \text{I}^- \rightarrow \text{MnO}_2 + \text{I}_2$$
5. Calculate the oxidation numbers of oxygen in (i)  $\text{O}_2\text{F}_2$  (ii)  $\text{OF}_2$
6. Calculate the oxidation number of chromium (Cr) in  $\text{Cr}_2\text{O}_7^{2-}$  ion
7. Calculate the oxidation number of Cr in  $\text{K}_2\text{Cr}_2\text{O}_7$ .
8. Calculate the oxidation number of Mn in  $\text{KMnO}_4$ ,  $\text{MnO}_4^{2-}$ .
9. How many number of moles of glucose are present in 540 grams of glucose.
10. Calculate the weight of 0.1 mole of Sodium carbonate.
11. How many no. of  $\text{CaCO}_3$  moles are present 200 grams of  $\text{CaCO}_3$ ?
12. The empirical formula of a compound is  $\text{CH}_2\text{O}$ . Its molecular weight is 90. Calculate the molecular formula of the compound.
13. Calculate kinetic energy of three moles of  $\text{CO}_2$  at  $27^\circ$  (in calories only).
14. Find kinetic energy of 5 moles of an ideal gas in calories at  $27^\circ\text{C}$ .
15. Calculate kinetic energy of 2 moles of Nitrogen at  $27^\circ\text{C}$ .
16. Calculate the pH of 0.01 M HCl solution.
17. What is pH? Calculate the pH of 0.001 M HCl solution.
18. Calculate pH of a  $1.0 \times 10^{-8}$  M solution of HCl
19. Calculate the pH of 0.001M NaOH.
20. Calculate the pH of 0.05 M  $\text{H}_2\text{SO}_4$  solution.

# V S A Q

## SECTION - A

- What is Chemical Oxygen Demand (COD)?
  - What is Biochemical Oxygen Demand (BOD)?
  - Which oxides causes acid rain? and What is its pH value?
  - Define Receptor, sink and speciation.
  - What happens when holes are formed in ozone layer?
  - What happens when carbon monoxide is increased in the air?
  - Name two important sinks for Carbon dioxide.
  - What are effects of acid rain?
  - What is Green house effect?
- Define Green house effect. Which gases are the cause for it?
  - Acid rains are harmful. Why? (or) Name two adverse effects caused by acid rains.
  - What happens when Fluorides are present in water?
  - What is the harm caused by CFCs?
  - Name two important sinks for Carbondioxide.
  - Define Pollutant and Contaminent.
  - Mention the harmful effects caused due to depletion of ozone layer.
- State Graham's law of diffusion.
  - State Dalton's law of partial pressures.
  - Which gas diffuses faster among  $N_2$ ,  $O_2$ ,  $CH_4$  gases? Why?
  - How many times methane diffuses faster than sulphurdioxide?
  - What is Boltzman's Constant? Give its value.
  - What is most probable speed?
  - Find the kinetic energy of 5 moles of an ideal gas in calories at  $27^\circ C$ .
  - Calculate kinietic energy of 3 moles of  $CO_2$  gas at  $27^\circ C$ .
  - Find the RMS velocity of  $CO_2$  gas at  $27^\circ C$ .
- How many number of moles of glucose are present in 540 grams of glucose.
  - Calculate the weight of 0.1 mole of Sodium carbonate.
  - The emperical formula of a compound is  $CH_2O$ . Its molecular weight is 90. Calculate the molecular formula of the compound.
  - Calcualte the volume of  $O_2$  at STP required to completely burn 100 ml of acetylene.
  - What are dispropoortination reactions? Give an example.
  - How many no. of  $CaCO_3$  moles are present 200 gms of  $CaCO_3$  ?
  - Determinie the oxidation number of sulphur in  $H_2S_2O_8$  (Marshall's acid)
  - Calculate the oxidation numbers of oxygen in  $H_2O_2$  and  $O_2F_2$ ?
  - Calculate the oxidation number of Mn in  $KMnO_4$ ,  $MnO_4^{2-}$ .
- What is homogeneous equilibrium? Write two homogenous reactions.
  - What is heterogeneous equilibrium? Write two heterogeneous reactions.
  - Write the relation between  $K_p$  and  $K_c$ .
  - All Bronsted bases are Lewis bases. Explain.
  - Define  $P^H$  of a solution. Write its significance.
  - What is conjugate acid - base pair? Give example.
  - Calculate the pHof  $10^{-3}$  M HCl
  - Calculate the pH of 0.05 M NaOH solution.
  - Concentration of Hydrogen ion is  $3.8 \times 10^{-3}$  M. What is its pH?
  - Derive the  $K_p$  and  $K_c$  relations for the reaction ,  $PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$
  - Calculate the pH of 0.05 M  $H_2SO_4$  solution.

6. (i) Describe the important uses of quick lime.  
(ii) Why are alkali metals not found in the free state in nature?  
(iii) Describe the important uses of Caustic Soda (or) Sodium Hydroxide.  
(iv) Describe the important uses of sodium carbonate.  
(v) Describe the importance of Plaster of Paris.  
(vi) What is the importance of  $\text{Ca}^{+2}$  in the functioning of the cell?  
(vii) Lithium Iodide is the most covalent among the alkali metal halides. Give the reasons.  
(viii) What is Baking soda? Give its uses.  
(ix) Write the average composition of portland cement.
7. (i) Why are IA group elements called as "alkali metals"?  
(ii) What is plaster of a paris? Mention its uses.  
(iii) Why gypsum is added to cement.  
(iv) Why does  $\text{BF}_3$  behave as a Lewis acid?  
(v) Explain inert pari effect.  
(vi) Give the formula of Borazine. What is its common name?  
(vii) Give the formulae of (a) Borax (b) Colemanite  
(viii) Sketch the structure of Boric acid.  
(ix) What is a Banana bond?
8. (i) How does Graphite funciton as a lubricant?  
(ii) Graphite is a good conductor. Explain.  
(iii) Why is diamond hard?  
(iv) What is allotropy? Give the crystalline allotropes of carbon.  
(v) C-C bond length in graphite is shorter than C-C bond length in diamond. Explain.  
(vi) What are silicones? Give the uses of silicones.  
(vii) Name any two man-made silicates.  
(viii) Give the use of  $\text{CO}_2$  in photosynthesis.
9. (i) Why is CO poisonous?  
(ii) Write the use of ZSM-5.  
(iii) What is meant by Dry ice? Give its applicaitons.  
(iv) Give the hybridisation of carbon in  
a)  $\text{CO}_3^{-2}$                       b) Diamond                      c) Graphite                      d) Fullerene  
(v) What is "producer gas"? How is producer gas prepared?  
(vi) How is water gas prepared.  
(vii) What is Synthesis gas?

10. (i) Write the structural formulae of the following compounds:

(a) Trichloroethanoic acid

(b) Neo-Pentane

(ii) Give the structural formulae of the following compounds.

(a) 2, 3-dimethyl butane

(b) 2-methyl but-1-ene

(iii) Write the structural formulae of the following compounds.

(a) 3,4,4,5-Tetramethyl heptane

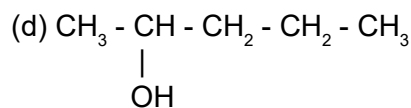
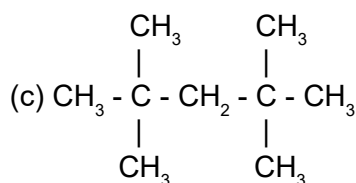
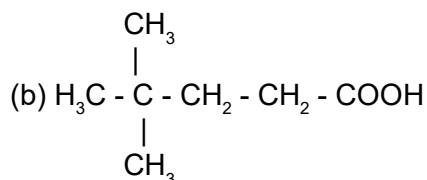
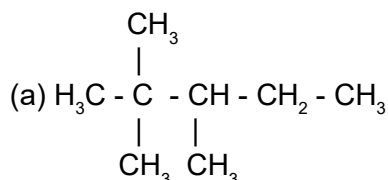
(b) 2-Methyl-1-butene

(iv) Draw the cis-trans isomers for the following compounds.

(a)  $\text{CHCl} = \text{CHCl}$

(b)  $\text{C}_2\text{H}_5\text{CH}_2\text{C} = \text{CCH}_3\text{C}_2\text{H}_5$

(v) Write IUPAC names of the following:



(vi) An Alkyne 'A' undergo cyclic polymerisation by passing through red hot iron tube to give 'B'. What are 'A' and 'B' ?



# S A Q

## SECTION - B

11. (i) Give the important postulates of kinetic molecular theory of gases.  
 (ii) State and explain Graham's law of diffusion.  
 (iii) Deduce (a) Boyle's law (b) Charle's law from kinetic gas equation.  
 (iv) Derive the ideal gas equation from gas laws.  
 (v) Find RMS velocity, average velocity and most probable velocity of CO<sub>2</sub> gas at 27°C.  
 (vi) 360 cm<sup>3</sup> of CH<sub>4</sub> gas diffused through a porous membrane in 15 minutes. Under similar conditions, 120 cm<sup>3</sup> of another gas diffused in 10 minutes. Find the molar mass of the gas.  
 (vii) At 25°C and 760 mm of Hg Pressure a gas occupies 600 ml volume. What will be its pressure at a height where temperature is 10°C and volume of hte gas is 640 ml.
12. (i) Balance the following redox equation in acidic medium by ion-electron method.  

$$\text{Fe}^{2+}_{(aq)} + \text{Cr}_2\text{O}_7^{2-}_{(g)} \rightarrow \text{Fe}^{3+}_{(aq)} + \text{Cr}^{3+}_{(aq)}$$
  
 (ii) Balance the following redox reaction by ion-electron method in acid medium  

$$\text{MnO}_4^{-}_{(aq)} + \text{SO}_2_{(g)} \rightarrow \text{Mn}^{+2}_{(aq)} + \text{HSO}_4^{-}_{(aq)}$$
  
 (iii) Balance the following equation in Basic medium by ion-electron method.  

$$\text{MnO}_4^{-} + \text{I}^{-} \rightarrow \text{MnO}_2 + \text{I}_2$$
  
 (iv) A carbon compound contains 12.8% carbon, 2% hydrogen, 85.1% bromine. The molecular weight of the compound is 187.9. Calculate the molecular formula.  
 (v) Calculate the empirical formula of oa compound having percentage composition:  
 Potassium (K) = 26.57, chromium (Cr) = 35.36, Oxygen (O) = 38.07.  
 (Given the atomic weights of K, Cr and O as 39 ; 52 and 16 respectively)
13. (i) State and explain "Hess law of constant heat summation" with example.  
 (ii) Define heat capacity? What are C<sub>p</sub> and C<sub>v</sub>? Show that C<sub>p</sub> - C<sub>v</sub> = R.  
 (iii) Give the mathematical formulation of first law of thermodynamics.  
 (iv) State and explain the significance of second law of thermodynamics.
14. (i) Derive the relation between K<sub>p</sub> & K<sub>c</sub> for the equilibrium reaction.  
 a)  $\text{N}_{2(g)} + 3\text{H}_{2(g)} \rightleftharpoons 2\text{NH}_{3(g)}$       b)  $2\text{SO}_{2(g)} + \text{O}_{2(g)} \rightleftharpoons 2\text{SO}_{3(g)}$   
 (ii) Explain the Bronsted-Lowry acid-base theory with example.  
 (iii) Explain Lewis acid base theory with example.  
 (iv) State Le-Chatlier's principle and apply the same to the following equilibrium  

$$\text{N}_{2(g)} + 3\text{H}_{2(g)} \rightleftharpoons 2\text{NH}_{3(g)} ; \Delta H = -92 \text{ KJ (or)}$$
  
 State LeChatlier's principle and apply it to the synthesis of ammonia by Haber's process.  
 (v) Define pH of a solution. Write its significance.  
 (vi) State and explain Salt hydrolysis.
15. (i) Describe electrolytic method for the preparation of H<sub>2</sub>O<sub>2</sub>.  
 (ii) What is Hardness of water? How is hardness of water removed by permutit process (or) ion exchange method or Calgon method?  
 (iii) Write a few lines on the utility of hydrogen as a fuel.  
 (iv) Write a note on heavy water.  
 (v) Write any four reducing properties of hydrogen peroxide. Give equations.  
 (vi) Explain with suitable examples, the following  
 a) Electron deficient      b) Electron-precise      and      c) Electron-rich hydrides

16. (i) How is diborane ( $B_2H_6$ ) prepared? Explain its structure.  
 (ii) Write an essay on the preparation and chemical activities of diborane.  
 (iii) Explain Borax bead test with a suitable example.  
 (iv) What are electron deficient compounds? Is  $BCl_3$  an electron deficient species? Explain.
17. (i) Explain  $sp^3d^2$  hybridisation with an example.  
 (ii) Explain the structure of  $PCl_5$  molecule with hybridisation.  
 (iii) Explain the structure of Ethylene.  
 (iv) State Fajan's rules with suitable examples.  
 (v) What is Hydrogen bond? Explain the different types of hydrogen bonds with example.  
 (vi) Explain the formation of coordinate covalent bond with one example.  
 (vii) What is meant by the term Bond order? Calculate the bond order of (a)  $N_2$  (b)  $O_2$
18. (i) Write two methods of preparation of Ethylene. Give the equations.  
 (ii) Explain (a) Position isomerism (b) Functional group isomerism with one example for each  
 (iii) Explain Wurtz reaction and Friedel Craft alkylation with one example for each.  
 (iv) How do you get Benzene from Acetylene?  
 Explain the halogenation and alkylation of Benzene.  
 (v) Write the corresponding equations for the following reactions and name products A,B,C.
- $$CaC_2 \xrightarrow{H_2O} A \xrightarrow{\text{hot Cu tube}} B \xrightarrow[323-333K]{\text{conc. } HNO_3 + H_2SO_4} C$$
- (vi) Describe two methods of preparation of Ethylene. Give the equation for the reactions of the ethylene with the following  
 (a) Ozone (b) Cold and alk.  $KMnO_4$
- (vii) How the following are obtained from Benzene?  
 (a) Nitro Benzene (b) Methyl Benzene  
 Give the equations.
- (viii) Write notes on the following (a) Distillation (b) Chromatography

# L A Q

## SECTION - C

19. (i) What are the postulates of Bohr's model of hydrogen atom? Discuss the importance of this model to explain various series of line spectra in hydrogen atom?  
 (ii) What are the postulates of Bohr's model of hydrogen atom? Write the limitations of Bohr's theory. Differentiate between emission and absorption spectra.  
 (iii) How are the quantum number  $n$ ,  $l$  and  $m_l$  arrived at? Explain the significance of these quantum numbers.  
 (iv) Define atomic orbital. Explain the shapes of s,p,d orbitals with the help of diagrams.  
 (v) Explain (a) Planck's quantum theory (b) de Broglie's wave hypothesis
20. (i) What is periodic property? How the following properties vary in a group and a period?  
 Explain (1) Atomic radius (2) Electron gain enthalpy  
 (3) Electro negativity (EN) (4) Ionisation potential (IE)  
 (ii) Define  $IE_1$  and  $IE_2$ . Why is  $IE_2 > IE_1$  for a given atom? Discuss the factors that effect IE on an element.  
 (iii) Write an essay on s,p,d and f block elements.  
 (iv) Relate the electronic configuration of elements and their properties in the classification of elements (or) write an essay on classification of elements into type?  
 (v) Explain (a) Valency (b) Diagonal relation (c) Variation of nature of oxides in the Group-I
21. (i) What do you understand by hybridisation? Explain different types of hybridisation involving s and p orbitals.  
 (ii) Given the Molecular Orbital Energy diagram of (a)  $N_2$  (b)  $O_2$ . Calculate the respective bond order. Write the magnetic nature of  $N_2$  and  $O_2$  molecules.  
 (iii) Give an account of VSEPR theory and its applications  
 (iv) How do you explain the geometry of the molecules on the basis of Valence bond theory?  
 (v) Describe any two methods of preparation of benzene with corresponding equations. Explain the following benzene reactions  
 (a) Halogenation (b) Alkylation (c) Acylation (d) Nitration  
 (vi) a) Write the preparation of ethane using the following method  
 i) Wurtz reaction ii) Kolbe's electrolytic method  
 (vii) Complete the following reactions and name the products A,B,C,D
- i)  $CaC_2 \xrightarrow{H_2O} A \xrightarrow{\text{hot Cu tube}} B \xrightarrow[323-333K]{\text{conc. HNO}_3 + H_2SO_4} C$
- ii) Ethylene  $\xrightarrow{Br_2/CCl_4} D$ .

# GUESS PAPER - 1

## JR. CHEMISTRY

### SECTION - A

**I. Answer ALL questions :**
**[10 x 2 = 20]**

1. What is Chemical Oxygen Demand (COD)?
2. What are effects of acid rain?
3. State Graham's law of diffusion.
4. Calculate the oxidation number of Mn in  $\text{KMnO}_4$ ,  $\text{MnO}_4^{2-}$ .
5. What is conjugate acid - base pair? Give example.
6. Describe the important uses of sodium carbonate.
7. What is Plaster of Paris? Mention its uses.
8. How does Graphite function as a lubricant?
9. What is Synthesis gas?
10. Write the structural formulae of the following compounds
  - a) Trichloroethanoic acid
  - b) Neo-Pentane

### SECTION - B

**II. Answer any SIX of the following Questions :**
**[6 x 4 = 24]**

11. Give the important postulates of kinetic molecular theory of gases.
12. Balance the following redox reaction by ion-electron method in acid medium
 
$$\text{MnO}_4^{-(\text{aq})} + \text{SO}_2(\text{g}) \rightarrow \text{Mn}^{2+(\text{aq})} + \text{HSO}_4^{-(\text{aq})}$$
13. State and explain "Hess law of constant heat summation" with example.
14. Derive the relation between  $K_p$  &  $K_c$  for the equilibrium reaction.
 
$$\text{N}_{2(\text{g})} + 3\text{H}_{2(\text{g})} \rightleftharpoons 2\text{NH}_{3(\text{g})}$$
15. What is the cause for permanent hardness of water?  
Explain the removal of hardness of water by Calgon method.
16. How is diborane ( $\text{B}_2\text{H}_6$ ) prepared? Explain its structure.
17. Explain the structure of  $\text{PCl}_5$  molecule with hybridisation.
18. Explain (a) Position isomerism (b) Functional group isomerism with one example for each

### SECTION - C

**III. Answer any Two of the following Questions :**
**[2 x 8 = 16]**

19. What are the postulates of Bohr's model of hydrogen atom? Discuss the importance of this model to explain various series of line spectra in hydrogen atom?
20. What is periodic property? How the following properties vary in a group and a period? Explain (a) Ionisation potential (IE) (b) Electronegativity (c) Electron gain enthalpy
21. a) Write the preparation of ethane using the following method
  - i) Wurtz reacton
  - ii) Kolbe's electrolytic method
- b) Complete the following reactions and name the products A,B,C,D
  - i)  $\text{CaC}_2 \xrightarrow{\text{H}_2\text{O}} \text{A} \xrightarrow{\text{hot Cu tube}} \text{B} \xrightarrow[\text{CH}_3\text{Cl}]{\text{AlCl}_3} \text{C}$
  - ii) Ethylene  $\xrightarrow{\text{Br}_2/\text{CCl}_4} \text{D}$ .

\* \* \* \* \*

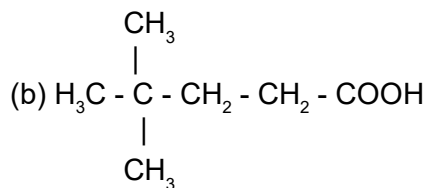
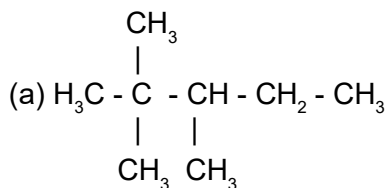
## GUESS PAPER - 2

### JR. CHEMISTRY

#### SECTION - A

**I. Answer ALL questions :**
**[10 x 2 = 20]**

1. What is Biochemical Oxygen Demand (BOD)?
2. Define Receptor Sink.
3. Which gas diffuses faster among  $N_2$ ,  $O_2$ ,  $CH_4$  gases? Why?
4. The empirical formula of a compound is  $CH_2O$ . Its molecular weight is 90. Calculate the molecular formula of the compound.
5. Calculate the pH of 0.05 M  $H_2SO_4$  solution.
6. Write the average composition of portland cement.
7. Give the formula and structure of Borazine (or Borzine).
8. What is allotropy? Give the crystalline allotropes of carbon.
9. What is meant by Dry ice? Give its applicaitons.
10. Write IUPAC names of the following:



#### SECTION - B

**II. Answer any SIX of the following Questions :**
**[6 x 4 = 24]**

11. State and explain Graham's law of diffusion.
12. A carbon compound contains 12.8% carbon, 2% hydrogen, 85.1% bromine. The molecular weight of the compound is 187.9. Calculate the molecular formula.
13. Define heat capacity? What are  $C_p$  and  $C_v$ ? Show that  $C_p - C_v = R$ .
14. State Le-Chatlier's principle and apply it to the synthesis of ammonia by Haber's process.
15. Write any four reducing properties of hydrogen peroxide. Give equations.
16. Explain Borax bead test with a suitable example.
17. What is Hydrogen bond? Explain the different types of hydrogen bonds with example.
18. How is acetylene prepared from the following compounds:  
a) Calcium carbide      b) 1,2-dibromoethane

#### SECTION - C

**III. Answer any Two of the following Questions :**
**[2 x 8 = 16]**

19. How are the quantum number  $n$ ,  $l$  and  $m_l$  arrived at? Explain the significance of these quantum numbers.
20. Define  $IE_1$  and  $IE_2$ . Why is  $IE_2 > IE_1$  for a given atom? Discuss the factors that effect IE on an element.
21. Describe any two methods of preparation of benzene with corresponding equations. Explain the following benzene reactions  
(a) Halogenation      (b) Alkylation      (c) Acylation      (d) Nitration

\* \* \* \* \*

**GUESS PAPER - 3****JR. CHEMISTRY****SECTION - A****I. Answer ALL questions :****[10 x 2 = 20]**

- Which oxides causes acid rain? and What is its pH value?
- Define Green house effect. Which gases are the cause for it?
- What is Boltzman's Constant? Give its value.
- Calculate the volume of O<sub>2</sub> at STP required to completely burn 100ml of acetylene.
- Calculate the pH of 0.05 M NaOH solution.
- Write the important uses of Caustic Soda.
- Why gypsum is added to cement.
- Why is diamond hard?
- What is Synthesis gas?
- Give the structural formulae of the following compounds.

(a) 2, 3-dimethyl butane

(b) 2-methyl but-1-ene

**SECTION - B****II. Answer any SIX of the following Questions :****[6 x 4 = 24]**

- Derive the ideal gas equation from gas laws.
- Balance the following redox equation in acidic medium by ion-electron method.  

$$\text{Fe}^{2+}_{(aq)} + \text{Cr}_2\text{O}^{2-}_{2(g)} \rightarrow \text{Fe}^{3+}_{(aq)} + \text{Cr}^{3+}_{(aq)}$$
- Give the mathematical formulation of first law of thermodynamics.
- Explain Lewis acid base theory with example.
- Write a few lines on the utility of hydrogen as a fuel.
- What are electron deficient compounds? Is BCl<sub>3</sub> an electron deficient species? Explain.
- Explain the structure of Ethylene.
- Write notes on the following (a) Distillation (b) Chromatography

**SECTION - C****III. Answer any Two of the following Questions :****[2 x 8 = 16]**

- Define atomic orbital. Explain the shapes of s,p,d orbitals with the help of diagrams.
- Write an essay on s,p,d and f block elements.
- What is hybridisation? Explain different types of hybridisation involving s and p orbitals.

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