NARAYANA IIT ACADEMY INDIA

43 YEARS OF EXCELLENCE

JR CHEMISTRY 1:5 IMP QUESTIONS 2023-24

QUESTIONS:

QUESTION NO-1 (STATES OF MATTER)

1) What is Boltzmann's constant? Give its value.
2) Which of the gases diffuses faster among N_2, O_2 and CH_4 Why?
3) Calculate Kinetic energy of 5 moles of nitrogen at 27^0 C?
4) Why is pressure cooker used for cooking food on hills?
5) What is surface tension?
6) What is an Ideal gas?

QUESTION NO-2 (ACIDS AND BASES)

1) What are Lewis acid & base? Give suitable example.
2) What is homogeneous equilibrium? Write two homogeneous reactions.
3) Calculate the pH of 0.05M H_2SO_4 solution
4) What is the effect of pressure on a gaseous chemical equilibrium
5) What is Bronsted base? Give an example.
6) Why does BF_3 behave as Lewis Acid?
7) Find the PH of 0.05M Ba(OH)2 Aqueous solution?

QUESTION NO-3 (ENVIRONMENTAL CHEMISTRY)

1) Which oxides cause acid rain? and what is its value?
2) What is chemical oxygen demand (COD)&(BOD)?
3) Define the terms sink, TLV & Receptor?
4) a) What is Greenhouse effect? It is caused by .....and .... gases _____

   b) Mention the harmful effects caused by Global warming
5) What is PAN? What Effect is caused by it?
6) Name the common compounds of Photochemical smog?
7) Mention the Harmful effects caused due to Depletion of Ozone layer?

QUESTION NO-4 (STOICHIOMETRY)

1) The empirical formula of compound is CH_2O. Its molecular weight is 90. Calculate the molecular formula of the compound.
2) Calculate the oxidation number of 'Cr' in $K_2Cr_2O_7$ or $Cr_2O_7^{-2}$
3) What volume of CO_2 is obtained at STP by heating 4g of $CaCO_3$?

4) How many numbers of moles of glucose are present in 540 gms of glucose?

5) Calculate the weight of 0.1 Mole of sodium carbonate?

6) Calculate the Molarity of NaOH in the solution prepared by disloving 4grms in enough Water to form 250ML of the solution?

QUESTION NO-5 (CHEMICAL BOND)

1) Why H_2O has higher BP than HF

2) What type of bonds are present in NH_4Cl? Write its structure.

3) Which of the two ions ca^{2+} or Zn^{2+} is more stable and why?

4) How many sigma and pi bonds are present in
   a) C_2H_2 b) C_2H_4

5) What is octet rule?

QUESTION NO-6 (14 TH GROUP ELEMENTS)

1) How does graphite function as a lubricant

2) Diamond has high melting point – explain

3) Graphite is a good conductor-explain

4) How is water gas or blue gas prepared?

5) Write the use of ZSM-5

6) What is allotropy? Give the crystalline allotropes of carbon.

7) Write the hybridisation of carbon in the following
   (a) CO_2 (b) Diamond (c) Graphite (d) Fullerene

QUESTION NO-7 (S -BLOCK ELEMENTS)

1) What happens when magnesium metal is burnt in air?

2) Why are alkali metals not found in the free state in nature

3) Why is gypsum added to cement?

4) Which is called milk of magnesia? Give its uses?

5) What happens, When $Mg(NO_3)_2$ is heated? Give the balanced equation?

6) Lithium salts are mostly hydrated why?

7) Describe the important uses of sodium carbonate?

QUESTION NO-8 (13th GROUP ELEMENTS)

1) Give the formula of borazine. What is its common name?

2) What is inertpair effect?

3) Give two uses of Aluminium?

4) Explain why atomic radius of Ga is less than that of Al.

5) Explain why atomic radius of Ga is less than that of Al ?

QUESTION NO-9 **(THERMODYNAMICS)**

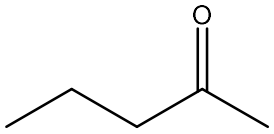
1) State the first law of thermodynamics. Explain its mathematical notation
2) What are intensive and extensive properties
3) State the third law of thermodynamics.
4) What is entropy? Explain with examples.
5) Define a system. Give an example.

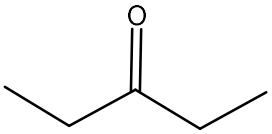
QUESTION NO-10 **(ORGANIC CHEMISTRY)**

1) Write the reagents required for conversion of benzene to methyl benzene.
2) Write a short note on a) Wurtz reaction b) Friedel craft alkylation
3) Write the structural formula of the given compounds -

   (a) 3,4,4,5 - Tetramethyl heptane (b) 2-Methyl -1-butene
4) Write the IUPAC names of

   (1) $CH_3-CH_2-CH_2-CH=CH_2$ (2) $CH_3-\overset{\overset{O}{\|}}{C}-CH_3$

   a) 

   b) 
5) Write the functional isomers of organic compound C_3H_6O.
6) What is fridel craft acylation?
7) What is polymerization of ethylene?
8) What is position isomerism?
9) What is decarboxylation ?
10) Kolbe"s electrolytic method?
11) How is nitrobenzene prepared.

II SHORT ANSWER QUESTIONS:

QUESTION NO-11 **(STATS OF MATTER)**

1) Deduce (a) Boyle's law and (b) Charle's law (c) Graham's law

   (d) Dalton's law from Kinetic gas equation.
2) Write the postulates of Kinetic Molecular Theory of Gases.
3) State and explain Graham's law of Diffusion?
4) State and explain Dalton's law of partial pressures.? Problems
5) Derive Ideal gas equation.

QUESTION NO-12 **(CHEMICAL BOND)**

1) Explain the hybridization involved in PCl_5 molecule.

2) What is Hydrogen bond Explain the different types of Hydrogen bonds with examples.

3) Explain the hybridization involved in SF_6 molecule

4) Predict the shape of the following molecules by using VSEPR theory

a) XeF_4 b) BrF_5 c) ClF_3 d) lCl_4^-

QUESTION NO-13 **(CHEMICAL BOND**

1) Explain the formation of Coordinate covalent bond with one example

2) Explain Fajan's rules and give suitable examples.

3) Define Dipole moment. Write its applications.

4) a) NH_3 has a higher dipole moment compared to NF_3 . Why?

b) dipole moment observed for NF_3 and not BF_3 . why?

OR

(THERMODYNAMICS)

1) State and explain the Hess's law of constant Heat summation.

2) State the second law of thermodynamics and explain it.

3) What is entropy explain with examples?

4) Explain spontaneity of a process in terms of Gibbs energy.

5) What are C_p and C_v? Show that $C_p - C_v = R$

QUESTION NO-14 **(STOICHIOMETRY)**

1) Balance the following redox equation by ion- electron method taking place in acidic medium.

a) $Cr_2O_7^{2-} + NO_2^- \rightarrow Cr^{3+} + NO_3^-$ b) $MnO_4^{-1} + SO_3^{-2} \rightarrow Mn^{2+} + SO_4^{-2}$

2) Determination of Empirical formula and molecular formula
A carbon compound contains 12.8%carbon, 2.1%hydrogen, 85.1% bromine. The molecular weight of the compound is 187.9. Calculate the molecular formula.

3) Determination of Empirical formula and molecula formula A compound having 4.07% hydrogen,

24.27% carbon and 71.65 % chlorine its molecular weight is 98.96 what are its emperical formula.

and molecular formula

4) Balance the following redox equation by ion-electron method taking place in basic medium.

$P_4 \xrightarrow{OH^-} PH_3 + H_2PO_2^-$ b) $MnO_4^- + I^- \rightarrow MnO_2 + I_2$

QUESTION NO-15 **(CHEMICAL EQUILIBRIUM)**

1) What is Lechatlier's principle? Discuss the application of lechatelier"S principle for the industrial

synthesis of ammonia by haber"s process?

2) Derive the relation between Kc and Kp for equilibrium reaction
a) $N_{2_{(g)}} + 3H_{2_{(g)}} \rightleftarrows 2NH_{3_{(g)}}$ b) $2SO_{2_{(g)}} + O_{2_{(g)}} \rightleftarrows 2SO_{3_{(g)}}$

3) a) What is a conjugate acid-base pair? Illustrate with examples.
b) Write conjugated acid and bases for following species
i) H_2O ii) NH_3 iii) HCO_3^- iv) HSO_4^- v) OH^- vi) H_2O_2

4) Explain the Arrhenius concept of acids and bases?

5) What are electron deficient compound. Explain why BF_3 act a Lewis acid.

QUESTION NO-16 (HYDROGEN AND ITS COMPOUNDS)

1) Explain the terms hard water and soft water. Write a note on the
(i) ion - exchange method and
(ii) Calgon method for the removal of hardness of water.

2) Explain the following with suitable examples
(a) electron-deficient hydrides b) Electron Precise hydrides c) Electron rich hydrides d) Ionic hydrides

3) Discuss with relevant chemical equations, various methods of preparing peroxide, wich of these methods is useful to prepare D_2O_2?

4) Write a few liens on the utility of hydrogen as a fuel ?

5) Write chemical reactions two justify that hydrogen peroxide can function as a oxidising as well as reducing agent

QUESTION NO-17 (13TH GROUP ELEMENTS)

1) Explain the structure of diborane.

2) Explain borax bead test with a suitable example.

3) Lithium reacts with water less vigorously than sodium. Give your reasons.

4) What are electron deficient compound? an electron deficient species.Explain

QUESTION NO-18 (S -BLOCK ELEMENTS)

.1) What is Plaster of Paris? Write a short note on it.

2) What do you know about Castner-Kellner process? Write the principle involved in it

3) Given an account of the biological importance of Na^+ and k^+ ions..

4) Give an account of the biological importance of Mg^{2+} and Ca^{2+}

OR

(14TH GROUP ELEMENTS)

1) Explain the difference in properties of diamond and graphite on the basis of their structure.

2) Why is diamond hard?

3) What do you understand by a) Allotropy b) inert pair effect c) catenation

4) Write a note on (a) silicates (b) zeolites (c) Fullerenes

LONG ANSWER QUESTION

QUESTION NO-19 (ATOMIC STRUCTUR)

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) How are the quantum numbers n, l and m, s arrived at? Explain the significance of these quantum. numbers.?

3) (a) Explain (i) Aufbau Principle (ii) Hund's Rule (iii) Pauli's Principle?
(b) Advantages and Limitations of Bohr's theory

QUESTION NO-20 **(PERIODIC TABLE)**

1) What is a periodic property? How the following properties vary in a group and in a period? Explain

(a) Atomic radius (b) IE (c) EN
(d) Electron gain enthalpy or electron affinity (e) Nature of oxides

2) Write an essay on s,p,d and f- block elements.

3) Define IE_1 and IE_2. Why is $IE_2 > IE_1$ for a given atom? Discuss the factors that affect IE of an element.

QUESTION NO-21 **(ORGANIC CHEMISTRY)**

1) Describe any two methods of preparation of benzene? Explain the halogenation, alkylation, acylation, nitration and sulphonation of benzene.

2) Describe two methods of preparation of ethylene. Give equation for the reaction of ethylene with the following
(a) Ozone (b) Hypohalous acid
(c) Cold and dil.alk $KMnO_4$ (d) Heated with O_2 at high pressure

3) How does acetylene react with the following reagents? Give the corresponding equation send and name the product formed in the reactions.
(a) Acetic acid (b) Water (c) Hydrogen (d) Halogens
(e) Hydrogen halide (f) Ammonical $AgNO_3$ andCu_2Cl_2

4) a) Complete the following reaction and name the product A, B and C.

$$CaC_2 \xrightarrow{H_2o} A \xrightarrow{hot\ metal\ tube} B \xrightarrow{AlCl_3+CH_3Cl} C$$

b) Name the products A, B and C formed in the following reactions. Give the equations for the reactions. Ethylene $\xrightarrow{Br_2/CCl_4} A \xrightarrow{Alc.KOH} B \xrightarrow{Br_2} C$

(OR)

(CHEMICAL BOND)

1) What do you understand by Hybridisation? Explain different types of hybridization involving s and p orbitals.
2) Give an account of VSEPR Theory, and its applications
3) Explain the factors favourable for the formation of Ionic compounds
4) Give the Molecular Orbital Energy Diagram of (a) N_2 and (b) Calculate the respective bond order. Write the magnetic nature of and molecules