MALAPPURAM DISTRICT HIGHER SECONDARY CHEMISTRY TEACHERS ASSOCIATION

OXY CHEMISTRY 3.0

FIRST YEAR MODEL EXAMINATION 3.4 BASED ON FOCUS AREA 2021

ANSWER KEY

Time 2 hrs **Cool Off Time : 20 minutes** **(Maximum score 60)**

Answer any 6 questions from 1 to 12. Each carries 2 scores. (6 X 2 = 12)

1. (i). Which one is not considered as a green housegas
(Water vapour, Ozone, Carbon monoxide, Methane, Carbon dioxide)
(ii). What is meant by green houseeffect. [2]

Ans (i). Carbon monoxide

(ii). Earth's atmosphere traps the heat from the sun and thus increasing the temperature of earth's surface.

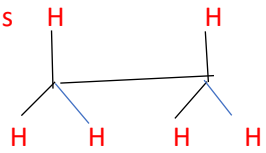
2. .Write the difference between inter molecular and intra molecular Hydrogen bond. [2]

Ans Inter molecular Hydrogen bonding take place in between two different molecules of same different compounds.

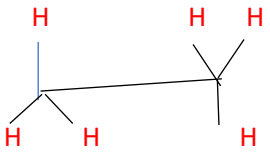
Intramolecular hydrogen bonding take place between hydrogen and an electro negative element.with in a molecule.

3. Draw Sawhorse projection formula for staggered and eclipsed conformations of ethane.
[2]

Ans



Eclipsed conformation



Staggered confirmation

4. . a) Name the test to detect the presence of Nitrogen in an organic compound . [1]
b) What is homologous series?
[1]

Ans a) Lassiagnes' test

b) A series of organic compounds which can be represented by a general formula and successive/ adjacent members differ by a -CH2- group is called homologous series.

5. . Suggest a method to convert ethyne to benzene . [2]

Ans Ethyne on passing through red hot iron tube, aromatisation take place to form Benzene.

6. State whether the following statements are true or false. [2]

(i) Sodium carbonate is commonly known as baking soda.

(ii) Group I elements are called alkali metals.

(iii) Sodium bicarbonate is a mild antiseptic for skin infections.

(iv) Except lithium chloride, other alkali metal chlorides form hydrates.

Ans (i). False (ii). True (iii). True (iv). False

7. (i). Important oxides of carbon are carbon monoxide and carbon dioxide.

Why carbon monoxide is considered as a poisonous gas?. [1]

(ii). Write the general formula of silicones. [1]

Ans (i).Carbon monoxide combines with haemoglobin of blood to form carboxy haemoglobin.

It destroys the oxygen carrying capacity of haemoglobin.

(ii). $(R_2SiO)_n$

8. State Hess's law of constant heat summation. [2]

Ans Hess's law states that whether a reaction is carried out in one step or several steps

total enthalpy change will be same

9.Calculate pH of 0.01M HCl.

[2]

pH = - log [H+]

= - log 10^{-2}

= 2

10. a) Name any one salt responsible for permanent hardness of water. [1]

b) Suggest one method to remove permanent hardness. [1]

Ansa] $CaCl_2$ / $CaSO_4$ /$MgCl_2$ /$MgSO_4$

b] Using washing soda/Calgon method/zeolite method/synthetic method.

11. Electron gain enthalpy of chlorine is greater than that of fluorine. why? [2]

Ans Due to small size, there is severe inter electronic repulsion in Fluorine.

12. Write the numerical values of universal gas constant (R in J/K mol ,L atm/ K mol and L bar /K mol [2]

Ans R = 8.314 JK-1mol-1

R = 0.0821 L atmK-1mol-1

R = 0.083 L bar K-1mol-1 (any two)

Answer any 8 questions from 13 to 28 Each carries 3 scores (3x8=24)

13. .Match the following:
[3]

A	B	C
1) Sodium	i) Lithium	a) Solvay process
2) Washing soda	ii) Liquid ammonia	b) Strong reducing agent
3) Alkali metal	iii) $Na_2CO_3.10H_2O$	c) Deep blue solution

Ans sodium – Liquid ammonia – Deep blue solution

Washing soda – $Na_2CO_3.10H_2O$ – Solvay process

Alkali metal – Lithium – Strong reducing agent

14. The simplest boron hydride is diborane
[3]
(i). Draw the structure of diborane.
(ii). From diborane how can you prepare borazine
(iii). Why borazine is called inorganic benzene.

Ans (i). Structure

(Ii). Diborane react with ammonia to get B2H6.2NH3, which on further heating gives borazine.

$3B_2H_6 + 6NH_3 \rightarrow 3[BH_2(NH_3)_2] + [BH_4] \xrightarrow{heat} 2B_3N_3H_6 + 12H_2$

(iii). Structure similar to that of benzene. 3. (i). Diamond, Graphite, Fullerene (ii). Graphite

(iii). sp_2 - Graphite or Fullerene sp_3 – Diamond

15. (i). Write any two harmful effect of acid rain. [1]
(ii). Biochemical Oxygen Demand (BOD) for pure water is about 1ppm.
What is the BOD value of highly polluted water? [1]
(iii). How the green chemistry is useful in bleaching of paper? [1]

Ans (i). Toxic to vegetables and aquatic life / Damage buildings / Corrode water pipes/

Dissolve heavy metals such as Cu, Pb, Hg, Al etc.

(ii). Greater than 17 ppm

(iii). Chlorine gas was used earlier for bleaching of paper. Now hydrogen peroxide with suitable

catalyst is an alternative to chlorine gas.

16Name different types of molecular hydrides . Give one example for each. [3]

Ans Electon deficient B_2H_6

Electron precise CH_4

Electron rich $H_2O/NH_3/HF$

17. Balance the given equation in acidic medium using half reaction method. [3]

$MnO_4^- + I^- \longrightarrow Mn^{2+} + I_2$

Ans $2\ MnO_4^- + 10\ I^- + 16H^+ \longrightarrow 2Mn^{2+} + 5I_2 + 8\ H_2O$

18.a) Write expression for K_c for the following reaction [1]

$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$

b) What is the relation between K_p and K_c for above reaction. [2]

Ans a) $K_c = \frac{[NH_3]^2}{[N_2][H_2]^3}$

b) $K_p = K_c (RT)^{\Delta n}$

$\Delta n = 2-4 = -2$

$K_p < K_c$

19.a) Identify the conjugate acid and conjugate base of the following . [2]

i) NH_3

Ii) HCO_3^-

b)Identify Lewis acid among the following [1]

i) NH_3 ii) Na^+ iii) Cl^- iv) $AlCl_3$

Ans a)conjugate acid NH_4^+ and H_2CO_3

Conjugate base NH_2^- and CO_3^{2-}

b) Na^+ and $AlCl_3$

20. Distinguish between intensive and extensive properties .

Give one example for each [3]

Ans Properties which doesnot depend on amount of substance present in system are known as intensive properties

Eg.T ,P, Density

Properties which depend on amount of substance present in system are known as extensive properties

Eg. V , Enthalpy , Entropy , Heat capacity

21.a) The hybridisation of carbon in ethane is sp^3 .Then what is the hybridization of Carbon in ethyne?

[1]

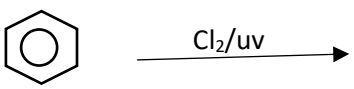
b) Explain the geometry of a molecule in which the hybridization involve "d" orbital. [2]

Ans a)sp hybridization

b) Explain the geometry of either PCl_5/ SF_6

22 .a) Explain the geometrical isomerism using 2-butene as example. [2]

b) Complete the following [1]



Ans a) Structure/ explanation of Cis and Trans forms of 2- butene

b) molecular formula/ structure/ equation of Benzene hexachloride

23.a) Give an example for homologous series [1]

b) Give the structural formula of the following:

i) 2,4,7- Tri methyl octane [1]

ii) 2-Chloro-4- methyl pentane

[1]

Ans a) Name/ general formula of any homologous series

b) structure of the compounds

24. 2 mol H_2& 2 mol O_2 combine to give 2 mol H_20.

a)Which reactant is the limiting reagent?

[1]

b)Why limiting reactant is called so?

[1]

c) Calculate the amount of excess reactant? [1]

Ans (a) H_2

(b) The limiting reagent will determine the amount of product formed.

(c) The amount of O_2 in excess = 1 mol.

25, (a) What are the conclusions of Alpha ray scattering experiment? [2]

(b) Write Rydberg formula.

[1]

Ans (a) →There is a positively charged centre within the atom.

→Most of the space within the atom is empty.

→The volume of +ve centre is very small comparing to the total volume of atom.

(b) wave number = $R_H \times Z^2\left[\frac{1}{n1\text{^}2} - \frac{1}{n2\text{^}2}\right]$

26. Quantum mechanical model gives information about orbital.

(a) Define orbital?

[1]

(b) Which quantum number is used to indicate the orbital? [1]

(c) Which quantum number has no direct relation with position of electron within atom? [1]

Ans (a) Orbital is the region of space around the nucleus where there is maximum

probability of finding an electron.

(b) Magnetic Quantum number.

(c) Spin Quantum number.

27. a) Atomic radius of noble gases is greater than halogens.Why? [1]

b) Ionisation enthalpy of Boron is less than Be. Why? [2]

Ans (a) Noble gases are monoatomic. They are non bonded. Their radii are usually

represented by Vander walls radii.

(b) Be has electronic configuration $1s^2\ 2s^2$, which is stable and it is very difficult to remove electron.

28a) Why real gases deviate from ideal behaviour? [2]

b) Write van der Waals equation for one mole of gas . [1]

Ans a) Real gases deviate from ideal behaviour due to two faulty statements in kinetic molecular theory of gas

(i) There is no intermolecular force of attraction between gaseous molecules.

(ii) Compared to total volume of gas volume of single molecule is negligible

b) $[P + a/V^2][V - b] = RT$

Answer any 6 questions from 29 to 40. Each carries 4 scores . (6 X 4 = 24)

29. a) Write possible chain isomers of the compound with molecular formula C_5H_{12}. [3]

b) How many Sigma and Pi bonds are present in the following

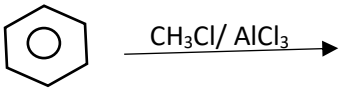
i) CH_3-CH_2-CH_3 ii) CH_3- CH=CH_2 [1]

Ans a) Structures/ names of n- pentane, iso pentane and neo pentane.

(pentane , 2-Methyl butane , 2,2-Dimethyl propane)

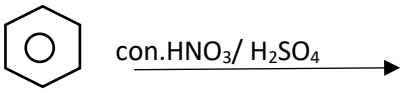
b) (i)10 Sigma, no pi bond (ii) 8 Sigma, 1 pi bond

30. Complete the following : [4]

a) 

b) CaC_2+ H_2O ⟶

c) CH_3COONa $\xrightarrow{NaOH+\ CaO}$

d) 

Ans a) Toluene/ structure

b) Ethyne / Acetylene and calcium hydroxide

c) CH_4 and Na_2CO_3

d) Nitro Benzene.

31. . (a). How will you prepare $Ca(OH)_2$ and $CaCO_3$ from CaO [2]

(b).Complete the following reaction [2]

(i). CaO +SiO_2 ⟶

(ii). $CaCO_3 + CO_2 + H_2O$ ⟶

Ans (a) $CaO + H_2O \rightarrow Ca(OH)_2$

$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

(b) . (i) $CaSiO_3$ (ii) $Ca(HCO_3)_2$

32. Some elements can exist in different crystalline forms and are called allotropes

(i) Write any two important allotropic forms of carbon. [2]

(ii) Which allotropic form of carbon is thermodynamically most stable? [1]

(iii) Name the allotropic forms of carbon in which carbon is undergoing sp^2 and sp^3 hybridisation. [1]

Ans (i). Diamond, Graphite, Fullerene

(ii). Graphite

(iii). sp2 - Graphite or Fullerene sp3 – Diamond

33. The spontaneity of a process is expressed in terms of Gibbs free energy change

(a) How is Gibbs free energy change related to enthalpy change and entropy change? [1]

(b) How is Gibbs free energy change useful in predicting feasibility of a process? [1]

(c) Enthalpy change and entropy change of a reaction are -20KJ/mol and -50J/K mol respectively. Identify the temperature at which reaction becomes spontaneous. [2]

Ans a) $\Delta G = \Delta H - T\Delta S$

b) ΔG = -ve reaction is spontaneous

c) At equilibrium $T = \dfrac{\Delta H}{\Delta S}$ S

$T = -20000/-50 = 400K$

Below 400K reaction is spontaneous

34. a) Write molecular formula of hydrogen peroxide. [1]

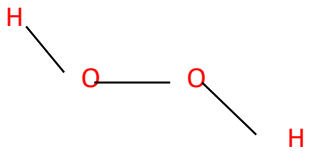
b) Draw structure of hydrogen peroxide. [1]

c) Why is hydrogen peroxide stored in wax lined glass or plastic vessels in dark. [1]

d) Give one use of hydrogen peroxide. [1]

Ans a) H_2O_2

b)



Open book like structure

c) In presence of light and alkali it decomposes to form H_2O and O_2

d) any one use like oxidising agent/ bleaching agent / antiseptic etc

35 . When some sodium acetate is added to a solution of acetic acid, the concentration of unionized acetic acid increases.

a) Write the phenomenon involved in the above statement ? Substantiate. [2]

b) What is homogeneous equilibrium ? Give an example. [1]

c) Give an example for acidic buffer. [1]

Ans a) common ion effect

Dissociation of a weak electrolyte at equilibrium is supressed by adding a strong electrolyte containing common ion

b) Equilibrium in which all reactants and products are in same phase is called homogeneous equilibrium

Eg . $N_{2\,(g)} + 3H_{2\,(g)} \longrightarrow 2NH_{3\,(g)}$

c) A solution of CH_3COOH and CH_3COONa or blood

36 . a) What do you mean by lone pair and bond pair of electrons. [2]

b) Based on bond order compare the relative stability of O_2 and O_2^- [2]

Ans a) Pair of electrons involved in the bond formation are called bond pair and those not used up for bond formation are called lone pair of electrons.

b) write MO configuration of both O_2 and O_2^-,

find bond order (O_2 is 2 and O_2^- is 1.5)

O2 more stable due to higher bond order

37. a) In terms of oxidation number define oxidation and reduction. [2]

b) Identify oxidizing and reducing agent in the following reaction. [2]

$H_2S + Cl_2 \longrightarrow 2HCl + S$

Ans a) Oxidation is a process in which oxidation number increases and reduction is a process in which oxidation number decreases

b) .oxidising agent Cl_2

Reducing agent H_2S

38. a) The compound NaCl is obtained from salt mines and sea water. Which law of chemical combination is illustrated here. State the law? [2]

b) Calculate the amount of CO_2 produced by complete combustion of 72g carbon? [2]

Ans (a) Law of Definite proportion. The same compound always contains same elements combined in the same fixed proportion by mass.

(b) $C + O_2 \rightarrow CO_2$

1 mol C → 1 mol CO_2

12g C → 44g CO_2

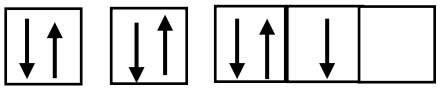
72g C → x CO

$\therefore x = \frac{72g \times 44g}{12g} = 264g.$

39. a) What are the defects of Bohr Atom model? [2]

b) The electronic configuration of an element is depicted as given below.

Which law of electronic configuration is violated here? State the law. [2]



Ans (a) 1. It fails to explain Zeeman effect, Stark effect & Fine spectrum.

2. It fails to explain the formation of chemical bonds.

(b) Hund's rule of maximum probability. No pairing of electrons occurs in degenerate orbitals until each orbital is singly occupied.

40. a) Write the equation to calculate compressibility factor (Z) ? [1]

b) What is 'Z' value for ideal gas? [1]

c) At 0̊C, N_2 gas has a volume of 2 litres. What will be its volume at 546K? [2]

Ans (a) $Z = \frac{PV}{nRT}$ OR $Z = \frac{(Vm)\ real}{(Vm)ideal}$

(b) Z = 1 (for ideal gas).

(c) T1 = 0̊C = 273K

V1 = 2L

T2 = 546K

V2 =?

$\frac{V1}{T1} = \frac{V2}{T2}$

2L/273K = V2/546K

2L x 546K = V2 x 273K

V2 = 4L.