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SAMPLE QUESTION PAPER

TERM-II

SESSION -2021-22

CHEMISTRY THEORY (043)

CLASS:XI

M.M :35 **TIME : 2 Hrs**

GENERAL INSTRUCTIONS:

Read the following instructions carefully.

1. There are 12 questions in this question paper with internal choice.
2. SECTION A - Q. No. 1 to 3 are very short answer questions carrying 2 marks each.
3. SECTION B - Q. No. 4 to 11 are short answer questions carrying 3 marks each.
4. SECTION C- Q. No. 12 is case based question carrying 5 marks.
5. All questions are compulsory.
6. Use of log tables and calculators is not allowed

SECTION – A

1. Consider the following acid base equilibrium :

   H_2SO_4 (aq) + CH_3COO^- (aq) $\rightleftharpoons$ CH_3COOH (aq) + HSO_4^-(aq)

   Write the two conjugate acid-base pair in the given equilibrium. 2

2. An alkali metal nitrate (A) when heated strongly produces a brown gas (B). Identify the compound A and B and write the complete reaction. 2

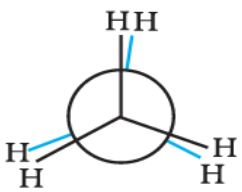
3. The solubility product of silver carbonate at 298 K is Ag_2CO_3 is $8x10^{-12}$. Calculate the solubility of the salt. 2

SECTION-B

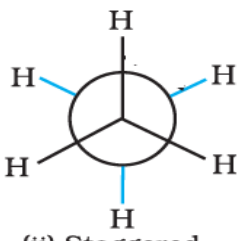
4. An alkene ‘A’ on ozonolysis gives two moles an aldehyde ‘B’ having molecular formula C_2H_4O.
   a) Write the IUPAC name of A and B
   b) Draw the geometrical isomers of alkene A. Which isomer is non polar and why? 1+2

OR

Rotation around C-C single bonds in an alkane leads to different spatial arrangements Of atoms in space. Each structure thus obtained due to C-C single bond rotation in alkane is called conformer. Newman’s projection of structure of two extreme conformations of ethane is shown below :



(i) Eclipsed



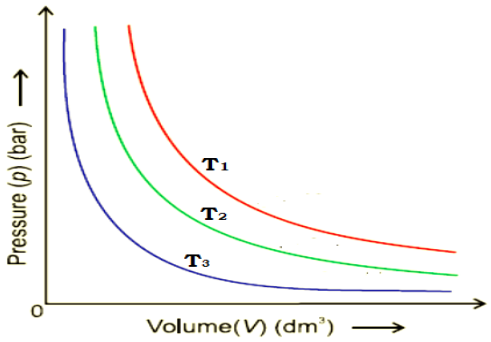
(ii) Staggered

a) Predict the total number of conformation of ethane molecule?
b) Which conformation of ethane has lowest torsional strain?
c) Is it possible to separate the extreme conformations of ethane.Give reason. 1+1+1

5. (a) Write van-der-waal Equation of state for n moles of gas.
(b) If the pressure correction factor in the van-der-waal equation for one mole is neglected then what will be value of compressibility factor? Mention the nature of deviation shown by the gas.
1+2

OR

(a) 3.1 g of a gas at 101°C occupies same volume as 0.187 g of Hydrogen gas at 37°C at same pressure. Calculate the molar mass of the gas.
(b) A plot of Pressure (P) vs Volume (V) for a gas at different values of temperature are shown in the figure below. 2+1



Which law is shown by the graph? Arrange the temperatures in increasing order.

6. Arrange the following in the increasing order of their property indicated :
a. Propyne , Benzene , Propene (pka values).
b. Toluene , Chlorobenzene , Nitrobenzene , Phenol (reactivity towards an electrophile)
c. n-Pentane , ethane , 2-methybutane, 2,2-dimethylpropane (boiling point) 1+1+1

7. At 197°C , equilibrium constant Kc for decomposition of PCl_5 is 8 x10^{-3}. If decomposition is depicted as, PCl_5 (g) $\rightleftharpoons$ PCl_3 (g) + Cl_2 (g)
(a) Calculate the value of Kc for the reverse reaction at same temperature.
(b) Calculate the value of Kp for the reaction at same temperature 1+2

OR

(a) State La Chatelier's Principle.
(b) At 500 K , the equilibrium constant Kc for the reaction
N_2 (g) +3H_2 (g) $\rightleftharpoons$ 2NH_3(g) is 0.061
The concentration of N_2 , H_2 and NH_3 at certain stage of reaction is 0.4 M , 0.3M and 0.06M respectively. In which direction the reaction will proceed. 1+2

8. (a) What is the structural difference between chlorides of boron and aluminium?
(b) Common oxidation state of Group 14 element is +2 &+4. Which member of Group 14 elements forms stable compound in +2 oxidation state compared to +4 oxidation state. Give reason 1+2

OR

(a) Compare the B-F bond length in BF_3 and BF_4^- ion.
(b) Which member of Group 14 element has unique tendency to form p-pie (π) bond? Explain.
(c) Which allotrope of carbon is soluble in benzene? 1+1+1

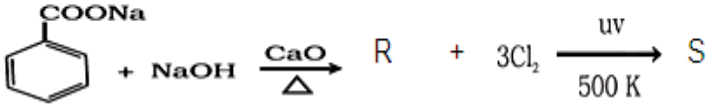
9. Account for the following :
   (a) Halides of boron on hydrolysis produces $[B(OH)_4]^-$ but halides of Al produces $[Al(H_2O)_6]^{3+}$ ion
   (b) CO is highly poisonous gas
   (c) Galium has higher ionisation enthalpy than aluminium 1+1+1

10. Carry out the following conversion
   (a) Ethyne to Acetophenone
   (b) Benzene to parachlorotoluene
   (c) Phenol to nitrobenzene 1+1+1

OR

(a) Complete the following sequences of following reaction

(i) $CH_2=CH-CH_2-CH+HBr \xrightarrow{(C_6H_5CO)_2O_2} P + Na \xrightarrow{\text{dry ether}} Q$

(ii) 

(b) Distinguish between propene and propane by a chemical reaction. 2 + 1

11. (a) Alkali metal dissolve in liquid ammonia and form deep blue solution.
   What is the change in magnetic nature of the solution when sodium is dissolved in ammonia and allowed to stand for sometime?
   (b) Arrange the following hydroxides in decreasing order of alkalinity
   NaOH, $Be(OH)_2$, KOH, LiOH, CsOH
   (c)Explain why Ba imparts colour in flame but Magnesium does not impart any colour. 1+1+1

SECTION C

12) Read the passage given below and answer the questions that follow

Thermodynamics deals with energy changes in chemical or physical processes an enables to study these changes quantitatively to make useful predictions. The energy stored within a substance is called the internal energy of the system. The changein internal energy (ΔU) of a system is the sum of all the energy inputs and outputs to andfrom the system. Work (W) and heat (Q) are the two modes ofinternal energy of the system. According to first law of thermodynamics the energyof isolated system is constant and mathematically it is expressed as $\Delta U = Q + W$. Heat exchange at constant pressure for any process gives the measure of enthalpy change (ΔH) of the system.

Every chemical reaction is associated with change of material as well as energy. The enthalpy change associated with a chemical reaction at 1 bar pressure and 298.15 K is called standard reaction enthalpy ($\Delta_r H^o$). According to Hess's law , for any chemical reaction the net heat exchange will be same whether the process occurs in one stage or in many stages.

According to second law of thermodynamics, in a spontaneous chemical reaction the net entropy of both the system as well as surrounding will increase, i.e ,$\Delta S_{total} > 0$. Gibbs free energy is another thermodynamic quantity that helps in predicting the direction of spontaneity of a process. Gibbse free energy is defined as G = H – TS where H = U+PV. For any chemical process at constant pressure and temperature Gibbs free energy of the system decreases, i.e , $\Delta G < 0$. U, H, S and G all are state

function and extensive property where as q and w are path function.

(a) Consider the following sublimation process : I_2 (solid) ----> I_2 (vapour)
At which condition of temperature the above reaction will be spontaneous?

(b) Although work done by the system is a path function, but when work is carried out Underspecific process then it is independent of the path.
What is the process when work behaves as a state function?

(c) State the relation between ΔU and ΔH for the given reaction at constant temperature and pressure

C_2H_6 (g) + 7/2 O_2 (g) ----------> $2CO_2$ (g) + $3H_2O$ (g).

(d) 8 gram of oxygen is compressed isothermally and reversibly at a temperature of 27°C from 10L to 5L. Calculate q and w for the process. Oxygen gas is behaving like an ideal gas. Given log 2=0.3 ,R =2 cal.K^{-1}mole^{-1}

OR

(d)Calculate the standard enthalpy of formation of CH_3OH(l) from the following data:

CH_3OH (l) + 3 /2 O_2 (g) → CO_2 (g) + $2H_2O$(l) ; $\Delta_r H\ 0 = -726$ kJ mol^{-1}
C (graphite) + O_2 (g) → CO_2 (g) ; $\Delta_c H\ 0 = -393$ kJ mol^{-1}
H_2 (g) + 1/ 2 O_2 (g) → H_2O(l) ; $\Delta_f H\ 0 = -286$ kJ mol^{-1}

1+1+1+2