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SET A



**INDIAN SCHOOL MUSCAT
SECOND TERM EXAMINATION
CHEMISTRY (043)**

CLASS: XI

Time Allotted: 2 hrs

26.02.2022

Max. Marks: 35

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.

1. Answer any two of the following

2x1

(a) Give an example for Wurtz reaction.

(b) What is the number of σ and π bonds in $N \equiv C - CH = CH - C \equiv N$?

(c) Name the type of hybridisation in C (2) and C (3) in the following molecule?

1 2 3 4



2. (a) Which type of intermolecular forces exist among the following?

2

(i) CO_2 and ammonia

(ii) HF

(iii) N_2

(iv) Na^+ and H_2O

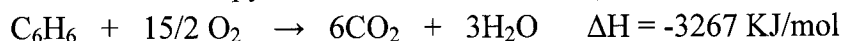
3. Using the equation of state $pV=nRT$; show that at a given temperature density of a gas is directly proportional to gas pressure p .

2

4. Define Hess's law.

3

Calculate the enthalpy of formation of benzene (C_6H_6) from the following data



OR

Define enthalpy of combustion.

Calculate the enthalpy of combustion of ethane using the following bond enthalpies.

$C-C = 347$, $C-H = 414$, $O=O = 498$, $C=O = 741$ and $O-H = 464$ all in KJ/mol.

5. (a) Write the I.U.P.A.C. names of 3
- (i) $\text{HC} \equiv \text{C} - \underset{\substack{| \\ \text{CH}_3}}{\text{CH}} - \text{CH} = \text{CH}_2$
- (ii) $\text{CH}_2 = \text{CH} - \text{CH}(\text{CH}_3) - \text{CH} = \text{CH} - \text{CH} = \text{CH}_2$
- (b) How will you distinguish between Propene and propyne?

OR

- (a) What happens when 1-Bromopropane is being treated with alcoholic KOH?
- (b) Using Huckel's rule, Prove benzene is aromatic
- (c) Butanal and pentan-3-one are the ozonolysis products of an alkene. What is the structural formula and IUPAC name of the alkene?
6. (a) How will you convert ethyne to benzene? 3
- (b) Benzene is highly unsaturated, yet it does not give usual addition reactions readily. Why?
- (c) The boiling point of hydrocarbons decreases with increase in branching. Give reason.
7. (a) What are real gases? 3
- (b) Why real gases deviate from ideal behaviour?
- (c) Give the conditions for real gases to behave ideally.
8. (a) Calculate the entropy change in surroundings when 1.00 mol of $\text{H}_2\text{O}_{(l)}$ is formed under standard conditions at 298 K. Given $\Delta_r H^\circ = -286 \text{ kJ mol}^{-1}$. 3
- (b) Predict the sign of ΔS for the reactions?
- (i) $\text{CaCO}_3(\text{s}) \rightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$
- (ii) $2 \text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2 \text{H}_2\text{O}(\text{g})$
9. (a) Write the conjugate acids of the following: 3
- NH_2^- , HCO_3^-
- (b) Given below are the dissociation constant values of few acids. Arrange them in order of increasing acidic strength.
- $\text{H}_2\text{SO}_3 = 1.3 \times 10^{-2}$, $\text{HNO}_2 = 4 \times 10^{-4}$
- $\text{CH}_3\text{COOH} = 1.8 \times 10^{-5}$, $\text{HCN} = 4 \times 10^{-10}$
- (c) What are Lewis acids and bases?

OR

- (a) If concentrations are expressed in mol L^{-1} and pressures in atmospheres, what is the ratio of K_p to K_c for the reaction
- $2\text{SO}_2 + \text{O}_2 \rightleftharpoons 2\text{SO}_3$
- at 25°C ? [$R = 0.0821 \text{ Latm K}^{-1} \text{ mol}^{-1}$]
- (b) Under what condition $K_p = K_c$ for a gaseous reaction?

10. Draw the Newmann projection formula for staggered and eclipsed conformation of ethane. Which of these conformations are more stable and why? 3

OR

Addition of HBr to propene yields 2-Bromopropane, while in presence of benzoyl peroxide, the same reaction yields 1-Bromopropane. Explain

11. (a) Arrange the following set of compounds in order of their decreasing relative reactivity with an electrophile E⁺. 3

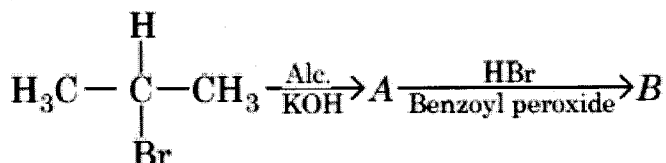
(i) Benzene ; 2, 4 -Dinitrochlorobenzene ; p-Nitrochlorobenzene

(b) Out of cis-but-2-ene and trans-but-2-ene which is polar, and which one is non-polar?

(c) How will you convert benzene to p-nitrobromobenzene?

OR

(a) Write structures of A and B in the following reaction :

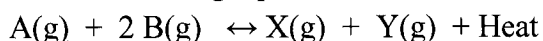


(b) Explain Friedel–Crafts alkylation reaction with an example.

12. Read the passage given below and answer the following questions:

Le Chatelier's principle is also known as the equilibrium law, used to predict the effect of change on a system at chemical equilibrium. This principle states that equilibrium adjust the forward and backward reactions in such a way as to accept the change affecting the equilibrium condition. When factor like concentration, pressure, temperature, inert gas that affect equilibrium, the equilibrium will shift in that direction where the effects that caused by these changes are nullified. This principle is also used to manipulate reversible reaction to obtain suitable outcomes.

(a) Consider the following equilibrium



What happens to the concentration of X when

(i) Y is removed from the system

(ii) Pressure is reduced

(iii) Temperature is increased

(iv) Catalyst is added to the system

(b) Calculate the pH of 0.08 M solution of a weak acid. The ionization constant of the weak acid is 2.5×10^{-5} .

OR

(b) 10 moles of HI is heated in a closed vessel of volume 2 L at 500 K. If 40 % of HI is dissociated at equilibrium calculate K_c for the reaction.



End of the Question Paper



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4. SECTION C - Q. No. 12 is case based question carrying 5 marks.
5. All questions are compulsory.

1. Answer any two 1x2
 - (a) Give an example of one ortho -para directing and one meta directing group.
 - (b) What is the number of σ and π bond in $\text{N} \equiv \text{C} - \text{CH} = \text{CH} - \text{C} \equiv \text{N}$?
 - (c) Name the type of hybridisation in C (2) and C (3) in the following molecule?

$$\begin{array}{cccc} 1 & 2 & 3 & 4 \\ \text{CH} & = & \text{C} & - & \text{CH} & = & \text{CH}_2 \end{array}$$
2. (a) Calculate the entropy change in surroundings when 1.00 mol of $\text{H}_2\text{O}(l)$ is formed under standard conditions at 298 K. Given $\Delta_f H^\circ = -286 \text{ kJ mol}^{-1}$. 2
 (b) Predict the sign of ΔS for the reactions
 (i) $\text{CaCO}_3(s) \rightarrow \text{CaO}(s) + \text{CO}_2(g)$
 (ii) $2 \text{H}_2(g) + \text{O}_2(g) \rightarrow 2 \text{H}_2\text{O}(l)$
3. Calculate the pressure exerted by 2 moles of oxygen when enclosed in a vessel of 10 L capacity at the temperature of 27°C . $R = 0.0831 \text{ L bar K}^{-1} \text{ mol}^{-1}$ 2
4. (a) What will be the enthalpy change for the following reaction? 3

$$\text{H}_2(g) + \text{Br}_2(g) \rightarrow 2\text{HBr}(g)$$

 Given that the bond energy of H_2 , Br_2 and HBr is 435 kJ mol^{-1} , 192 kJ mol^{-1} and 368 kJ mol^{-1} respectively.
 (b) The enthalpy of atomisation for the reaction $\text{CH}_4(g) \rightarrow \text{C}(g) + 4\text{H}(g)$ is 1665 kJ mol^{-1} . What is the bond energy of C – H bond?

OR

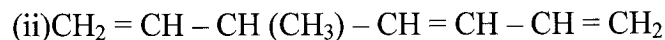
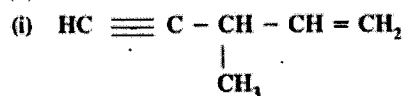
Define enthalpy of combustion.

Calculate the enthalpy of combustion of ethane using the following bond enthalpies.

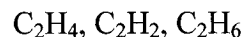
C-C = 347, C-H = 414, O=O = 498, C=O = 741 and O-H = 464 all in KJ/mol.

- 5 (a) Write the I.U.P.A.C. names of

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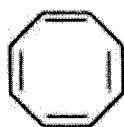
- (b) Arrange the following in the decreasing order of acidic character?



OR

- (a) Write the product when 2-Bromopropane is being treated with alcoholic KOH?

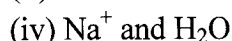
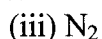
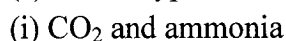
- (b) Explain why the following system is not aromatic?



- (c) Predict the products of reductive ozonolysis of pent-2-ene.

- 6 (a) Which type of intermolecular forces exist among the following?

3

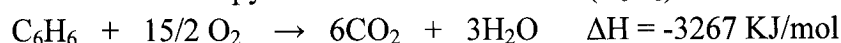


- (b) Explain the physical significance of van der Waals' constants.

7. Define Hess's law.

3

Calculate the enthalpy of formation of benzene (C_6H_6) from the following data



8. (a) What are real gases?

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- (b) Why real gases deviate from ideal behaviour?

- (c) Give the conditions for real gases to behave ideally.

9. (a) How will you convert benzene into p-nitrobromobenzene?

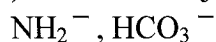
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- (b) Draw the cis and trans structures of hex-2-ene. Which isomer will have higher boiling point and why?

OR

Draw the Newmann projection formula for staggered and eclipsed conformation of ethane. Which of these conformations are more stable and why?

10. (a) Write the conjugate acids of the following:



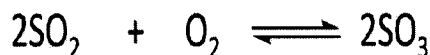
- (b) Write the conjugate bases of the following:



- (c) What are Lewis acids and bases?

OR

- (a) If concentrations are expressed in mol L^{-1} and pressures in atmospheres, what is the ratio of K_p to K_c for the equilibrium



at 25°C ? [$R=0.0821\text{LatmK}^{-1}\text{mol}^{-1}$]

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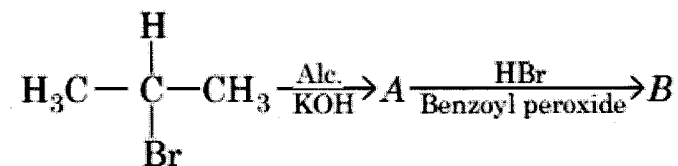
(i) Benzene ; 2, 4 -Dinitrochlorobenzene ; p-Nitrochlorobenzene

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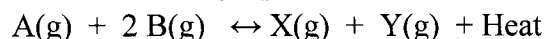


- (b) Explain Friedel–Crafts alkylation reaction with an example.

12. Read the passage given below and answer the following questions: 5

Le Chatelier's principle is also known as the equilibrium law, used to predict the effect of change on a system at chemical equilibrium. This principle states that equilibrium adjust the forward and backward reactions in such a way as to accept the change affecting the equilibrium condition. When factor like concentration, pressure, temperature, inert gas that affect equilibrium, the equilibrium will shift in that direction where the effects that caused by these changes are nullified. This principle is also used to manipulate reversible reaction to obtain suitable outcomes.

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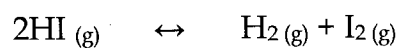
What happens to the concentration of X when

- (i) Y is removed from the system
- (ii) Pressure is reduced
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- (iv) Catalyst is added to the system

(b) Calculate the pH of 0.08 M solution of a weak acid. The ionization constant of the weak acid is 2.5×10^{-5} .

OR

(b) 10 moles of HI is heated in a closed vessel of volume 2 L at 500 K. If 40 % of HI is dissociated at equilibrium calculate K_c for the reaction.



End of the Question Paper



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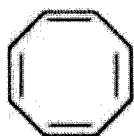
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$$\begin{array}{ccccccc} 1 & 2 & 3 & 4 \\ CH & = & C & - & CH & = & CH_2 \end{array}$$
2. Calculate the pressure exerted by 2 moles of oxygen when enclosed in a vessel of 10 L capacity at the temperature of $27^\circ C$. $R = 0.0831 \text{ L bar K}^{-1} \text{ mol}^{-1}$ 2
3. (a) Given below are the dissociation constant values of few acids. Arrange them in order of increasing acidic strength. 2
 $H_2SO_3 = 1.3 \times 10^{-2}$, $HNO_2 = 4 \times 10^{-4}$
 $CH_3COOH = 1.8 \times 10^{-5}$, $HCN = 4 \times 10^{-10}$
 (b) Give the conjugate acid and conjugate base of HCO_3^-
4. (a) Write the I.U.P.A.C. names of 3
 - (i) $HC \equiv C - \underset{\substack{| \\ CH_3}}{CH} - CH = CH_2$
 - (ii) $CH_2 = CH - CH(CH_3) - CH = CH - CH = CH_2$
 (b) Arrange the following in the decreasing order of acidic character?
 C_2H_4 , C_2H_2 , C_2H_6

OR

- (a) Predict the product when 2-bromopropane is being treated with alcoholic KOH?
 (b) Explain why the following system is not aromatic?



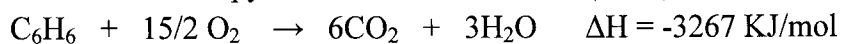
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 (ii) $2 \text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2 \text{H}_2\text{O}(\text{l})$

OR

Define Hess's law.

Calculate the enthalpy of formation of benzene (C_6H_6) from the following data



- 6 (a) A gaseous mixture contains 56 g N_2 , 44 g CO_2 and 16 g CH_4 . The total pressure of the mixture is 720 mm Hg. What is the partial pressure of CH_4 ? ($\text{N}=14\text{u}$, $\text{C}=12\text{u}$, $\text{O}=16\text{u}$, $\text{H}=1\text{u}$) 3
 (b) What do you mean by aqueous tension?
- 7 (a) How will you convert ethyne to benzene? 3
 (b) Benzene is highly unsaturated, yet it does not give usual addition reactions readily. Why?
 (c) Which of the following has higher boiling point? Give reason
 (i) 2-methylpentane (ii) 2,3-dimethylbutane
- 8 (a) Which type of intermolecular forces exist among the following? 3
 (i) CO_2 and ammonia (ii) HF
 (iii) N_2 (iv) Na^+ and H_2O
 (b) Explain the physical significance of van der Waals' constants.
- 9 (a) What will be the enthalpy change for the following reaction? 3

$$\text{H}_2(\text{g}) + \text{Br}_2(\text{g}) \rightarrow 2\text{HBr}(\text{g})$$

 Given that the bond energy of H_2 , Br_2 and HBr is 435 kJ mol^{-1} , 192 kJ mol^{-1} and 368 kJ mol^{-1} respectively.
 (b) The enthalpy of atomisation for the reaction $\text{CH}_4(\text{g}) \rightarrow \text{C}(\text{g}) + 4\text{H}(\text{g})$ is 1665 kJ mol^{-1} . What is the bond energy of C – H bond?

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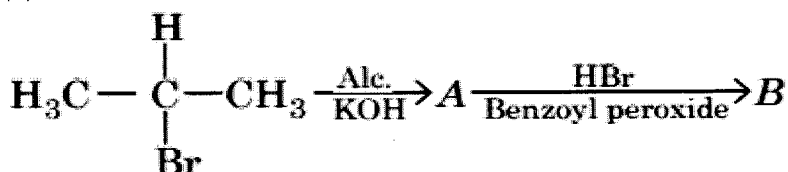
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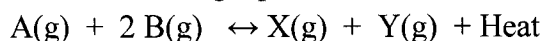
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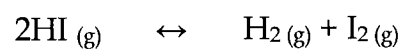
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