

**GULF SAHODAYA EXAMINATION –2016**  
**(Saudi Chapter)**

**Class: XI**  
**Sub : Chemistry**

**SET A**

**Max.Marks:70**  
**Time : 3 hrs**

**General instructions:**

- (i) All questions are compulsory.
- (ii) Questions 1 to 5 are very short answer questions carrying 1 mark each.
- (iii) Question numbers 6 to 10 are short answer questions carrying 2 marks each
- (iv) Question number 23 is a value based question, carrying 4 marks.
- (v) Question numbers 24 to 26 are long answer questions, carrying 5 marks each.
- (vi) Use log tables, if necessary. Use of Calculator is not permitted.

1. Show by a chemical reaction with water that  $\text{Na}_2\text{O}$  is a basic oxide.
2. State Aufbau principle.
3. Liquids at high altitudes boil at lower temperatures in comparison to that at sea level .Give reason.
4. Solubility of  $\text{AgCl}$  in water at  $25^\circ\text{C}$  is  $1.06 \times 10^{-5} \text{ mol L}^{-1}$ .  
Calculate the solubility product ( $K_{sp}$ ) of  $\text{AgCl}$  at this temperature.
5. Draw geometrical isomers of  $\text{CHCl} = \text{CHCl}$
6. 45.4 L of nitrogen reacted with 22.7 L of  $\text{O}_2$  to form 45.4 L of nitrogen oxide as per the equation  $2\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \longrightarrow 2\text{N}_2\text{O}(\text{g})$   
(i) Which law is obeyed here? (ii) State the law.
7. How many photons of light with a wavelength of 4000 pm are necessary to provide 1 J of energy? ( $h = 6.626 \times 10^{-34} \text{ Js}$ )  
OR  
Calculate the Debroglie wavelength of an electron (mass =  $9.1 \times 10^{-31} \text{ kg}$ ) moving at 1 % speed of light. ( $h = 6.626 \times 10^{-34} \text{ Js}$ ).
8. (a) Write the Lewis structure of nitrite ion ,  $\text{NO}_2^-$   
(b) Although both  $\text{CO}_2$  and  $\text{H}_2\text{O}$  are triatomic molecules, the shape of  $\text{H}_2\text{O}$  molecule is bent while that of  $\text{CO}_2$  is linear .Explain this on the basis of dipole moment.

SET A

9. a) Draw the structure of  $\text{BeCl}_2$  (solid) and  $\text{BeCl}_2$  (vapour).  
 b) Name two hormones that control the concentration of calcium in blood plasma.
10. Balance the following equation in acidic medium by ion electron method.  
 $\text{MnO}_4^- (\text{aq}) + \text{Fe}^{2+} (\text{aq}) \longrightarrow \text{Fe}^{3+} (\text{aq}) + \text{Mn}^{2+} (\text{aq})$
11. Define (a) Inductive effect (b) Negative resonance effect (c) Carbanion
12. a) Write the number of unpaired electrons present in the ground state of Phosphorous atom ( $Z = 15$ ).  
 b) List the quantum numbers ( $n$  and  $l$ ) for 4f orbital.  
 c) State the physical significance of  $\psi^2$
13. a) Suggest a method to purify the liquids which have high boiling points and decompose below their boiling points.  
 b) Which is expected to be more stable and Why?
- $\text{O}_2\text{NCH}_2\text{CH}_2\text{O}^-$       or       $\text{CH}_3\text{CH}_2\text{O}^-$
- c) Write the name of isomerism of the following compounds  
 $\text{CH}_3-\text{O}-\text{CH}_2\text{CH}_2\text{CH}_3$     and     $\text{C}_2\text{H}_5-\text{O}-\text{C}_2\text{H}_5$
- OR
- a) Differentiate between electrophile and nucleophile.  
 b) Give the bond line structural formulae of the following  
 i) 2, 2, 4-Trimethylpentane    ii) 3-Nitrocyclohexene
14. a) What is the (i) hybridisation (ii) shape (iii) bond angle of  $\text{PCl}_5$ ?  
 b) Why are the axial bonds of  $\text{PCl}_5$  longer than equatorial bonds?
15. A gaseous mixture containing 50 g of nitrogen and 10 g of oxygen were enclosed in a vessel of 10 L capacity at  $27^\circ\text{C}$ . Calculate (i) the number of moles of each gas (ii) the partial pressure of each gas (iii) the total pressure of the gaseous mixture.  
 ( $R=0.0821 \text{ LatmK}^{-1}\text{mol}^{-1}$ , Atomic mass of  $\text{N}=14 \text{ u}$ ,  $\text{O} = 16 \text{ u}$ )
16. a) Express the change in internal energy of the system when no heat is absorbed by the system from the surroundings, but work is done on the system.  
 What type of wall does the system have?  
 b) State third law of thermodynamics  
 c) If the standard free energy change for a reaction is found to be zero, what will be its equilibrium constant?
17. a) Define limiting reagent.  
 b) Calculate the mass of sodium acetate ( $\text{CH}_3\text{COONa}$ ) required to make 500 mL of 0.375 molar aqueous solution. Molar mass of sodium acetate is  $82.0245 \text{ gmol}^{-1}$
18. a) What do you mean by biochemical oxygen demand?

SET A

- b) What is smog? Differentiate between classical smog and photochemical smog.
19. a) State Hess's law of constant heat summation.  
b) It is planned to carry out the reaction:  
$$\text{CaCO}_3(\text{s}) \longrightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g}) \text{ at } 1273 \text{ K and } 1 \text{ bar pressure.}$$
$$\Delta H^0 = 176 \text{ kJmol}^{-1} \text{ and } \Delta S^0 = 157.2 \text{ Jmol}^{-1}.$$
Is the reaction spontaneous at this temperature and pressure?
20. Give reasons:  
a) Potassium carbonate cannot be prepared by Solvay process.  
b) LiI is more soluble than KI in ethanol.  
c) A solution of  $\text{Na}_2\text{CO}_3$  is alkaline.
- 21 a) Explain the principle of paper chromatography.  
b) Draw the orbital diagram showing hyper conjugation in ethyl cation.  
c) Sodium salt of which acid is needed for the preparation of propane?  
Write chemical equation for the reaction.
22. a) A boy has reported the radii of Cu,  $\text{Cu}^+$ ,  $\text{Cu}^{2+}$  as 0.096nm, 0.122nm, and 0.072nm respectively. However it has been noticed that he interchanged the values by mistake. Assign the correct values to different species.  
b) Differentiate between the terms ionization enthalpy and electron gain enthalpy.
23. As a futuristic step towards 'Going Green', Japan announced an innovative idea to widely replace automobiles, which use petrol and diesel as the dominating source of fuel and introduce into mainstream, vehicles fuelled by hydrogen. Hydrogen is used in fuel cells for generating electrical energy. It has many advantages over the conventional fossil fuels.  
a) Write any one advantage of hydrogen over fossil fuels?  
b) What do you mean by hydrogen economy?  
c) Write any one method of preparation of hydrogen.  
d) What are the values shown by the country in adopting such a radical change?
24. a) State LeChatliers's principle  
b) Consider the reaction  $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{SO}_3(\text{g})$   
$$\Delta H = + 189.4 \text{ kJ mol}^{-1}$$
Indicate the direction in which the equilibrium will shift when  
(i) temperature is increased (ii) pressure is decreased.
- c) The ionization constant of acetic acid is  $1.74 \times 10^{-5}$ . Calculate the degree of dissociation of acetic acid in its  $4.35 \times 10^{-2} \text{ M}$  solution and pH of the solution.

OR

SET A

- a) Derive an expression for ionisation constant ( $K_a$ ) of weak acids.  
 b) The equilibrium constant for the reaction for the following reaction is  $1.6 \times 10^{-5}$  at 1024K,  $H_2(g) + Br_2(g) \rightleftharpoons 2 HBr(g)$   
 Find the equilibrium pressure of all gases if 10 bar of HBr is introduced into a sealed container at 1024K.

25. a) How can you explain higher stability of  $BCl_3$  as compared to  $TiCl_3$ ?  
 b) Suggest a reason as to why CO is poisonous.  
 c) What are silicones? Explain the method of preparation of silicones.

OR

Account for the following:

- a) Write balanced equations (i) Silicon dioxide is treated with hydrogen fluoride  
 (ii) Boric acid is added to water  
 b) Boron is unable to form  $BF_6^{3-}$  ion c) A mixture of dilute NaOH and aluminium pieces is used to open a drain d) Graphite is used as a lubricant.
- 26 a) Explain Markovnikov rule taking a suitable example.

- b) Convert benzene into (i) p-nitrobromobenzene (ii) acetophenone  
 c) Complete the equations: (i)  $CH_3CH_2Cl + KOH (alc) \longrightarrow$   
 (ii)  $CH_2 = CH_2 + H_2O + [O] \xrightarrow{dil. KMnO_4}$

OR

- a) Explain Wurtz reaction.  
 b) Draw Newman projections for staggered and eclipsed conformations of propane.  
 c) What are the necessary conditions for a system to be aromatic?  
 d) Identify X, Y.  $CH \equiv CH \xrightarrow{\text{red hot iron tube, } 873 \text{ K}} X \xrightarrow{\text{Con. HNO}_3, \text{ Con H}_2\text{SO}_4} Y$

**GULF SAHODAYA EXAMINATION –2016**  
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**SET B**

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- (iv) Question number 23 is a value based question, carrying 4 marks.
- (v) Question numbers 24 to 26 are long answer questions, carrying 5 marks each.
- (vi) Use log tables, if necessary. Use of Calculator is not permitted.

1. State Pauli Exclusion Principle.
2. Draw geometrical isomers of  $C_2H_5CH=CHC_2H_5$
3. Liquids at high altitudes boil at lower temperatures in comparison to that at sea level .Give reason.
4. Solubility of AgCl in water at  $25^{\circ}C$  is  $1.06 \times 10^{-5} \text{ mol L}^{-1}$ .  
Calculate the solubility product (Ksp) of AgCl at this temperature.
5. Show by a chemical reaction with water that  $Cl_2O_7$  is an acidic oxide.
6. a) Write the Lewis structure of CO molecule  
b) Although  $NH_3$  and  $H_2O$  molecules are distorted tetrahedral, bond angle in water is less than that in ammonia. Explain.
7. How many photons of light with a wavelength of 4000 pm are necessary to provide 1 J of energy? ( $h = 6.626 \times 10^{-34} \text{ Js}$ )  
OR  
Calculate the Debroglie wavelength of an electron (mass =  $9.1 \times 10^{-31} \text{ kg}$ ) moving at 1 % speed of light. ( $h = 6.626 \times 10^{-34} \text{ Js}$ ).
8. 45.4 L of nitrogen reacted with 22.7 L of  $O_2$  to form 45.4 L of nitrogen oxide as per the equation  $.2N_2(g) + O_2(g) \longrightarrow 2N_2O(g)$   
(i) Which law is obeyed here? (ii) State the law.

**SET B**

9. a) Beryllium and magnesium do not give colour to the flame whereas other alkaline earth metals do so. Why?  
b) Name two hormones that control the concentration of calcium in blood plasma.
10. b) Balance the following equation in acidic medium by ion electron method.  
$$\text{MnO}_4^- (\text{aq}) + \text{Fe}^{2+} (\text{aq}) \longrightarrow \text{Fe}^{3+} (\text{aq}) + \text{Mn}^{2+} (\text{aq})$$
11. a) Define limiting reagent.  
b) Calculate the mass of sodium acetate ( $\text{CH}_3\text{COONa}$ ) required to make 500 mL of 0.375 molar aqueous solution. Molar mass of sodium acetate is  $82.0245 \text{ gmol}^{-1}$
12. a) Suggest a method to purify the liquids which have high boiling points and decompose below their boiling points.  
b) Which is expected to be more stable and Why?
- $\text{O}_2\text{NCH}_2\text{CH}_2\text{O}^-$  or  $\text{CH}_3\text{CH}_2\text{O}^-$
- c) Write the name of isomerism of the following compounds  
 $\text{CH}_3-\text{O}-\text{CH}_2\text{CH}_2\text{CH}_3$  and  $\text{C}_2\text{H}_5-\text{O}-\text{C}_2\text{H}_5$
- OR
- a) Differentiate between electrophile and nucleophile.  
b) Give the bond line structural formulae of the following  
i) 2, 2, 4-Trimethylpentane    ii) 3-Nitrocyclohexene
13. a) Write the number of unpaired electrons present in the ground state of Silicon atom ( $Z = 14$ ).  
b) List the quantum numbers ( $n$  and  $l$ ) for 3d orbital.  
c) What do you understand by the term threshold frequency?
14. A gaseous mixture containing 50 g of nitrogen and 10 g of oxygen were enclosed in a vessel of 10 L capacity at  $27^\circ\text{C}$ . Calculate (i) the number of moles of each gas (ii) the partial pressure of each gas (iii) the total pressure of the gaseous mixture.  
( $R = 0.0821 \text{ LatmK}^{-1}\text{mol}^{-1}$ , Atomic mass of  $\text{N} = 14 \text{ u}$ ,  $\text{O} = 16 \text{ u}$ )
15. a) What is the (i) hybridisation (ii) shape (iii) bond angle of  $\text{SF}_6$ ?  
b) With the help of MO theory explain why  $\text{Be}_2$  molecule does not exist?
16. a) Express the change in internal energy of the system when no heat is absorbed by the system from the surroundings, but work is done on the system.  
What type of wall does the system have?  
b) State third law of thermodynamics  
c) If the standard free energy change for a reaction is found to be zero, what will be its equilibrium constant?
17. Define (a) Electromeric effect (b) Positive resonance effect (c) Carbocation

**SET B**

18. a) Write a brief note on acid rain.  
 b) What do you mean by ozone hole? write any one consequence of it.
19. a) State Hess's law of constant heat summation.  
 b) It is planned to carry out the reaction:  

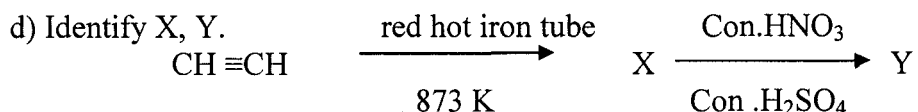
$$\text{CaCO}_3(\text{s}) \longrightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g}) \text{ at } 1273 \text{ K and } 1 \text{ bar pressure.}$$

$$\Delta H^0 = 176 \text{ kJmol}^{-1} \text{ and } \Delta S^0 = 157.2 \text{ Jmol}^{-1}.$$
 Is the reaction spontaneous at this temperature and pressure?
20. a) Explain the principle of paper chromatography.  
 b) Draw the orbital diagram showing hyper conjugation in ethyl cation.  
 c) Sodium salt of which acid is needed for the preparation of propane?  
 Write chemical equation for the reaction.
21. a) A boy has reported the radii of Cu, Cu<sup>+</sup>, Cu<sup>2+</sup> as 0.096nm, 0.122nm, and 0.072nm respectively. However it has been noticed that he interchanged the values by mistake. Assign the correct values to different species.  
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 a) Potassium carbonate cannot be prepared by Solvay process.  
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23. As a futuristic step towards 'Going Green', Japan announced an innovative idea to widely replace automobiles, which use petrol and diesel as the dominating source of fuel and introduce into mainstream, vehicles fuelled by hydrogen. Hydrogen is used in fuel cells for generating electrical energy. It has many advantages over the conventional fossil fuels.  
 a) Write any one advantage of hydrogen over fossil fuels?  
 b) What do you mean by hydrogen economy?  
 c) Write any one method of preparation of hydrogen.  
 d) What are the values shown by the country in adopting such a radical change?
24. a) Explain Markovnikov rule taking a suitable example.  
 b) Convert benzene into (i) p-nitrobromobenzene (ii) acetophenone  
 c) Complete the equations: (i)  $\text{CH}_3\text{CH}_2\text{Cl} + \text{KOH (alc)} \longrightarrow$   
 (ii)  $\text{CH}_2 = \text{CH}_2 + \text{H}_2\text{O} + [\text{O}] \xrightarrow{\text{dil. KMnO}_4}$

OR

SET B

- Explain Wurtz reaction.
- Draw Newman projections for staggered and eclipsed conformations of propane.
- What are the necessary conditions for a system to be aromatic?



25. a) State LeChatliers's principle
- Consider the reaction  $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{SO}_3(\text{g}) \quad \Delta H = +189.4 \text{ kJ mol}^{-1}$   
Indicate the direction in which the equilibrium will shift when  
(i) temperature is increased (ii) pressure is decreased.
  - The ionization constant of acetic acid is  $1.74 \times 10^{-5}$ . Calculate the degree of dissociation of acetic acid in its  $4.35 \times 10^{-2} \text{ M}$  solution and pH of the solution.

OR

- Derive an expression for ionisation constant ( $K_a$ ) of weak acids.
  - The equilibrium constant for the reaction for the following reaction is  $1.6 \times 10^5$  at 1024K,  $\text{H}_2(\text{g}) + \text{Br}_2(\text{g}) \rightleftharpoons 2\text{HBr}(\text{g})$   
Find the equilibrium pressure of all gases if 10 bar of HBr is introduced into a sealed container at 1024K.
26. a) How can you explain higher stability of  $\text{BCl}_3$  as compared to  $\text{TlCl}_3$ ?
- Suggest a reason as to why CO is poisonous.
  - What are silicones? Explain the method of preparation of silicones..

OR

Account for the following:

- Write balanced equations for:  
(i) Silicon dioxide is treated with hydrogen fluoride  
(ii) Boric acid is added to water
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- Graphite is used as a lubricant.



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- (vi) Use log tables, if necessary. Use of Calculator is not permitted.

1. What is the oxidation state and covalency of  $[\text{AlCl}(\text{H}_2\text{O})_5]^{2+}$ ?
2. State Hund's rule of maximum multiplicity.
3. Solubility of AgCl in water at  $25^\circ\text{C}$  is  $1.06 \times 10^{-5} \text{ mol L}^{-1}$ .  
Calculate the solubility product ( $K_{sp}$ ) of AgCl at this temperature.
4. Draw geometrical isomers of  $\text{C}_6\text{H}_5\text{CH}=\text{CHCH}_3$ .
5. Liquids at a high altitudes boil at lower temperatures in comparison to that at sea level .Give reason.
6. How many photons of light with a wavelength of 4000 pm are necessary to provide 1 J of energy? ( $h = 6.626 \times 10^{-34} \text{ Js}$ )  
OR  
Calculate the Debroglie wavelength of an electron (mass =  $9.1 \times 10^{-31} \text{ kg}$ ) moving at 1 % speed of light. ( $h = 6.626 \times 10^{-34} \text{ Js}$ ).
7. a) What is milk of magnesia? Write any one use.  
b) Write a method of preparation of  $\text{BeCl}_2$ .
8. 45.4 L of nitrogen reacted with 22.7 L of  $\text{O}_2$  to form 45.4 L of nitrogen oxide as per the equation  $2\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \longrightarrow 2\text{N}_2\text{O}(\text{g})$   
(i) Which law is obeyed here? (ii) State the law.
9. a) Write the Lewis structure of  $\text{CO}_3^{2-}$   
b) Which out of  $\text{NH}_3$  and  $\text{NF}_3$  has higher dipole moment and why?

**SET C**

10. b) Balance the following equation in acidic medium by ion electron method.  
$$\text{MnO}_4^- (\text{aq}) + \text{Fe}^{2+} (\text{aq}) \longrightarrow \text{Fe}^{3+} (\text{aq}) + \text{Mn}^{2+} (\text{aq})$$
11. a) Write the Electronic configuration of Cr atom.(Z = 24)  
b) List the quantum numbers (n and l) for 5s orbital.  
c) What do you mean by Bohr radius?
12. a) Suggest a method to purify the liquids which have high boiling points and decompose below their boiling points.  
b) Which is expected to be more stable and Why?  
$$\text{O}_2\text{NCH}_2\text{CH}_2\text{O}^- \quad \text{or} \quad \text{CH}_3\text{CH}_2\text{O}^-$$
  
c) Write the name of isomerism of the following compounds  
 $\text{CH}_3-\text{O}-\text{CH}_2\text{CH}_2\text{CH}_3$  and  $\text{C}_2\text{H}_5-\text{O}-\text{C}_2\text{H}_5$   
OR  
a) Differentiate between electrophile and nucleophile.  
b) Give the bond line structural formulae of the following  
i) 2, 2, 4-Trimethylpentane      ii) 3-Nitrocyclohexene
13. a) Define limiting reagent .  
b) Calculate the mass of sodium acetate ( $\text{CH}_3\text{COONa}$ ) required to make 500 mL of 0.375 molar aqueous solution. Molar mass of sodium acetate is  $82.0245 \text{ gmol}^{-1}$
14. a) What is the (i) hybridisation (ii) shape (iii) bond angle of  $\text{CH}_4$ ?  
b) Calculate the bond order of  $\text{O}_2$  molecule?
15. Define (a) Negative electromeric effect (b) resonance effect (c) Free radical
16. A gaseous mixture containing 50 g of nitrogen and 10 g of oxygen were enclosed in a vessel of 10 L capacity at  $27^\circ\text{C}$ . Calculate (i) the number of moles of each gas (ii) the partial pressure of each gas (iii) the total pressure of the gaseous mixture.  
( $R=0.0821 \text{ LatmK}^{-1}\text{mol}^{-1}$ , Atomic mass of N=14 u, O = 16u )
17. a) Express the change in internal energy of the system when no heat is absorbed by the system from the surroundings, but work is done on the system.  
What type of wall does the system have?  
b) State third law of thermodynamics  
c) If the standard free energy change for a reaction is found to be zero, what will be its equilibrium constant?
18. a) What do you mean by green chemistry?

SET C

- b) List two gases that are responsible for green house effect .  
c) What are viable particulates?
19. Give reasons:  
a) Potassium carbonate cannot be prepared by Solvay process.  
b) LiI is more soluble than KI in ethanol.  
c) A solution of  $\text{Na}_2\text{CO}_3$  is alkaline.
20. a) Explain the principle of paper chromatography.  
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c) Sodium salt of which acid is needed for the preparation of propane?  
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23. As a futuristic step towards 'Going Green', Japan announced an innovative idea to widely replace automobiles, which use petrol and diesel as the dominating source of fuel and introduce into mainstream, vehicles fuelled by hydrogen. Hydrogen is used in fuel cells for generating electrical energy. It has many advantages over the conventional fossil fuels .  
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d) What are the values shown by the country in adopting such a radical change?
24. a) How can you explain higher stability of  $\text{BCl}_3$  as compared to  $\text{TlCl}_3$ ?  
b) Suggest a reason as to why CO is poisonous.  
c) What are silicones? Explain the method of preparation of silicones.

OR

SET C

Account for the following:

- Write balanced equations for: (i) Silicon dioxide is treated with hydrogen fluoride (ii) Boric acid is added to water
  - Boron is unable to form  $\text{BF}_6^{3-}$  ion
  - A mixture of dilute NaOH and aluminium pieces is used to open a drain
  - Graphite is used as a lubricant.
- 25 a) Explain Markovnikov rule taking a suitable example.
- Convert benzene into (i) p-nitrobromobenzene (ii) acetophenone
  - Complete the equations: (i)  $\text{CH}_3\text{CH}_2\text{Cl} + \text{KOH (alc)} \longrightarrow$   
(ii)  $\text{CH}_2 = \text{CH}_2 + \text{H}_2\text{O} + [\text{O}] \xrightarrow{\text{dil. KMnO}_4}$

OR

- Explain Wurtz reaction.
  - Draw Newman projections for staggered and eclipsed conformations of propane.
  - What are the necessary conditions for a system to be aromatic?
  - Identify X, Y.  

$$\text{CH} \equiv \text{CH} \xrightarrow[873 \text{ K}]{\text{red hot iron tube}} \text{X} \xrightarrow[\text{Con. H}_2\text{SO}_4]{\text{Con. HNO}_3} \text{Y}$$
26. a) State LeChatliers's principle

- Consider the reaction  $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{SO}_3(\text{g})$   $\Delta H = +189.4 \text{ kJmol}^{-1}$   
Indicate the direction in which the equilibrium will shift when  
(i) temperature is increased (ii) pressure is decreased.
- The ionization constant of acetic acid is  $1.74 \times 10^{-5}$ . Calculate the degree of dissociation of acetic acid in its  $4.35 \times 10^{-2} \text{ M}$  solution and pH of the solution.

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