

**SSLC MODEL EXAMINATION**  
**FEBRUARY - 2020**  
**CHEMISTRY**  
**(English)**

Time 1  $\frac{1}{2}$  Hours

Total Score : 40

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**General Instructions:**

- The first 15 minutes is the cool - off time. You may use the time to read and plan your answers.
  - Answer the questions only after reading the instructions and questions thoroughly.
  - Five questions are given in each Section. Answer any four from each Section.
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SECTION - A

**Score**

(Answer **any 4** questions from **1 to 5**. Each question carries **1** score.)

1. Which one of the following subshells is not possible in an atom?  
(2p, 3f, 1s, 4d)
2. Which is the monomer of polythene?  
[Chlorine, Ethene, Vinyl chloride, Isoprene]
3. The relationship between volume and number of molecules of a gas at constant temperature pressure is known as \_\_\_\_\_.  
[Charles' law, Avagadro's law, Boyle's law, Le-Chatelier's Princiles]
4. When molten sodium chloride (NaCl) is electrolysed, the gas liberated at the anode is \_\_\_\_\_.
5. Find the relation and fill up suitably.  
Iron : Haematite  
Aluminium : \_\_\_\_\_.

**Section: B**

6. The molecular mass of water ( $H_2O$ ) is 18.  
(a) Find the mass of 1 GMM  $H_2O$ .  
(b) How many moles of molecules are there in 180 g of  $H_2O$  ?
7. Haematite is converted into iron by using the blast furnace.  
(a) Which are the substances fed into the blast furnace along with the ore of iron?  
(b) Which compound acts as the reducing agent in the blast furnace?
8.  $FeCl_2$  and  $FeCl_3$  are two different chlorides of iron.  
[Hint: Atomic number of Fe=26  
Oxidation state of Cl=(-1)]  
(a) Find the oxidation state of Fe in  $FeCl_2$ .  
(b) Write down the subshell wise electronic configuration of  $Fe^{3+}$ .
9. (a) Which homologous series do the hydrocarbons with general formula  $C_nH_{2n}$  belong to [alkane, alkene, alkyne]  
(b) Write the structural formula of a member of the same homologous series having 3 carbon atoms.
10. Soaps and detergents are cleansing agents.  
(a) Name the byproduct in the industrial production of soap.  
(b) How does excessive use of detergents destroy aquatic life?
11. The relation between the volume and temperature of a fixed mass of gas at constant pressure is shown in the table.

Volume (V) (L)	Temperature (T) (K)
600	300
400	(P)
(Q)	500

12. Electroplating is one of the practical utilities of electrolysis. Copper can be coated on an iron bangle by this process.  
(a) Which metal is connected to negative terminal of the battery in this process?  
(b) Which is the electrolyte used here?  
(c) Write down any other practical utility of electrolysis.

13. Match columns A, B and C suitably.

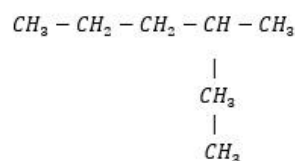
A Characteristics of ore	B Method of concentration	C Example
Ore particles are heavier than the impurities	Froth floatation	Tin stone
Ore particles are lighter than the impurities	Magnetic separation	Ore of gold
Magnetic nature of ore	Levigation	Zinc sulphide

14. (Which are the chemicals required for the preparation of ammonia in the laboratory?

(b) Which is the drying agent used to remove moisture from ammonia?

(c) The gas jar used for collecting ammonia is kept inverted. Why? a)

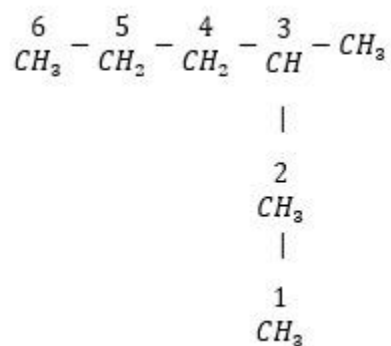
15. Given below is the structural formula of a hydrocarbon.



(a) What is the molecular formula of this hydrocarbon?

(b) Name the branch present.

(c) Write down the IUPAC name of this hydrocarbon.



(c) Number of carbon atoms in the main chain: 6 Word root: Hex Suffix: ane Name of the alkyl group coming as branch: methyl Position of the branch: 3 IUPAC name of the given compound is 3-methyl hexane.

16. The atomic number of element X is 12. [Symbol is not real]

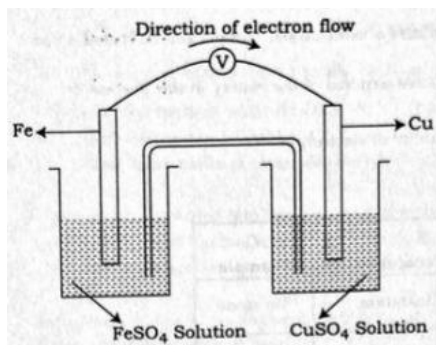
(a) Write the subshell wise electronic configuration of X.

(b) Which period does this element belong to?

(c) Which block does it belong to ?

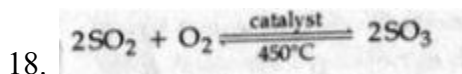
(d) Write down the molecular formula of the chloride of X.  
[Hint: Valency of Cl=1]

17.



The given diagram represents a galvanic cell.

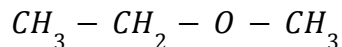
- Which metal acts as the anode?
- At which electrode reduction takes place?
- Write down the chemical equation for the reduction reaction at this electrode.
- Cu electrode is replaced by Ag electrode in this cell. Which metal will act as the anode then?



Represents an important stage in the Industrial Preparation of Sulphuric acid.

- By what name is the Industrial Preparation of Sulphuric acid known as?
- Which is the catalyst used in this process?
- How do the following changes influence the forward reaction?
  - More oxygen ( $\text{O}_2$ ) is added
  - Pressure is decreased

19. The structural formula of an organic compound is given below:



- Identify the functional group present in this compound.
- What are the compounds with the given functional group commonly called?
- Write down the structural formula of its functional isomer and its IUPAC name.

20.

Substitution reaction,  
Polymerisation,  
Combustion, Addition reaction,  
Thermal cracking

Choose the name of the reaction from the box and complete the table.

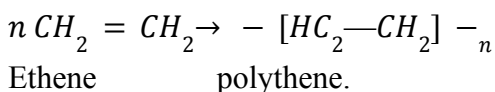
Chemical Equation	Name of the reaction
$CH_2 = CH_2 + H_2 \rightarrow CH_3 - CH_3$	(a)
$CH_3 - CH_3 + Cl_2 \rightarrow CH_3 - CH_2Cl + HCl$	(b)
$CH_3 - CH_2 - H_3 \rightarrow CH_2 = CH_2 + CH_4$	(c)
$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$	(d)

### ANSWERS

1. The third shell(M) has a maximum of 18 electrons. All the '18' electrons are filled by 3s, 3p and 3d subshells. Since, there are no electrons left. Therefore, the 3f subshell does not exist.

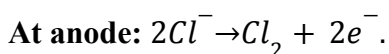
Subshell	s	p	d
Maximum number of electrons that can be accommodated	2	6	10

2. Polythene is a polymer. Its monomer is ethene. Polymerisation reaction is given below:



3. At constant temperature and pressure, the volume of a gas is directly proportional to the number of molecules. This relationship between volume and number of molecules of a gas at constant temperature and pressure is known as Avagadro's law.

4. When molten sodium chloride ( $NaCl$ ) is electrolysed, the gas liberated at the anode is chlorine ( $Cl_2$ ). The reaction is given below:



5. In the given relationship, haematite is an ore of iron. Therefore, we should search for ore of aluminium. Bauxite is the ore of aluminium.

### Section: B

6. (a) The amount of a substance in grams equal to its molecular mass is called gram molecular mass. Therefore, 1 GMM is equal to the molecular mass in grams of a molecule. The molecular mass of water ( $H_2O$ ) is 18 g. So, the mass of 1 GMM of water ( $H_2O$ ) is 18 g.

(b)

$$\text{No. of GMM} = \frac{\text{Given mass in grams}}{\text{Grams Molecular mass (GMM)}}$$

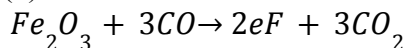
$$\therefore \text{No. of GMM} = \frac{180g}{18g} = 10$$

Since, 1 GMM = 1 Mole

Therefore, 10 GMM = 10 moles

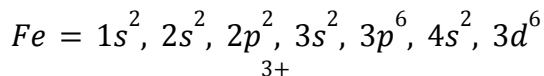
7. (a) Haematite is converted into iron using the blast furnace. Blast of hot air is passed through the bottom of the furnace. Haematite, limestone, and coke are fed into the furnace through a special arrangement at the top of the furnace.

(b) The reduction of haematite into iron is done by the carbon monoxide.



8. (a) In  $FeCl_2$ , has oxidation state of -1. There are two chlorine atoms in the compound. The total of the oxidation numbers of all the atoms in a neutral compound is zero. Therefore, in  $FeCl_2$  Fe has oxidation state of +2 as  $Fe^{2+}$ .

(b) The atomic number of iron is 26. In iron the electronic configuration of iron is:

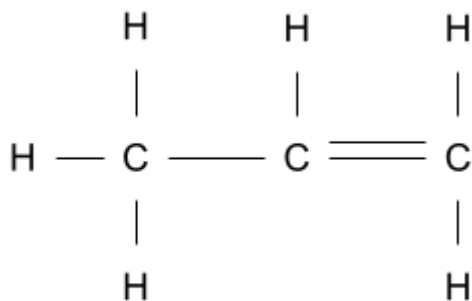


When it forms,  $Fe^{3+}$  cation, it loses 2 electrons from outermost subshell (4s) and 1 electron from (3d). Therefore, subshell wise electronic configuration of  $Fe^{3+}$  is  $1s^2, 2s^2, 2p^2, 3p^2, 3s^2, 3d^5$ .

9. (a) Alkenes has general formula  $C_n H_{2n}$ . The first homologue of this series is ethene ( $CH_2 = CH_2$ ), which can be obtained by putting  $n = 2$  in the general formula.

(b) The formula for three carbon atoms can be obtained by putting  $n = 3$  in the general formula. Therefore, for  $n = 3$ , the chemical formula is  $C_3 H_6$ .

$C_3H_6$  is known as propene. Structural formula of propene is  $CH_2 = CH - CH_3$ . Its structure is given below:



PROPENE

**10. (a)** Soap is the salt formed when oils and fats react with alkalis. Sodium hydroxide and potassium hydroxide are commonly used alkalis. Glycerol is obtained as a by-product in the industrial production of soap.

(b) The excessive use of the detergents causes environmental problems. The microorganisms in water cannot decompose the components of detergents. Hence, the detergents released into water leads to the destruction of aquatic life. For example, the detergents which contain phosphate increases the growth of algae and limits the quantity of oxygen. Therefore, it decreases the quantity of oxygen leading to death of the aquatic organisms.

**11. (a)** Here, the pressure is constant. Therefore, we will use charle's law. Charle's law states that, at constant pressure, the volume of a definite mass of a gas is directly proportional to the temperature in Kelvin scale. If V is volume and T the temperature, then  $V/T$  will be a constant.

$$\therefore \frac{600}{300} = \frac{400}{P} \Rightarrow P = 200 \text{ K} \left\{ \text{using } \frac{V}{T} = \text{constant} \right\}$$

Similarly for calculating the value of Q, apply charle's law:

$$\frac{600}{Q} = \frac{300}{500} \Rightarrow Q = 1000 \text{ K} \left\{ \text{using } \frac{V}{T} = \text{constant} \right\}$$

(b) Charle's law is associated with the given relation.

**12. (a)** The most common application of electrolysis is electroplating. Electroplating is a process of coating one metal with another using an electric current. The article to be coated is connected with the negative terminal of the battery which means iron bangle is connected to the negative terminal of the battery.

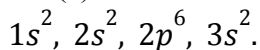
(b) A salt solution of the metal to be coated is taken as the electrolyte. Copper sulphate ( $CuSO_4$ ) is the electrolyte used in the electroplating of iron bangles. The electrolyte is a salt of the anode metal which gets dissociated into its respective ions. The positive ions are called cations, and the negative ions are called anions. The current in the solution is due to the flow of these ions. The anions move towards the anode, and the cations move towards the cathode. The cations are converted into





(c) Number of carbon atoms in the main chain: 6 Word root: Hex Suffix: ane Name of the alkyl group coming as branch: methyl Position of the branch: 3 IUPAC name of the given compound is 3-methyl hexane.

16. (a) The subshell wise electronic configuration of element 'X' is



(b) The period number is the same as the shell number of the outermost shell in the subshell electronic configuration. The shell number of outermost shell ( $3s^2$ ) is 3. Therefore, the period number of the element X is 3.

(c) The outermost electrons of the element X are filled in 's' subshell. Hence, the element 'X' belongs to the s-block.

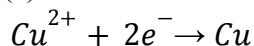
(d) The outermost electrons of the element X are filled in 's' subshell. Hence, the element 'X' belongs to the s-block. Also, element 'X' belongs to  $2^{nd}$  group as it has 2 electrons in the last subshell. The valency of "X" is 2 because it requires two electrons to gain its stability. Therefore, the symbol of ion is  $X^{2+}$ . Since, the valency of chloride is given -1. So X will take two chlorine atoms to make the compound neutral as a whole. Hence, the molecular formula of chloride of X is  $XCl_2$ .

17. (a) From the reactivity series, we know that *Fe* has higher reactivity than *Cu*.

That is *Fe* loses two electrons and becomes  $Fe^{2+}$ . An electrode at which oxidation occurs is called 2+ anode. Therefore, *Fe* acts as the anode.

(b) The electrons liberated from the *Fe* rods reach the copper electrode through the external circuit and these electrons are received by copper ions in the solution changing them into copper. Therefore reduction takes place at the copper electrode.

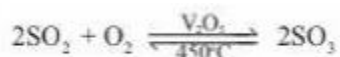
(c) The reduction reaction at cathode is given below:



(d) From the reactivity series, we know that *Fe* has higher reactivity than *Ag*. That is *Fe* loses two electrons and becomes  $Fe^{2+}$ . An electrode at which oxidation occurs is called anode. Therefore, *Fe* acts as the anode.

18. (a) Sulphuric acid is industrially prepared by the contact process.

(b) The catalyst used in this process is vanadium pentoxide  $V_2O_5$ . The reaction is shown below:



c)

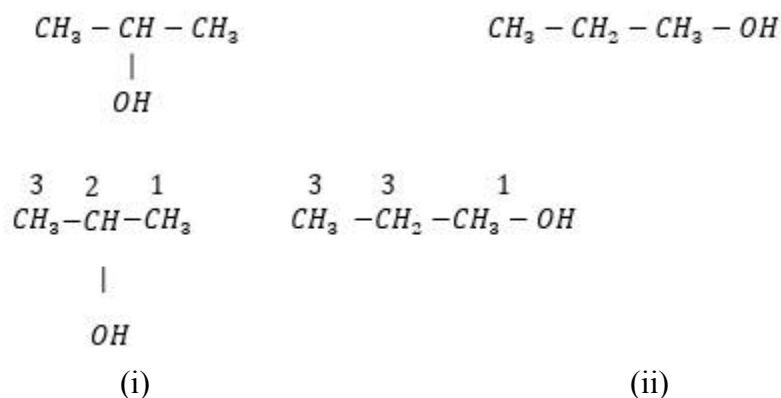
(i) Here, concentration of oxygen  $O_2$  is increased. According to Le Chatelier's principle, the system rearranges by converting the increased amount of reactant into products. Therefore, rate of forward reaction increases and consequently concentration of  $SO_2$  is increased.

(ii) Here, both reactants and products are gases. 3 moles of reactant molecules are giving 2 moles of product molecules. In a gaseous system, decreases in the number of molecules helps to decrease the pressure. According to the Le Chatelier's principle, when the pressure increases, the equilibrium will shift towards the direction in which the number of gaseous molecules decreases. If the pressure decreases, the equilibrium will shift towards the direction in which the number of gaseous molecules increase. Since here the pressure decreases, the reaction will proceed backwards.

19. (a) The function group present in the given compound is alkoxy group ( $R' - O - R$ ). This compound can be viewed in two different ways. One with alkoxy group as  $- O - CH_3$  and other with alkoxy group as  $CH_3 - CH_2 - O$ .

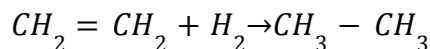
(b) The compounds with alkoxy group are called as ethers.

(c) Compound having the same molecular formula, but having a difference in their functional groups in compounds are known as functional isomers. The functional isomer of the given compounds is  $CH_3CH_2CH_2OH$ . There are two structural formula possible for this molecular formula, which are given below:

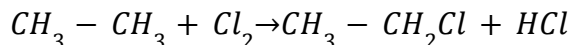


The IUPAC name of the first compound is propan-2-ol and IUPAC name of the second compound is propan-1-ol.

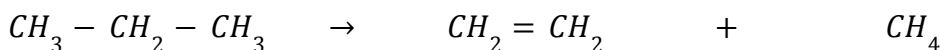
20. (a) The organic compounds with carbon-carbon double or triple bonds combine with hydrogen to form saturated compounds; such reactions are called addition reactions.



(b) When ethane reacts with chlorine hydrogen atoms of ethane are replaced by chlorine atoms. This is called substitution reaction. The reaction is given below:



(c) Some hydrocarbons with high molecular masses, when heated in the absence of air, undergo decomposition to form hydrocarbons with lower molecular masses. This process is called thermal cracking. For example, thermal cracking of propane.



Propane

Ethene

Methane

(d) When hydrocarbon burn they combine with the oxygen in the air to form  $CO_2$  and  $H_2O$  along with heat and light. This process is called combustion.

