**EFOTEC**

**Class: S5( All)**

**Date: 20/4/2020**

**Mark: 70Marks**

**Model Questions of CHEMISTRY FOR S5 STUDENT**

**Choose the letter that corresponds to the correct answer (15marks)**

1. Which of the following does NOT exhibit geometric isomerism? (Hint: draw them!)

A) 4-octene B) 2-pentene C) 3-hexene D) 2-hexene E) 1-hexene

1. Analysis of a sample of a covalent compound showed that it contained 14.4% hydrogen and 85.6% carbon by mass. What is the empirical formula for the compound?

A) CH B) CH2 C) CH3 D) C2H3 E) none of these

1. An organic compound X contains carbon, hydrogen and oxygen only. When 1.29g of X is burnt completely, 3.30g of carbon dioxide and 1.35g of water are formed. Which one of the followed is the empirical formula of X?
2. CH2O B) C2H6O C) C4H8O D) C5H10O E) C2H4O
3. What is the IUPAC name for the following compound?



A) 4-vinyl-2-pentyne B)4-methylhex-2-yn-5-ene C) 3-methylhex-4-yn-1-ene

D) 3-methylhex-1-en-4-yne E) 4-methylhex-5-en-2-yne

1. 1.4g of an alkene gives 3.8g of dichloroalkane on reaction with chlorine. Which one of the following is the molecular formula of the alkene.
2. C2H4 B) C3H6 C) C4H8 D) C6H12 E) C3H4
3. What is the number of moles of oxygen required for the complete combustion of one mole of butane?
4. 5.5 B) 6 C) 6.5 D) 7 E) 13
5. The mechanism of the reaction between propene and hydrogen chloride is:
6. Electrophilic addition B) Electrophilic substitution

C) Nucleophilic addition D) Nucleophilic substitution

E) Nucleophilic elimination

1. The limiting reagent in a chemical reaction is one that:
2. has the largest molar mass (formula weight).
3. has the smallest molar mass (formula weight).
4. has the smallest coefficient.
5. is consumed completely.
6. is in excess.
7. Which of the following statements is **FALSE** for the chemical equation given below in which nitrogen gas reacts with hydrogen gas to form ammonia gas assuming the reaction goes to completion?

N2 + 3H2 2NH3

1. The reaction of one mole of H2 will produce 2/3 moles of NH3.
2. One mole of N2 will produce two moles of NH3.
3. One molecule of nitrogen requires three molecules of hydrogen for complete reaction.
4. The reaction of 14 g of nitrogen produces 17 g of ammonia.
5. The reaction of three moles of hydrogen gas will produce 17 g of ammonia.
6. When iron pyrite (FeS2) is heated in air, the process known as "roasting" forms sulfur dioxide and iron(III) oxide. When the equation for this process is completed and balanced, using the smallest whole number coefficients, what is the coefficient for "O2"?

\_\_\_ FeS2 + \_\_\_ O2 \_\_\_ SO2 + \_\_\_ Fe2O3

A) 2 B) 4 C) 7 D) 8 E) 11

1. The segment -CH2CH2CH2CH2CH2CH2- represents the polymer named \_\_\_\_\_\_\_ .

A) polybutylene B) polyhexene C) polypropylene D) polystyrene

E) polyethylene

1. What is the sum of the coefficients in the balanced equation for the complete combustion of 2-methylbutane? Use smallest whole number coefficients. Do not forget coefficients of 1.

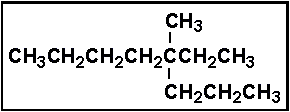
A) 10 B) 13 C) 17 D) 20 E) 23

1. Which of the following compounds displays optical isomerism?

A) CH2(OH)-CH2(OH) B) CH3-CHCl-COOH C) CH2=CHCl

D) CHCl=CHCl E) CH3-O-C2H5

1. Select the correct IUPAC name for:



A) 5-methyl-5-ethyloctane B) 5-methyl-5-propylheptane

C) 4-ethyl-4-methyloctane D) 3-methyl-3-propyloctane

E) 3-methyl-3-propylheptane

1. The name of the alkane isomer of cis-3-hexene is:

A) 2-methylpentane B) 3-methylpentane C) n-hexane

D) 2,3-dimethylbutane E) cyclohexane

**OPEN QUESTIONS (55 MARKS)**

1. Most of the fractions produced during fractional distillation are used as fuels.
2. Write an equation for the complete combustion of octane. **(1mark)**
3. Write two equations for the incomplete combustion of octane. **(2marks)**
4. Give two reasons why incomplete combustion is undesirable. **(1mark)**
5. This question concerns the isomers of C4H8.
6. Name the alkene CH3CH2CH=CH2 and Explain why it does not show geometrical isomerism. **(1mark)**
7. Draw and name an isomer of CH3CH2CH=CH2 which does show geometrical isomerism. **(1mark)**
8. Draw and name another isomer of CH3CH2CH=CH2 which does not show geometrical isomerism. **(1mark)**
9. A hydrocarbon was analysed and found to contain 2.4g of carbon and 0.5g of hydrogen. Its relative molecular mass is 58. (atomic mass of C=12, H=1)
10. Work out its empirical formula **(2marks)**
11. Work out its molecular formula **(1mark)**
12. Draw and name each structural isomer of this molecule. **(2marks)**
13. Discuss the difference in boiling points of the isomers in (c) above. **(2marks)**
14. Give the structural formula of the second member of the homologous series for each of the following functional group: ***(3marks)***

(a) Chloroalkane (b) Aldehyde (c) Carboxylic acid

(d) Amide (e) Nitrile (f) Amine

1. Some of the naphtha fraction is thermally cracked to produce more useful products.
2. Give the molecular formula of an alkane with ten carbon atoms. **(1mark)**
3. Write an equation to illustrate the thermal cracking of one molecule of tetradecane, C14H30, in which the products are ethene and propene, in the ratio of 2:1, and one other product. **(2marks)**
4. Write chemical equations of reaction (structural formulae) of the organic compounds given below and the products formed.
5. 2-Pentene + ozone  **(1mark)**
6. 2-Methyl 3-hexene + MnO4- **(1mark)**
7. But-2-ene + oxygen **(1mark)**
8. By giving appropriate reagents and conditions to be used in different equations of the steps of synthesis, write equations of reaction that enable the synthesis of

2,3-dimethylbut-2-ene from propane (CH3CH2CH3). **(4marks)**

1. Many naturally-occurring organic compounds can be converted into other useful products. Oleic acid can be obtained from vegetable oils. Oleic acid is an example of an unsaturated compound. CH3(CH2)7CH=CH(CH2)7COOH oleic acid.
2. Deduce the molecular formula and the empirical formula of oleic acid.**(2marks)**
3. Identify a reagent for a simple chemical test to show that oleic acid is unsaturated. State what you would observe when oleic acid reacts with this reagent. **(2marks)**
4. Ethane reacts with chlorine in bright sun light.
5. What do we call this type of reaction? ***(1mark)***
6. Write an equation to show the reaction between an ethane molecule and a

chlorine molecule. ***(1mark)***

1. What happens to start the reaction off? ***(1mark)***
2. What do we call this first step in the mechanism? ***(1mark)***
3. Give an equation to show one of the propagation steps in the reaction.

***(1mark)***

1. Explain what happens in a termination step. ***(1mark)***
2. Give three examples of possible termination steps for the reaction between ethane and chlorine. ***(1.5marks)***
3. If we have excess chlorine present, give the structural formula of the other

Halogenoalkanes made. ***(2.5marks)***

1. (a) Acid strength of hydrogen halides (group VII halides) increases down the group.
2. Describe the term “acid” according to Lowry-Brönsted theoy. ***(1mark)***

(ii) Explain the reason why HBr is stronger acid than HCl.

(Atomic number: Cl=17, Br=35). ***(1mark)***

(b) Copper is a metal with a high melting point and forms copper (I) chloride (CuCl).

(i) Write the full electronic configuration of Cu and that of Cu+ ion in terms of s,p,d and f notation. (Atomic number Cu: 29). ***(1mark)***

(ii) Indicate the block and period in the periodic table that contains copper.

***(1mark)***

(iii) Explain in terms of its structure and bonding why copper has a high melting point. ***(1mark)***

(iv) Explain why copper is ductile (can be stretched into wires). ***(1mark)***

1. The alkene A of the structure formula CH3CH=C(CH3)CH2CH3 reacts with hydrogen bromide to form CH3CH2CBr(CH3)CH2CH3, as the major product.
2. Give the name of this alkene and state the type of stereoisomerism shown by this compound. **(1mark)**
3. Draw and name the structural isomer of A that does not show the same type isomerism with alkene A. **(1mark)**
4. Name and outline a mechanism for the reaction between the alkene A and hydrogen bromide.**(3marks)**
5. Give the structure of the isomeric product also formed in the above reaction and explain why the two isomers are obtained in unequal amounts.**(2marks)**
6. Through exhaustive hydrogenation of a hydrocarbon C with molecular formula C9H16, C fixes 2 moles of hydrogen once catalyzed with Platinum as a powder to give another hydrocarbon D. By strong oxidation using acidified potassium permanganate solution, C gives acetone (CH3-CO-CH3), succinic acid (HOOC-CH2-CH2-COOH) and acetic acid (CH3-COOH).

Identify the structural formula and name of hydrocarbon C and D ***(3marks)***

***Stay@home***