This is a Class 1 exam

Lebanon Evangelical School for Boys and Girls

Lebanon Evangelical School

for Boys and Girls Loueizeh - Baabda

Stage Exam 04

20-25JUN2025

Do NOT write in this box. Your MARK will be placed here.

Subject :	Chemistry	
Class :	11S	
Teacher :	Mrs. Mirella Freige	
Duration :	1 hour	
You are to answer the questions to this exam on : Lined paper		
Your name :		*Time taken to complete exam*
Your Class :		
Exam Room :		
How many sheets, including cover sheet :		

- Do not open this paper until the teacher in charge instructs you to do so.
- The most important thing to remember in taking an exam is NEVER PANIC.
- If you are caught cheating in this exam, you will be awarded zero for ALL exams that are taken on this day.

Exercise I (16 points)

Identify the letter of the choice that best answers the statement.

1. What is the general formula for alkenes?

A. $C_n H_{2n+2}$
B. $C_n H_{2n}$
C. $C_n H_{2n-2}$
D. $C_n H_{2n-4}$

2. Which of the following is an example of an alkene?

A. Ethane
B. Propane
C. Butene
D. Methane

3. What type of bond is present between the carbon atoms in an alkene?

A. Single bond
B. Double bond
C. Triple bond
D. Ionic bond

4. Which reaction is characteristic of alkenes?

A. Substitution
B. Neutralization
C. Addition
D. Precipitation

5. What happens when bromine water is added to an alkene?

A. It turns green
B. It remains brown
C. It decolorizes
D. It produces a precipitate

6. Which of the following compounds is not an isomer of butene (C_4H_8)?

A. 1-butene
B. 2-butene
C. Cyclobutane
D. Butane

7. Alkenes can be converted to alkanes by:

A. Hydrogenation
B. Combustion
C. Halogenation
D. Dehydration

8. What is the systematic name of $CH_2 = CH - CH_3$?

A. Ethene
B. Propane
C. Propene
D. Butene

9. Which reagent is used to test for the presence of a carbon-carbon double bond?

A. Limewater
B. Benedict's solution
C. Bromine water
D. Sodium hydroxide

10. What is the main difference between alkanes and alkenes?

A. Alkenes are saturated hydrocarbons
B. Alkenes contain only single bonds
C. Alkenes contain at least one double bond
D. Alkenes contain hydroxyl groups

11. What is produced when ethene reacts with water in the presence of a catalyst?

A. Ethanol
B. Methanol
C. Ethane

12. What kind of isomerism is shown by 1-butene and 2-butene?

A. Chain isomerism
B. Functional group isomerism
C. Position isomerism

13. What is the molecular formula of hexene?

A. C_6H_{14}
B. C_6H_{10}
C. C_6H_{12}
D. C_6H_8

14. The reaction of an alkene with hydrogen in the presence of a nickel catalyst is called:

A. Hydrolysis
B. Hydration
C. Hydrogenation
D. Polymerization

15. What are the products formed during the complete combustion of ethene?

A. $CO + H_2O$
B. $CO_2 + H_2O$
C. $C + H_2O$
D. $CH_4 + O_2$

16. What is formed when an alkene reacts with chlorine gas?

A. A haloalkane
B. An alcohol
C. An alkane

Exercise II (7 points) Elemental Analysis of an organic compound

The complete combustion of 0.56 g of compound (A) produces 1.76 g of carbon dioxide CO_2 and 0.72 g of water vapor H_2O.

1- Determine the mass percentages of carbon and hydrogen in (A).

2- Deduce that compound (A) is a hydrocarbon.

3- The molar mass of (A) is M(A) = 70 g/mol. Determine its molecular formula.

4- If the molecule of compound (A) is linear, write the possible condensed structural formulas of (A) and give their systematic names.
Name the type of isomerism between them.

5- If the compound (A) is branched, write the possible condensed structural formulas of (A) and give their systematic names.

Exercise III **Chemical Reactions**

1- Thermal cracking (2 points)

The octane brought to 500°C and in the presence of a suitable catalyst breaks to give among others, propene and an alkane (A).

Determine the molecular formula of (A), then write the equation for the breakdown reaction of octane using condensed structural formulas.

2- Addition reactions (5 points)

Using condensed structural formulas, recopy and complete the following equations:

2.1. Propene + ... → 1,2-dichloropropane

2.2. Propene + H_2O → .....(major product)

2.3. 2-butene + Cl_2 → .....

2.4. .....+ .....→ 2-methyl-2-propanol

2.5. 2-pentene + ... → pentane

3- Hydrogenation of alkenes (5 points)

Catalytic hydrogenation of an alkene (A) gives a compound (B) whose mass percentage in hydrogen is 17.2%.

3.1. Write the equation for the hydrogenation reaction using general formulas.

3.2. Show that the alkene has the molecular formula C_4H_8.

3.3. Write the three possible condensed structural formulas of (A), and give their names.

3.4. Write the two possible condensed structural formulas of (B), and give their names.

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Exercise I ; (1pt each)

1. B	9. C
2. C	10. B
3. B	11. A
4. C	12. C
5. C	13. C
6. D	14. C
7. A	15. B
8. C	16. A.

Exercise II

$m(A) = 0.56\,g$

$m_{CO_2} = 1.76\,g$

$m_{H_2O} = 0.72\,g$.

1- $m_C = \frac{3}{11} \times m_{CO_2} = \frac{3}{11} \times 1.76 = 0.48\,g$. (1/4)

$m_H = \frac{1}{9} \times m_{H_2O} = \frac{1}{9} \times 0.72 = 0.08\,g$. (1/4)

$\%C = \frac{m_C}{m(A)} \times 100 = \frac{0.48}{0.56} \times 100 = 85.71\%$ (1/4)

$\%H = \frac{m_H}{m(A)} \times 100 = \frac{0.08}{0.56} \times 100 = 14.28\%$ (1/4)

2- $\%C + \%H = 85.71 + 14.28 = 99.99\% \simeq 100\%$ (1/4)

So (A) contains only Carbon and Hydrogen elements. (1/4)

3- $M(A) = 70\,g/mol$

Based on the Law of definite proportions: (1/2)

$$\frac{12x}{\%C} = \frac{y}{\%H} = \frac{M}{100} \Rightarrow \frac{12x}{85.71} = \frac{y}{14.28} = \frac{70}{100}$$

$\Rightarrow x = \frac{85.71 \times 70}{1200} = 4.99 \simeq 5$. (1/2)

and $y = \frac{14.28 \times 70}{100} = 9.99 \simeq 10$. (1/2)

(A): C_5H_{10}.

4- $CH_2=CH-CH_2-CH_2-CH_3$ 1-pentene. (1/2)

$CH_3-CH=CH-CH_2-CH_3$ 2-pentene (1/2)

Positional Isomers (1/2)

5- $CH_2=C(CH_3)-CH_2-CH_3$ 2-methyl-1-butene. (1)

$CH_3-C(CH_3)=CH-CH_3$ 2-methyl-2-butene. (1)

$CH_2=CH-CH(CH_3)-CH_3$ 3-methyl-1-butene. (1/2)

Exercise III

1. Octane $\longrightarrow$ propene + Alkane (A)

$C_8H_{18} \longrightarrow C_3H_6 + C_xH_y$

Law of Conservation of mass: Number of atoms of each element is conserved:

$8 = 3 + x \Rightarrow x = 5$

$18 = 6 + y \Rightarrow y = 12$.

(A): C_5H_{12}. (1)

$CH_3-CH_2-CH_2-CH_2-CH-CH_2-CH_2-CH_3 \rightarrow CH_3-CH=CH_2 + CH_3-CH_2-CH-CH_2-CH_3$ (1)

2.1) $CH_2=CH-CH_3 + Cl_2 \longrightarrow CH_2(Cl)-CH(Cl)-CH_3$ (1)

2.2) $CH_2=CH-CH_3 + H-OH \longrightarrow CH_3-CH(OH)-CH_3$

2-propanol (1)

2.3) $CH_3-CH=CH-CH_3 + Cl_2 \longrightarrow CH_3-CH(Cl)-CH(Cl)-CH_3$ (1)

2.4) $CH_2=C(CH_3)-CH_3 + H_2O \longrightarrow CH_3-C(OH)(CH_3)-CH_3$ (1)

2.5) $CH_3-CH=CH-CH_2-CH_3 + H_2 \longrightarrow CH_3-CH_2-CH_2-CH_2-CH_3$ (1)

3 3.1) $C_nH_{2n} + H_2 \longrightarrow C_nH_{2n+2}$ (1/2) % H = 17.2 %.

3.2) Law of definite proportions:

$$\frac{\%(H)}{\%\,H} = \frac{M_{compound}}{100} \Rightarrow \frac{2n+2}{17.2} = \frac{14n+2}{100}$$

$\Rightarrow \boxed{n=4}$; Alkene (A): C_4H_8 (2) proved.

3.3) $CH_2=CH-CH_2-CH_3$ (1/2) 1-butene

(A) $CH_3-CH=CH-CH_3$ (1/2) 2-butene

$CH_3-C(CH_3)=CH_2$ 2-methylpropene (1/2)

(B) $CH_3-CH_2-CH_2-CH_3$ Butane (1/2)

$CH_3-CH(CH_3)-CH_3$ (1/2) methylpropane