

FIRST EDITION

CHEMISTRY OF PETROCHEMICAL PROCESSES VOL. 1

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HAK CIPTA TERPELIHARA DAN PENAFIAN

HAK CIPTA TERPELIHARA

Tidak dibenarkan mengeluarkan mana-mana bahagian sama ada artikel, ilustrasi dan isi kandungan E-Book ini dalam apa jua bentuk dan dengan apa cara sekalipun, sama ada secara elektronik, fotokopi, rakaman atau cara lain sebelum mendapat izin bertulis daripada Donald Anak Juan, Nuraiman bin Abd Rahman, and Hafizah binti Naihi.

Tanggungjawab hakcipta tidak ada kena mengena dengan maklumat di dalam E-Book ini. Penulis tidak bertanggungjawab ke atas sebarang kesilapan ataupun maklumat yang tidak dimasukkan walaupun langkah berjaga-jaga sudah diambil.

PENAFIAN

Penerbitan ini mengandungi pandangan serta pengalaman penulis dan juga sumber dari yang boleh dipercayai. Ia bertujuan membantu dan menyediakan maklumat berkenaan perkara yang dibincangkan. Penulis tidak bertanggungjawab ke atas mana-mana kerugian, kehilangan atau risiko yang ditanggung oleh perseorangan atau sebagainya, yang timbul akibat daripada penggunaan mana-mana kandungan E-Book ini sama ada secara langsung ataupun tidak langsung.

INTRODUCTION

SYNOPSIS

This e-Book revolves around chemistry in hydrocarbon compounds namely alkanes and alkenes in the petrochemical industry in particular and the chemical, petroleum and process industries in general.

E-Book users will be exposed to the characteristics, uses, reactions and processes that occur for alkanes and alkenes in the petrochemical industry. Through this e-Book, users can not only understand and master alkanes and alkenes but they can also apply the knowledge they gain in their daily lives..

SINOPSIS

e-Book ini berkisarkan kepada kimia dalam sebatian hidrokarbon iaitu alkana dan alkena dalam industri petrokimia khususnya dan industri kimia, petroleum dan proses secara amnya.

Pengguna e-Book akan didedahkan dengan ciri-ciri, kegunaan, tindak balas serta proses-proses yang berlaku untuk alkana dan alkena di dalam industri petrokimia. Melalui e-Book ini, pengguna bukan sahaja dapat memahami serta menguasai alkana dan alkena malah mereka juga dapat mengaplikasikan pengetahuan yang mereka peroleh di dalam kehidupan seharian.



Donald Anak Juan

AUTHOR'S PROFILE

Authors background

The author is a graduate engineer (IEM), background of Chemical and Process Engineering before further studies in Chemical Engineering (Bioprocess). The author also has four years of industrial working experiences in one of Malaysia's leading petrochemical company.



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- Responsible as the course coordinator for courses such as Chemistry of Petrochemical Processes (2021 - present), Piping and Instrumentation Diagram (2015-2019), and Heat Transfer (2016-2017).
- Teach other courses such as Applied Chemistry, Process Engineering Lab 2 & 3, and Final Year Project (Project 1 & 2).

Nuraiman bin Abd Rahman



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The author hold a Bachelor of Chemical Technology, with a qualification on ensuring operational safety and regulatory compliance, he have experience in implementing and optimizing safety protocols within the department. In parallel, he have cultivated a dynamic skill set in software development over the past four years. This skills in software has enabled him to bridge technical knowledge with background in chemical technology and safety.



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PROCESSES, VOL. 1

Chapter 1

Paraffinic
Hydrocarbons



INTRODUCTION OF PARAFFINIC HYDROCARBONS

- Natural gas and petroleum contain a large amount of paraffin.
- Paraffinic hydrocarbons are better known as alkanes.
- Any of the saturated hydrocarbons with the general formula C_nH_{2n+2} , where C is a carbon atom, H is a hydrogen atom, and n is an integer, is referred to as a paraffin hydrocarbon.
- Paraffins containing fewer than 5 carbon atoms per molecule are usually gaseous at room temperature, those having 5 to 15 carbon atoms are usually liquids, and the straight-chain paraffins having more than 15 carbon atoms per molecule are solids.
- Branched-chain paraffins have a much higher octane number rating than straight-chain paraffins and, therefore, are the more desirable constituents of gasoline.



CLASSIFICATION OF HYDROCARBONS

Type of Compound	General Formula	Example
Alkane	C_nH_{2n+2}	
Alkene	C_nH_{2n-2}	
Alkyl	C_nH_{2n+1}	
Cycloalkene	C_nH_{2n}	
Cycloalkene	C_nH_{2n-2}	
Benzene (aromatic compound)	—	

Figure 1.1: Classification of hydrocarbon

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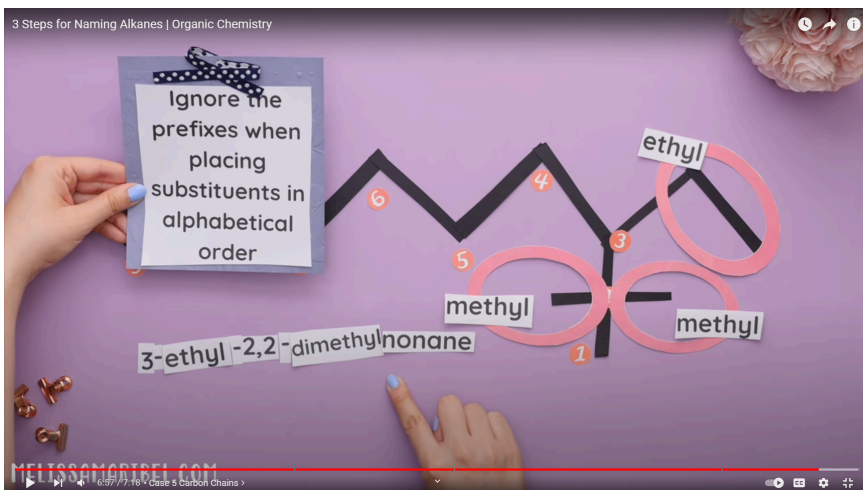
Chapter 2

Paraffinic
Hydrocarbons

Interactive
Activities
1



Watch Alkane Tutorial on [YouTube](#)



Scan the QR Code above for the alkane interactive video





Class Activity: Naming the alkane



Scan the QR Code above to answer the Quiz





Class Activity: Chemical Properties of the alkane



Scan the QR Code above to answer the Quiz



CHEMISTRY OF
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Chapter 3

Olefinic
Hydrocarbons



INTRODUCTION OF OLEFINIC HYDROCARBONS

- Alkenes, commonly referred to as olefins, are partially unsaturated straight-chain hydrocarbons characterized by one or two double carbon–carbon bonds.
- Olefins are produced at crude oil refineries and petrochemical plants and are not naturally occurring constituents of oil and natural gas.
- In the IUPAC naming system, the name of the olefins suffixes with the “ene”.
- Ethylene is the smallest olefin. The common olefins examples are propane, ethene, butene, and pentene.
- Olefin is a man-made fabric that is extremely durable. The fibres are created using heat, pressure, and a catalyst.
- In fact, olefin often goes by another name: polypropylene. This chemically created fabric is often considered to be more environmentally friendly than cotton, silk, and other natural fibres.



OLEFINIC HYDROCARBONS (ALKENES)

- General formula for alkenes are C_nH_{2n} where n is the number of carbon atoms in the molecule.
- Alkenes are relatively stable compounds, but are more reactive than alkanes.
- The olefins most commonly used in the alkylation unit are butylene and propylene to produce alkylate.
- Figure 3.1 below shows the prefix of alkene with number of carbon start from 2.

Number of carbons (n)	Prefix	Alkene (ending-ene)	Alkylene (ending-ylene)	Formula (C_nH_{2n})
1	-	-	-	-
2	Eth	Ethene	Ethylene	C_2H_4
3	Prop	Propene	Propylene	C_3H_6
4	But	Butene	Butylene	C_4H_8
5	Pent	Pentene	Pentylene	C_5H_{10}
6	Hex	Hexene	Hexylene	C_6H_{12}
7	Hept	Heptene	Heptylene	C_7H_{14}
8	Oct	Octene	Octylene	C_8H_{16}
9	Non	Nonene	Nonylene	C_9H_{18}
10	Dec	Decene	Decylene	$C_{10}H_{20}$

Figure 3.1: Alkene compounds

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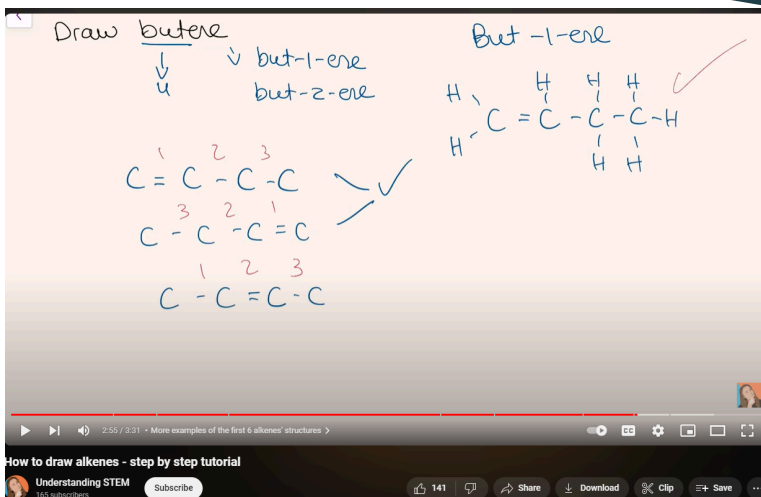
Chapter 4

Olefinic
Hydrocarbons

Interactive
Activities
2



Watch Alkene Tutorial on [YouTube](#)



Scan the QR Code above for the alkene interactive video

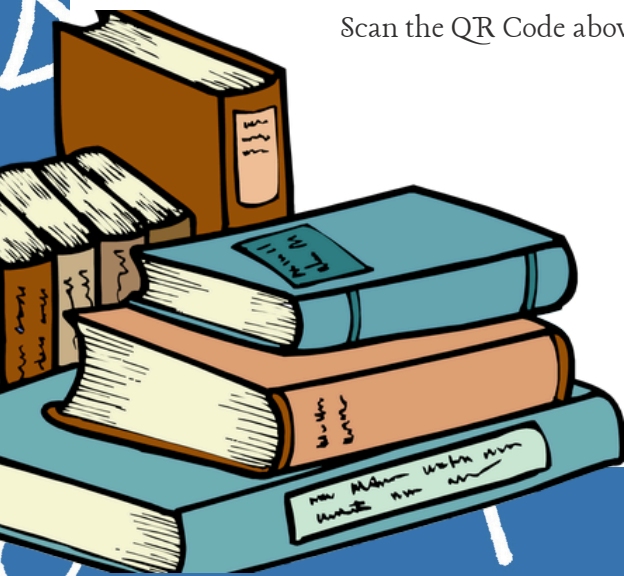




Class Activity: Intro and Properties of Alkene



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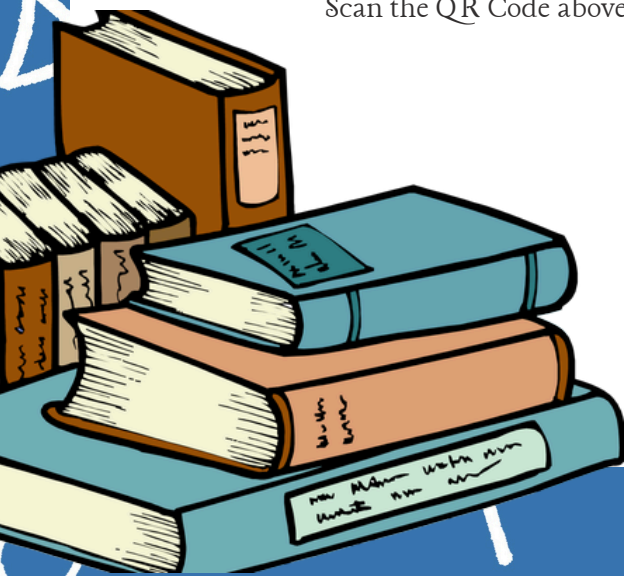




Class Activity: IUPAC name of Alkenes



Scan the QR Code above to answer the Quiz





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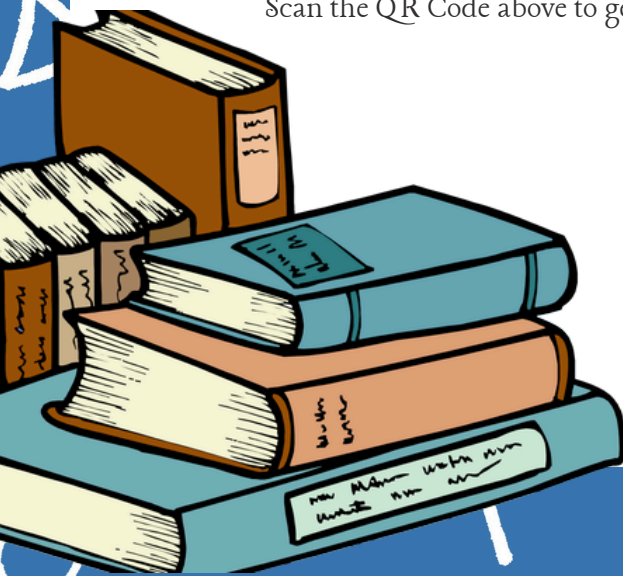
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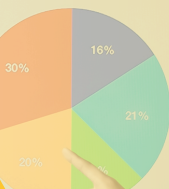
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Andy
Chloe
Daniel
Grace
Sophia

result person
UNIT SOLD

Pie Chart

Andy
Chloe
Daniel
Grace
Sophia



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