

	Reactors مفاعلات	Reagent مساعد	Catalysts محفزه	products نواتج	The reaction التفاعل
Preparation of alkanes  Hydrogenation	alkene	H <sub>2</sub>	Metal ::	alkane	
	alkyne	2 ( H <sub>2</sub> )	Pt \ Pd \ Ni Solvent, pressure		
Hydrolysis	Grignard reagent: R-MgX	HOH	Acid ::  H <sup>+</sup>	RH + MgX(OH)	$R-MgX + HOH \rightarrow RH + MgX(OH)$
	Alkane	X <sub>2</sub>	Heat \ ultraviolet light	RX + HX	$RH + X_2 \xrightarrow{\text{Heat or UV light}} RX + HX$ <b>Combustion</b> $C-H + O_2 \xrightarrow{\text{heat}} CO_2 + H_2O + \text{heat}$
Reactions of alkanes ( free radical substitution)	Alkane  halogenation	X <sub>2</sub>	Heat \ ultraviolet light	RX + HX	$RH + X_2 \xrightarrow{\text{Heat or UV light}} RX + HX$ <b>Combustion</b> $C-H + O_2 \xrightarrow{\text{heat}} CO_2 + H_2O + \text{heat}$
Preparation of alkenes	ROH ( Alkane-OH )  قاعده سايتزيف Dehydration of alcohol	—	Mineral acid: H <sub>2</sub> SO <sub>4</sub> \ H <sup>+</sup> \ H <sub>3</sub> PO <sub>4</sub> + Heat	Alkene + H <sub>2</sub> O	
	RX ( Alkane-X )  Dehydrohalogenation of alkyl halides	—	Alkaline condition: KOH or NaOH + alcohol + heat	Alkene + (X <sub>2</sub> \ HX )	
	RX ( Alkane-X )  Dehydrohalogenation of alkyl halides ( vicinal )	—	Zn \ acetic acid Or NaI \ acetone		
Reactions of Alkenes (1)  ( Electrophilic addition reaction )	Alkene  hydrogenation	H <sub>2</sub>	pt	Alkane	
	Alkene  halogenation	X <sub>2</sub> \ X + X	Room temperature + ccl <sub>4</sub>	Vicinal dihalide ( alkane-X-X )	
	Alkene  Addition of acids	Acids :: HX  قاعده ماركينوف		RX ( Alkane-X ) \	
	Alkene  Addition of water	H-OH  قاعده ماركينوف	Acid	Alcohol (R-OH)  Single bonds	

Reactions of Alkenes (2) (Oxidation)	Alkene  Addition of ozone	O <sub>3</sub>	Zn \ H <sub>3</sub> O <sup>+</sup> or H <sup>+</sup>	Open alkene = 2 open aldehyde or ketone  Cycloalkene = 1 open aldehyde or ketone	$\text{CH}_3-\text{CH}_2-\text{CH}=\underset{\text{CH}_3}{\text{C}}-\text{CH}_3 \xrightarrow[\text{Zn, H}_2\text{O}]{\text{O}_3} \text{CH}_3-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{H} + \text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3$ <p>الدهيد      كيتون</p>
	Alkene  Oxidating using KMnO <sub>4</sub>	K <sup>+</sup> MnO <sub>4</sub> <sup>-</sup>	OH <sup>-</sup> , H <sub>2</sub> O	ROH-ROH +MnO <sub>2</sub> + K <sup>+</sup> OH <sup>-</sup>	$\text{RCH}=\text{CH}-\text{R} \xrightarrow[\text{H}_2\text{O, OH}^-]{\text{KMnO}_4} \text{R}-\underset{\text{OH}}{\text{CH}}-\underset{\text{OH}}{\text{CH}}-\text{R}$ <p><i>cis</i></p>
Preparation of Alkyne	Dihalide alkyl  Dehydrohalogenation of alkyl dihalides	—	Geminal = KOH, NaNH <sub>2</sub>  Vicinal = excess NaOH + heat	Alkyne + HX + HX	<p>geminal</p> <p>vicinal</p> <p>Excess NaNH<sub>2</sub> Heat</p>
	Sodium acetylide R≡R-NA Reaction of sodium acetylide with alkyl halide	Alkyl halide R-X		Alkyne + NaX	$\text{H}_3\text{C}-\text{C}\equiv\text{C}^- \text{Na}^+ + \text{CH}_3\text{CH}_2\text{Br} \rightarrow \text{CH}_3-\text{C}\equiv\text{C}-\text{CH}_2\text{CH}_3 + \text{NaBr}$
Reactions of alkyne (electrophilic addition reaction)  Hydrogenation	Alkyne	H <sub>2</sub>	Pd	Cis alkene	$\text{H}_3\text{C}-\text{C}\equiv\text{C}-\text{CH}_3 \xrightarrow{\text{H}_2/\text{Pd}} \text{H}_3\text{C}-\underset{\text{H}}{\text{C}}=\underset{\text{H}}{\text{C}}-\text{CH}_3$ <p><i>cis</i></p>
	Alkyne	H <sub>2</sub>	Na or Li + liq NH <sub>3</sub>	trans alkene	$\text{H}_3\text{C}-\text{C}\equiv\text{C}-\text{CH}_3 \xrightarrow[\text{liq NH}_3]{\text{Na or Li}} \text{H}_3\text{C}-\underset{\text{H}}{\text{C}}=\underset{\text{CH}_3}{\text{C}}-\text{H}$ <p><i>trans</i></p>
	Alkyne	2 H <sub>2</sub>	Ni	alkane	$\text{H}_3\text{C}-\text{C}\equiv\text{C}-\text{CH}_3 \xrightarrow{\text{H}_2/\text{Ni}} \text{H}-\underset{\text{H}}{\text{C}}-\underset{\text{H}}{\text{C}}-\underset{\text{H}}{\text{C}}-\underset{\text{H}}{\text{C}}-\text{H}$
Reactions of alkyne (electrophilic addition reaction)	Alkyne  halogenation	X <sub>2</sub> or 2 X <sub>2</sub>		Dihalide alkene Tetrahalide alkane	$\text{H}-\text{C}\equiv\text{C}-\text{H} \xrightarrow{\text{Br}_2} \text{H}-\underset{\text{Br}}{\text{C}}=\underset{\text{Br}}{\text{C}}-\text{H} \xrightarrow{\text{Br}_2} \text{H}-\underset{\text{Br}}{\text{C}}-\underset{\text{Br}}{\text{C}}-\text{H}$
	Alkyne  قاعده ماركينكوف Addition of hydrogen halide	HX or 2 HX		halide alkene dihalide alkane	$\text{CH}_3\text{C}\equiv\text{CH} + \text{HCl} \rightarrow \text{CH}_3-\underset{\text{Cl}}{\text{C}}=\underset{\text{H}}{\text{C}}-\text{H} \xrightarrow{\text{HCl}} \text{CH}_3-\underset{\text{Cl}}{\text{C}}-\underset{\text{Cl}}{\text{C}}-\text{H}$
	Alkyne  قاعده ماركينكوف hydration	H-OH	H <sub>2</sub> SO <sub>4</sub> , HgSO <sub>4</sub>	Ethyne = aldehyde Others = ketone	$\text{H}-\text{C}\equiv\text{C}-\text{H} + \text{H}-\text{OH} \rightarrow \text{H}-\underset{\text{OH}}{\text{C}}=\underset{\text{H}}{\text{C}}-\text{H} \rightarrow \text{H}-\overset{\text{O}}{\parallel}{\text{C}}-\underset{\text{H}}{\text{C}}-\text{H}$ <p>تغير في الشكل</p>

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