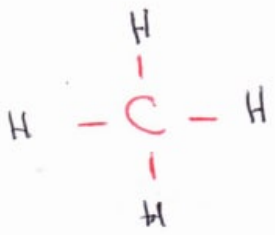
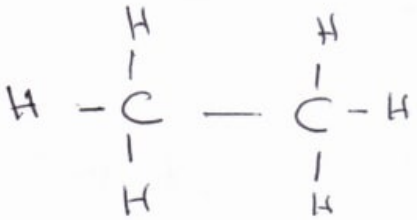
Organic Chemistry

الكيمياء العضوية :- علم يهتم بدراسة المركبات التي تحتوي على الكاربون و الهيدروجين



حيث يكون لكاربون (4) ارتباطات سواء كانت مع نفسه او مع الهيدروجين



حيث سوف ندرس تسمية هذة المركبات , تفاعلاتها و تحضيرتها و ميكانيكة التفاعل الخاصة بها.

لاشكال المركبات عضويه

ولاً")

CH_4

المركبات الحاديه :-

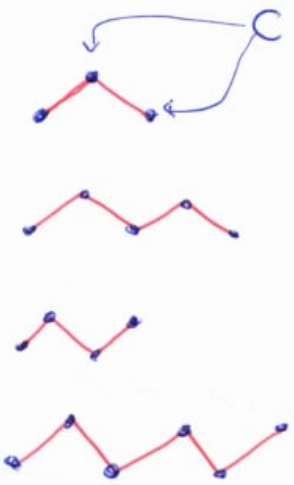
$CH_3 - CH_3$

هذا النوع يكون فيها الكاربون وهيدروجين

شكل واضح وحريص

$CH_3 - CH_2 - CH_3$

(ثانياً) :- المركبات الخطيه وهذا نوع سوف نركز عليه



حيث ان كل بدية سلسله وزاويه يمثل ذرة كاربون

* في الشكل الاسفل نلاحظ سلسله من (3) ذرات كاربون

*

and $CH_3 - CH_2 - CH_3$

*

$\longrightarrow$ C = 3

* في ذرة كاربون رقم (1)

(3) هيدروجين

لأن لديها ارتباط واحد فقط

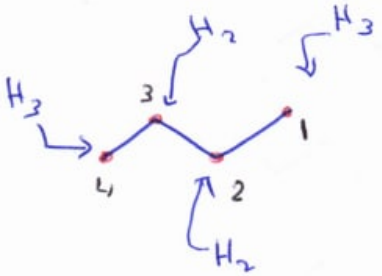
*

ذرة كاربون لديها ارتباط واحد ← لديها (3) هيدروجين

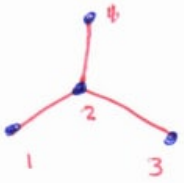
ذرة كاربون لديها ارتبطين ← لديها (2) هيدروجين

ذرة كاربون لديها (3) ارتباطات ← لديها (1) هيدروجين

ذرة كاربون لديها (4) ارتباطات ← (0) هيدروجين



$\rightarrow C_4 H_{10}$



$\longrightarrow C_4 H_{10}$

* ستكون دراستنا ضمن سلاسل من C_1 الى C_{10}

ومن المهم حفظ هذه السلاسل

حفظ

C = 1	→ meth	
C = 2	→ eth	
C = 3	→ prop	
C = 4	→ but	
C = 5	→ pent	
C = 6	→ hex	
C = 7	→ hept	
C = 8	→ oct	
C = 9	→ non	
C = 10	→ dec	

Ex

CH_4

or

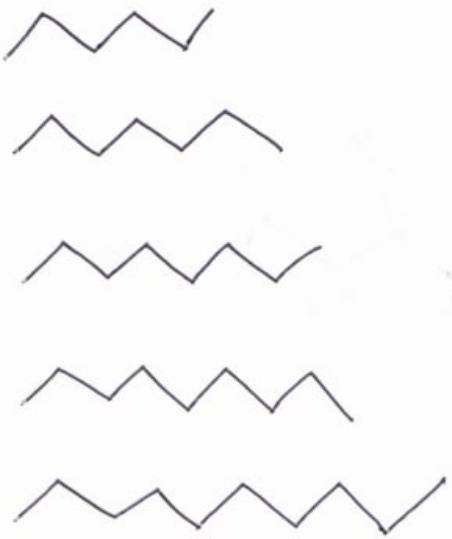
CH_3-CH_3

$CH_3-CH_2-CH_3$

$CH_3-CH_2-CH_2-CH_3$

$CH_3-CH_2-CH_2-CH_2-CH_3$

or



Alkane

سلاسل كاربونيه مشبعة بل هيدروجين

أولاً : تسمية Alkane IUPC

(1) - نحدد اطول سلسله كاربونيه ممكنه

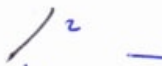
(2) - نرقم من الطرف قريب لتفرع او الكل تفرع

*

ane

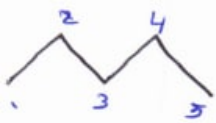
نضعها بعد الاسم لدلالة
على ان سلسله مشبعه خاليه
من نقص اي يعني عدم وجود
اصرة مزدوجه او ثلاثيه
(≡) (=)

→ Propane



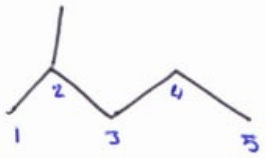
→ eth ane

→ but ane



→ Pent ane

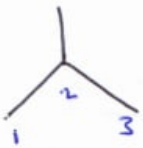
→ hex ane



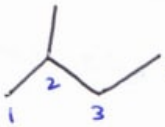
* على ذرة الكاربون (2) يوجد تفرع ولتعبر عن التفرع نضع مصطلح (yl)

2- methyl - Pentane

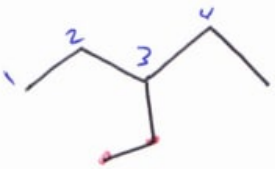
التفرعات — اسم السلسلة الرئيسية



→ 2 - methyl - Propane

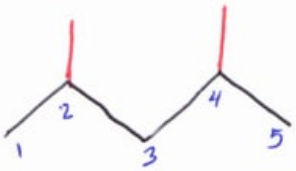


→ 2 - methyl - butane



→ 3 - ethyl - Pentane

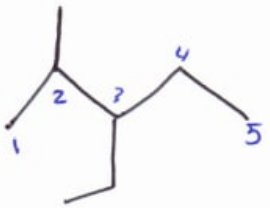
* في حال وجود تفرعين متشابهين نستخدام (di)



→ 2,4 - dimethyl - Pentane

→ يوجد تفرعين عند ذرة -2- meth

وعند ذرة -3- eth



وسوف نرتب حسب الابجدية

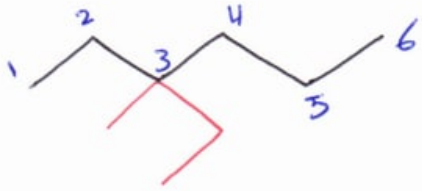
↳ 3-ethyl-2-methyl-Pentane

* على ذرة كاربون (2) يوجد تفرعين

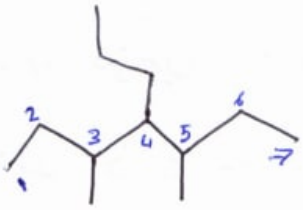
لذلك سوف نكرر الرقم ونضيف

مقطع (di) لان التفرعين متشابهين

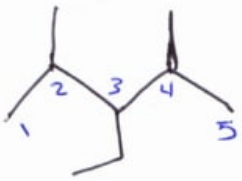
2,2-dimethyl-Pentane



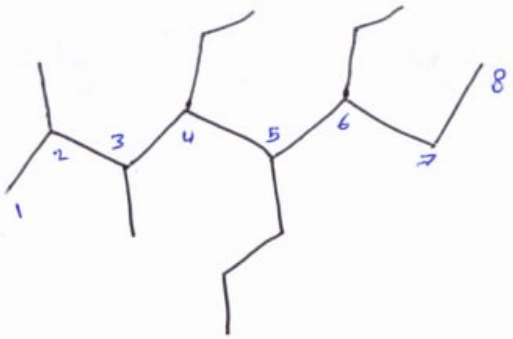
3-ethyl-3-methyl-hexane



3,5 - dimethyl - 4 - propyl - heptane



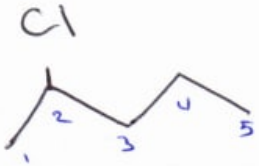
3-ethyl
2,4 - dimethyl
Pentane



4,6 - diethyl - 2,3 - dimethyl - 5 - propyl
octane

* الهالوجينات (X)

X = Cl, Br, F, I



2- Chloro - Pentane

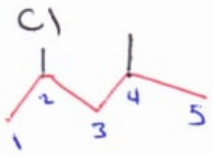
Cl → Chloro

Br → Bromo

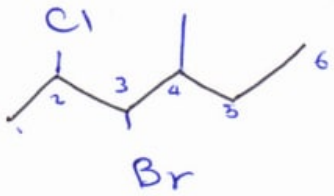
F → Floro

I → Iodo

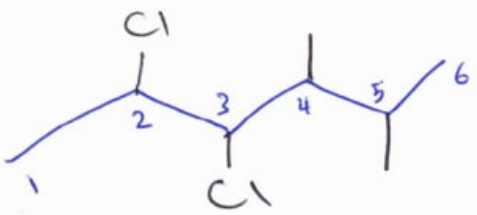
* نرقم حسب أقرب X



2- Chloro - 4- methyl



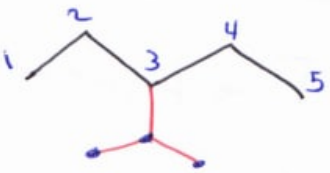
3- Bromo - 2- Chloro - 4 - methyl - hexane



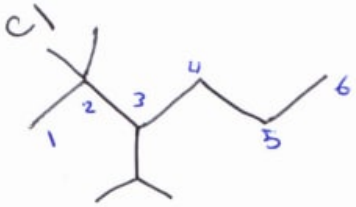
2,3 - di chloro - 4,5 - dimethyl - hexane

/ Iso / tert / sec /

- Iso نستخدام مصطلح Iso - عند وجود تفرع داخل المتفرع



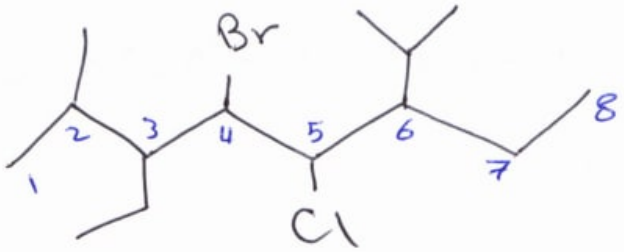
3- Isopropyl - Pentane



2- Chloro - 2- methyl

3- Isopropyl

hexane

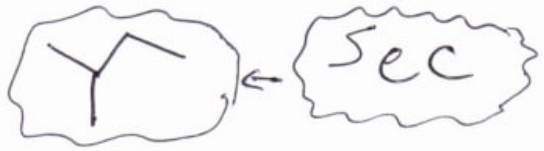


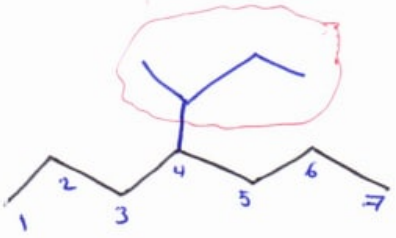
4- Bromo - 5- Chloro - 3- ethyl - 2- methyl

6- Iso propyl - Octane

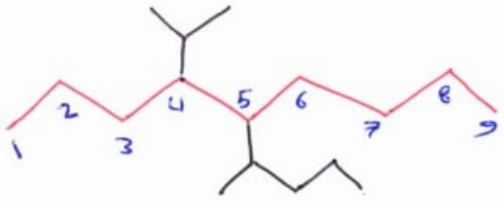
[10]

Secbutyl



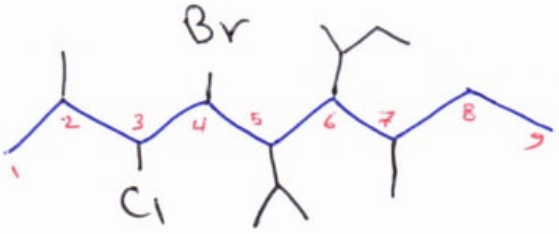


4- Sec butyl - heptane



4- Iso Propyl - 5 - Sec Pentyl

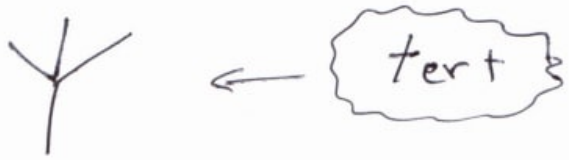
nonane

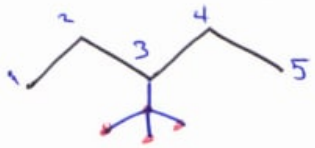


4- Bromo - 3 - chloro - 2,7 - dimethyl

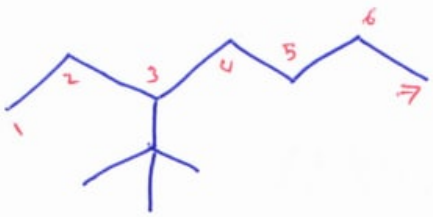
5- Iso Propyl - 6- Sec butyl

nonane

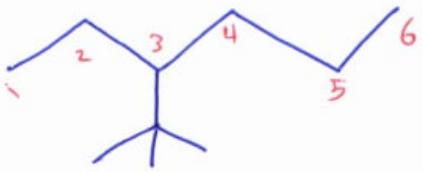




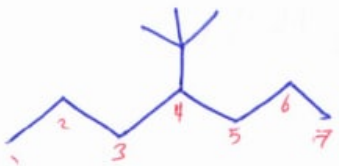
3- tert butyl - Pentane



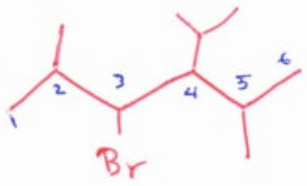
3- tertbutyl-heptane



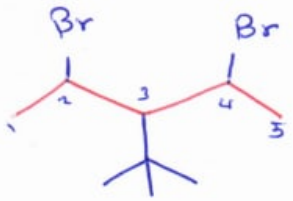
3- tert butyl -hexane



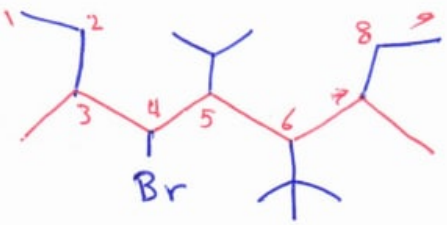
4- tert butyl - hept ane



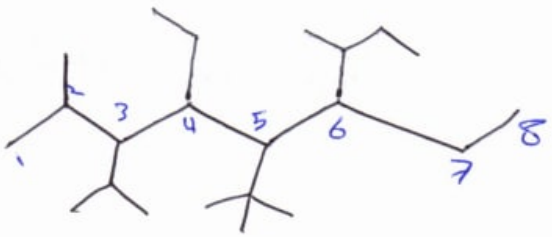
3-Bromo-2,5-dimethyl
4-Isopropyl-hexane



2,4-di Bromo-3-tert butyl
Pentane



4-Bromo-3,7-dimethyl
5-Isopropyl-6-tert butyl
nonane



4-ethyl-2-methyl
3-Isopropyl-5-tert butyl
6-Secbutyl
Octane

النوع الثاني من اسئلة التسمية

وهو يعطيك اسم التركيب ويريد التركيب

* هذا نوع يمكن الاستفادة منه في التأكد من تسمية عند الحل

الحل

1- نرسم الاسم موجود في السلسلة

2- نرقم ترقيم ثابت

3- نضع تفرعات

EX)

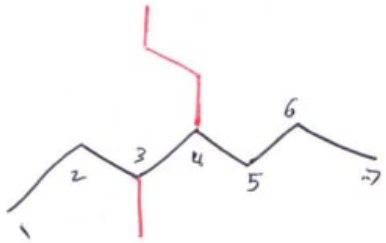
3-methyl-4-Propyl-heptane

الحل

اولا" نرسم السلسلة

ثانيا" نرقم

وثالثا" نضع تفرعات



3-methyl-4-Propyl-heptane

Ex) 2-chloro-Pentane

الحل

① ترقيم السلسلة
② كتابة الاسم
③ نضع تفرعات

Q./ Draw the Name of Structure

1 -> 2-Chloro-2-methyl butane

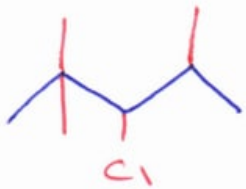
2 -> 1-Chloro-3-methyl butane

3 -> 3-chloro-2,2,4-trimethyl Pentane

4 -> 1-chloro-2,4,4-trimethyl Pentane

1- 

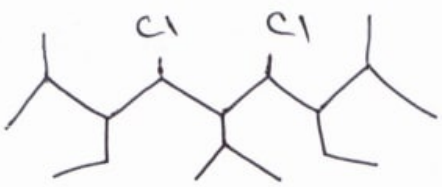
2- 

3- 

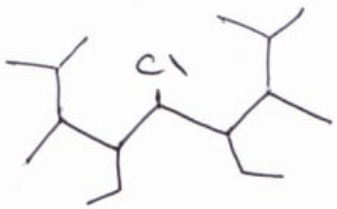
4- 

Q/A/ give the IUPC Name for the following compounds.

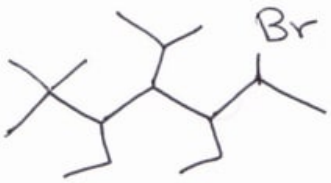
(a)



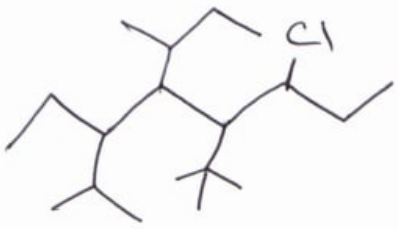
(b)



(d)



(c)



Q/B/ Give stractr for Name

(a) - 3-ethyl-2,4-dimethyl-Pentane

(b) 4,6-di ethyl-3,3-dimethyl-octane

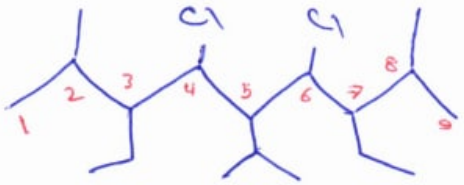
(c) 3-ethyl-3-methyl-hexane

(d) 2,3-di Chloro-4,5-di methyl-hexane

The Answer

Q/A/

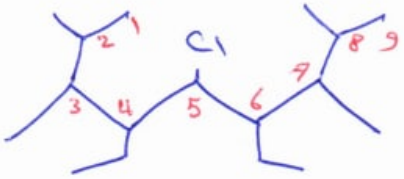
(a)



4,6- di Chloro - 3,7 - di ethyl - 2,8 - di methyl

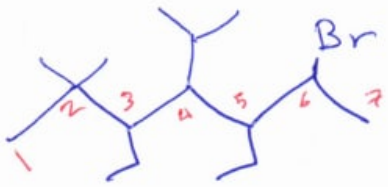
5- Iso Propyl - nonane

(b)



5- Chloro - 4,6 - di ethyl - 2,3,7,8 - tert methyl nonane

(d)

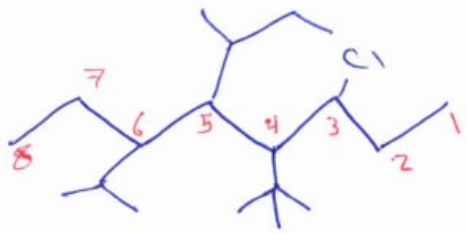


6 ~~8~~- Bromo - 3,5 - di ethyl

2,2 - dimethyl - ~~heptane~~

4- Iso Propyl - heptane

(C)



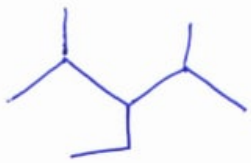
3- Chloro - 4- tert butyl

5- sec butyl - 6- ISo Propyl

Octane

Q/B/

(a)



3- ethyl -2,4- dimethyl Pentane

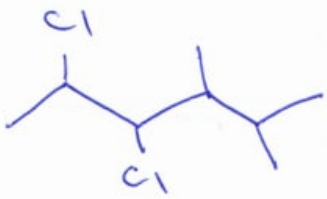
(b)

4,6 di ethyl - 2,3- dimethyl Octane

(C)

3- ethyl -3- methyl hexane

(d)



2,3- di chloro -4,5 - dimethyl hexane

Alkane reationes

تفاعلات الكان

أ- مع الاوكسجين (الاحتراق)

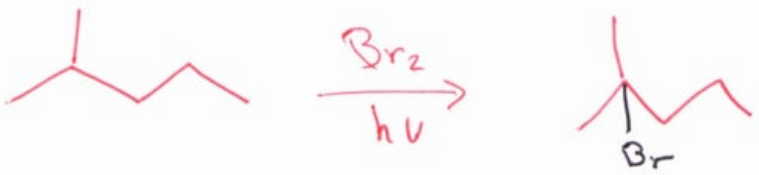
وتنتج CO_2 و H_2O

$$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$$

ب- الهلجنة :- وهو اهم تفاعل والذي يستبدال الهيدروجين ب (X)

$$CH_4 + Cl_2 \xrightarrow{h\nu} CH_3Cl + HCl$$

* يستبدال الهيدروجين الطرفي ويعوض عن الهالوجين بدل الهيدروجين

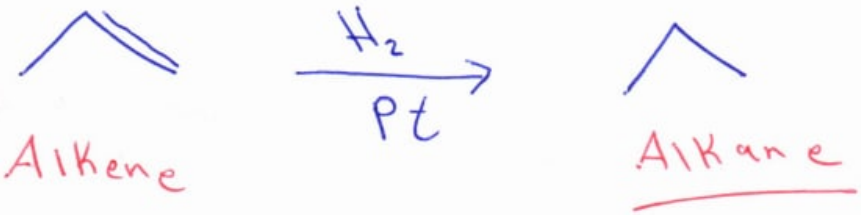


Alkane Preparation

تحضير الكان

أولاً: يمكن الحصول على (Alkane) من هدرجة المركبات ذي مشبعة (Alkene) و (Alkyne) بواسطة H_2/Pt أو Ni

Ex>

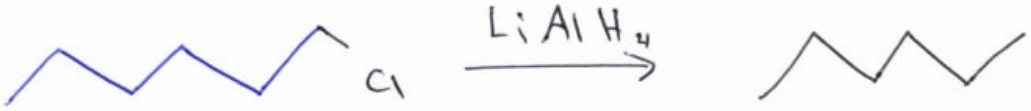


ثانياً: من هاليد الالكيل (مشابه تفاعل X على)

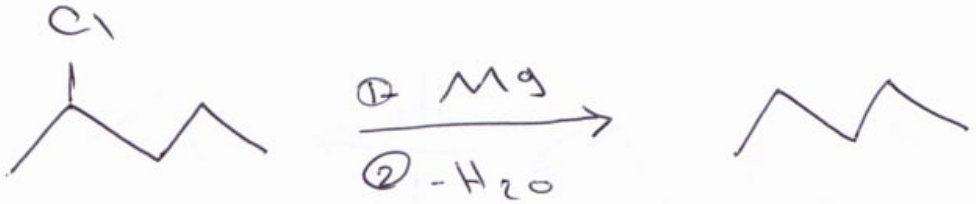
بواسطة اما Zn/HCl او $LiAlH_4$

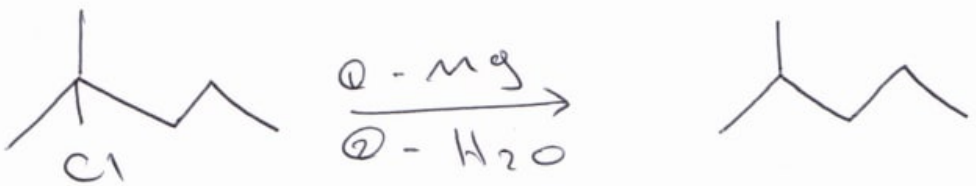
هاليد الالكيل

Alkane



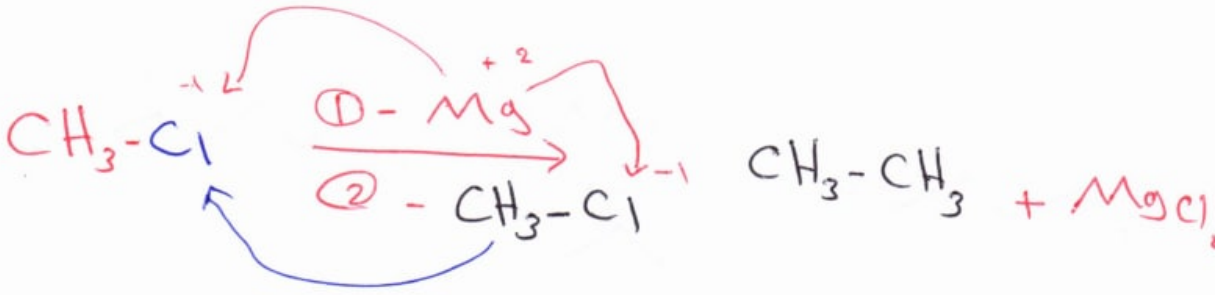
ثالثاً - بواسطة كاشف كرينارد

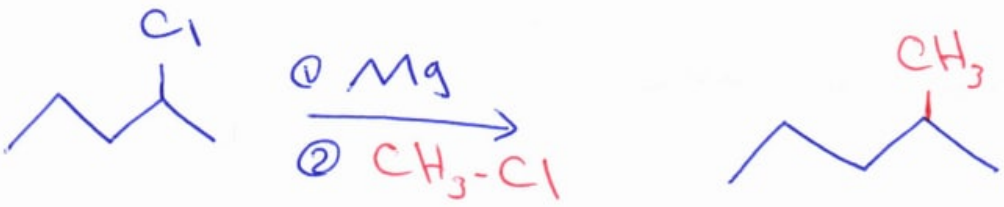


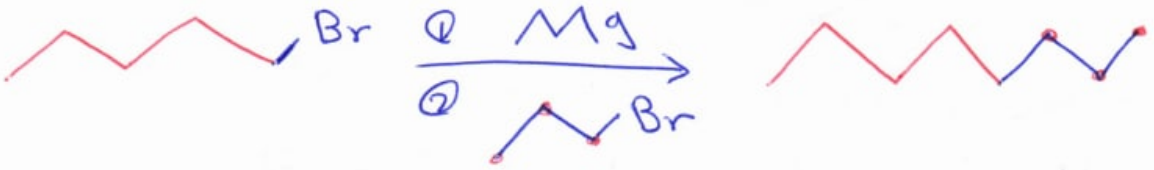


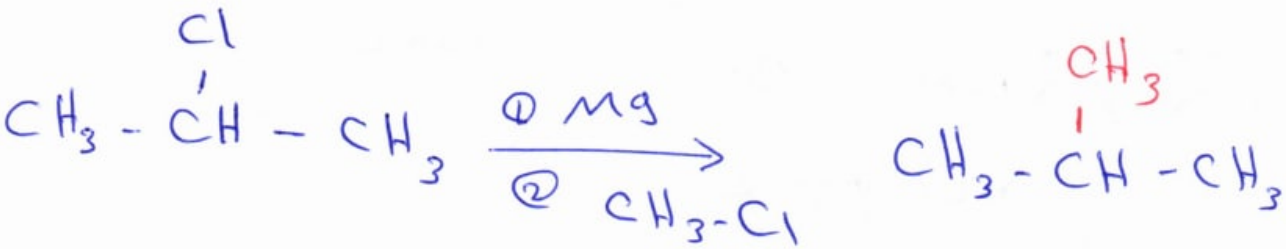
رابعاً :- في حال نريد ان نزيد عدد ذرات

كاربون سلسلة سوف نستخدام هذه الطريقة

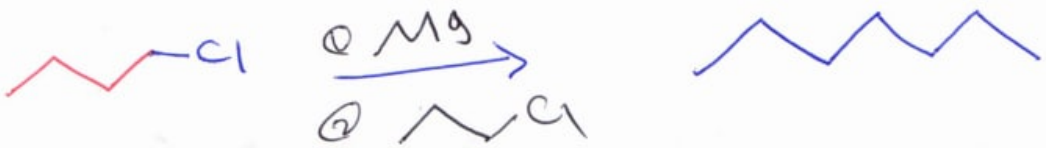








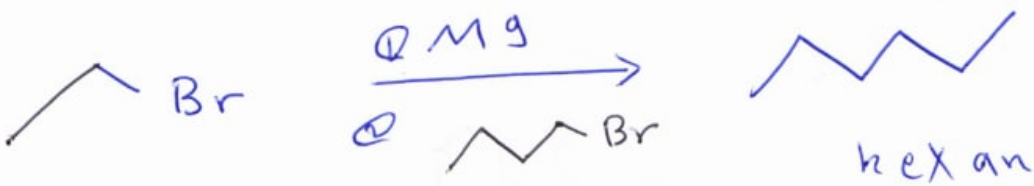
Q / Prapara heptane from
Chloro butane



chloro butane + chloro propane = heptane

C=4 + C=3 = C=7

Q / from Bromo ethane prapare
hexane



hexane

Q For Prapara ane reaction

Q. / Prapare Pentane from

$CH_3 - CH_2 - Br$

Ans → ethane + propane

$$CH_3 - CH_2 - Br + CH_3 - CH_2 - CH_2 - Br \xrightarrow{Mg}$$

$CH_3 - CH_2 - CH_2 - CH_2 - CH_3$ Pentane

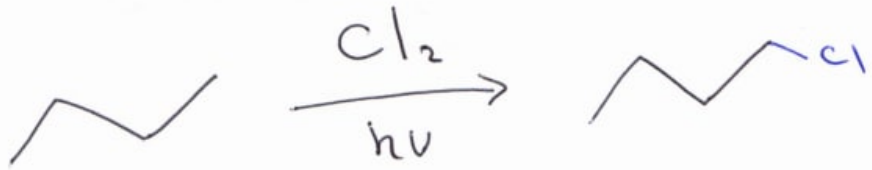
Q/ Prepare 2-methyl hexane from $CH_3 - CH_2 - Br$

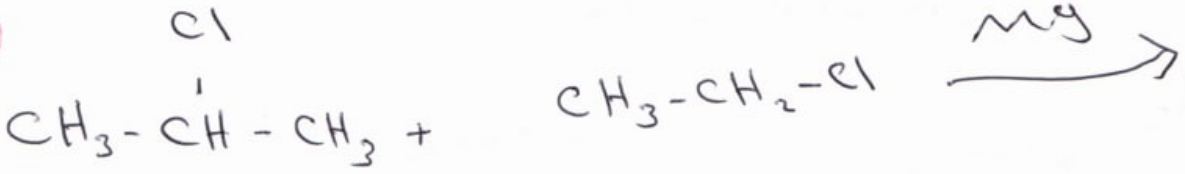
$$CH_3 - CH_2 - Br \xrightarrow[②]{① Mg}$$

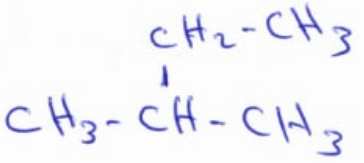
$$Br - CH_2 - CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_3$$

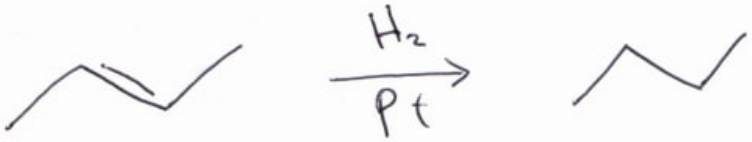
$$CH_3 - CH_2 - CH_2 - CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_3$$

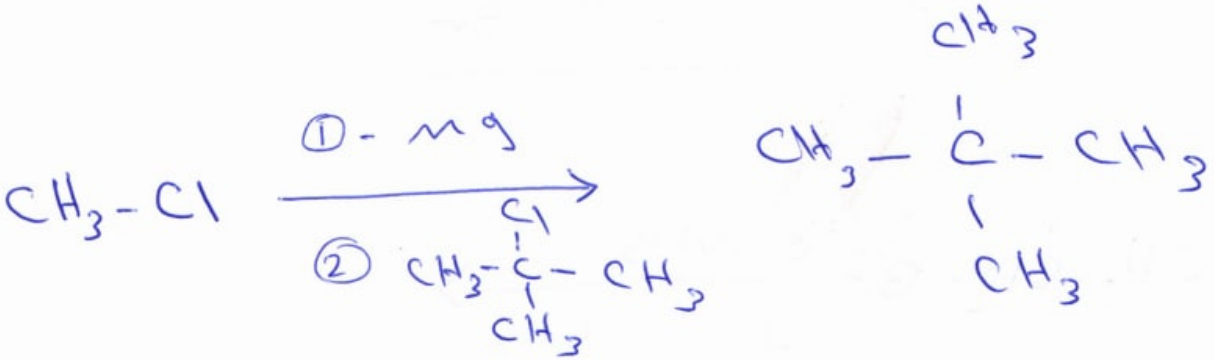
2-methyl hexane

(a) 
Cl2
hν
Cl

(b) 
Cl
CH3 - CH - CH3 +
CH3 - CH2 - Cl
Mg

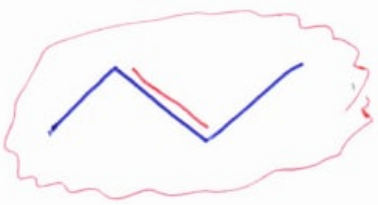

CH2 - CH3
CH3 - CH - CH3

(c) 
H2
Pt


CH3 - Cl
① - Mg
Cl
② CH3 - C - CH3
CH3
CH3
CH3 - C - CH3
CH3

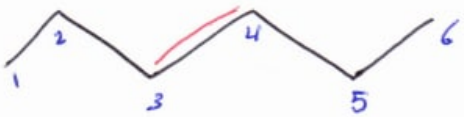
Alkene

$CH_2=CH_2$ وهو سلسلة تكون فاقدة ذرتي هيدروجين

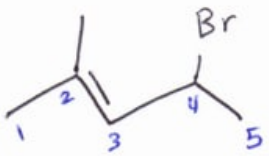


التسمية :- نفس قواعد تسمية الالكان لكن هنا نرقم من طرف القريب لاصرة المزدوجه (=) .

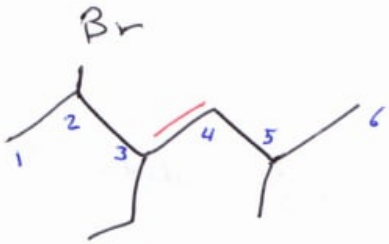
ونضع رمز ene لسلسلة لدلالة على ان سلسله تحتوى على اصرة مزدوجه (=)



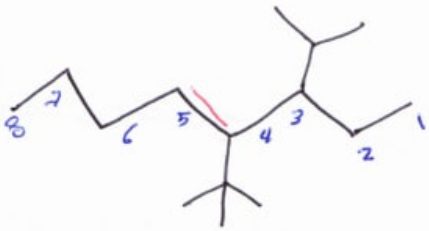
hex-3-ene



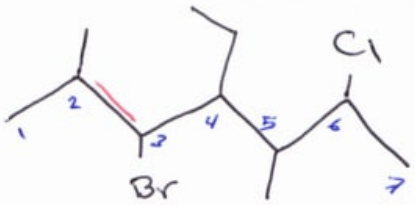
4-Bromo-2-methyl Pent-2-ene



2-Bromo-3-ethyl-5-methyl hex-3-ene

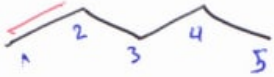


3-Isopropyl-4-tert butyl oct-4-ene



3-Bromo-6-Chloro
4-ethyl-3,5 dimethyl hept-2-ene

Pent-1,4-diene



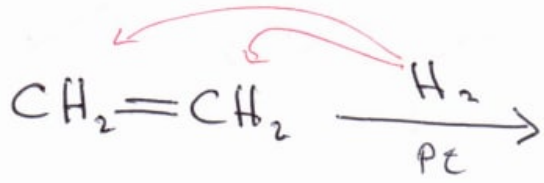
Pent ene

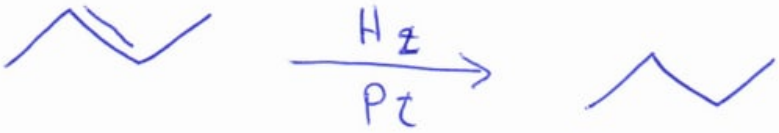
Alkene reactions

تفاعلات الالكين

[1] اضافة H_2 بوجود Pt او Ni

* تكون اضافة على كاربونات اهرة مزدوجة فقط

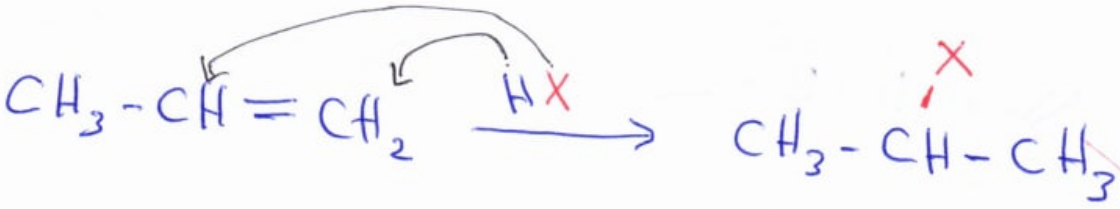


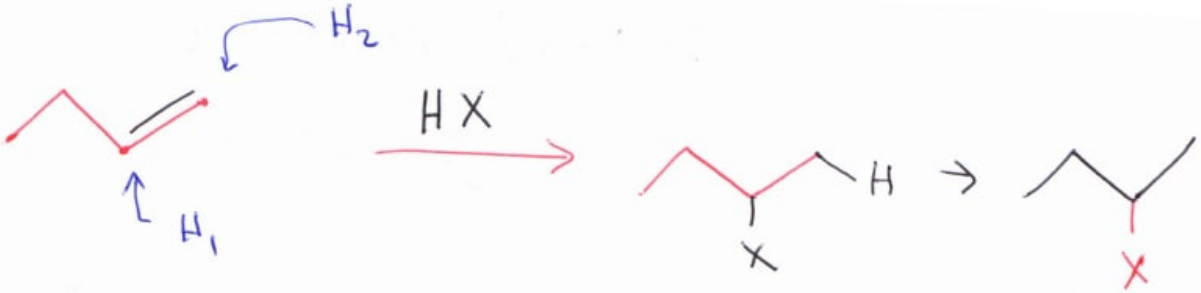


[2] اضافة HX (هاليد الهدروجين) ويكون على شكل نواة

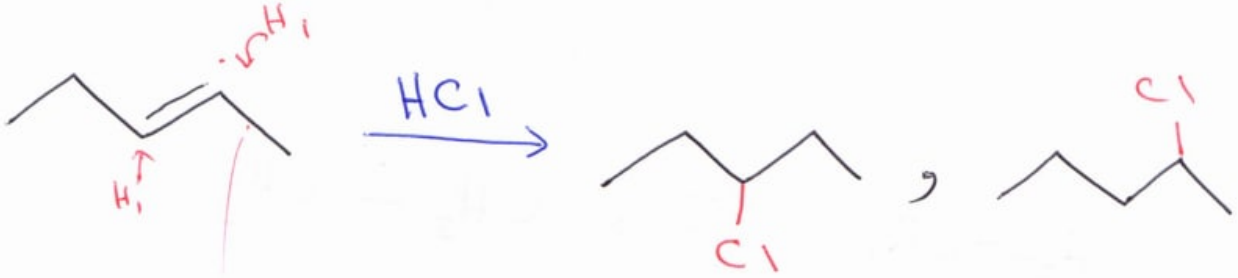
P- HX على وفق قاعدة ماركونيكوف

(تذهب H الى ذرة كاربون التي تحتوي اكثر هيدروجين)

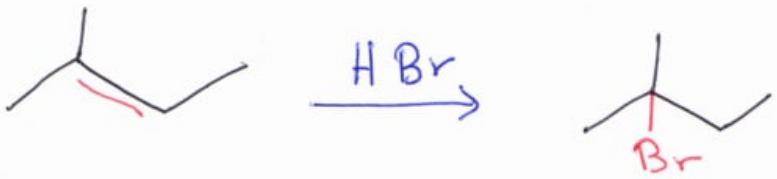


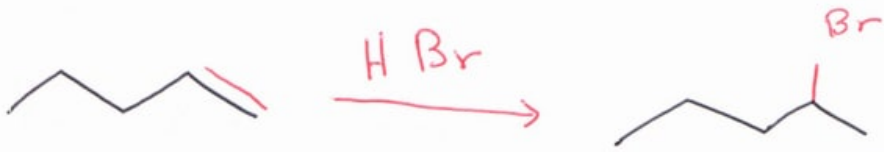


EX)



لان ذرة كاربون اكثر مساوية ناخذ احتمالين



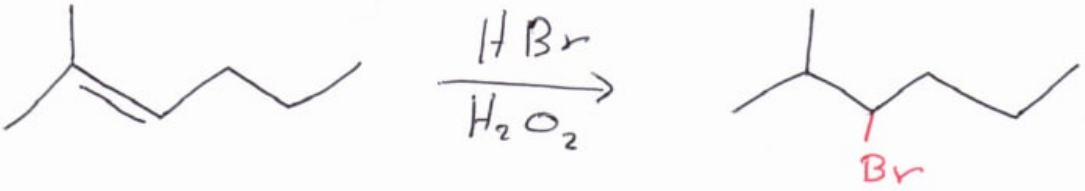


ميكانيكية هذا تفاعل

{ب} اضافة $\frac{HX}{H_2O_2}$ عكس ماركو نيكوف

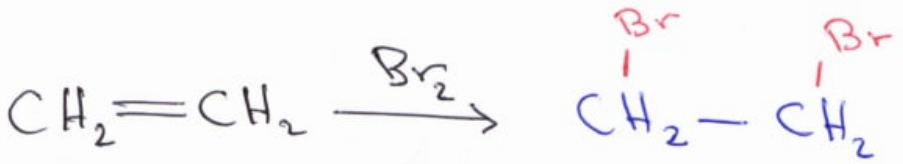
تذهب الهيدروجين نحو ذرة كاربون اقل هيدروجين

Ex)

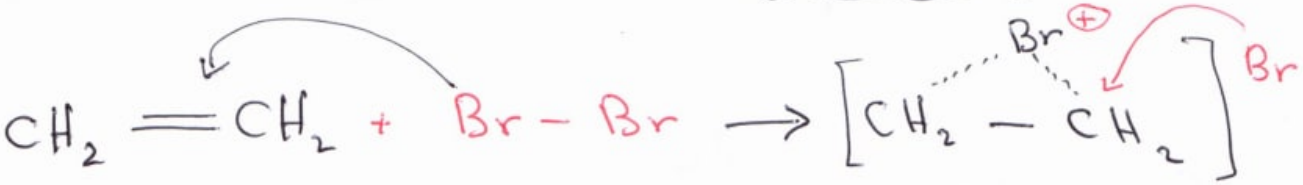


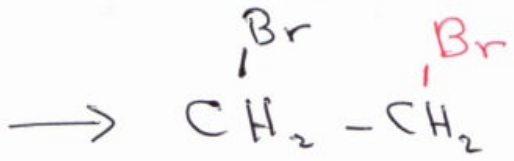
{30}

3 اضافة X_2



ميكانيكة هذا تفاعل





4 اضافه H_2O (H_2OH) بوجود H_2SO_4

* حسب ماركو نيكوف

(P)

$$CH_3-CH=CH_2 \xrightarrow[H_2SO_4]{H_2O} CH_3-\overset{OH}{\underset{|}{C}}H-CH_2$$

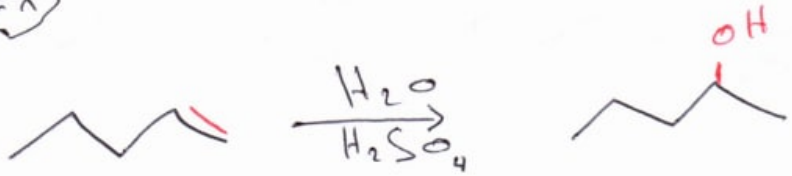
ميكانيكة هذا التفاعل

$$CH_3-CH=CH_2 + H-HSO_4 \xrightarrow{H_2O} CH_3-\overset{+}{C}H-CH_3$$

$$\left[CH_3-\overset{+}{C}H-CH_3\right] \xrightarrow{H_2O} \left[CH_3-\underset{|}{\overset{H}{\overset{+}{O}}}-CH-CH_3\right] \quad HSO_4^-$$

$$\rightarrow CH_3-\overset{OH}{\underset{|}{C}}H-CH_3 + H_2SO_4$$

(Ex)

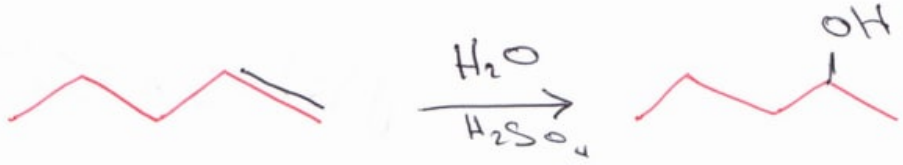


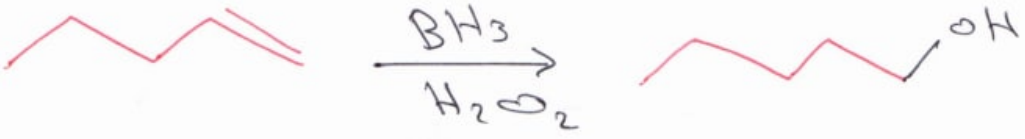
{ب} اضافه الکتن مارکر

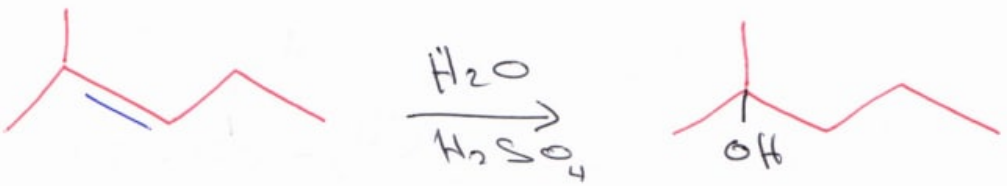
$\frac{BH_3}{H_2O_2}$

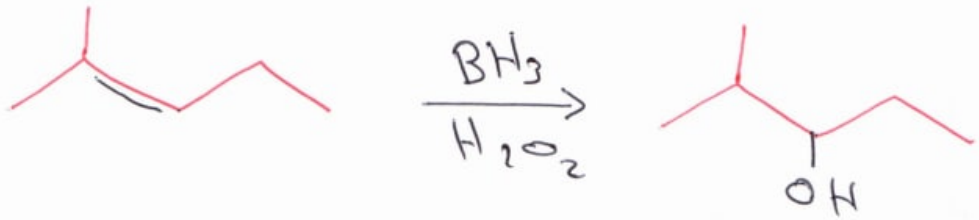
$$CH_3-CH=CH_2 \xrightarrow[H_2O_2]{BH_3} CH_3-CH_2-\underset{OH}{CH_2}$$

Ex)

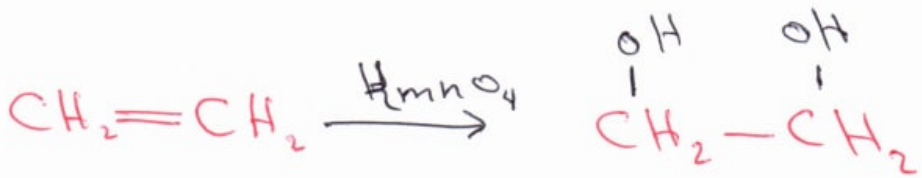




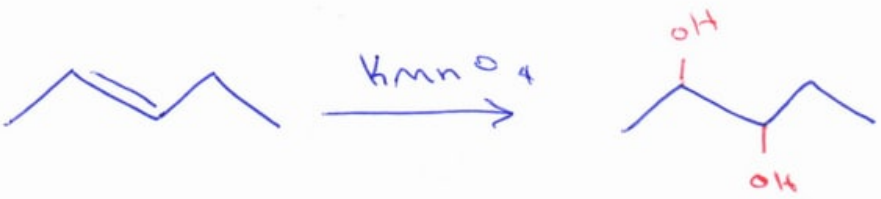


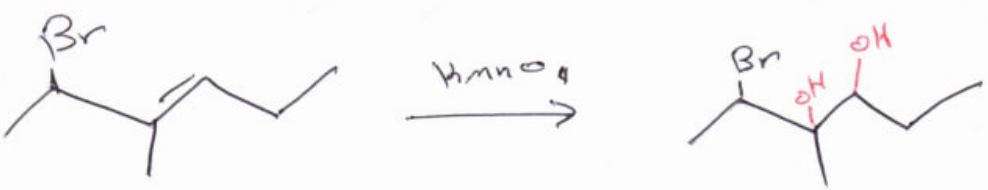


اضافة OH , OH بواسطة $KMnO_4$ او OSO_4



Ex)





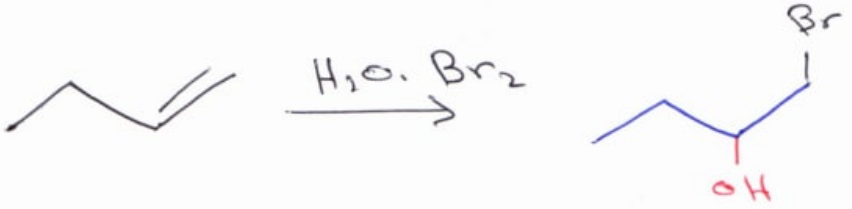
6 اضافه X و OH بواسطه H_2O, X_2

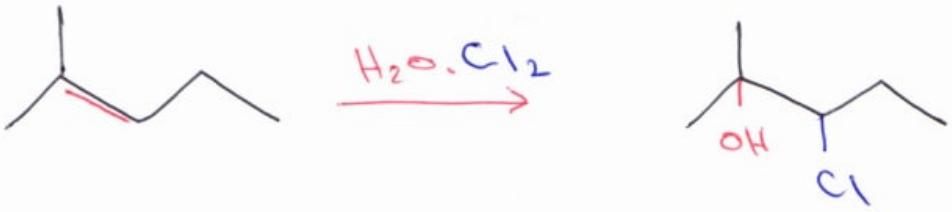
X ← الی الکی هیدروجین

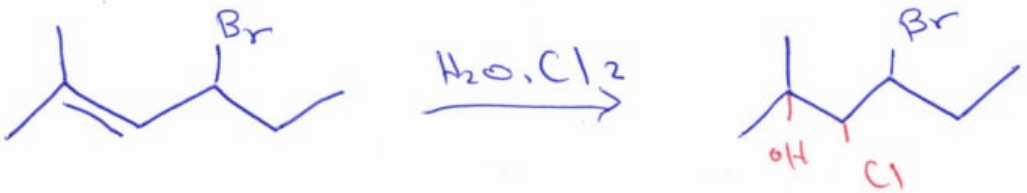
OH ← الی اقل هیدروجین

$$CH_3-CH=CH_2 \xrightarrow{H_2O,Cl_2} CH_3-\underset{OH}{CH}-\underset{Cl}{CH_2}$$

Ex)





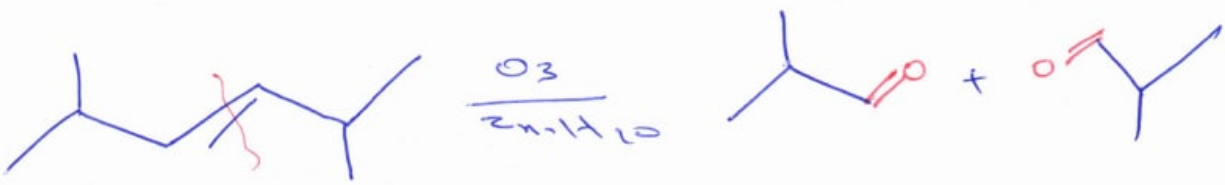


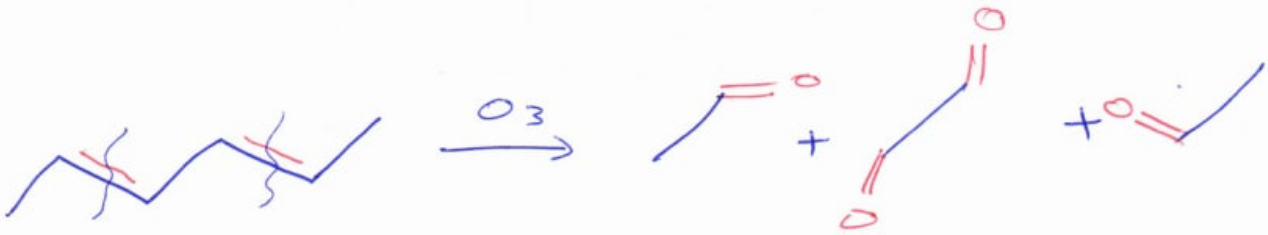
7

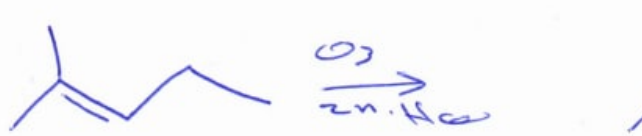
لشطر تفاعل O_3

* تفاعل يقطع سلسلة الى جزئين ويضيف ($=O$) الى هرافين

$$CH_2=CH_2 \xrightarrow[Zn.H_2O]{O_3} \overset{O}{\overset{\|}{C}}H_2 + O=CH_2$$

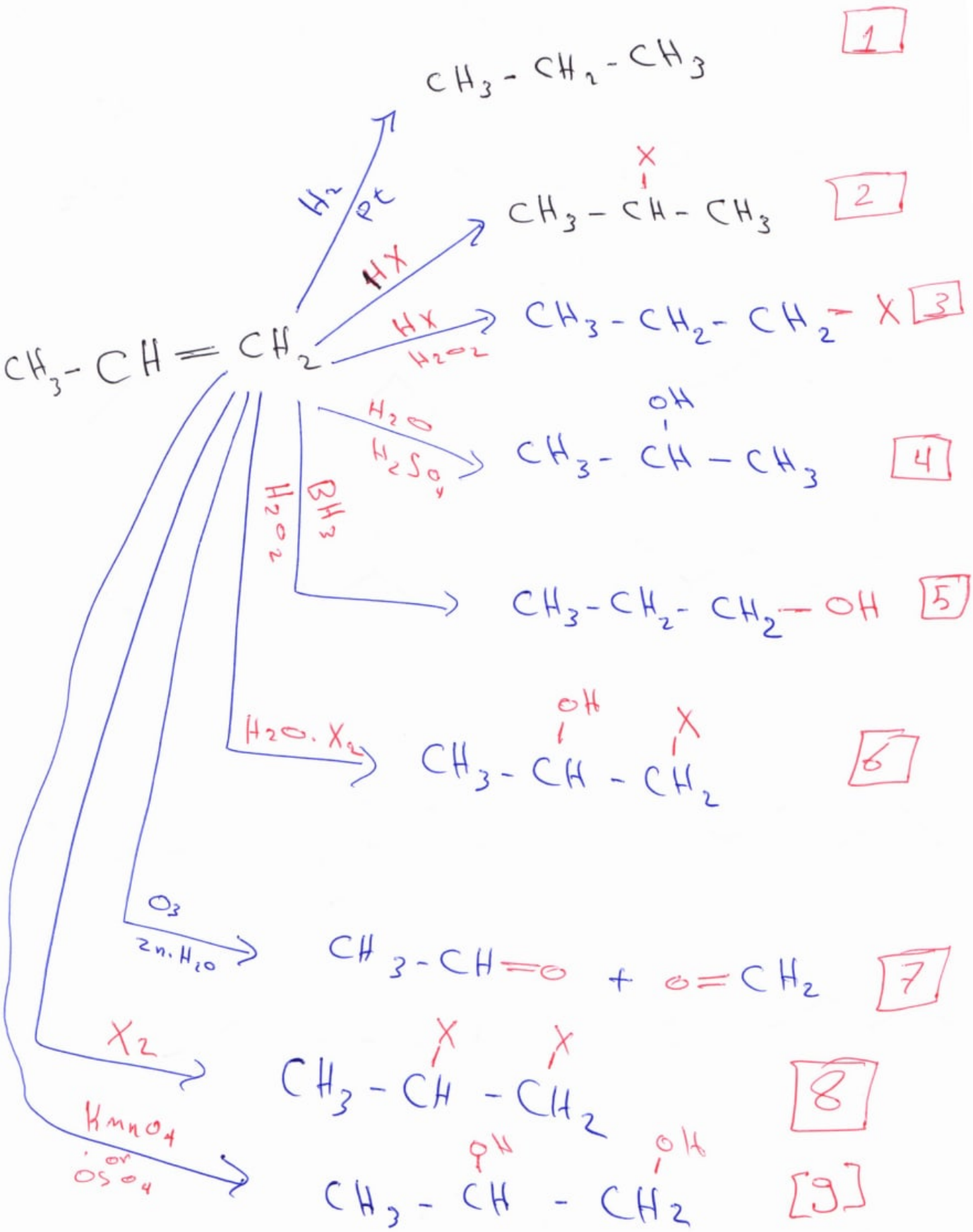






36

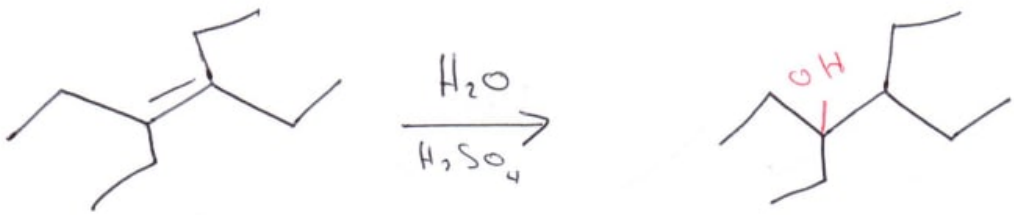
Alkene reactions



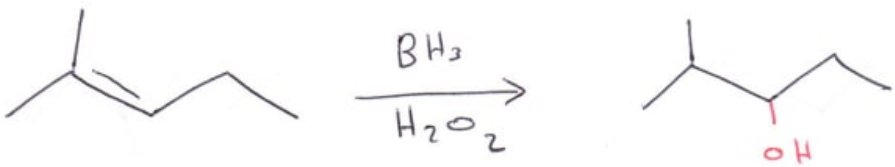
Q of reactions

(a)

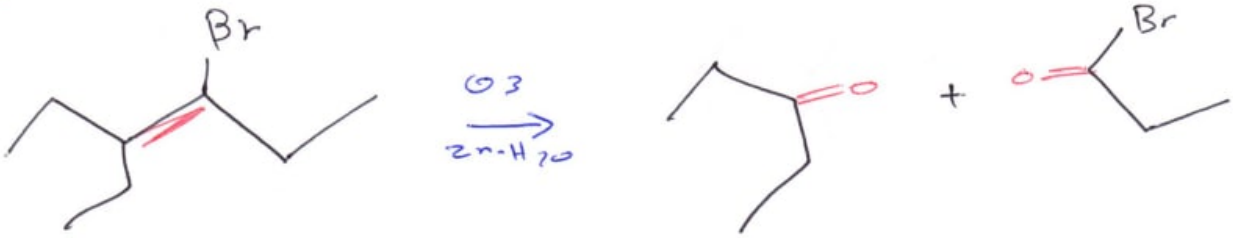
(b)



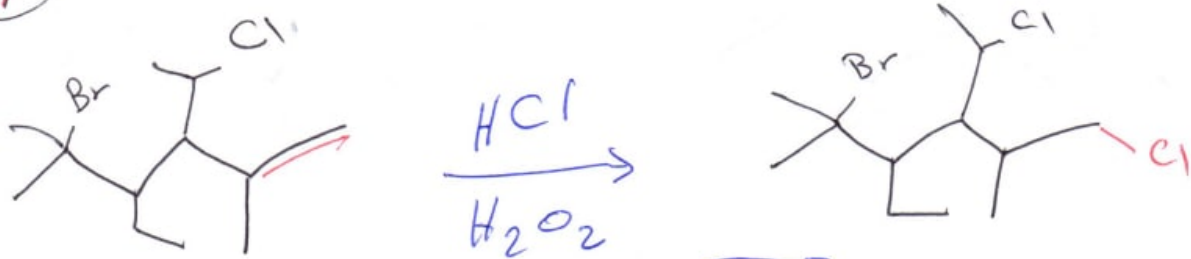
(c)



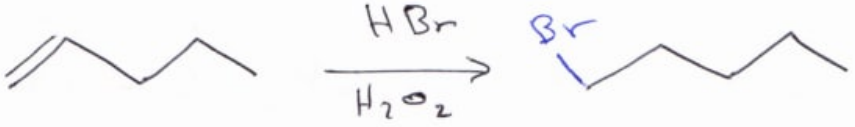
(d)



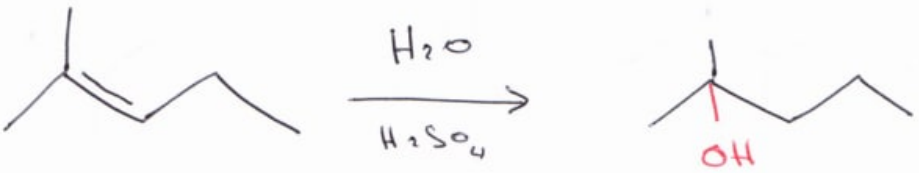
(f)



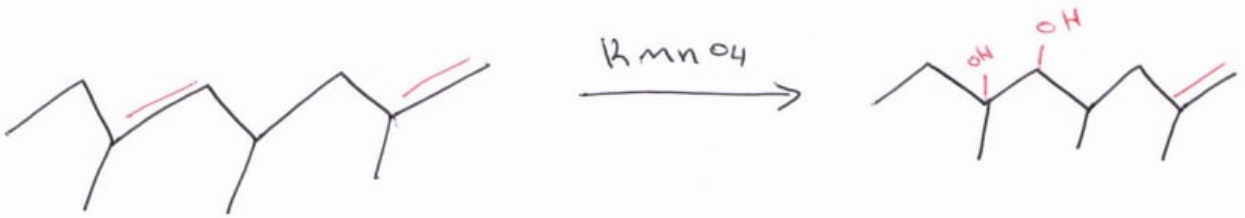
(a) Pentene + $\xrightarrow[H_2O_2]{HBr}$?

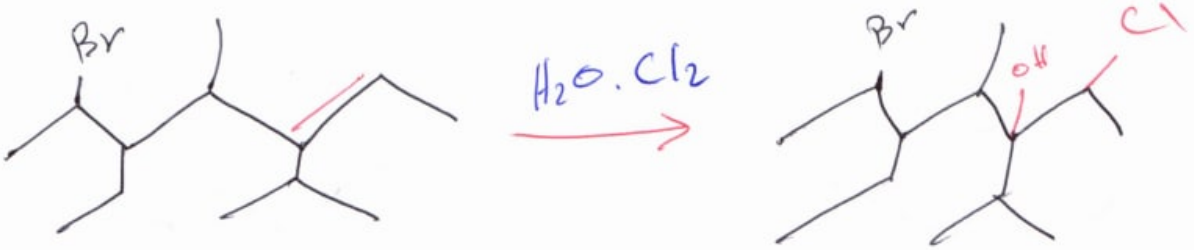


(B) 2-methyl-Pent-2-ene + $\xrightarrow[H_2SO_4]{H_2O}$



(C)





Alkene Preparation

تحضير الكين

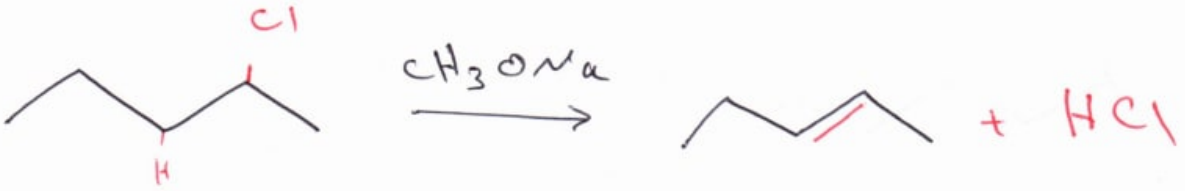
P

وقت قاعدة
سايز
تحذف H أقل

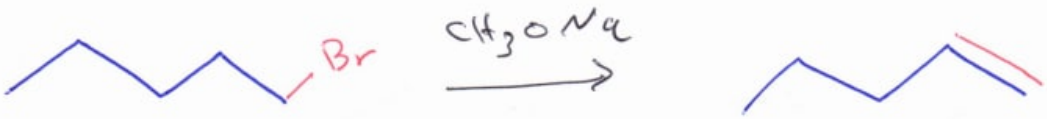
1 من هاليد الالكيل RX

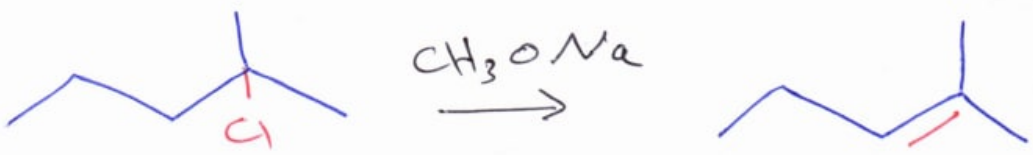
بواسطة

CH_3ONa أو alc. KOH



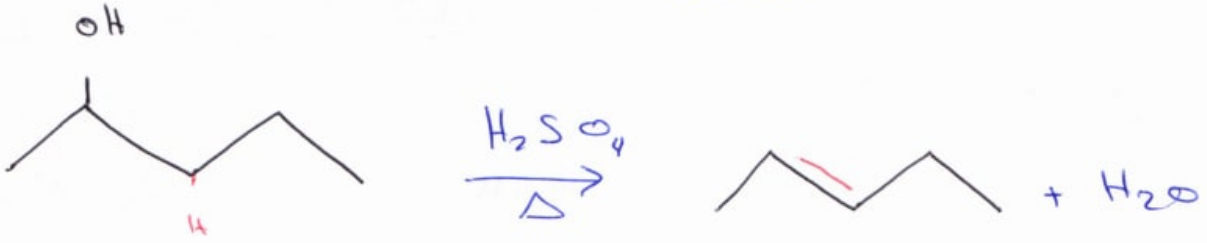
$$CH_3-CH_2-Cl \xrightarrow{\text{alc. KOH}} CH_2=CH_2 + HCl$$

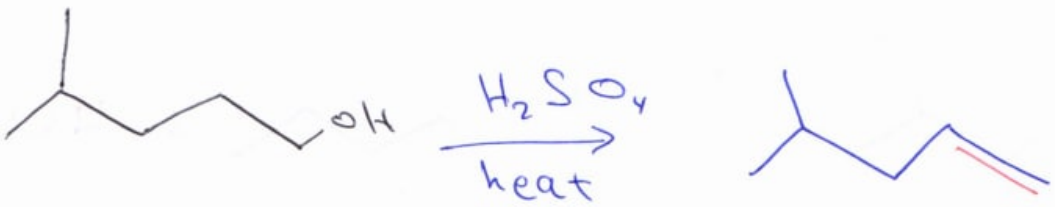




2 من RoH مركبات تحتوي على OH

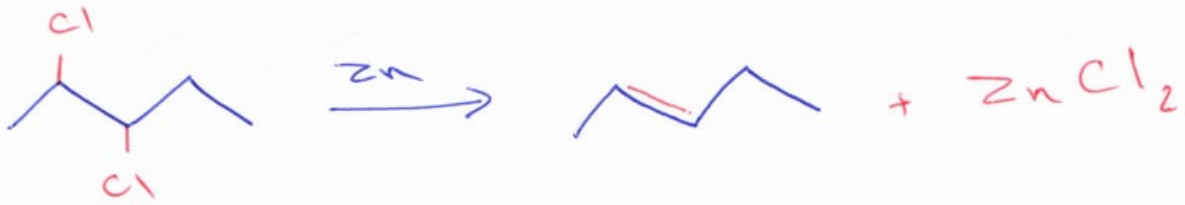
بواسطة $\frac{H_2SO_4}{Heat}$





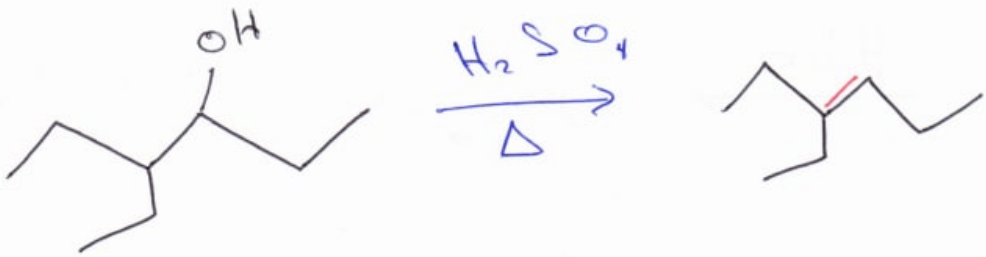
$$CH_3-CH_2-OH \xrightarrow[\Delta]{H_2SO_4} CH_2=CH_2 + H_2O$$

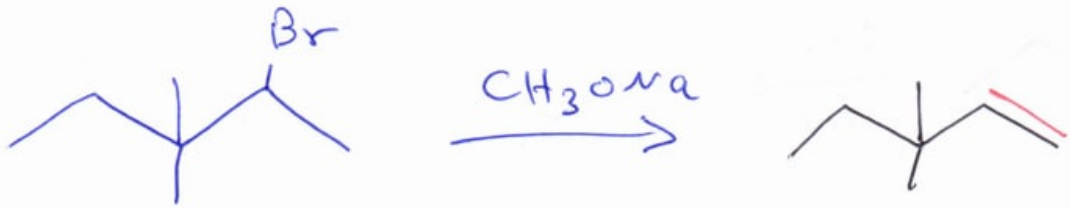
3 حذف X_2 من مركبات بواسطة Zn

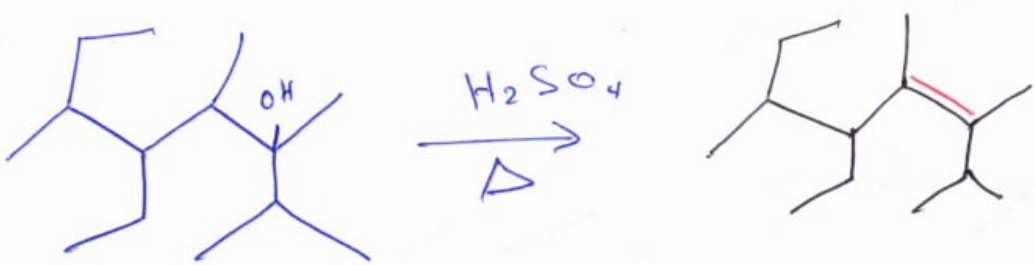


$$\begin{matrix} Cl & Cl \\ | & | \\ CH_2-CH_2 \end{matrix} \xrightarrow{Zn} CH_2=CH_2 + ZnCl_2$$

Q of Pre Parains

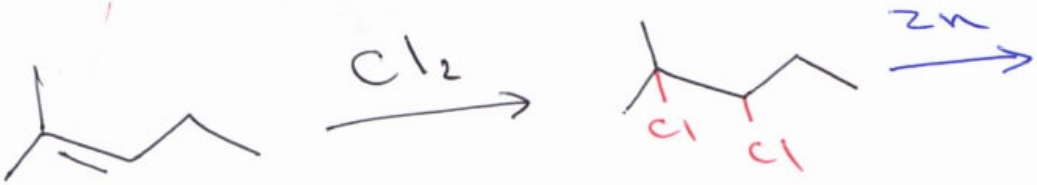


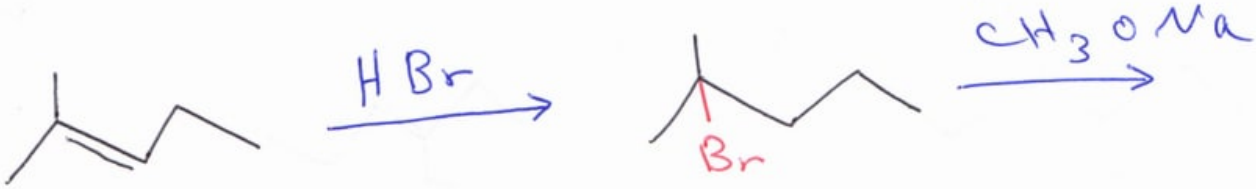


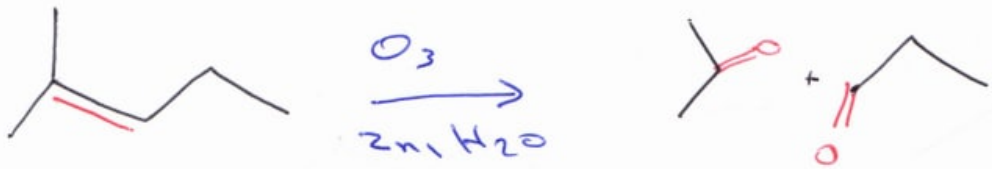


Q/1/

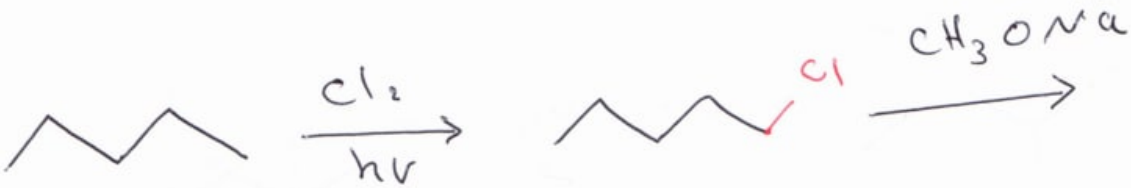

H_2O
H_2SO_4
OH
H_2SO_4
Δ


Cl_2
Cl
Cl
Zn

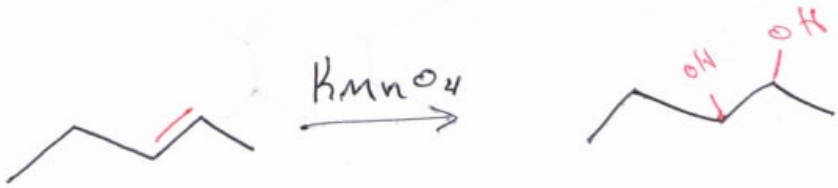

HBr
Br
CH_3ONa


O_3
Zn, H_2O
O

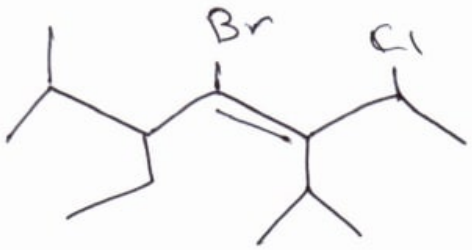
Q/2/

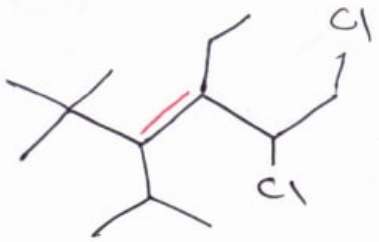

Cl_2
hv
Cl
CH_3ONa

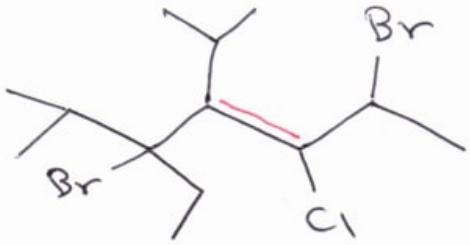

H_2O
H_2SO_4
OH
H_2SO_4

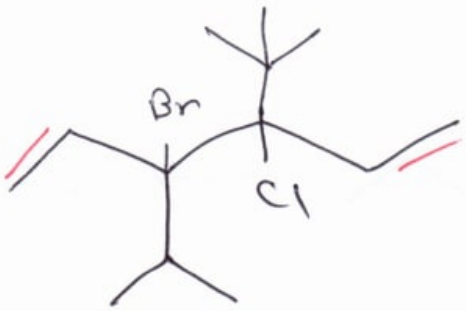

$KMnO_4$
OH
OH

Q1/A/ Give the IUPC Name









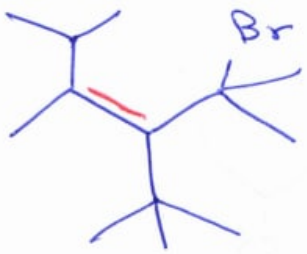
Q/2/B / Give the ✱ structr for Name

(a) 4, 6- diethyl - 2, 3- di methyl
5- propyl - oct-3- ene

(b) 4- ethyl - 2- methyl - 3- Isopropyl
5- sec butyl - oct-2- ene

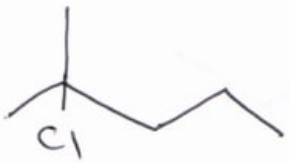
Q/2/

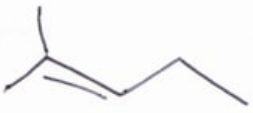
(a)



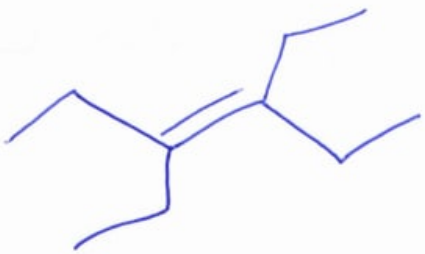
$\xrightarrow{HBr}$?

(b)



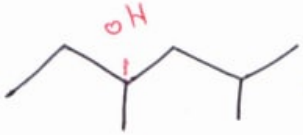
$\xrightarrow{?}$  $\xrightarrow[H_2SO_4]{H_2O}$?

(c)



$\underline{KMnO_4}$?

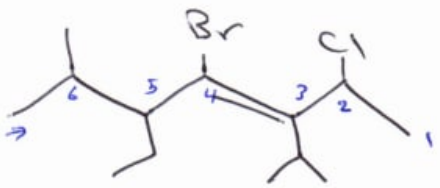
(d)

$\xrightarrow{?}$ 

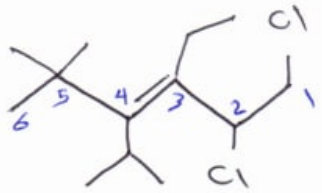
$\xrightarrow[\Delta]{H_2SO_4}$?

$\xrightarrow[Zn.H_2O]{O_3}$

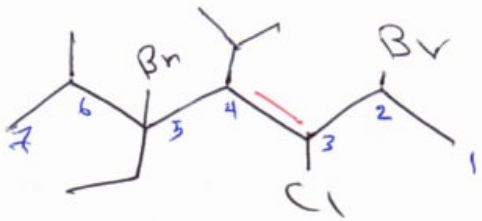
Q11



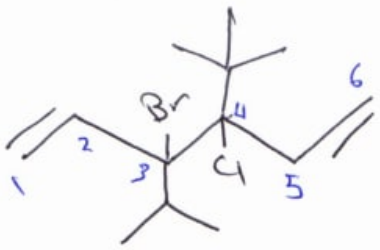
4-Bromo-2-chloro-5-ethyl-6-methyl-3-Isopropyl hept-3-ene



1,2-di Chloro-3-ethyl-4-Isopropyl 5,5-di methyl-hex-3-ene



2,5-di Bromo-3-Chloro-5-ethyl-6-methyl 4-ISO Propyl-hept-3-ene

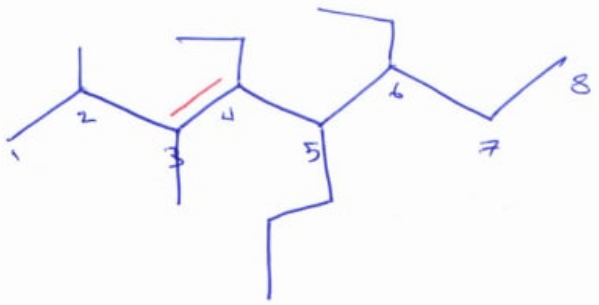


3-Bromo-4-Chloro-3-Isopropyl

4-tert butyl-hex-1,5-diene

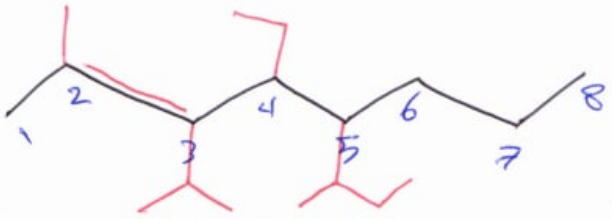
Q/1/B

(a)



4,6-diethyl
2,3-dimethyl
5-Propyl
oct-3-ene

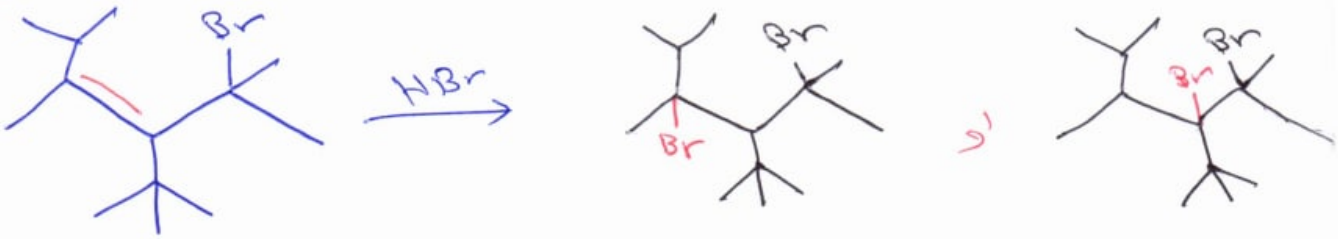
(b)



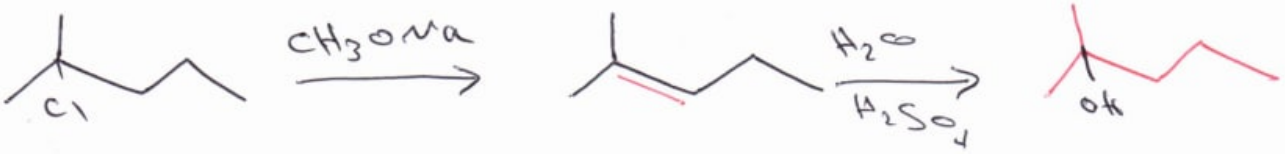
4-ethyl
2-methyl
3-Isopropyl
5-sec butyl
oct-2-ene

Q/2/

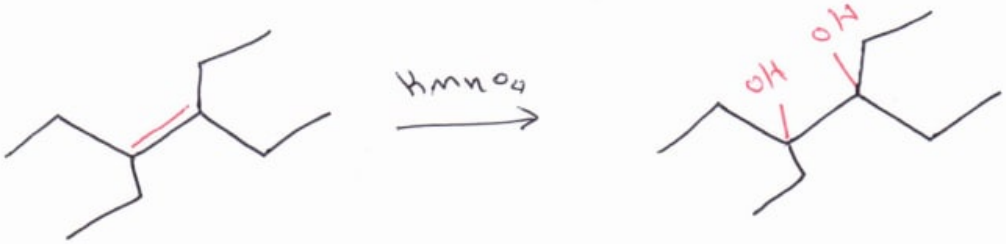
(a)


Br
HBr
Br
Br
Br
Br

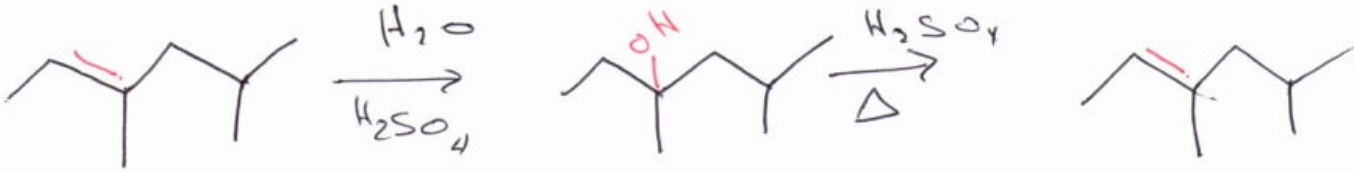
(b)


Cl
CH3ONa
H2O
H2SO4
OH

(c)


KMnO4
OH
OH

(d)


H2O
H2SO4
OH
H2SO4
Δ