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有機化學實驗

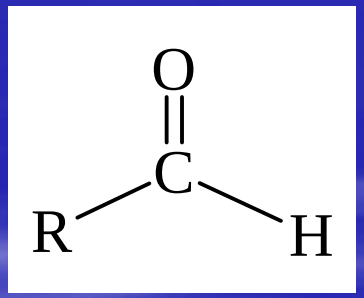
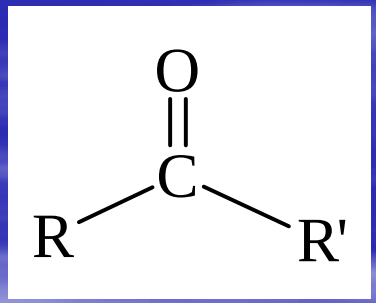
Aldehydes and Ketones

醛、酮化學反應與檢驗

原　理

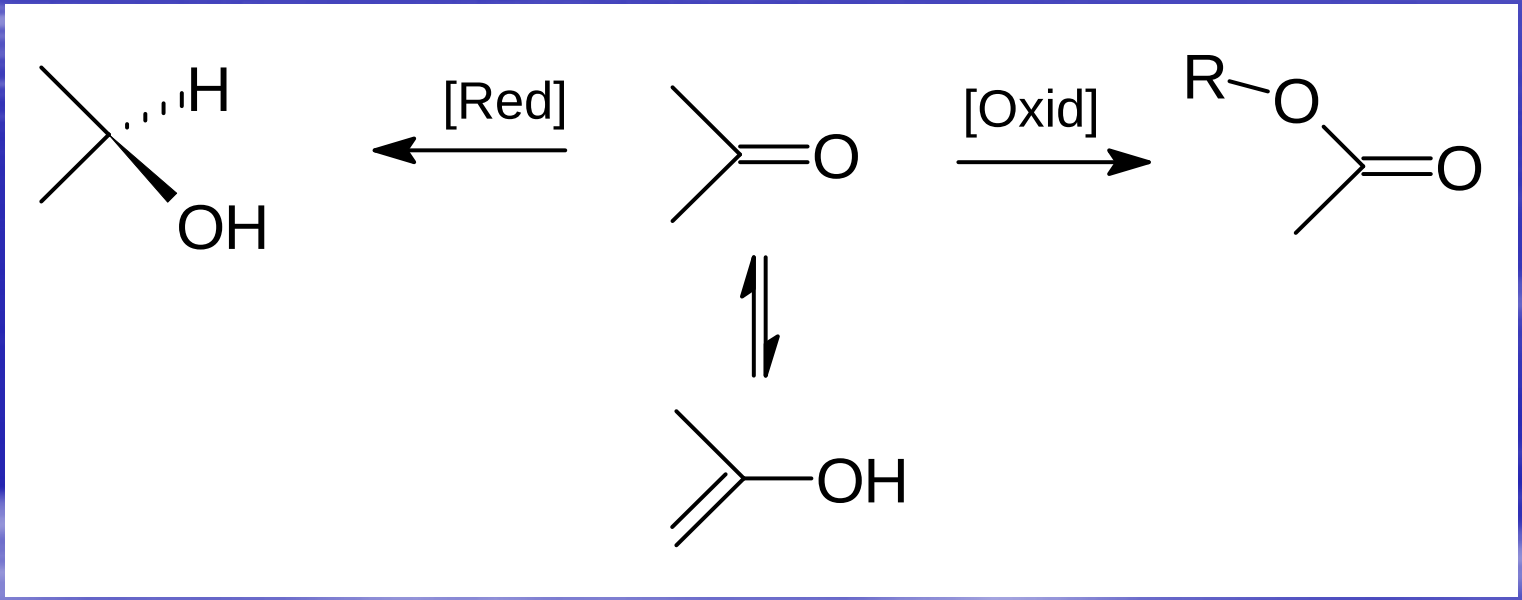
1. Aldehydes and ketones:

aldehydes **ketones**

reactivity:  **>** 

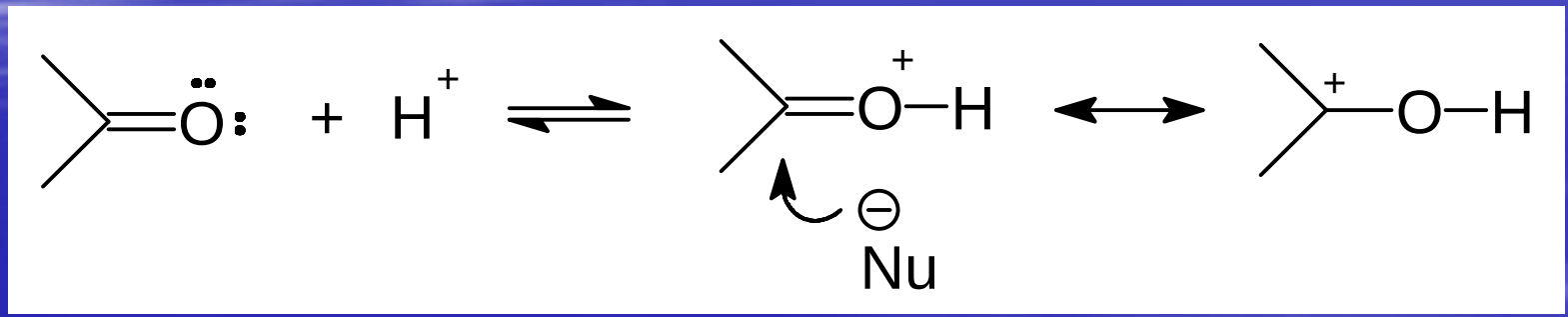
Reaction of Carbonyl Group:

(1) Oxidation & Reduction:



Reaction of Carbonyl Group:

(2) Protonation:



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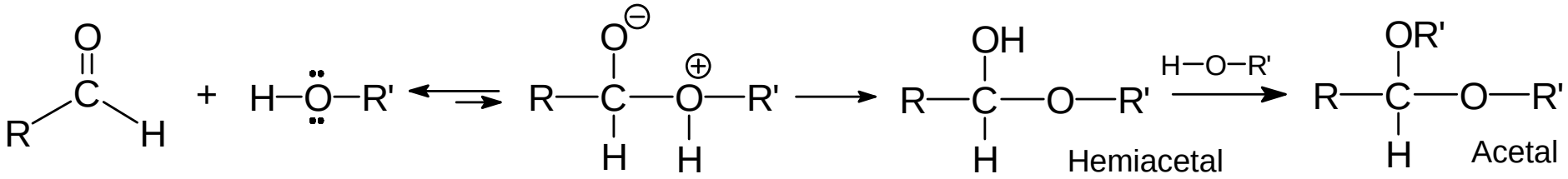
Reaction of Carbonyl Group:

(3) Condensation of aldehyde (ketone) and alcohol:



(Ketone → Hemiketal → Ketal) 可當醛、酮的保護基

加入鹽酸水解可復原回原來的醛基或酮基

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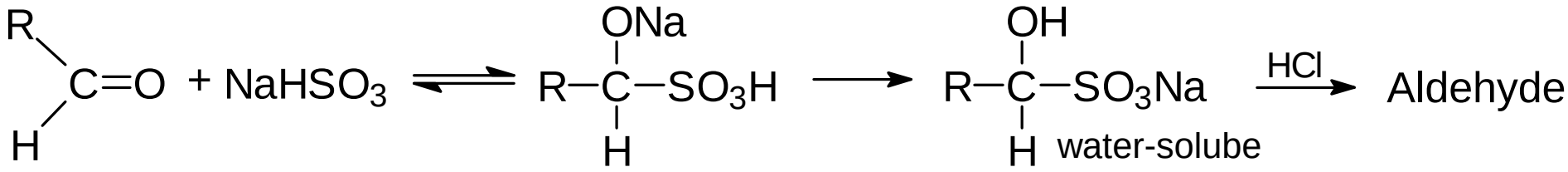
Reaction of Carbonyl Group:

(4) Bisulfite addition: (工業界純化醛的方法)



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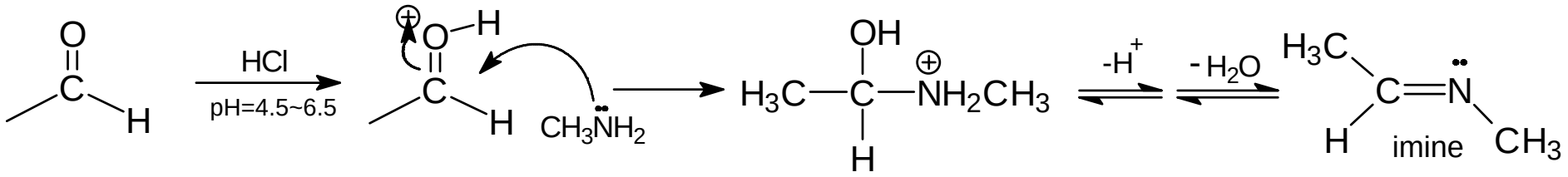
Reaction of Carbonyl Group:

(5) Reaction with amine: (imine or Schiff base)



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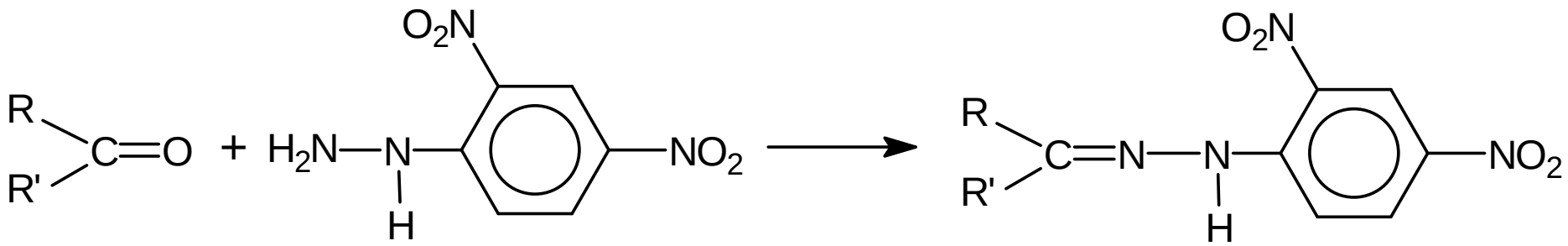
Reaction of Carbonyl Group:

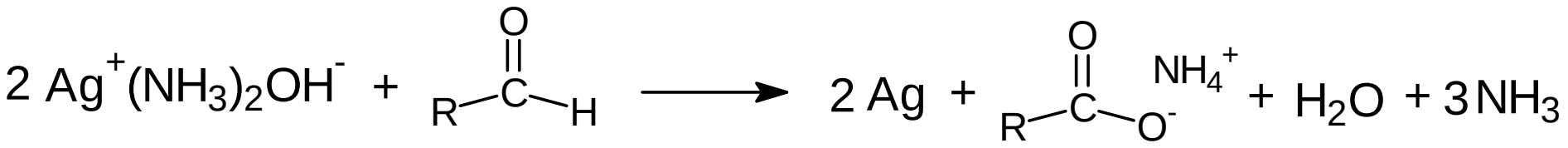
(6) 2,4-dinitrophenylhydrazones



Aldehydes and Ketones

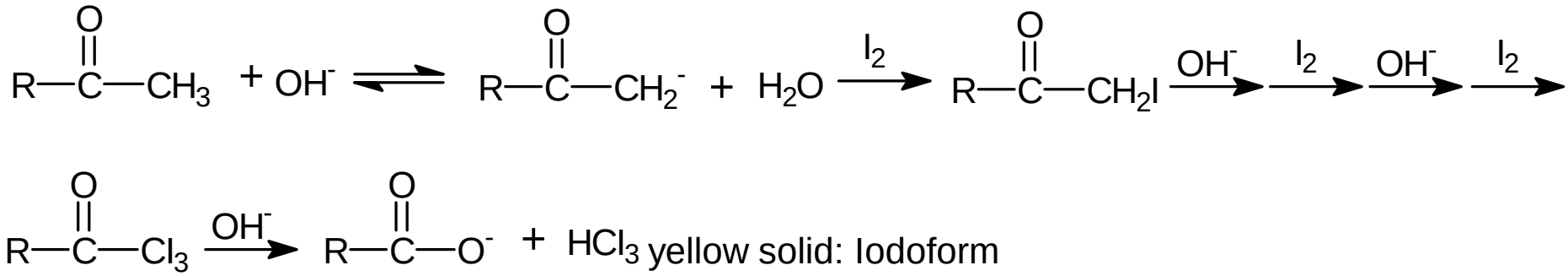
2. reaction of carbonyl group:

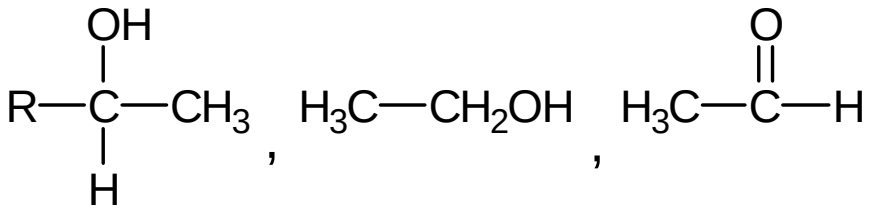
(7) Tollen's Reagent:
(identification for aldehyde and ketones)



Reaction of Carbonyl Group:

(8) Iodoform Test: (identification of methyl ketone)



positive for 

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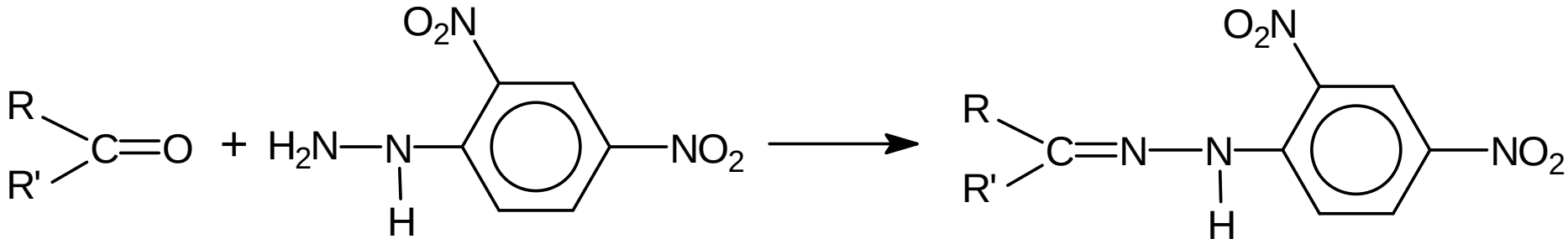
步　驟

(1) Identification of carbonyl group with 2,4-DNP:



Procedures :

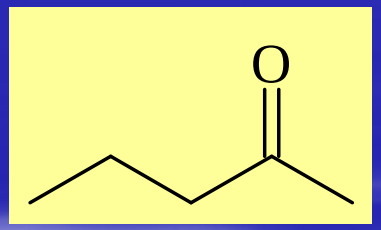
1 or 2 drops sample + 1mL Methanol
+ 0.5mL 2,4-DNP reagent
↓
shake vigorously
↓
if no ppt, stand for 15 min

步　驟

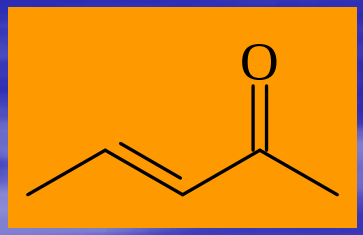
Notes : Products (2,4-dinitrophenylhydrazone):

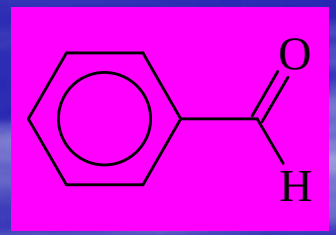
yellow→ aldehydes or ketones in which the carbonyl group is not conjugated with another functional group

Ex:



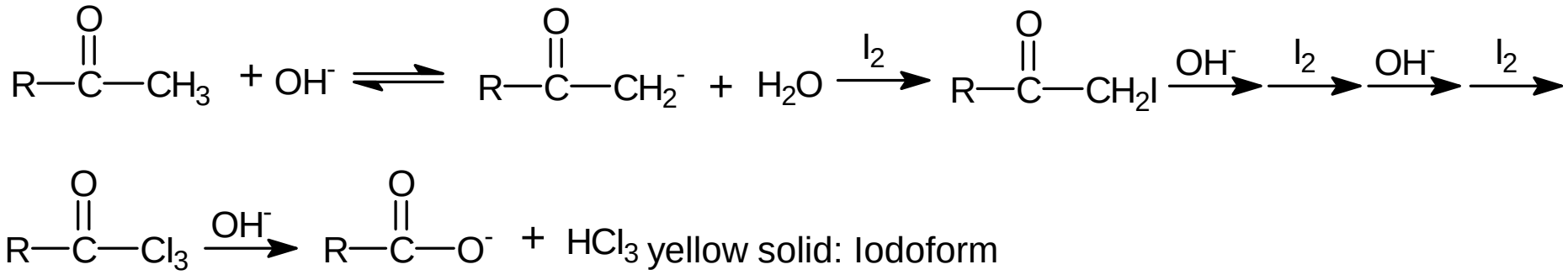
Ex:





orange-red→ aldehydes or ketones in which the carbonyl group is conjugated with C=C or with benzene ring

(2) Iodoform test: (identification of methyl ketone)



Reagent :

20g KI + 10g I_2 + 80mL H_2O → ~90mL $KI_{3(aq)}$
stirring until solution is complete
(This solution is deep brown due to the I_3^-)

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步　驟

2 drops sample + 1mL 1,4-dioxane + 1mL 10%$NaOH_{(aq)}$

↓

add $KI_{3(aq)}$ and shake until a slight excess yields a definite dark color of iodine

↓

water bath at temp.=60℃

↓

If the solution becomes colorless, continue adding $KI_{3(aq)}$ and shake
(until the dark color of iodine no change for 2 min)

↓

fill the test tube with H_2O and allow to stand for 15 min

↓

Result: produced the yellow ppt (iodoform m.p 119~121℃)

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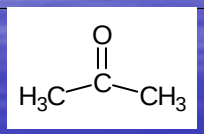
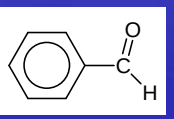
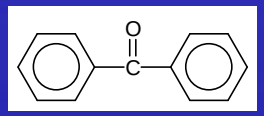
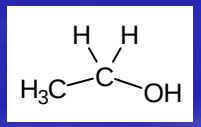
結　果

Samples	Structures	2,4-DNP	Iodoform test	Silver mirror
Acetone		+	+	–
Benzaldehyde		+	–	+
Benzophenone		+	–	–
Ethanol		–	+	–
Unknown 1				
Unknown 2				
Unknown 3				

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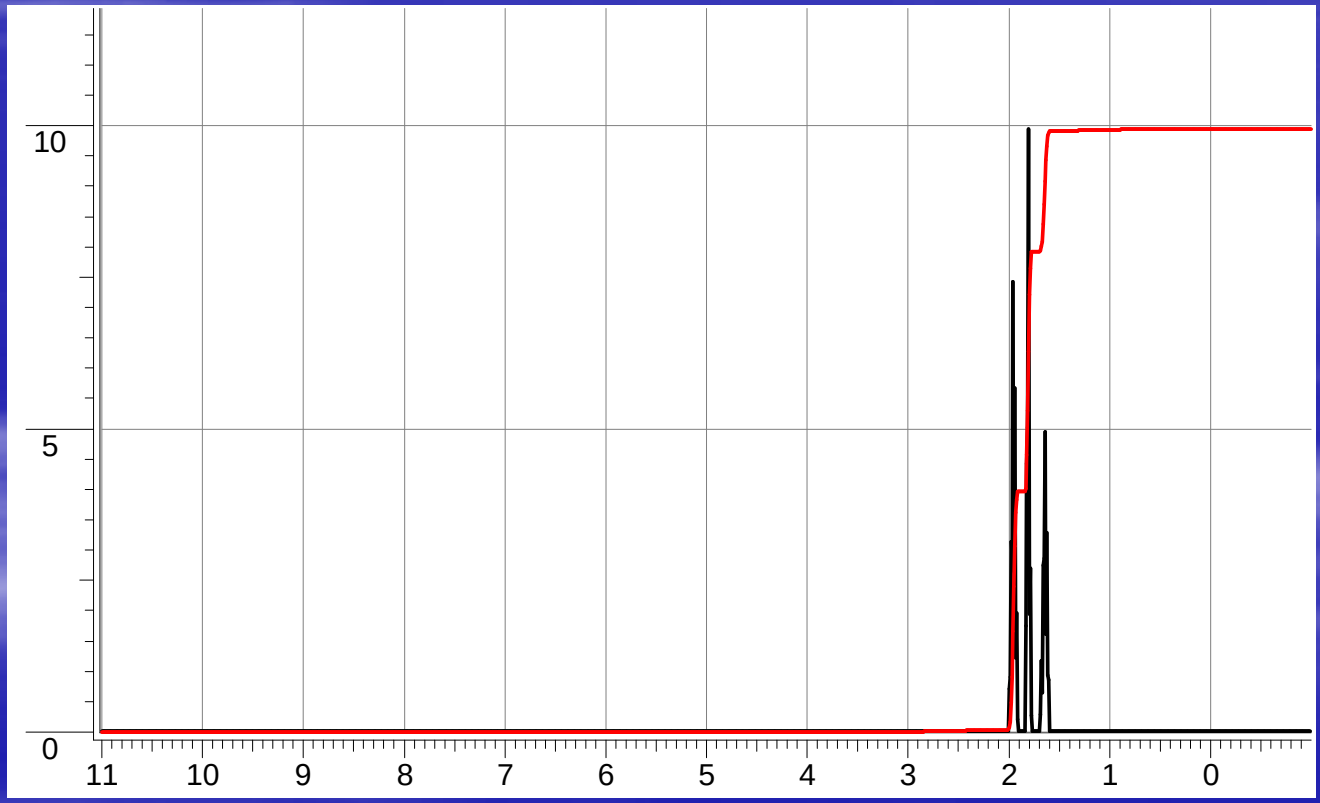
Homework

(1) 實驗中, unknown 1 的分子式為$C_6H_{10}O$, H^1-NMR光譜如下,試問其結構式為何?



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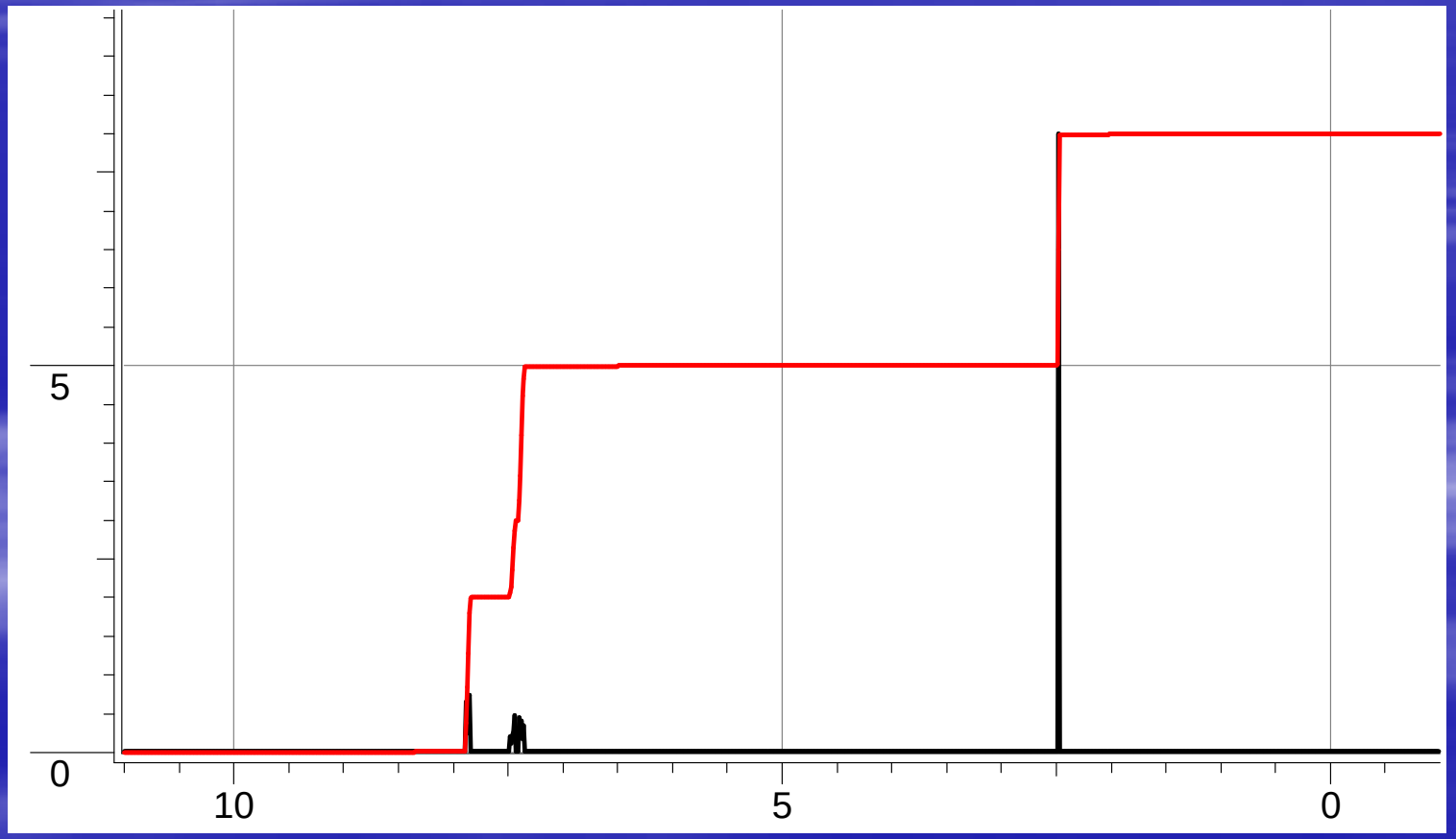
Homework

(2) 實驗中, unknown 2 的分子式為C_3H_8O, 試問其結構式為何?

Homework

(3) 實驗中, unknown 3 的分子式為C_8H_8O, H^1-NMR光譜如下, 試問其結構式為何?



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Check out

1. 需要將所有試管交至天平室檢查。
2. 檢查過後請將廢液倒到”含鹵素”有機廢液桶。
3. 試管需清洗乾淨,置於各組共用器材櫃。
4. 評分後,鑰匙交回方可離開。