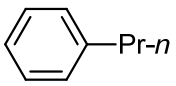
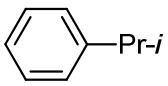
第七章　芳　烃

1. 写出单环芳烃 C_9H_{12} 的同分异构体的构造式并命名之。

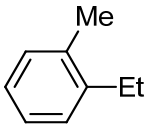
解答：分子式 C_9H_{12} 的单环芳烃的同分异构体构造式和命名如下：



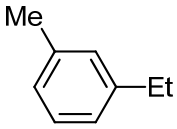
正丙苯



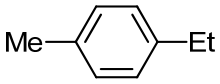
异丙苯



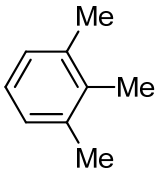
邻乙基甲苯



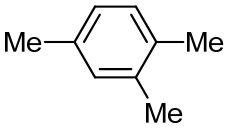
间乙基甲苯



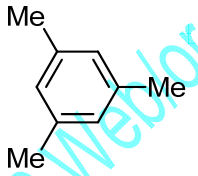
对乙基甲苯



连三甲苯



偏三甲苯



均三甲苯

2. 写出下列化合物的构造式。

(1). 2-硝基-3,5-二溴甲苯　　(2). 2，6-二硝基-3-甲氧基甲苯

(3). 2-硝基对甲苯磺酸　　(4). 三苯甲烷

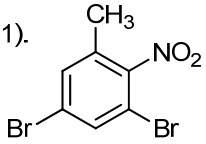
(5). 反二苯基乙烯　　(6). 环己基苯

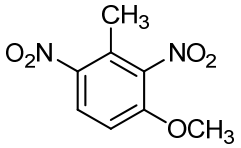
(7). 3-苯基戊烷　　(8). 间溴苯乙烯

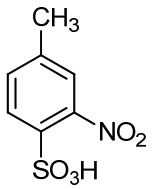
(9). 对溴苯胺　　(10). 对氨基苯甲酸

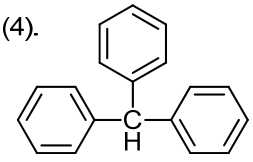
(11). 8-氯-1-萘甲酸　　(12) (*E*)-1-苯基-2-丁烯

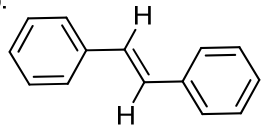
解答：

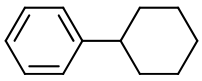
(1).


(2).


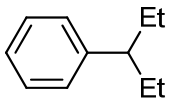
(3).


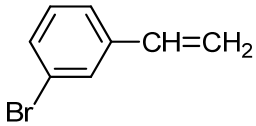
(4).


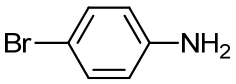
(5).


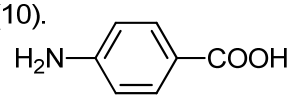
(6).


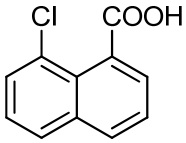
Organic_edu@hotmail.com

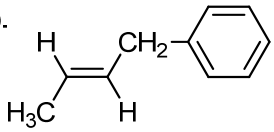
(7). 

(8). 

(9). 

(10). 

(11). 

(12). 

3. 写出下列化合物的结构式。

(1). 2-nitrobenzoic acid

(2). *p*-bromotoluene

(3). *o*-dibromobenzene

(4). *m*-dinitrobenzene

(5). 3,5-dinitrophenol

(6). 3-chloro-1-ethoxybenzene

(7). 2-methyl-3-phenyl-1-butanol

(8). *p*-chlorobenzenesulfonic acid

(9). benzyl bromide

(10). *p*-nitroaniline

(11). *o*-xylene

(12). tert-butylbenzene

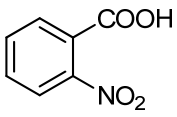
(13). *p*-cresol

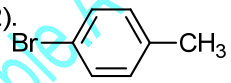
(14). 3-phenylcyclohexanol

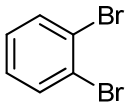
(15). 2-phenyl-2-butene

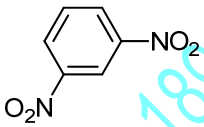
(16). naphthalene

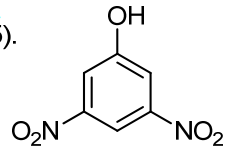
解答：

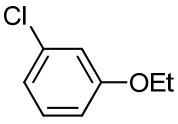
(1). 

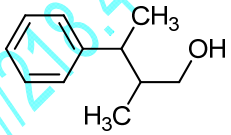
(2). 

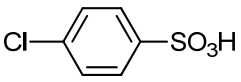
(3). 

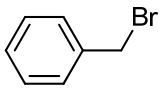
(4). 

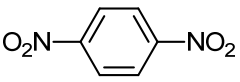
(5). 

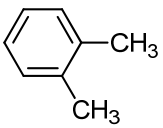
(6). 

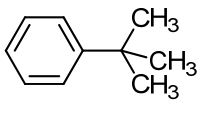
(7). 

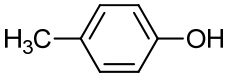
(8). 

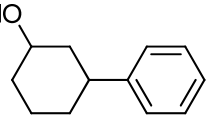
(9). 

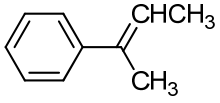
(10). 

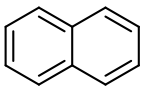
(11). 

(12). 

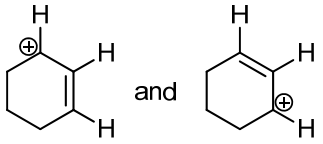
(13). 

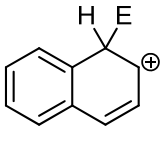
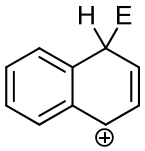
(14). 

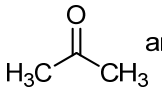
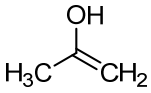
(15). 

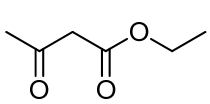
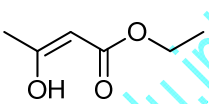
(16). 

4. 在下列各组结构中应使用“ ⟷ ”或“ ⇌ ”才能把它们正确地联系起来，为什么？

(1).  and

(2).  and 

(3).  and 

(4).  and 

解答：

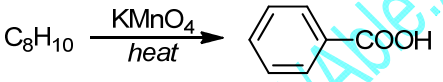
(1). ⟷ (共振结构);

(2). ⟷ (共振结构);

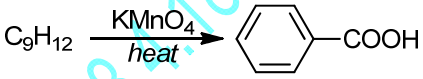
(3). ⇌ (互变异构);

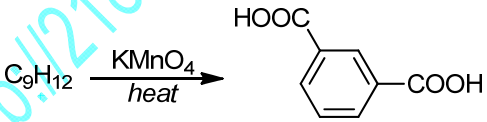
(4). ⇌ (互变异构).

5. 写出下列反应的反应物构造式。

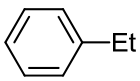
(1). 

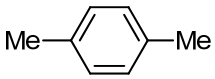
(2). 

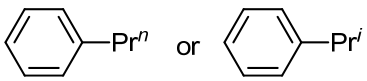
(3). 

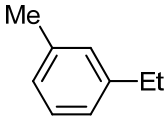
(4). 

解答：

(1). 

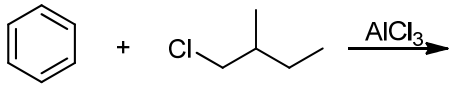
(2). 

(3). 

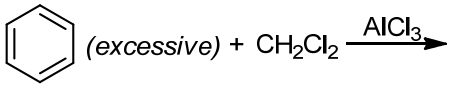
(4). 

6. 完成下列反应。

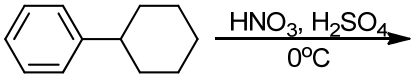
(1).



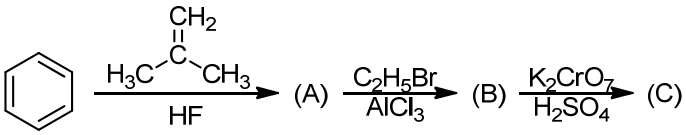
(2).



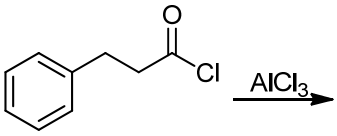
(3).



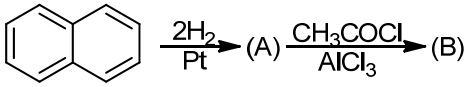
(4).



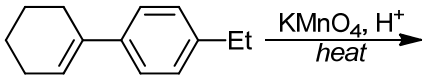
(5).



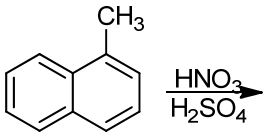
(6).



(7).

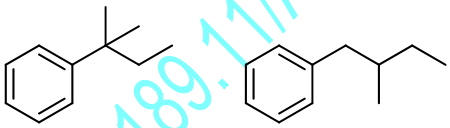


(8).

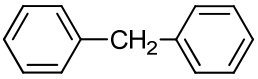


解答：

(1).

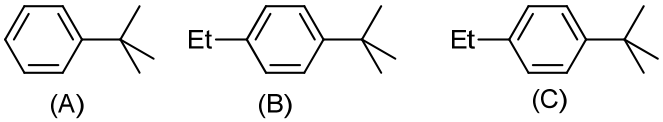


(2).

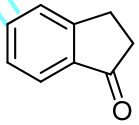


(3).

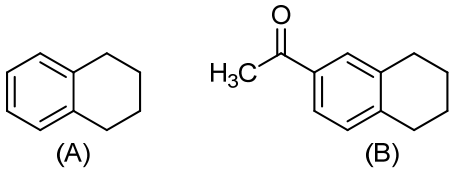
(4).



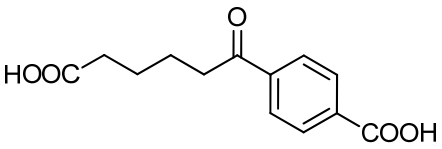
(5).



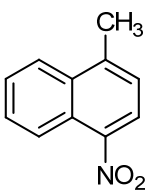
(6).



(7).



(8).



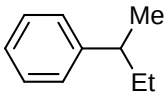
7. 写出下列反应的主要产物的构造式和名称。

(1). $C_6H_6 + CH_3CH_2CH_2CH_2Cl \xrightarrow[100^oC]{AlCl_3}$

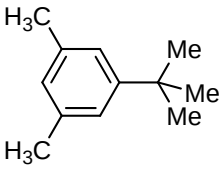
(2). $m\text{-}C_6H_4(CH_3)_2 + (CH_3)_3CCl \xrightarrow[100^oC]{AlCl_3}$

(3). $C_6H_6 + CH_3CHClCH_3 \xrightarrow[100^oC]{AlCl_3}$

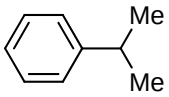
解答：

(1). 

仲丁苯

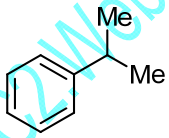
(2). 

3,5-二甲基叔丁苯

(3). 

异丙苯

8. 试解释下列傅-克反应的实验事实：

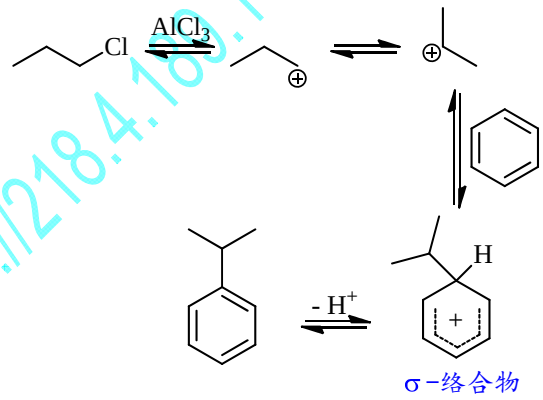
(1). $C_6H_6 + CH_3CH_2CH_2Cl \xrightarrow[100^oC]{AlCl_3}$ 

$+ HCl$

(2). 苯与 RX 在 $AlCl_3$ 存在下进行单烷基化需要使用过量的苯。

解答：

(1).

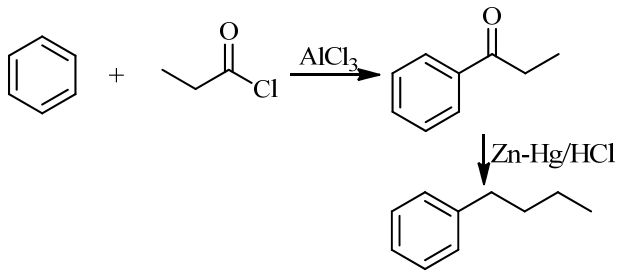


σ-络合物

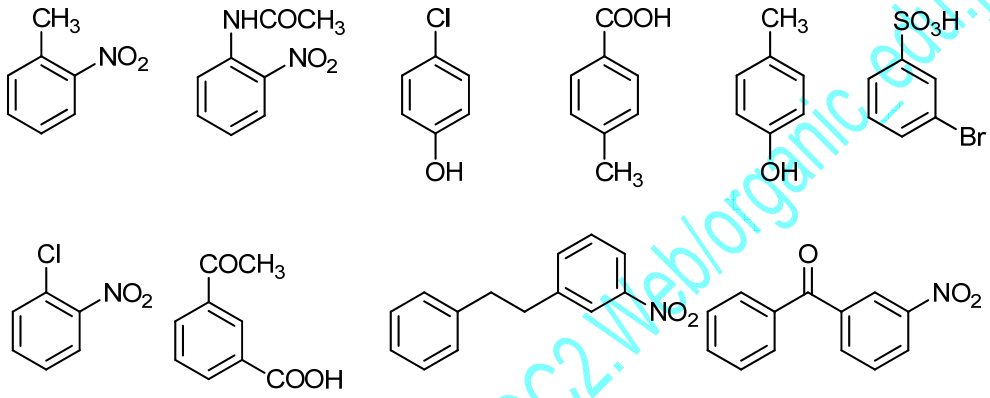
(2). 因为单烷基苯比本更容易进行烷基化反应，因此需要大大过量的苯；同时，次反应中苯还作为反映的溶剂，因而用量较大。

9. 怎样从苯和脂肪族化合物制取丙苯？用反应方程式表示。

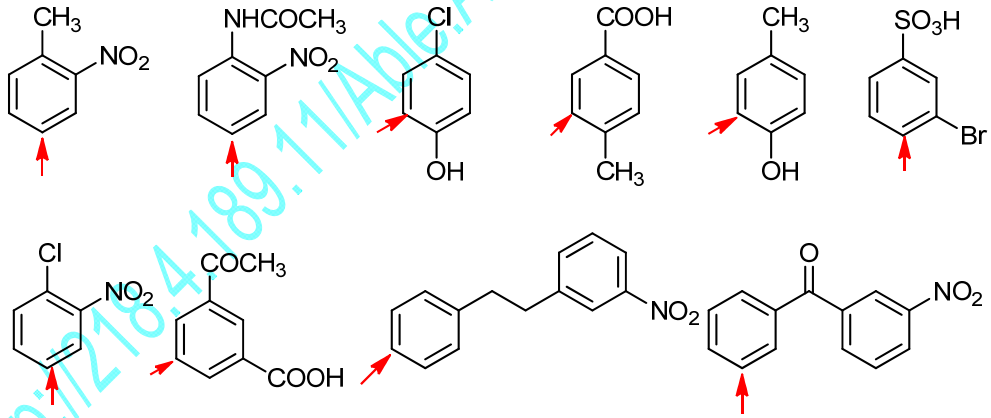
解答：



10. 将下列化合物进行一次硝化，试用箭头表示硝基进入的位置(指主要位置)。



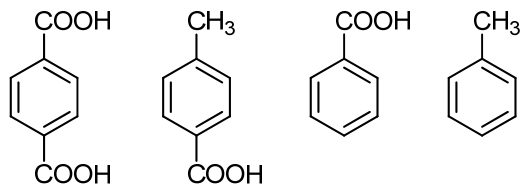
解答：

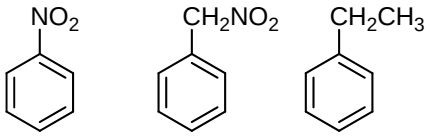


11. 比较下列各组化合物进行硝化反应时的难易。

(1). 苯; 1,2,3-三甲苯; 甲苯; 间二甲苯;

(2). 苯; 硝基苯; 甲苯;

(3). 

(4). 

解答：

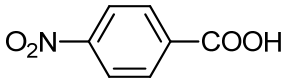
(1). 1,2,3-三甲苯>间二甲苯>甲苯>苯

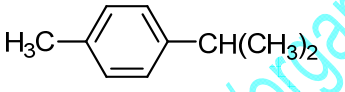
(2). 甲苯>苯>硝基苯

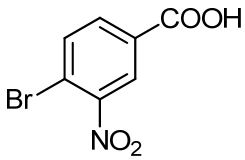
(3). 甲苯>对甲苯甲酸>苯甲酸>对苯二甲酸

(4). 乙基苯>α-硝基甲苯>硝基苯

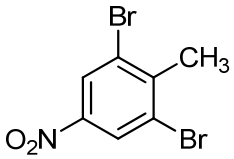
12. 以甲苯为原料合成下列各化合物。请你提供合理的合成路线。

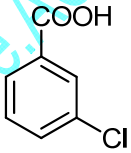
(1). 

(2). 

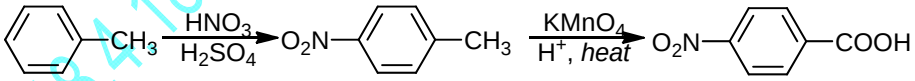
(3). 

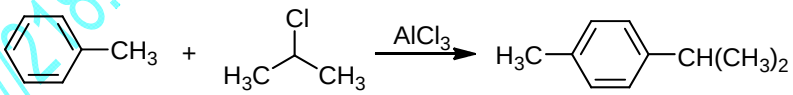
(4). 

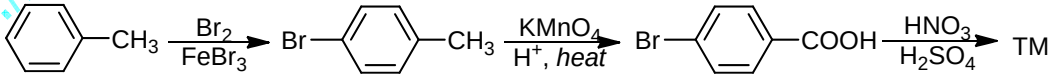
(5). 

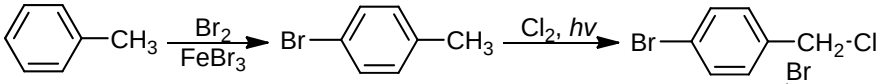
(6). 

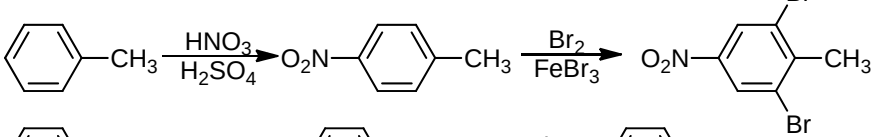
解答：

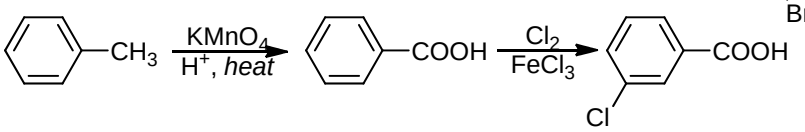
(1). 

(2). 

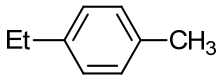
(3). 

(4). 

(5). 

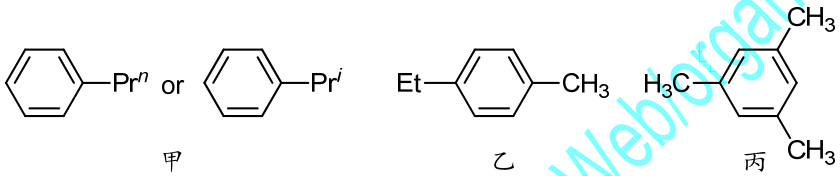
(6). 

13. 某芳烃其分子式为 C_9H_{12},用重铬酸钾的硫酸溶液氧化后得一种二元酸，将原来的芳烃进行硝化所得的一元硝基化合物主要有两种，问该芳烃的可能构造式如何？并写出各步反应式。

解答：该化合物可能的结构式为： 

14. 甲、乙、丙三种芳烃分子同为 C_9H_{12}，氧化时甲得一元羧酸，乙得二元羧酸，丙得三元羧酸。但经硝化时，甲和乙分别得到两种一硝基化合物，而丙只得一种一硝基化合物，求甲、乙、丙三者的结构。

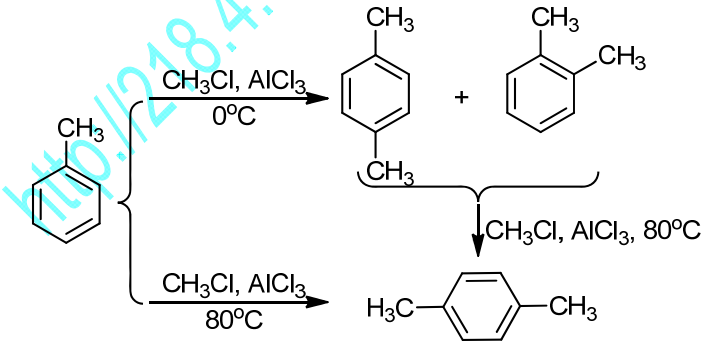
解答：化合物甲、乙、丙的结构分别为：



15. 比较下列碳正离子的稳定性。R_3C^+ $ArCH_2^+$ Ar_3C^+ Ar_2CH^+ CH_3^+

解答：稳定性顺序分别为：$Ar_3C^+ > Ar_2CH^+ > ArCH_2^+ > R_3C^+ > CH_3^+$

16. 下列傅-克反应过程中，哪一个产物是速率控制产物？哪一个是平衡控制产物?



解答：在低温 0°C 下进行的反应为速率控制产物，在 80°C 下进行的反应为平衡控制产物。

17. 解释下列事实：

(1). 甲苯硝化可得到 50%邻位产物，而叔丁基苯硝化只得 16%的邻位产物。

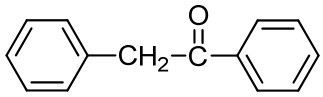
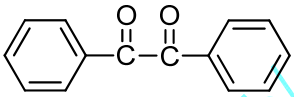
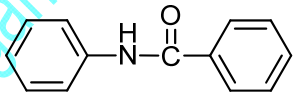
(2). 用重铬酸钾酸性溶液做氧化剂，使甲苯氧化成苯甲酸，反应产率差，而将对硝基甲苯氧化成对硝基苯甲醛，反应产率好。

解答：

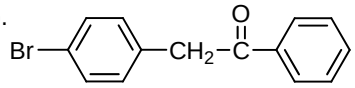
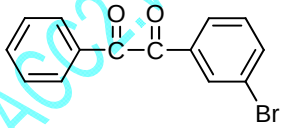
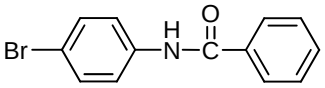
(1). 因为叔丁基的位阻大于甲基的，所以邻位产物少；

(2). 这是由于硝基的吸电子诱导效应将甲基上的电荷吸引到苯环上，从而是甲基碳原子上的电子云密度降低，这进一步降低了 C—H 键之间的电子云密度，使 C—H 键容易被氧化剂进攻而断裂，所以对硝基甲苯的氧化活性高；

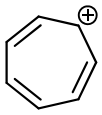
18. 下列各化合物在 Br_2 和 $FeBr_3$ 存在下发生溴代反应，将得到什么产物？

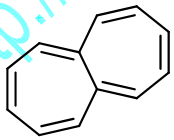
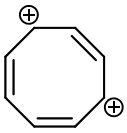
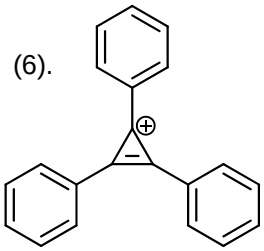
(1). 
(2). 
(3). 

解答：

(1). 
(2). 
(3). 

19. 下列化合物或离子哪些具有芳香性，为什么？

(1). 
(2). 
(3). 

(4). 
(5). 
(6). 

解答：(2), (3), (5), (6)具有芳香性，因为它们的 p 电子数分别为 6, 6, 6, 2，且都为平面分子，符合休克尔规则。而(1)和(4)的 p 电子数分别为 4 和 12，不符合休克尔规则。