



52<sup>nd</sup> IChO 2020  
International Chemistry Olympiad

Istanbul, Turkey

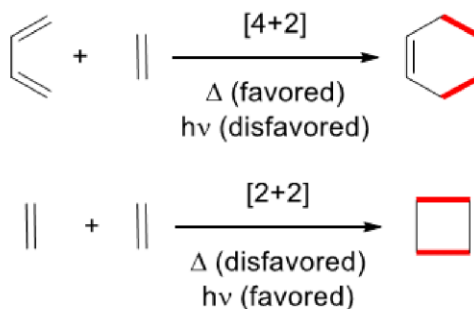
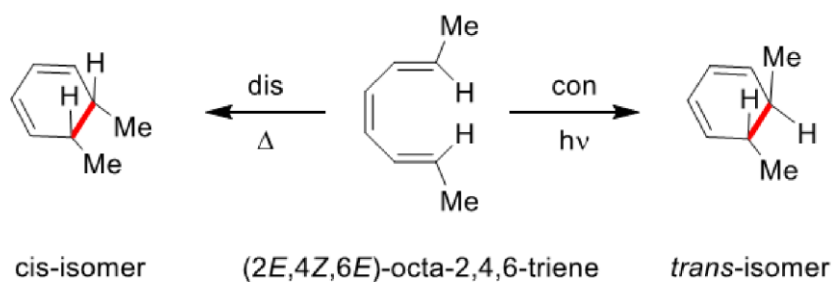
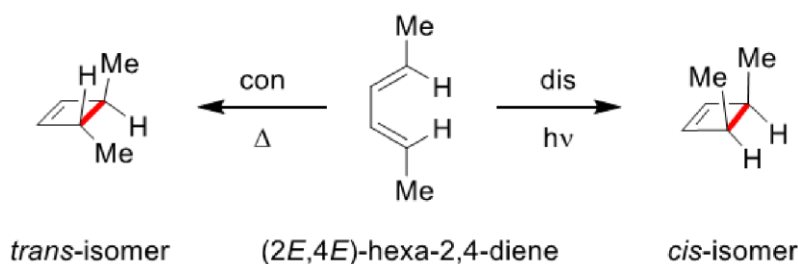
# 10-masala:

## Vudvard-Goffman qoidasi va perisiklik reaksiyalar.

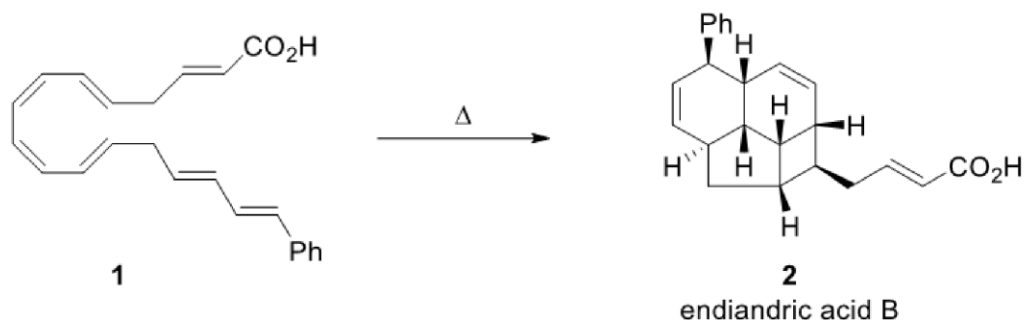
CHEMISTRY FOR A BETTER TOMORROW

Vudvard-Goffman qoidasi Robert Vudvard va Roald Goffman tomonidan ishlab chiqilgan boʻlib, perisiklik reaksiyalarda mahsulotlarning stereokimyosi va reaksiyaning aktivlanish energiyalarini bashorat qilish uchun ishlatiladi. Bu qonun siklobirikish, sigmatrop koʻchish, elektrosiklizatsiya va xeletrop reaksiyalar kabi barcha turdagi perisiklik reaksiyalarda (xattoki, ularning teskari “retro” koʻrinishlarida ham) oʻz aksini topadi.

Woodward–Hoffmann rules for electrocyclic reactions		
System	Conditions	Motion
$4n$	thermal ( $\Delta$ )	conrotatory (con)
	photochemical ( $h\nu$ )	disrotatory (dis)
$4n+2$	thermal	disrotatory
	photochemical	conrotatory

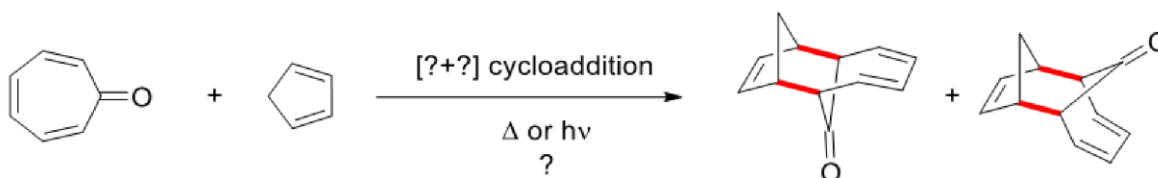


1. Birikma 1 ni qizdirsak, ketma-ket perisiklik reaksiyalar oqibatida u kislotaga 2 ni hosil qiladi. Barcha bosqichlardagi perisiklik reaksiyalarni va ularning turlarini ko'rsating.

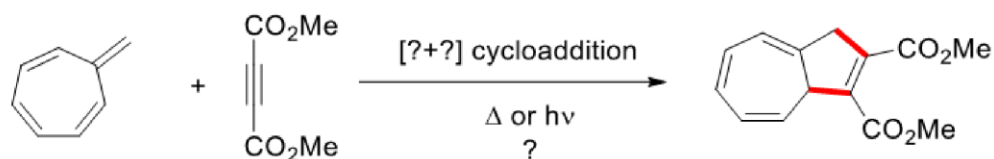


Quyidagi reaksiyalarda nechtadan  $\pi$  elektronlar qatnashadi? Vudvard-Goffman qoidasiga ko'ra ular qanday sharoitda amalga oshadi, termikmi yoki fotokimyoviyi?

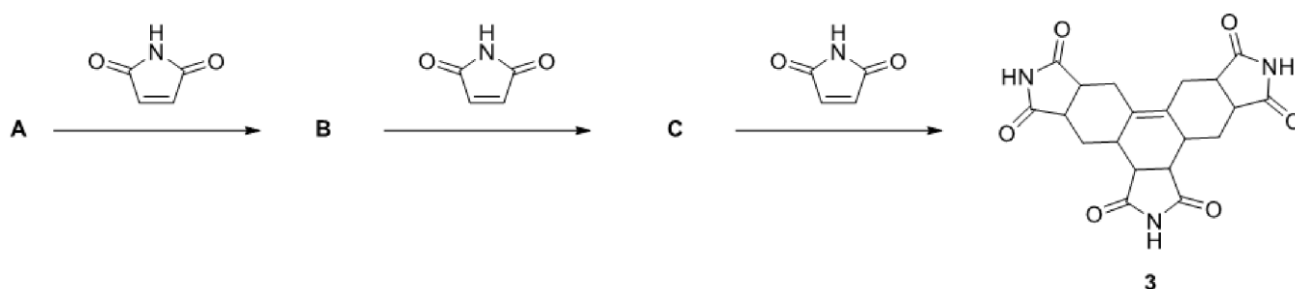
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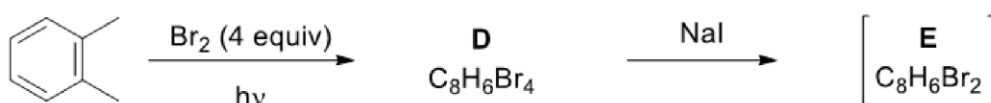
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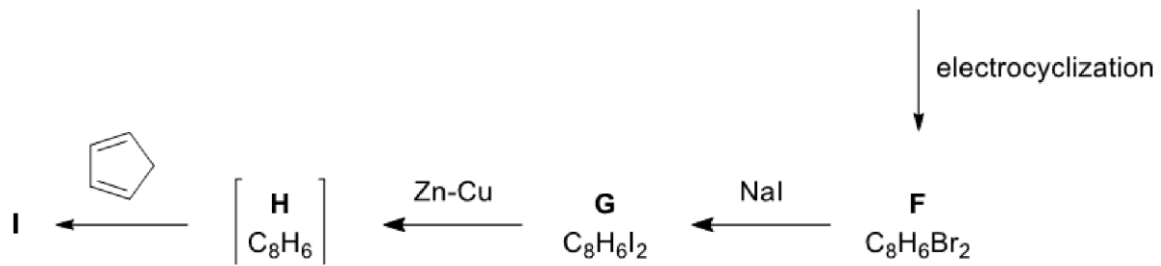


4. A ning suksinimid bilan Domino Dils-Alder reaksiyalariga kirishishi oqibatida addukt 3 hosil bo'ladi. A-C larning strukturalarini chizing.



5. Quyida keltirilgan sxema benzoid tetrasiklik uglevodorod I ning *endo*-izomerini *o*-ksiloldan sintez qilishni namoyon etadi. Tetrabrom-*o*-ksilol D ning natriy yodidi bilan  $Br_2$ -eliminatsiyalanishi faol intermediatni hosil qiladi, u esa  $4\pi$  elektrosiklizatsiyasiga uchrab F moddani hosil qiladi. D-I intermediat va mahsulotlarning strukturalarni chizing.



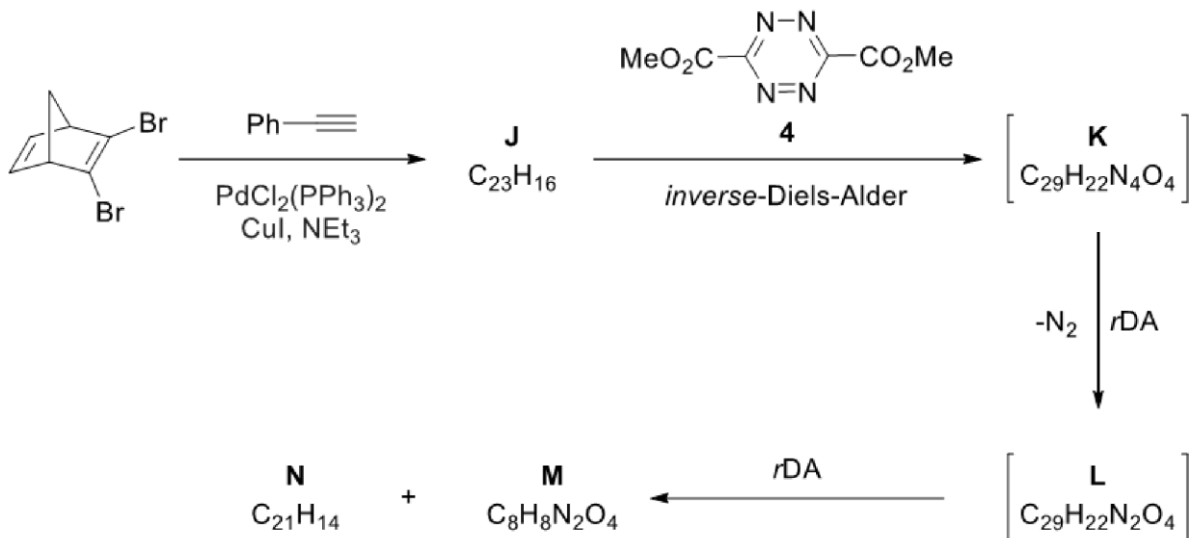


### retro-Diels-Alder reaksiyasi

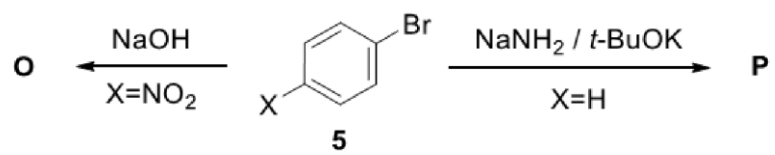
retro-Diels-Alder (*rDA*) reaksiyasi Diels-Alder reaksiyasining teskarisi bo'lib, bunda siklogeksendan dien va dienofil hosil bo'ladi. Odatda *rDA* reaksiyasi qizdirilganida boradi. Ba'zida substratning tabiatiga qarab past harorat ham yetarli bo'lishi mumkin.

6. Organik va koordinatsion kimyoda siklopentadienlar juda muhim sintetik intermediatlar bo'lib hisoblanishadi. O'rinbosar saqlamaydigan siklopentadien disiklopentadienni qizdirib parchalash orqali olinadi. Biroq o'rinbosar tutuvchi siklopentadienlar sikl ichidagi qo'shbog'larning oson ko'chib yurishi tufayli barqaror emas. Shu sababli o'rinbosar tutuvchi siklopentadienlarni sintez qilish usullari unchalik ham ko'p emas. Quyidagi sxemada o'rinbosar tutuvchi shunday siklopentadienning hosilasi sintez qilingan. *rDA* dan tashqari ba'zi bosqichlarda *inversiv*-Diels-Alder, ya'ni elektronga boy dienofil va elektronga muhtoj (tetrazin **4** kabi) dien o'rtasidagi siklobirikish reaksiyasidan ham foydalanilgan, bunda dienofilning elektron bilan to'lgan yuqori molekulyar orbitali dienning elektron bilan to'lmagan pastki molekulyar orbitali bilan ta'sirlashadi.

**J-N** intermediatlar va mahsulotlarning strukturalarini chizing.

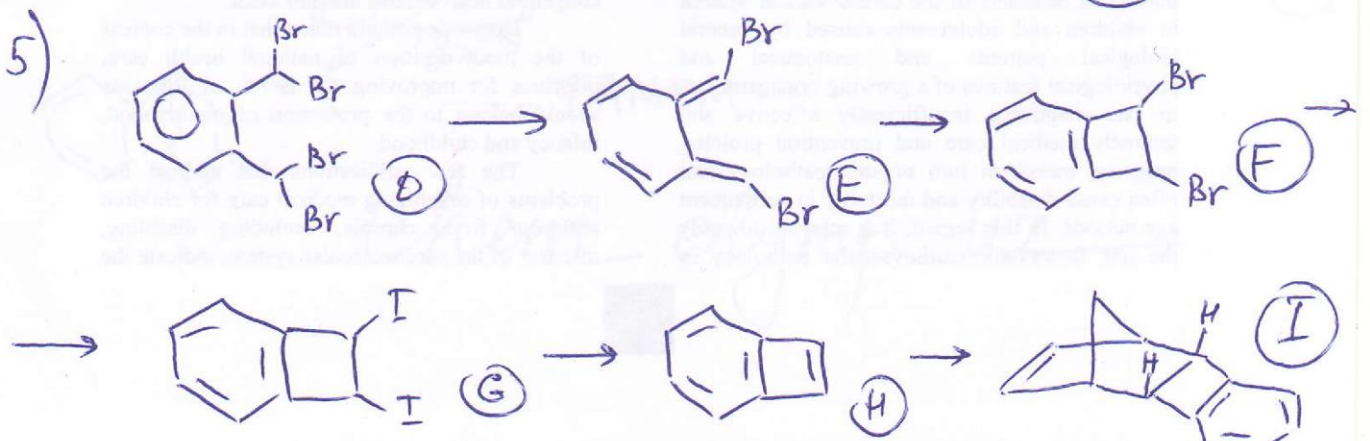
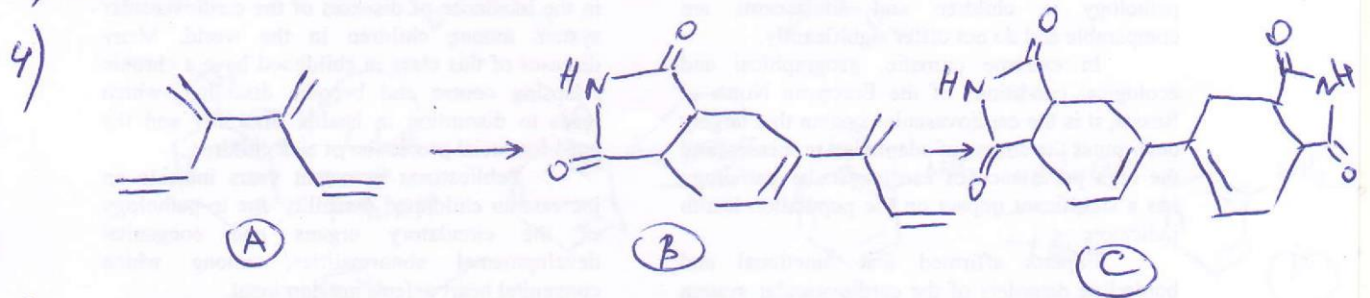
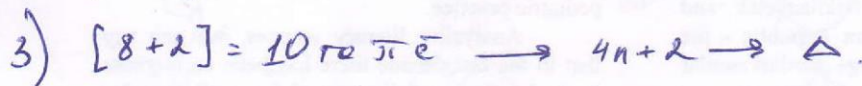
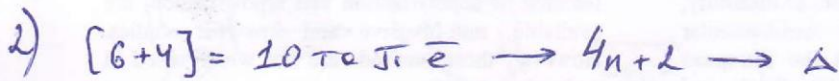
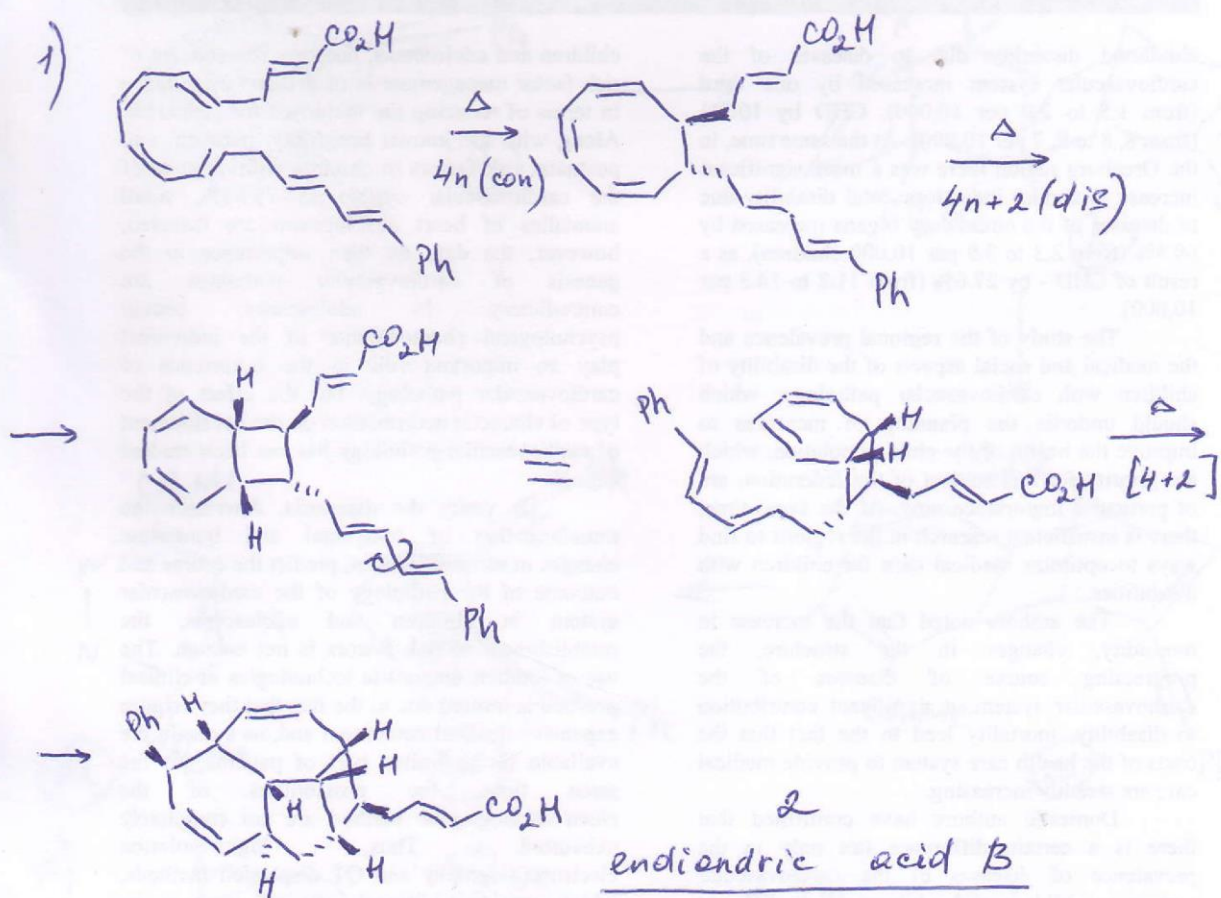


7. Nukleofil aromatik almashinish reaksiyalari sintetik organik kimyoda o'ta muhim hisoblanishadi. Quyida keltirilgan sxemada aril galogenid **5** siklik 1,3-dien ishtirokida reaksiyon muhit va aromatik sikldagi o'rinbosarning tabiatiga qarab ikkita turli xil intermediatlar hosil qilish orqali reaksiyaga kirishadi. Mahsulotlarning (**O** va **P**) strukturalarini chizing va ushbu mahsulotlar qanday intermediatlar orqali hosil bo'lishini tushuntiring.

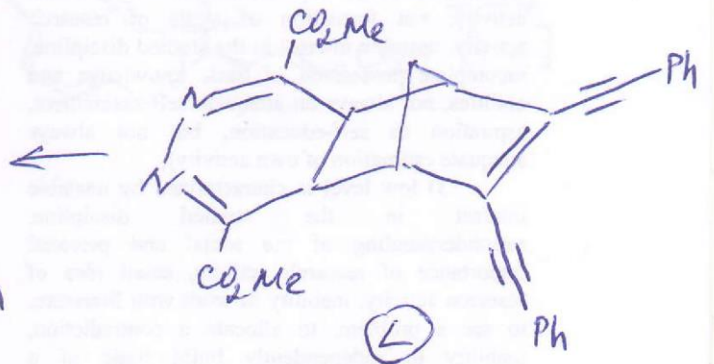
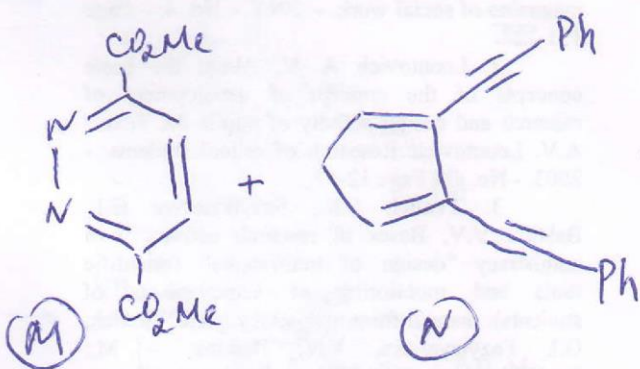
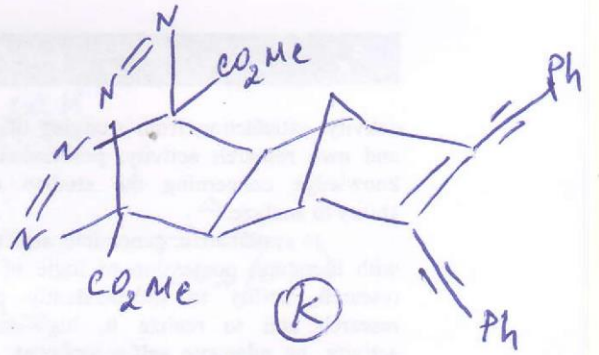
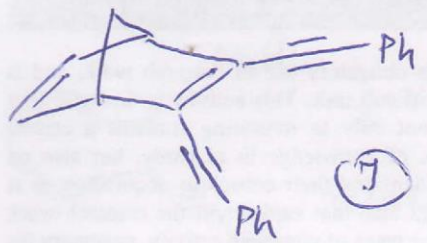


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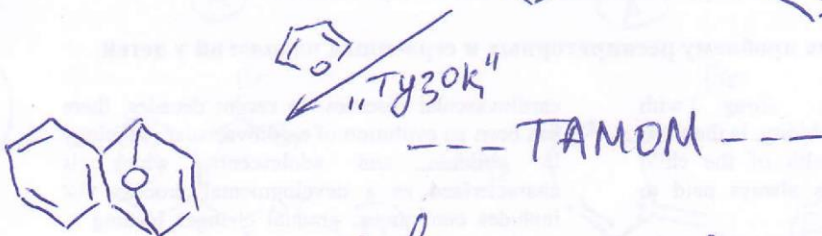
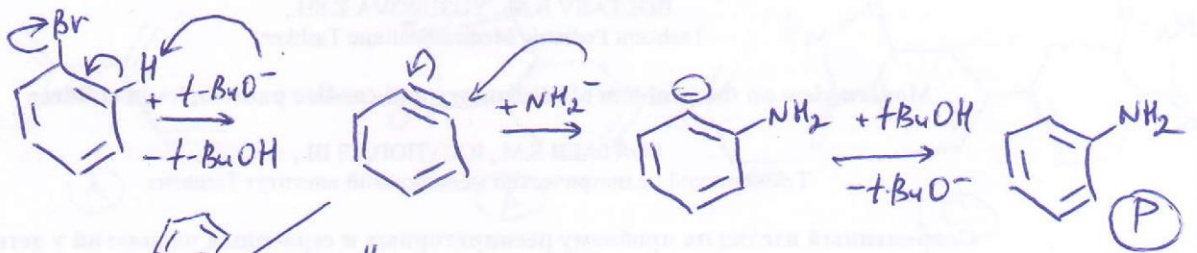
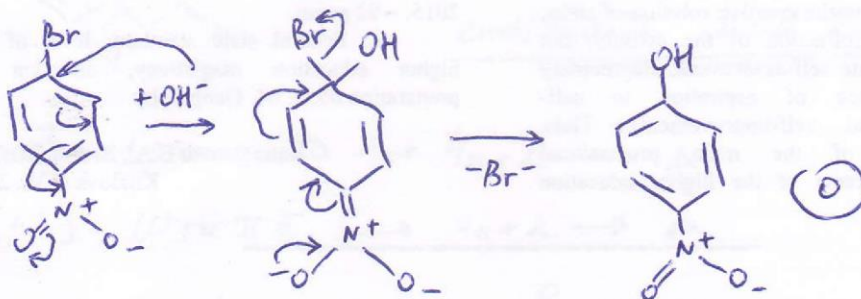
10-маселә







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@olimpdep



Fan olimpiadalari bo'yicha  
iqtidorli o'quvchilar bilan ishlash  
DEPARTAMENTI