

# OLIMPIADA DE CHIMIE 2021

Etapa a II-a

10 aprilie

Barem de evaluare și de notare

Clasa a XI-a

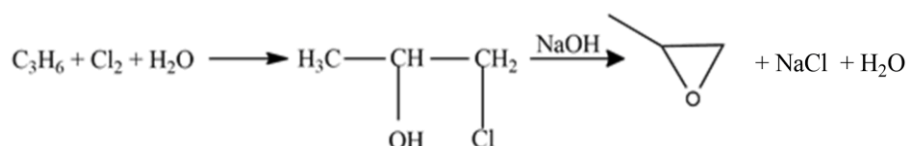
Se punctează orice modalitate de rezolvare corectă a cerințelor!

## Subiectul I

(30 de puncte)

Subiectul A. ....10 puncte

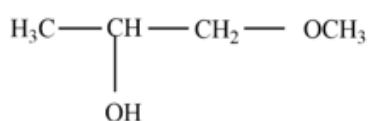
1. 2 ecuații x 1,5p (3p)



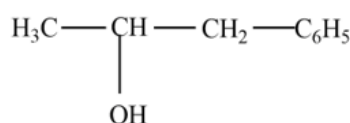
2. A este chiral (0,5p), marcarea atom carbon asimetric (0,5p)



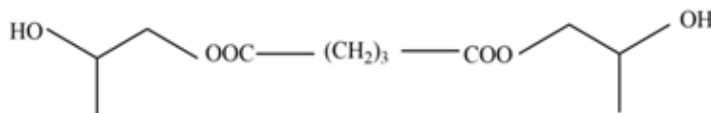
3. 4 formule structurale x 1,5p (6p)



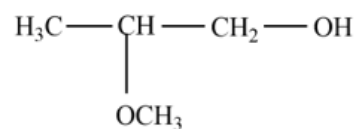
B



C



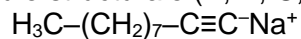
D



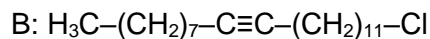
E

Subiectul B. ....10 puncte

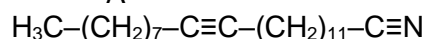
5 formule structurale (A, B, C, D, E) x 1p (5p)



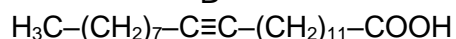
A



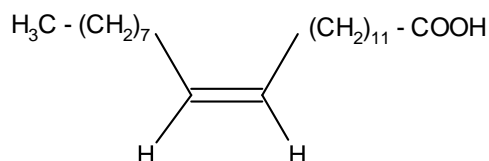
B



C



D



E

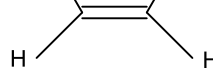
2 formule structurale (F, G) x 2p (4p)

$H_3C-(CH_2)_7$   $(CH_2)_{11}COOH$



F

$H_3C-(CH_2)_7$   $(CH_2)_{11}-COO-(CH_2)_2-OSO_3Na$

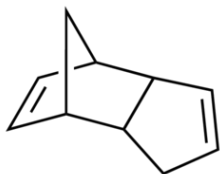


G

condiția de reacție pentru transformarea lui D în E:  $H_2/Pd/Pb^{2+}$  (1p)

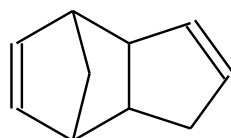
**Subiectul C.** .....10 puncte

1. 4 formule structurale x 1p (4p)

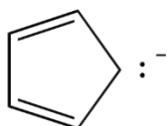
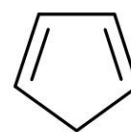


sau

A

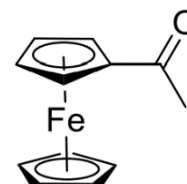


B



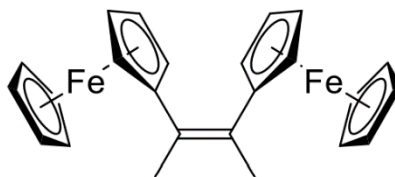
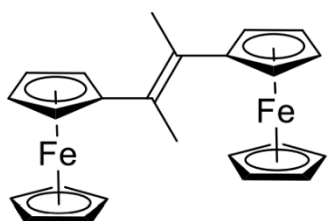
sau

C



D

2. 2 formule structurale x 1p (2p)



E + F

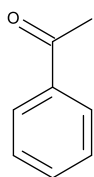
3. scrierea ecuației reacției de oxidare a compusului B cu  $KMnO_4/H_2SO_4$  (1p)

4. precizarea stereochemiei atomilor de carbon asimetric din compusul A (1p)

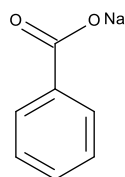
5. aciditatea mai mare explicată prin stabilitatea ridicată a anionului aromatic  $C_5H_5^-$  (1p)

6. compusul organometalic respectă regula celor 18 electroni (1p)

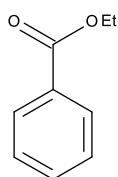
1.



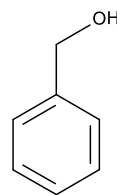
A (0,5p)



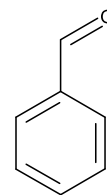
B (0,5p)



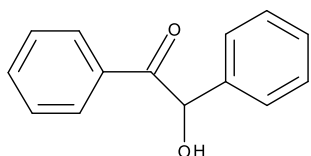
C (0,5p)



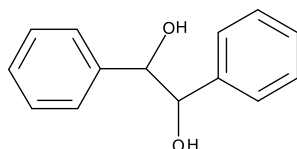
D (0,5p)



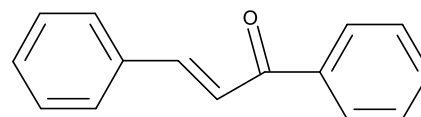
E (0,5p)



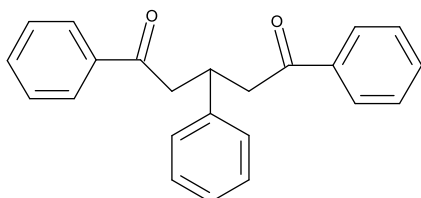
F (1,5p)



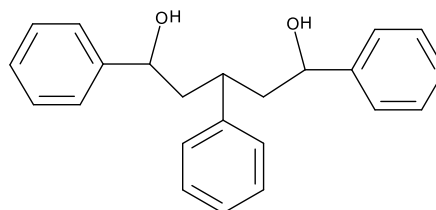
G (1p)



I (1p)

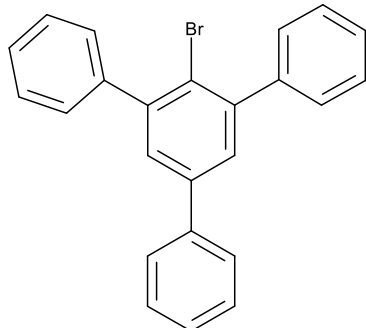


J (1,5p)



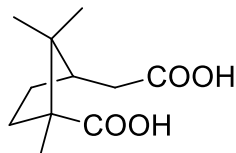
K (1p)

2. scrierea produsului de reacție (1,5p)

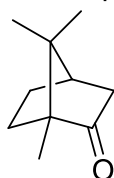


Subiectul B. ....20 puncte

1. 2 formule structurale x 1,5p (3p)

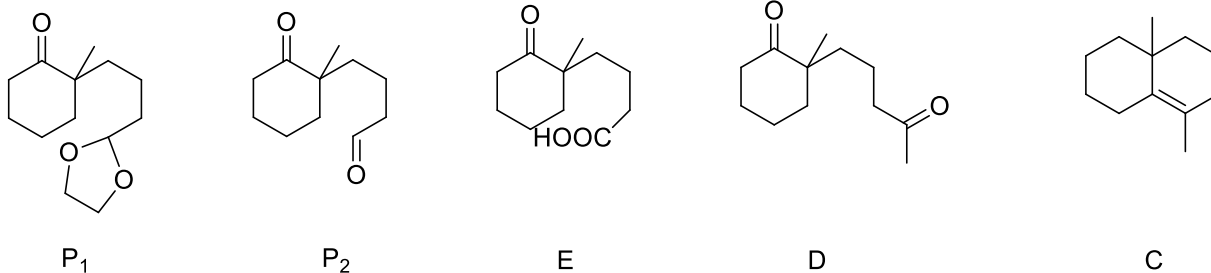


X

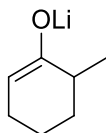


Y

2.1. 5 formule structurale x 1,5p (7,5p)

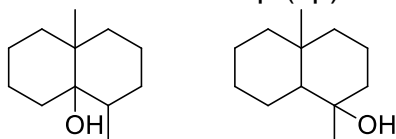


2.2. scrierea formulei produsului de reacție (2p)

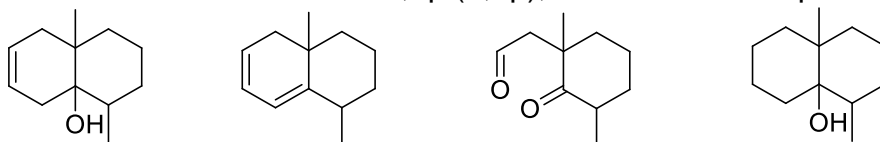


La tratarea cu o bază tare, voluminoasă, reacția este controlată cinetic.

2.3. 2 structuri x 1p (2p)



3. 3 formule de structură x 1,5p (4,5p), identificarea compusului B1 (1p)



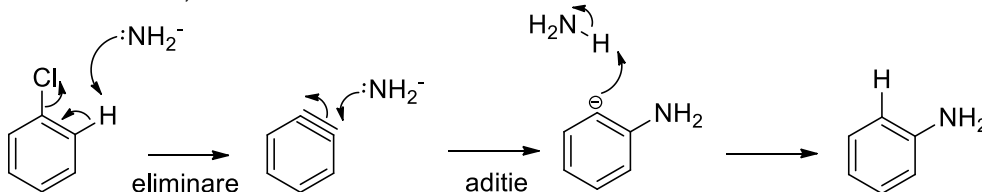
### Subiectul al III-lea

(40 de puncte)

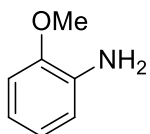
**Subiectul A.** .....20 puncte

1. scrierea mecanismului de reacție pentru transformarea R1 (2p)

Mecanismul implică mai întâi o dehidrohalogenare *syn*, cu formare de benzin cu legătură triplă, urmată de adiția de amidură 50 : 50 la oricare din cele două capete.

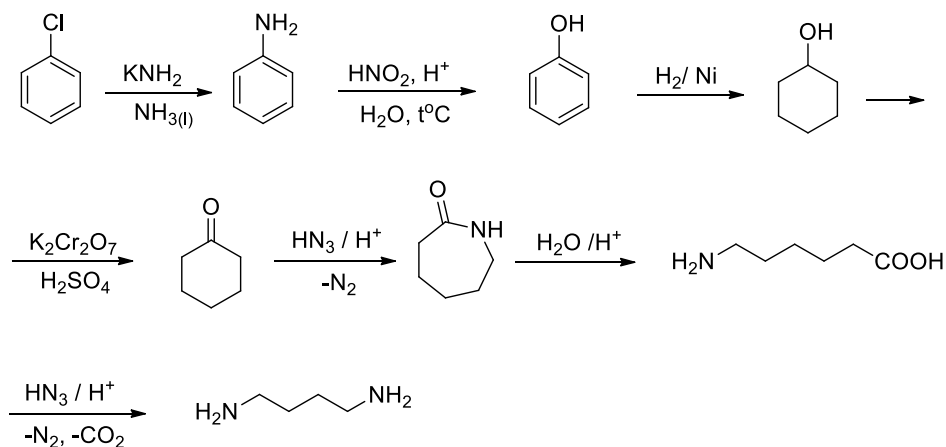


2. scrierea produsului secundar ce s-ar fi putut forma în reacția R2 (1p), explicație pe baza efectelor electronice (1p)

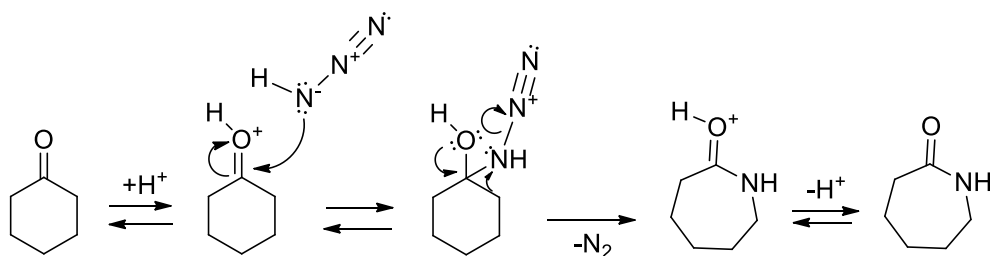


Mecanismul decurge printr-un benzin asimetric. Amidura se adăunează în poziția meta, pentru că se formează anionul mai aproape de grupa metoxi și este stabilizat prin efect inductiv. Efectul electromer nu influențează, sarcina electrică negativă, după adiție, aflându-se într-un orbital  $sp^2$ .

3. 3 compuși (A, B, C) x 1p (3p)  
3 compuși (D, E, F) x 2p (6p)

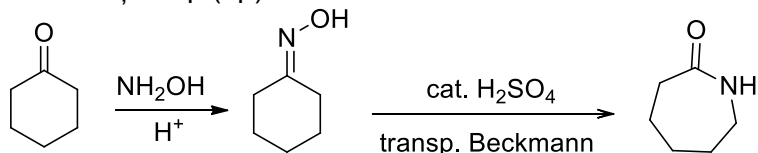


4.



- protonarea grupei carbonil (0,5p)
- adiția acidului azotidric, rămâne doar sarcină pozitivă pe azotul central (1p)
- are loc o transpoziție cu eliminare de  $N_2$  (1p)
- se deprotonează grupa carbonil rămasă protonată (0,5p)

5. 2 reacții x 1p (2p)

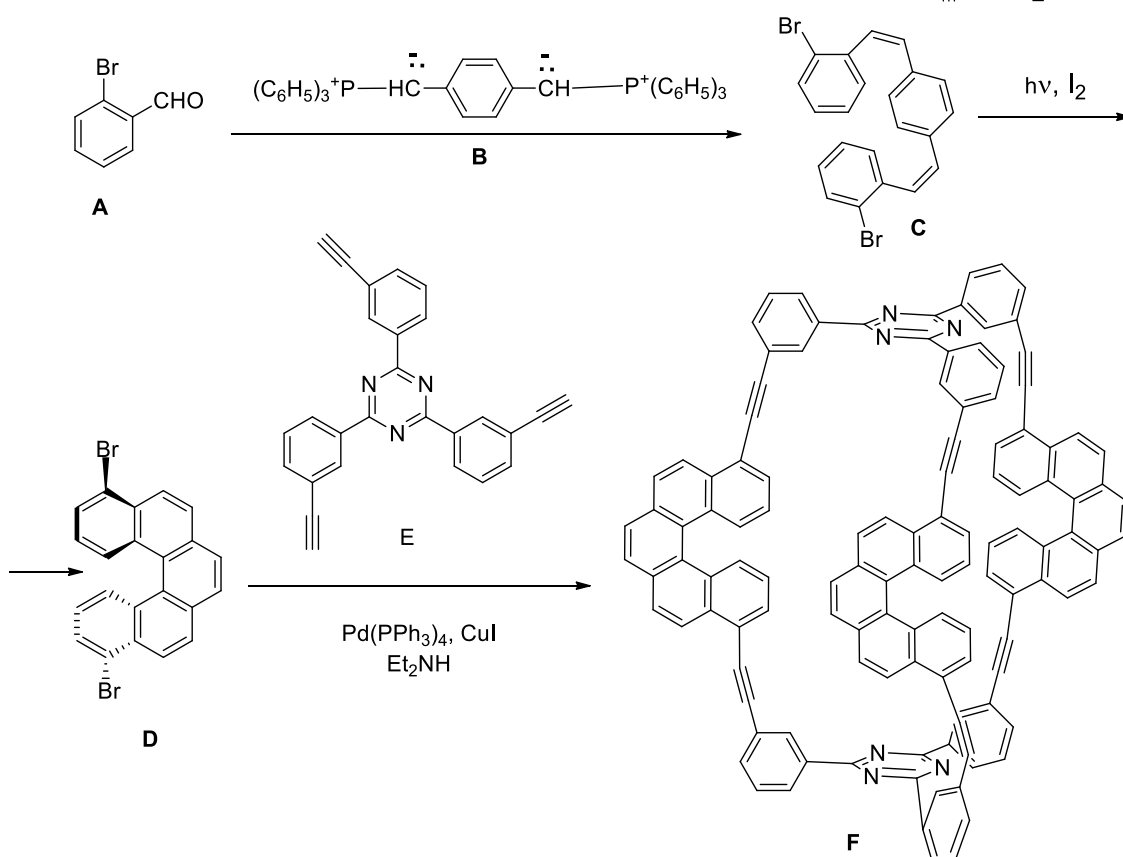
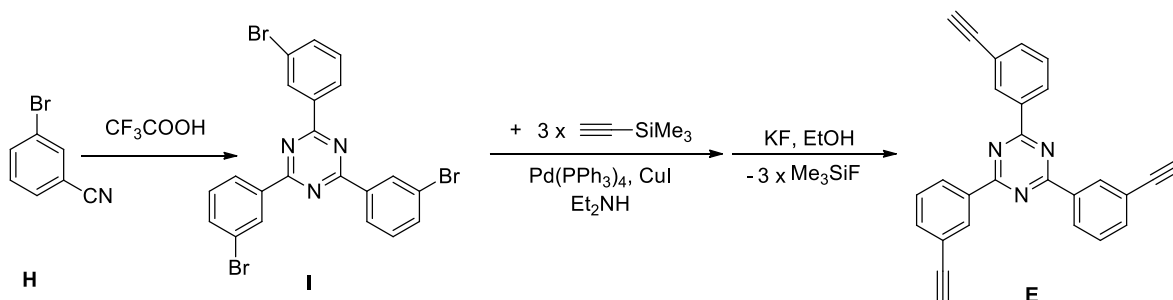
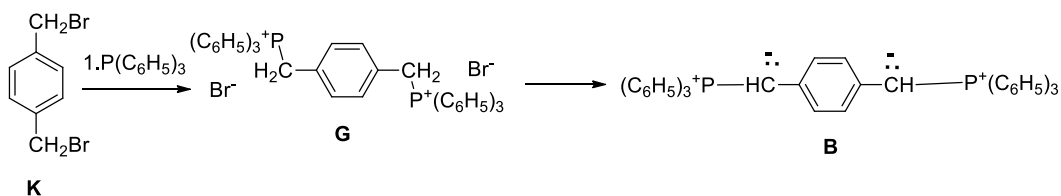
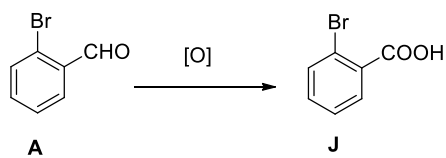


6. p = 50% (1p), explicație corectă (1p)

Dacă reacția are loc prin benzin atunci în doar 50% din cazuri se păstrează legat de atomul de azot, în celelalte 50% din cazuri fiind la unul dintre atomii orto vecini.

**Subiectul B.** .....20 puncte

- 8 formule structurale (A, B, C, D, E, G, I, J) 8 x 1,5p (12p)  
structura compusului F (3p)
- chiralitate elicoidală pentru D și F (2p)
- 4 stereoizomeri (1p) (PPP, MMM, PPM și MMP) (4x0,5p)



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