

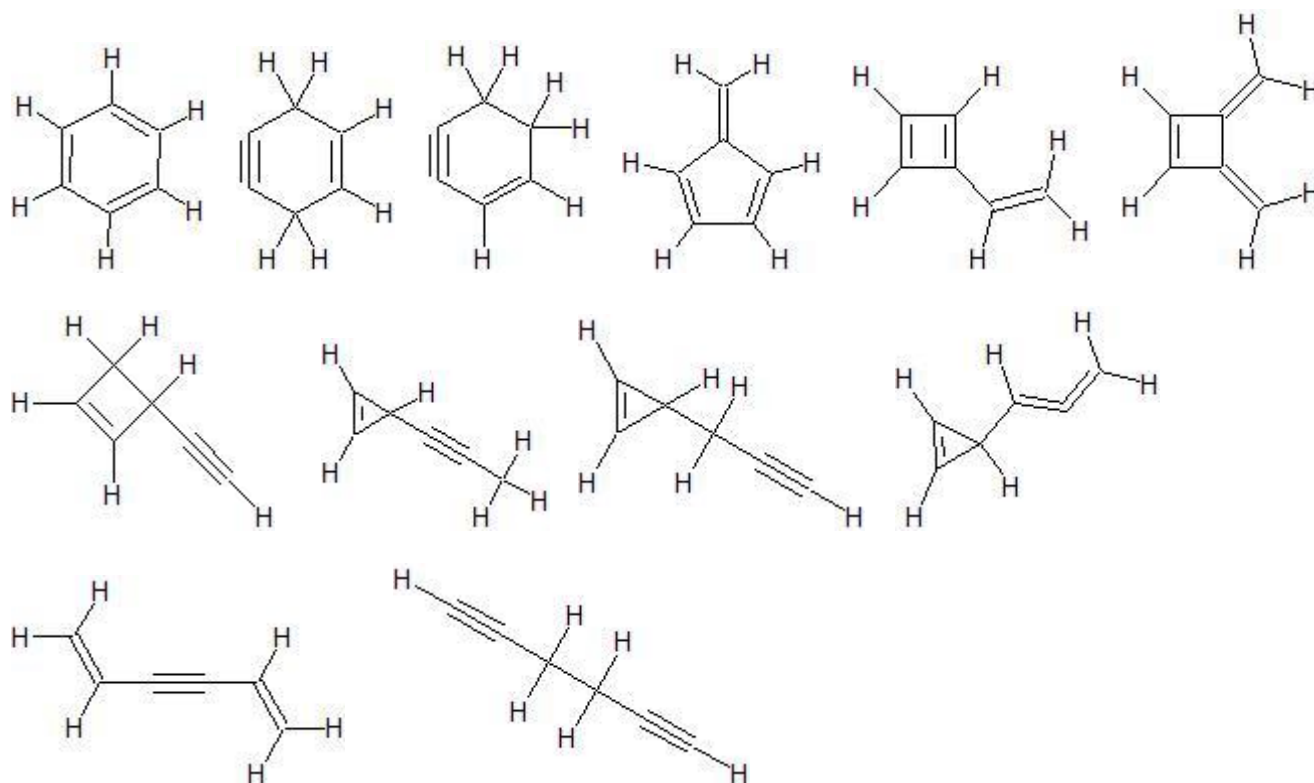
Capitolul 5 –EXERCIȚII ȘI PROBLEME PENTRU CONCURSURI

5.4.ARENE

Exerciții și probleme

5.4. 1. O hidrocarbură, **A**, are formula moleculară C_6H_6 . Cu siguranță această hidrocarbură este benzenul ? Dacă nu, scrieți cât mai multe formule structurale teoretic posibile pentru **A**.

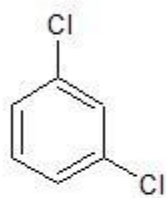
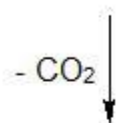
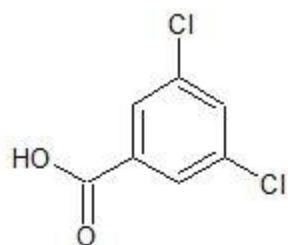
Rezolvare:



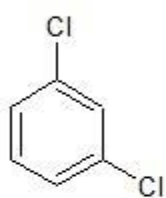
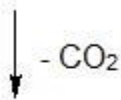
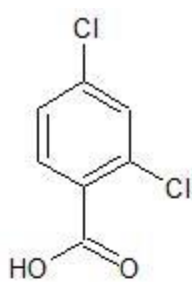
5.4. 2. Se cunosc 6 derivați substituiți ai acidului benzoic cu formula $C_6H_3X_2COOH$. Prin decarboxilarea a trei dintre aceștia se obține același compus **A**. Prin decarboxilarea altor doi acizi carboxilici dintre aceștia rezultă același compus **B**. Prin decarboxilarea celui de-al șaselea

acid carboxilic rezultă compusul **D**. Stabilește structura compușilor **A**, **B**, **D** și scrie ecuațiile reacțiilor de decarboxilare.

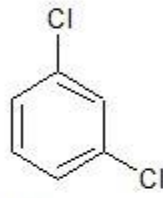
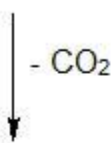
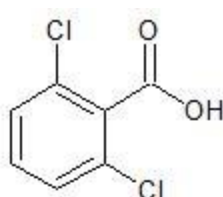
Rezolvare: X = Cl



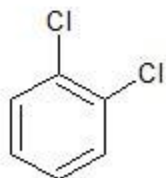
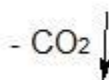
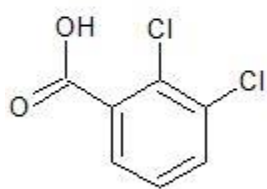
(A)



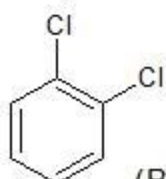
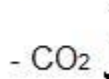
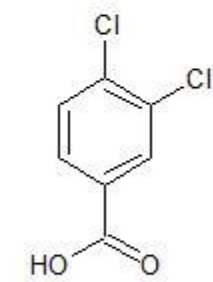
(A)



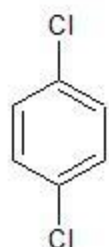
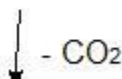
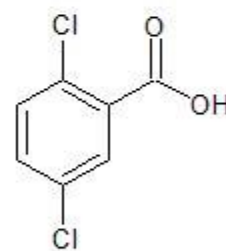
(A)



(B)



(B)

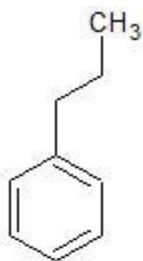


(D)

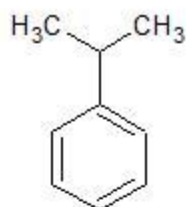
5.4. 3. Un compus aromatic **A** (C_9H_{12}) conduce prin oxidare la un acid aromatic dicarboxilic **B**. Neutralizarea a 0,83 g de **B** necesită 20 ml soluție 0,5 N de hidroxid de sodiu. La nitrarea lui **B** rezultă un singur mononitroderivat. Stabilește formula lui **A**.

Rezolvare:

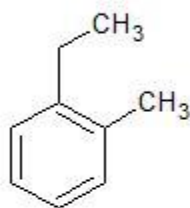
Izomerii C_9H_{12} :



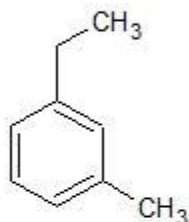
propilbenzen



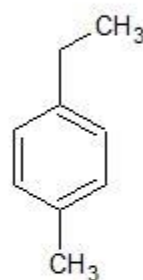
izopropilbenzen



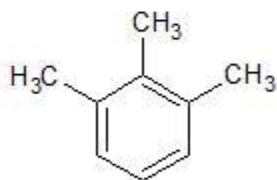
orto-metiletilbenzen



meta-metiletilbenzen

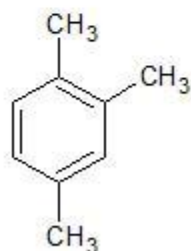


para-metiletilbenzen



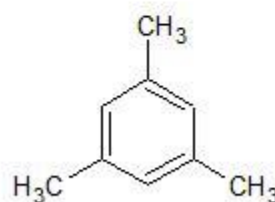
1,2,3-trimetilbenzen

izomer vicinal



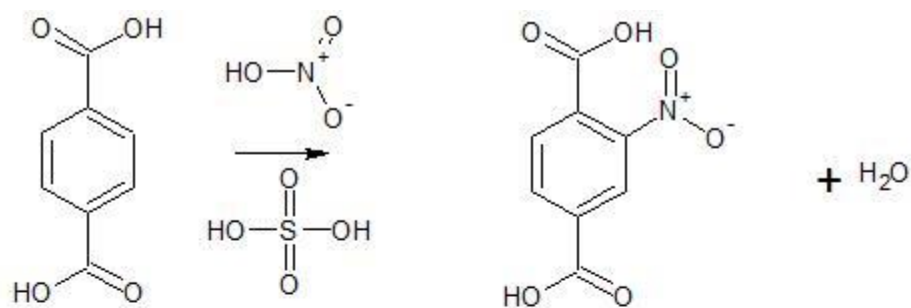
1,2,4-trimetilbenzen

izomer asimetric

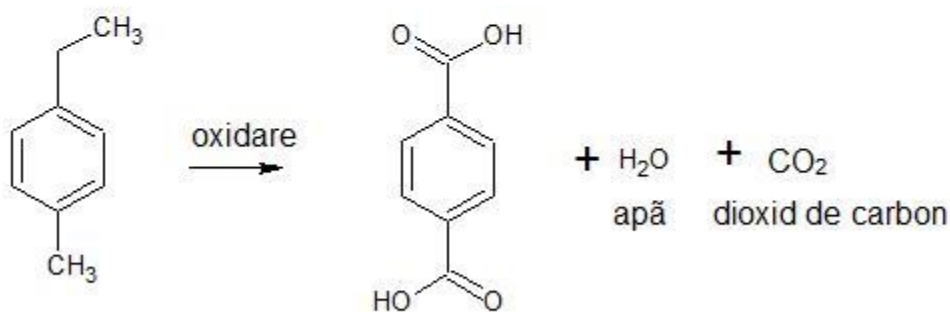


1,3,5-trimetilbenzen

izomer simetric



(B) acidul tereftalic



para-metil-etilbenzen

(B)

(A) C_9H_{12}

$$M \text{ NaOH} = 23 + 16 + 1 = 40 \text{ g/mol}$$

$$1000 \text{ ml soluție} \dots\dots\dots 0,5 \cdot 40 \text{ g NaOH}$$

$$20 \text{ ml soluție} \dots\dots\dots x \text{ g NaOH}$$

$$x = 20 \cdot 0,5 \cdot 40 / 1000 = 0,4 \text{ g NaOH}$$

$$M \text{ B g} \dots\dots\dots 2 \cdot 40 \text{ g NaOH}$$

$$0,83 \text{ g acid B} \dots\dots\dots 0,4 \text{ g NaOH}$$

$$M \text{ B} = 0,83 \cdot 2 \cdot 40 / 0,4 = 166 \text{ g/mol}$$

$$M \text{ R} (\text{COOH})_2 = R + 2 \cdot 12 + 4 \cdot 16 + 2 \cdot 1 = R + 90 = 166 \text{ g/mol}$$

$$R = 166 - 90 = 76$$

R este C_6H_4

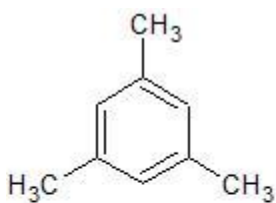
Acidul **B** este $C_6H_4(COOH)_2$

5.4. 4. Oxidarea hidrocarburii aromatice **A** (C_9H_{12}) conduce la acidul tricarboxilic **B** ($C_9H_6O_6$). Ce formule poți atribui lui **A** pentru ca **B** să conducă la :

- un singur derivat mononitrat;
- doi mononitroderivați;
- trei mononitroderivați.

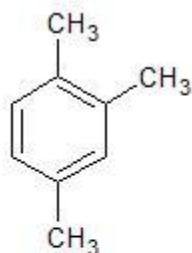
Rezolvare:

Izomerii C_9H_{12} :



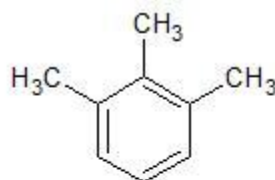
1,3,5-trimetilbenzen

izomer simetric



1,2,4-trimetilbenzen

izomer asimetric



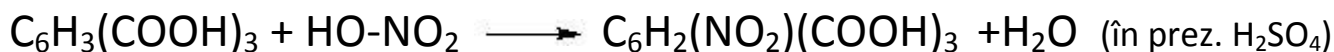
1,2,3-trimetilbenzen

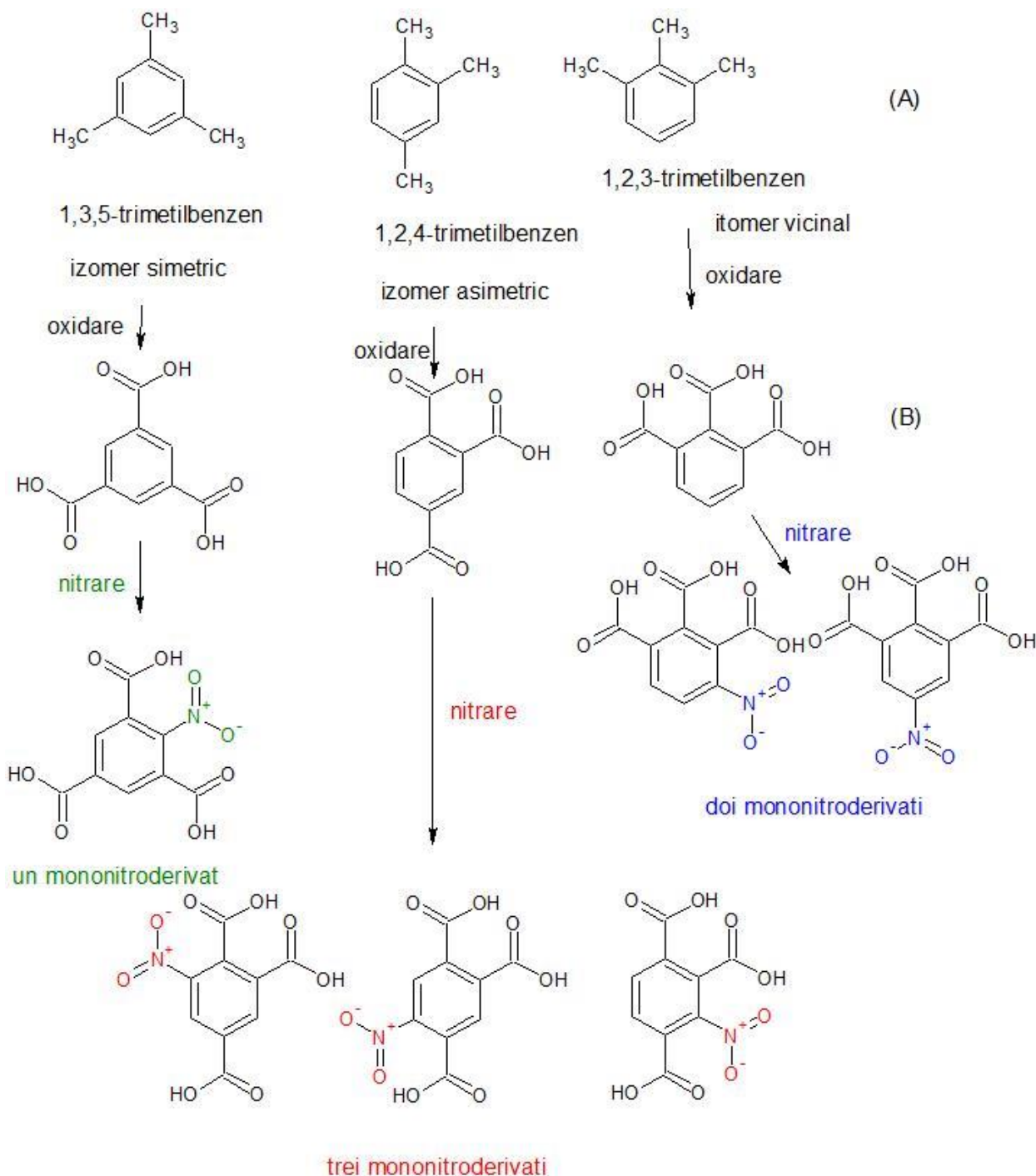
izomer vicinal



A este $C_6H_3(CH_3)_3$

B este $C_6H_3(COOH)_3$

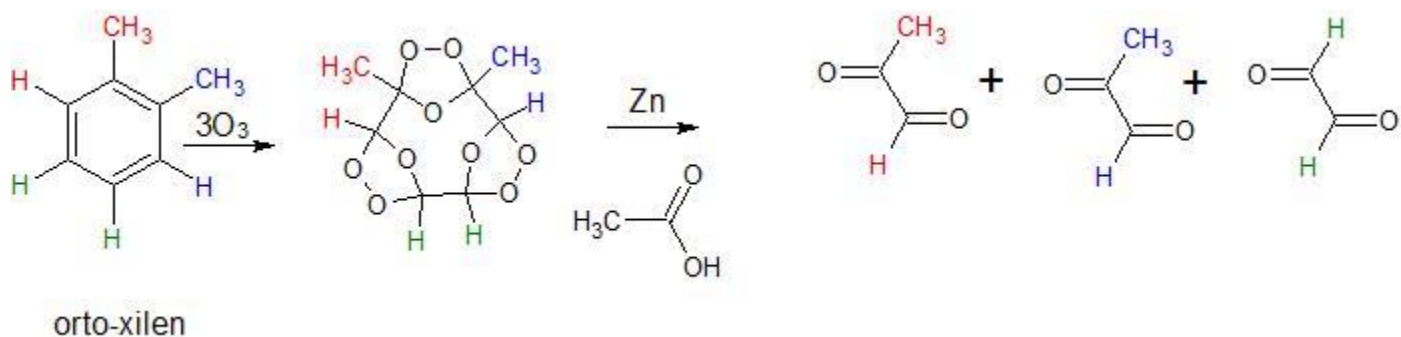
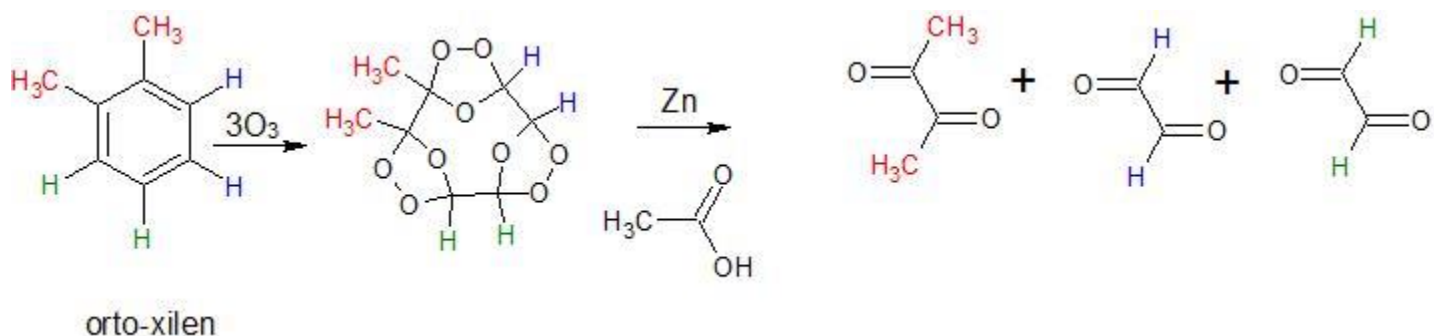
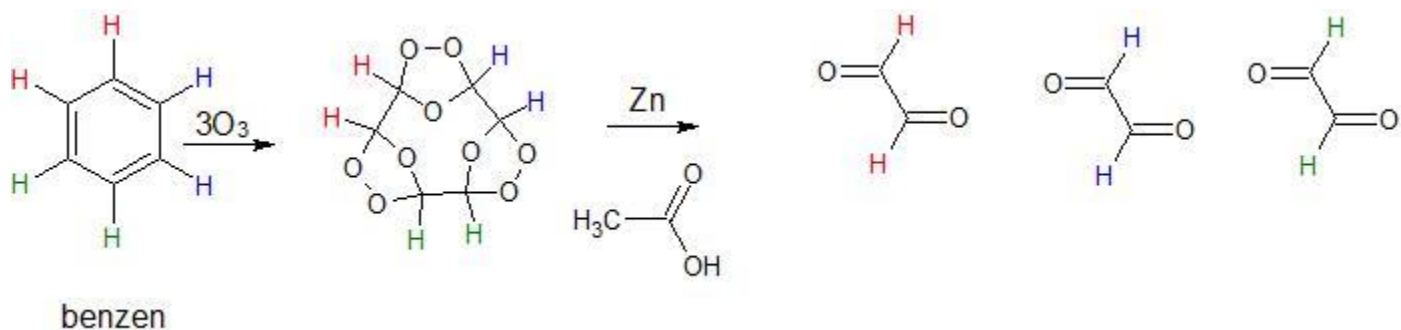




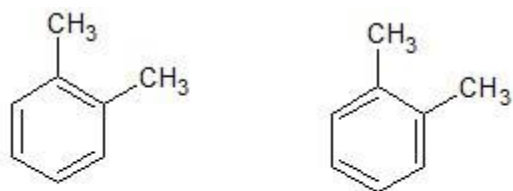
5.4. 5. Un mol de benzen (ca atare sau cu una sau mai multe catene saturate poate reacționa cu trei moli de ozon.

- a. Ce compus (compuși) rezultă după tratarea ozonidei cu Zn și acid acetic și îndepărtarea benzenului nereacționat ?
 b. Scrie două formule Kekule pentru o-xilen.

Rezolvare a:

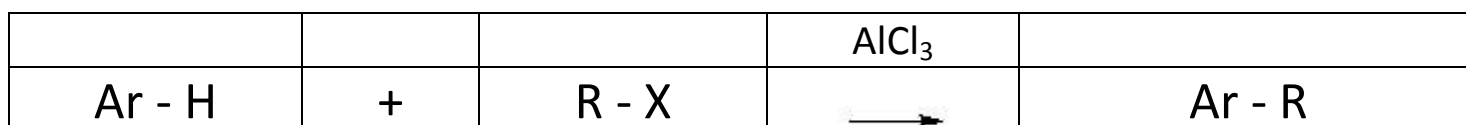


Rezolvare b:



orto-xilen

5.4. 6. În reacția Friedel-Crafts:



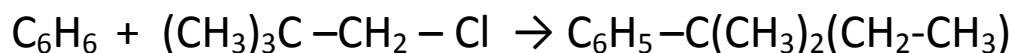
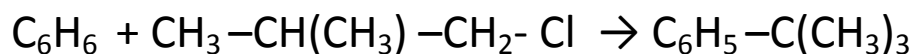
Hydrocarbură aromatică este atacată preferențial de carbocationul cel mai stabil care poate rezulta din derivatul halogenat. Care sunt produșii principali ai reacției Friedel-Crafts dintre benzen și următorii derivați halogenați:

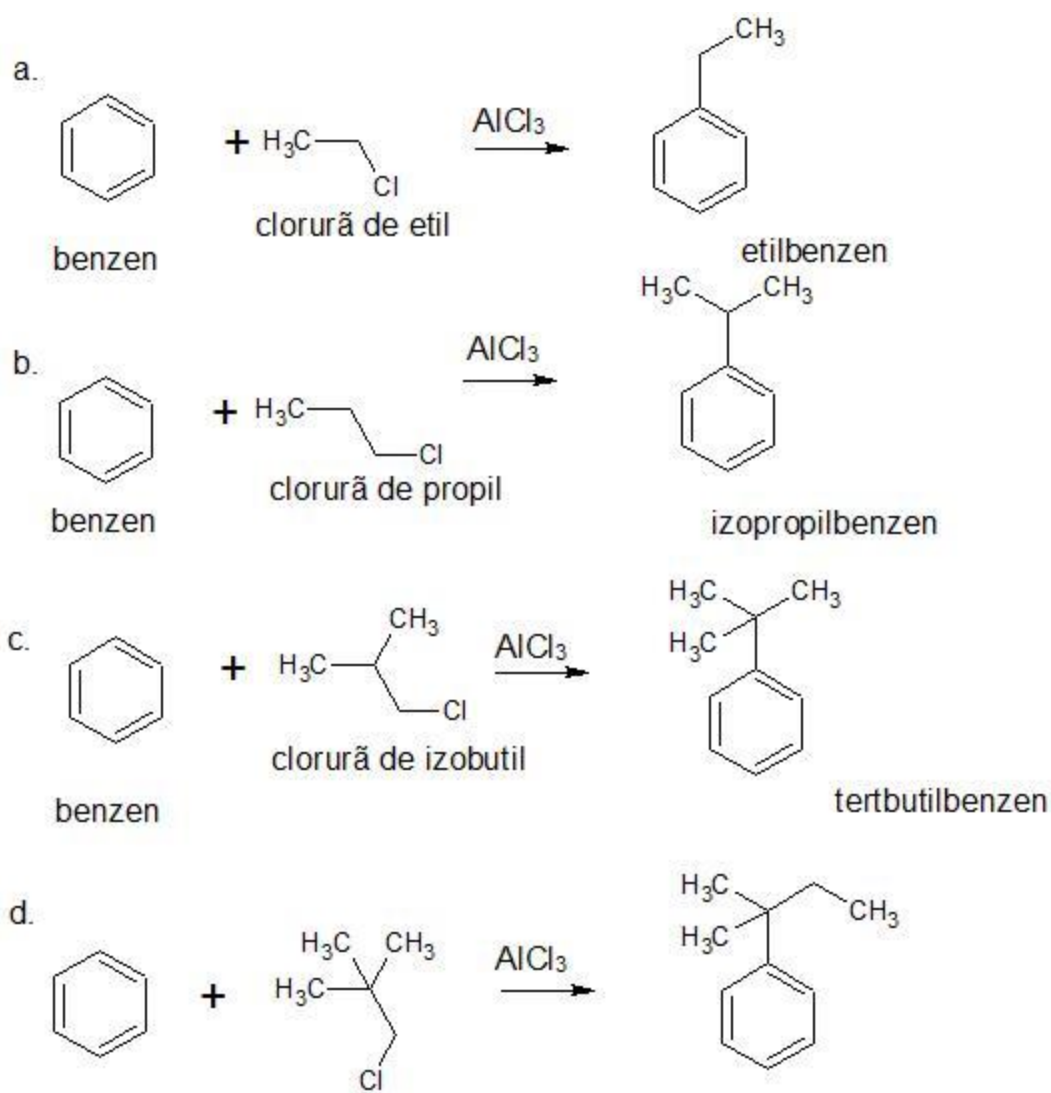
- $\text{CH}_3 - \text{CH}_2 - \text{Cl}$
- $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{Cl}$
- $\text{CH}_3 - \text{CH}(\text{CH}_3) - \text{CH}_2 - \text{Cl}$
- $(\text{CH}_3)_3\text{C} - \text{CH}_2 - \text{Cl}$

Notă. Stabilitatea carbocationilor crește în seria: *primar* < *secundar* < *terțiar*.

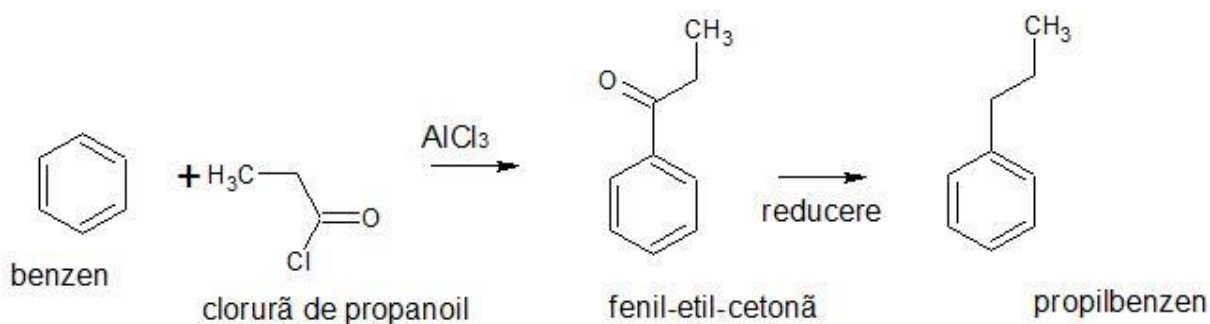
Rezolvare:

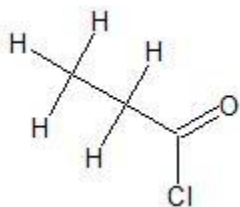
În prezență de AlCl_3 :



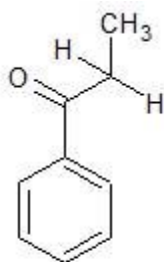


5.4. 7. Propune o metodă de sinteză a $C_6H_5-CH_2-CH_2-CH_3$ care să evite formarea izomerului $C_6H_5-CH(CH_3)_2$. **Rezolvare:**

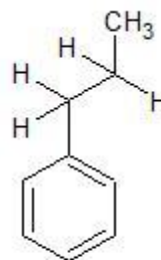




clorură de propanoil

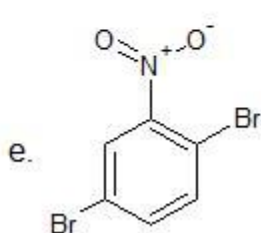
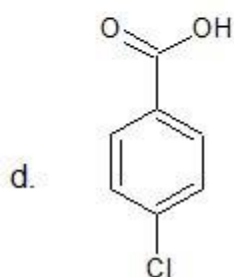
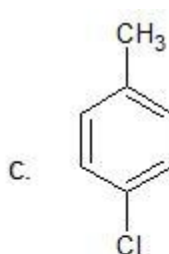
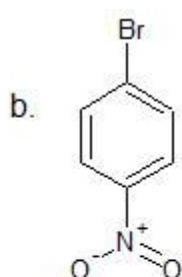
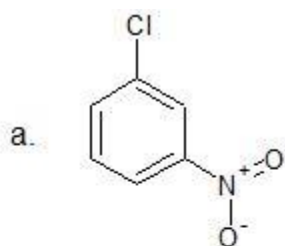


fenil-metil-cetonă



propilbenzen

5.4. 8. Pornind de la benzen, clorură de metil și orice altă substanță anorganică necesară găsește o metodă de sinteză pentru fiecare din următoarele substanțe:



Rezolvare:

