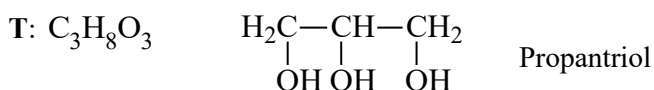




OLIMPIADA DE CHIMIE – etapa județeană
11 martie 2012
BAREM DE EVALUARE – Clasa a XI-a

Subiectul I 20 puncte

a) C : H = 3 : 4 (raport masic); C : H = 1 : 1 (raport molar); N.E. = 0, T: $C_nH_{2n+2}O_n$; $M_T = 92 \Rightarrow n = 3$

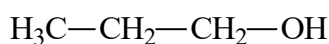


T: $C_3H_8O_3$ - **3 puncte**; Formula structurală – **2 puncte**; Denumirea – **1 punct**

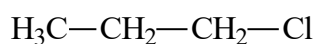
b)



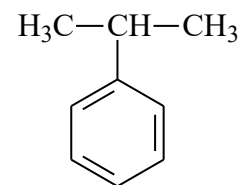
A



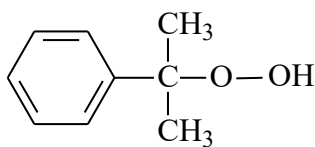
B



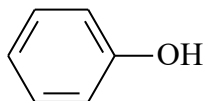
C



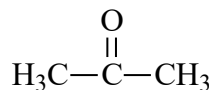
D



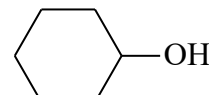
E



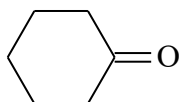
F



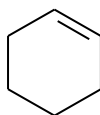
G



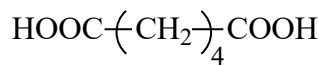
I



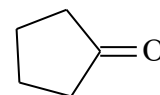
H



J



K



L



a



b



c



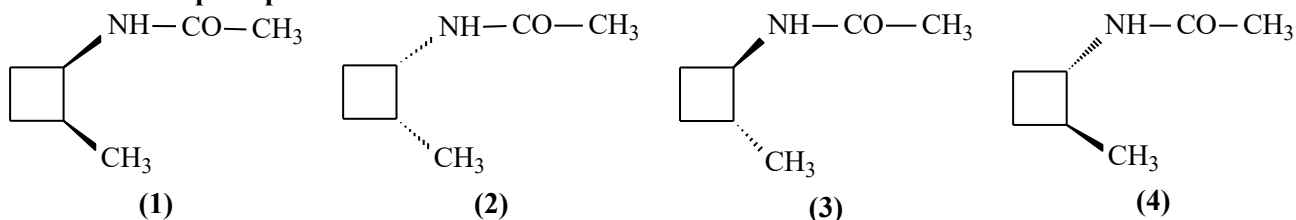
d

16 substanțe X 0,5 p = **8 puncte**; 12 denumiri X 0,5 p = **6 puncte**

Subiectul II 25 puncte

A. a) Compusul **A** prezintă doi diastereoizomeri, *cis* și *trans*, ambii chirali:

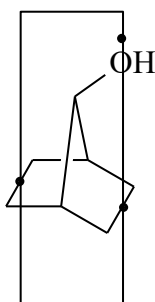
4 structuri X 1 p = 4 puncte



Relații între stereoizomeri – 1 punct

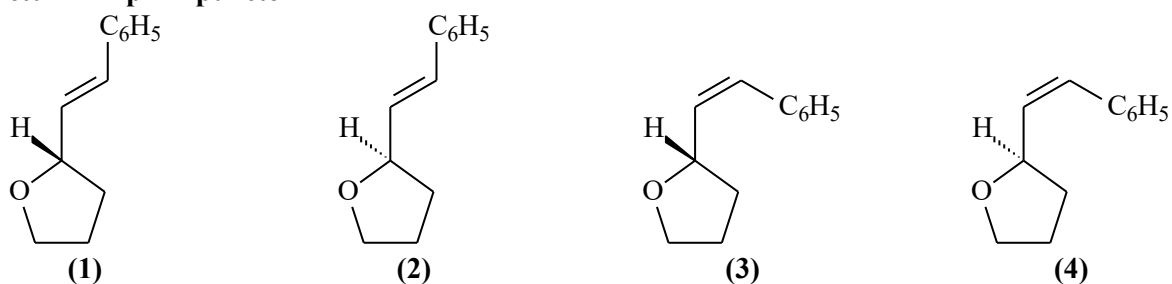
b) Molecula compusului **B** are un plan de simetrie (planul care trece prin punctele negre) și compusul nu este chiral.

1 punct



c) Compusul **C** prezintă doi diastereoizomeri, *Z* și *E*. De asemenea, există un centru chiral și fiecare alchenă are doi enantiomeri.

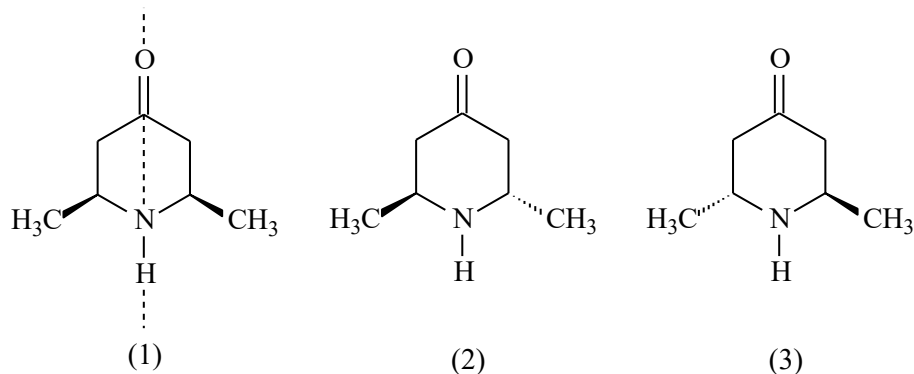
4 structuri X 1 p = 4 puncte



Relații între stereoizomeri – 1 punct

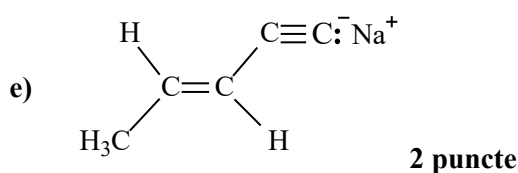
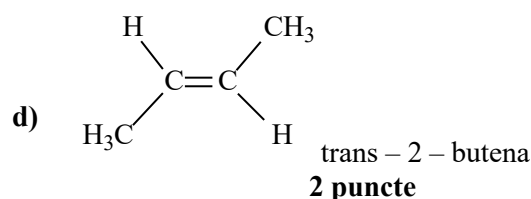
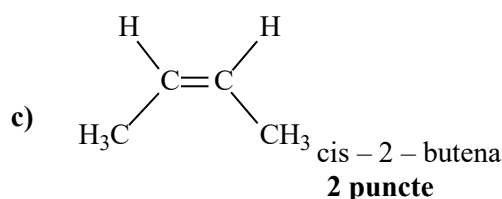
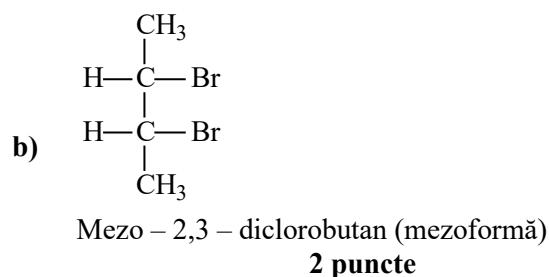
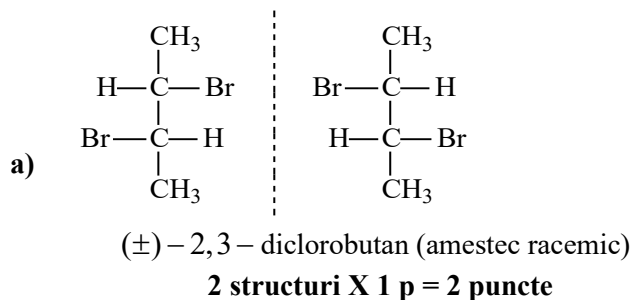
d) Compusul **D** prezintă doi diastereoizomeri. Unul dintre ei prezintă un plan de simetrie și este o mezoformă, iar celălalt este chiral și prezintă doi enantiomeri.

3 structuri X 1 p = 3 puncte



Relații între stereoizomeri – 1 punct

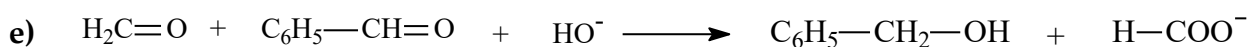
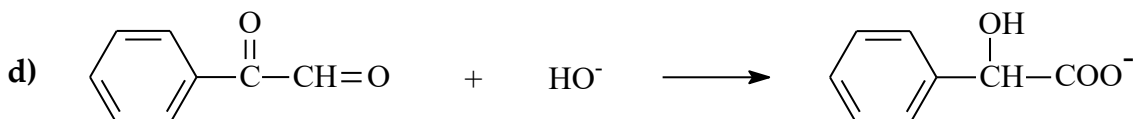
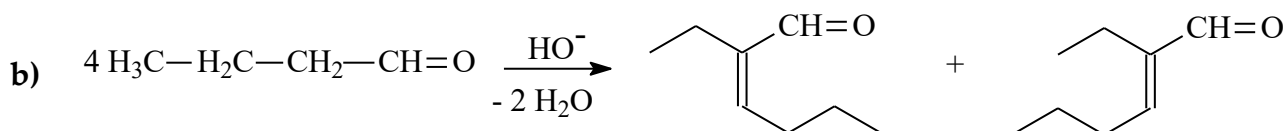
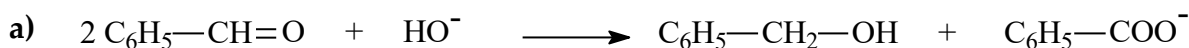
B.



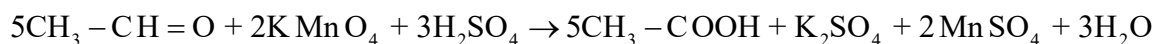
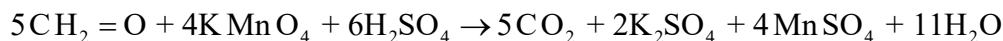
Subiectul III 25 puncte

A.

5 ecuații X 2 puncte = 10 puncte



B. a) 2 ecuații X 2 p = 4 puncte



b) raționament – 2 puncte; calcule – 2 puncte

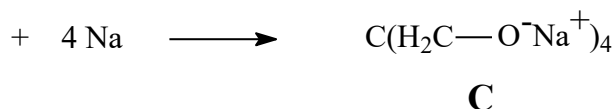
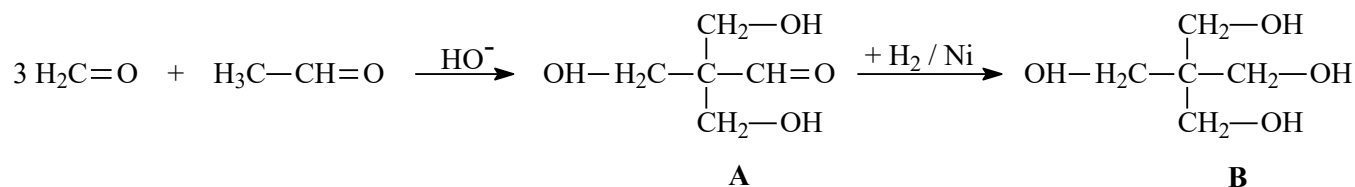
$$n_{\text{H}_2\text{O}} = 3,6 \text{ moli}$$

$$n_{\text{CH}_2\text{O}} = a \text{ moli} \Rightarrow n_1 = 2,2a \text{ moli H}_2\text{O}$$

$$n_{\text{CH}_3\text{CHO}} = b \text{ moli} \Rightarrow n_2 = 0,6b \text{ moli H}_2\text{O}$$

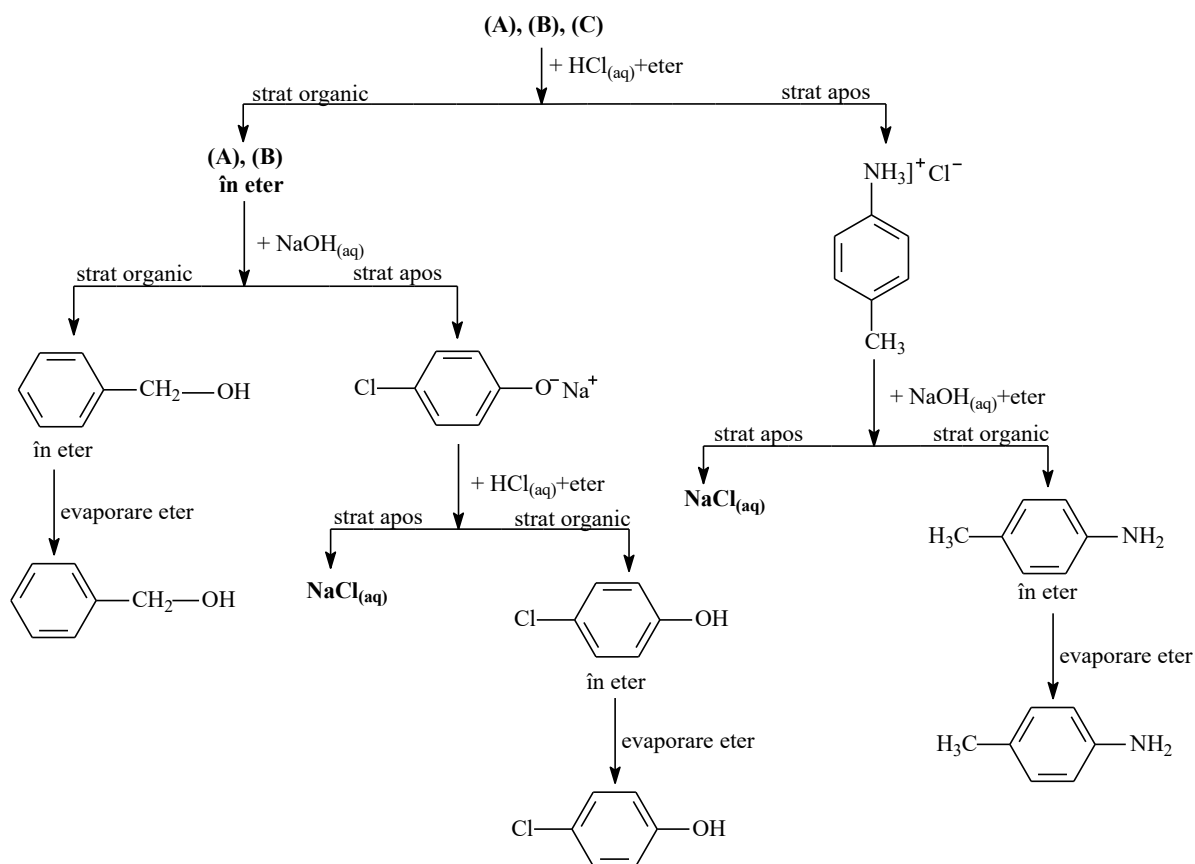
$$\begin{cases} 30a + 44b = 67 \\ 2,2a + 0,6b = 3,6 \end{cases} \Leftrightarrow \begin{cases} a = 1,5 \text{ moli CH}_2\text{O} \\ b = 0,5 \text{ moli CH}_3 - \text{CH} = \text{O} \end{cases}$$

c) $\text{CH}_2\text{O} : \text{CH}_3 - \text{CH} = \text{O} = 1,5 : 0,5 = 3 : 1$ (raport stoechiometric) **1 punct**



3 compuși X 2 p = 6 puncte

Subiectul IV **30 puncte**
A.



5 puncte

Orice altă variantă corectă de rezolvare a schemei se va puncta corespunzător.

B. 5 asocieri X 1 p = 5 puncte

1 - b; 2 - a; 3 - d; 4 - c; 5 - e

C.

a) $n = \frac{p \cdot V}{R \cdot T} = \frac{2 \cdot 2,46}{0,082 \cdot 300} = 0,2 \text{ moli } \text{H}_2 \Rightarrow \text{A} : \text{H}_2 = 1 : 1$ (raport molar) $\Rightarrow$ hidrocarbura A conține o legătură dublă $\text{C} = \text{C}$; - **2 puncte**

Notăm A cu C_xH_y .



$$M_A = M; \quad M_B = M + 2 \Rightarrow M + 2 = M + \frac{2,941}{100} \cdot M \Rightarrow M = 68$$

$$\begin{cases} 12 \cdot x + y = 68 \\ x + y = 13 \end{cases} \Leftrightarrow \begin{cases} x = 5 \\ y = 8 \end{cases} \quad \text{A are formula moleculară } C_5H_8 - \mathbf{3 \text{ puncte}}$$

$N.E._A = 2$; - **1 punct**

A conține o legătură dublă $C = C \Rightarrow$ în molecula hidrocarburii A mai există și un ciclu. - **1 punct**

Prin oxidarea energetică a hidrocarburii A rezultă un compus C cu catenă liniară. Rezultă că hidrocarbura A este ciclopentena.



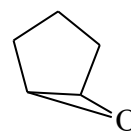
A **2 puncte**



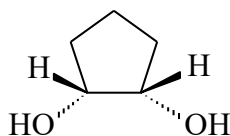
B



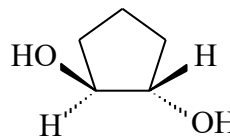
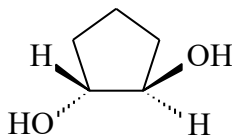
C



E



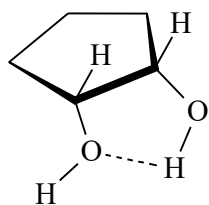
D



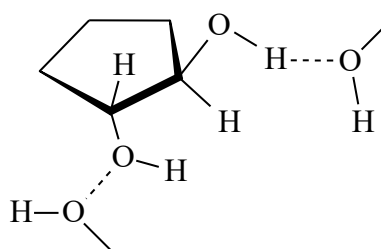
F / G

6 formule X 1 p = 6 puncte

b)



D



F / G

$P.f.D < P.f.F \text{ sau } G$ - **2 puncte**

Explicație - 3 puncte

Cis-1,2-ciclopentandiolul (**D**) are punctul de fierbere mai scăzut decât trans-1,2-ciclopentandiolul (**F** sau **G**) deoarece formează legături de hidrogen intramoleculare și nu este așa de puternic asociat cu moleculele vecine. Trans-1,2-ciclopentandiolul nu poate forma legături de hidrogen intramoleculare, dar este puternic asociat prin legături de hidrogen intermoleculare, după cum se poate observa mai sus.

Barem elaborat de Vasile Sorohan, profesor la Colegiul „Costache Negruzzi” Iași