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etapa județeană/municipiului București
22 februarie 2020
Clasa a X-a

BAREM DE EVALUARE ȘI DE NOTARE

- Se punctează orice formulare/modalitate de rezolvare corectă a cerințelor.

Subiectul I

30 de puncte

A.

15 puncte

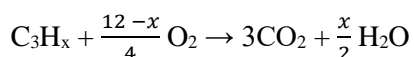
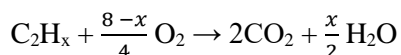
1. 3 puncte

$p = 20\% \text{ C}_{11}\text{H}_{24}$ descompus

2. 6 puncte

Considerăm că amestecul conține

$$a \text{ moli } \text{C}_2\text{H}_x \quad b \text{ moli } \text{C}_3\text{H}_x \quad a + b = 0,3$$



(2 ecuații x 1 punct = 2 puncte)

$$x = 4 \text{ adică } \text{C}_2\text{H}_4 \text{ și } \text{C}_3\text{H}_4$$

$$a = 0,1 \text{ moli } \text{C}_2\text{H}_4 \quad b = 0,2 \text{ moli } \text{C}_3\text{H}_4$$

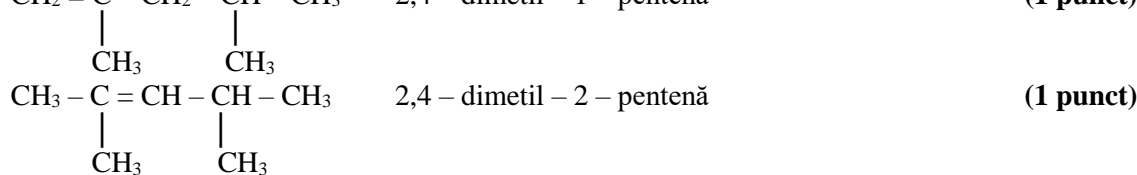
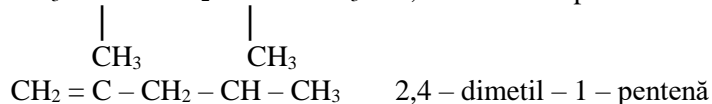
$$33,33\% \text{ C}_2\text{H}_4 \quad 66,66\% \text{ C}_3\text{H}_4$$

(2 puncte)

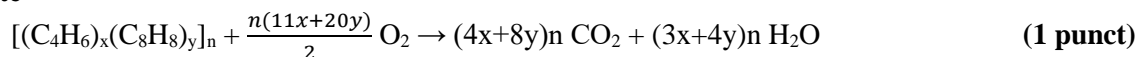
(1 punct)

(1 punct)

3. 3 puncte



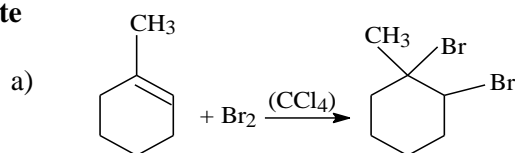
4. 3 puncte



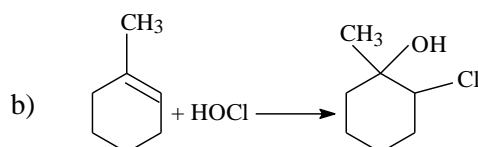
B.

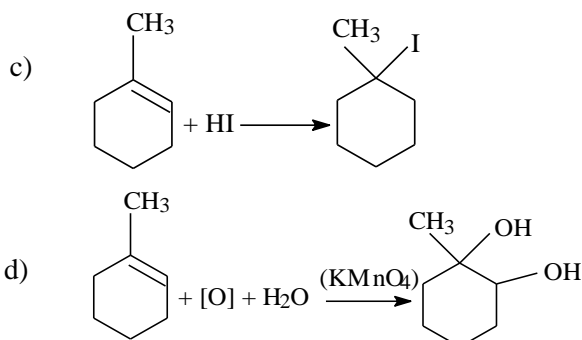
15 puncte

1. 6 puncte



(4 ecuații x 1,5 puncte = 6 puncte)





2. 9 puncte

- a) $\text{CH}_4 : \text{C}_2\text{H}_2 : \text{H}_2 = 4 : 1 : 5$ (3 puncte)
- b) $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$
 $\text{C}_2\text{H}_2 + \frac{5}{2}\text{O}_2 \rightarrow 2\text{CO}_2 + \text{H}_2\text{O}$ (3 ecuații x 1 punct = 3 puncte)
- $\text{H}_2 + \frac{1}{2}\text{O}_2 \rightarrow \text{H}_2\text{O}$
- $V_{\text{O}_2} = 291,2 \text{ L} ; V_{\text{aer}} = 1456 \text{ L}$ (1 punct)
- c) $2\text{CH}_4 \xrightarrow{1500^\circ\text{C}} \text{C}_2\text{H}_2 + 3\text{H}_2$ (1 punct)
- $m = 106,6 \text{ g C}_2\text{H}_2$ (1 punct)

Subiectul al II-lea

25 de puncte

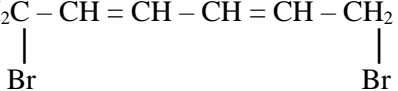
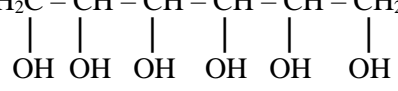
A.

10 puncte

1. (4 puncte)

- a) Formula moleculară a pravastatinei: $\text{C}_{23}\text{H}_{36}\text{O}_7$. (1 punct)
- b) $\text{C}_{\text{primar}} : \text{C}_{\text{secundar}} : \text{C}_{\text{terțiar}} : \text{C}_{\text{cuaternar}} = 5 : 10 : 7 : 1$ (1 punct)
- c) electroni π : electroni p neparticipanți = $8 : 28 = 2 : 7$ (1 punct)
- d) N. E. = 6 (1 punct)

2. (6 puncte)

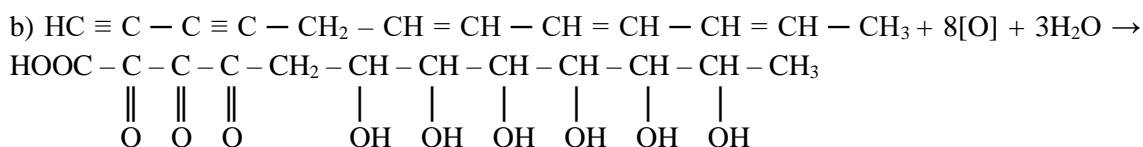
- a) $\text{H}_2\text{C} = \text{CH} - \text{CH} = \text{CH} - \text{CH} = \text{CH}_2$ (1 punct) 1,3,5 – hexatrienă (0,5 puncte)
- b) $\text{H}_2\text{C} - \text{CH} = \text{CH} - \text{CH} = \text{CH} - \text{CH}_2$ 1,6,- dibromo – 2,4 – hexadienă
 (Z, Z / E, E / Z,E) (3 izomeri x 0,5=1,5 puncte)
- c) $\text{H}_2\text{C} = \text{CH} - \text{CH} = \text{CH} - \text{CH} = \text{CH}_2 + 2\text{KMnO}_4 + 4\text{H}_2\text{O} \rightarrow 2\text{MnO}_2 + 2\text{KOH} +$
 $+ \text{H}_2\text{C} - \text{CH} - \text{CH} - \text{CH} - \text{CH} - \text{CH}_2$
 (2 puncte)
- $V_{\text{KMnO}_4} = 1 \text{ mol}; V_{\text{soluție}} = 5 \text{ L}$ (1 punct)

B.

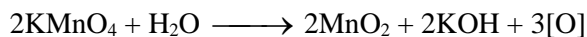
15 puncte

1. (7 puncte)

a) Hidrocarbura A conține 3 legături duble; $2^3 = 8$ izomeri geometrici (2 puncte)

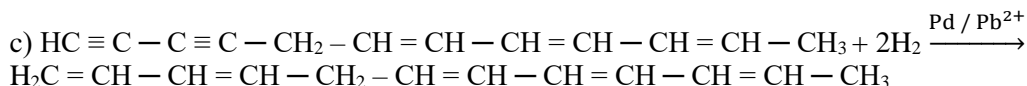


(2 ecuații x 1 punct = 2 puncte)



$$V_{\text{soluție}} = 0,8 \text{ L} = 800 \text{ mL}$$

(1 punct)



Numărul izomerilor geometrici ai hidrocarbunii rezultate $2^4 = 16$.

(2 puncte)

2. (8 puncte)

a) Formula moleculară a hidrocarbunii: $\text{C}_{10}\text{H}_{14}$; N. E. = 4

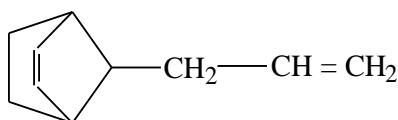
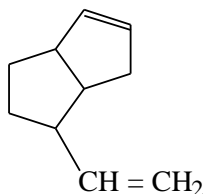
(2 puncte)

b) $n_{\text{Br}_2} = 0,1$ moli; $n_{\text{C}_{10}\text{H}_{14}} = 0,05$ moli; $\frac{n_{\text{Br}_2}}{n_{\text{C}_{10}\text{H}_{14}}} = 2 \rightarrow 2$ legături π

(2 puncte)

2 formule de structură posibile:

(4 puncte)



Subiectul al III-lea

25 de puncte

A.

8 puncte

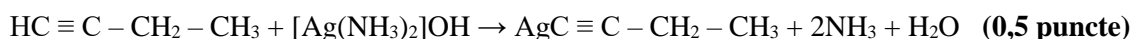
a) $\text{HC} \equiv \text{C} - \text{CH}_2 - \text{CH}_3$ 1 – butină

$\text{H}_3\text{C} - \text{C} \equiv \text{C} - \text{CH}_3$ 2 – butină

(2 puncte)

b) $v_{\text{amestec}} = \frac{p \cdot V}{R \cdot T} = 5$ moli

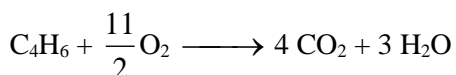
(0,5 puncte)



(0,5 puncte)

Amestecul conține 1 mol 1 – butină, 1 mol 2 – butină și 3 mol H_2

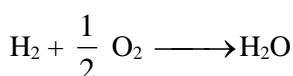
(0,5 puncte)



(0,5 puncte)

$$v_1 = 11 \text{ mol O}_2$$

(0,25 puncte)

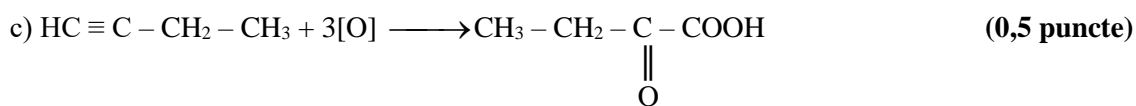


(0,5 puncte)

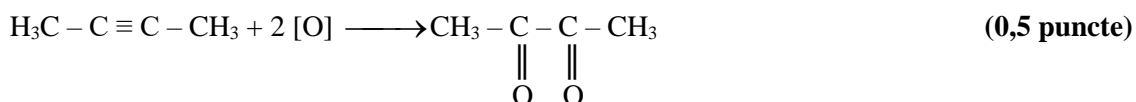
$$v_2 = 1,5 \text{ mol O}_2$$

(0,25 puncte)

$$v_{O_2} = 12,5 \text{ mol}; \quad V_{O_2} = 280 \text{ L}; \quad V_{\text{aer}} = 1400 \text{ L} \quad (0,5 \text{ puncte})$$

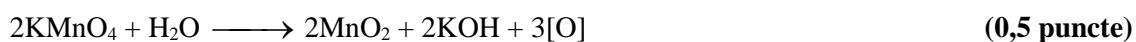


Pentru 1 mol de 1 – butină se consumă 3 mol [O]



Pentru 1 mol de 2 – butină se consumă 2 mol [O]

Pentru oxidarea a 2 mol butine se consumă 5 mol [O]



$$2 \text{ mol KMnO}_4 \dots\dots\dots 3 \text{ mol [O]}$$

$$z \text{ mol KMnO}_4 \dots\dots\dots 5 \text{ mol [O]}$$

$$z = \frac{10}{3} \text{ mol KMnO}_4 \quad V_{\text{soluție}} = 3,33 \text{ L} \quad (1 \text{ punct})$$

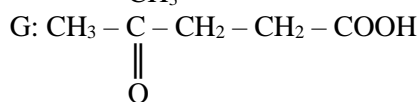
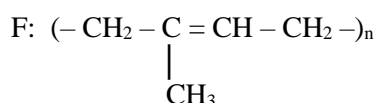
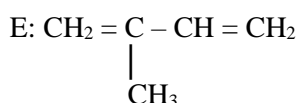
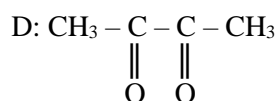
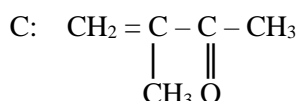
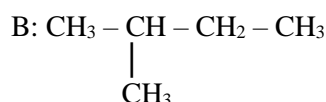
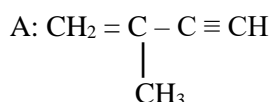
B. **17 puncte**

1. (11 puncte)

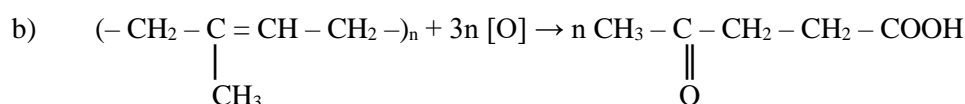
$$a) \quad v_{H_2} = \frac{p \cdot V}{R \cdot T} = 1,5 \text{ mol } H_2 \quad \frac{v_{H_2}}{v_A} = \frac{1,5 \text{ mol}}{0,5 \text{ mol}} = 3 \text{ legături } \pi$$

$$N. E. A = 3 \quad \text{Formula brută A: } C_n H_{2n-4}$$

$$\text{Formula brută C: } C_n H_{2n-2} O \quad \mu_C = 84 \frac{\text{g}}{\text{mol}} \quad n = 5 \quad (2 \text{ puncte})$$



(7 formule de structură x 1 punct = 7 puncte)

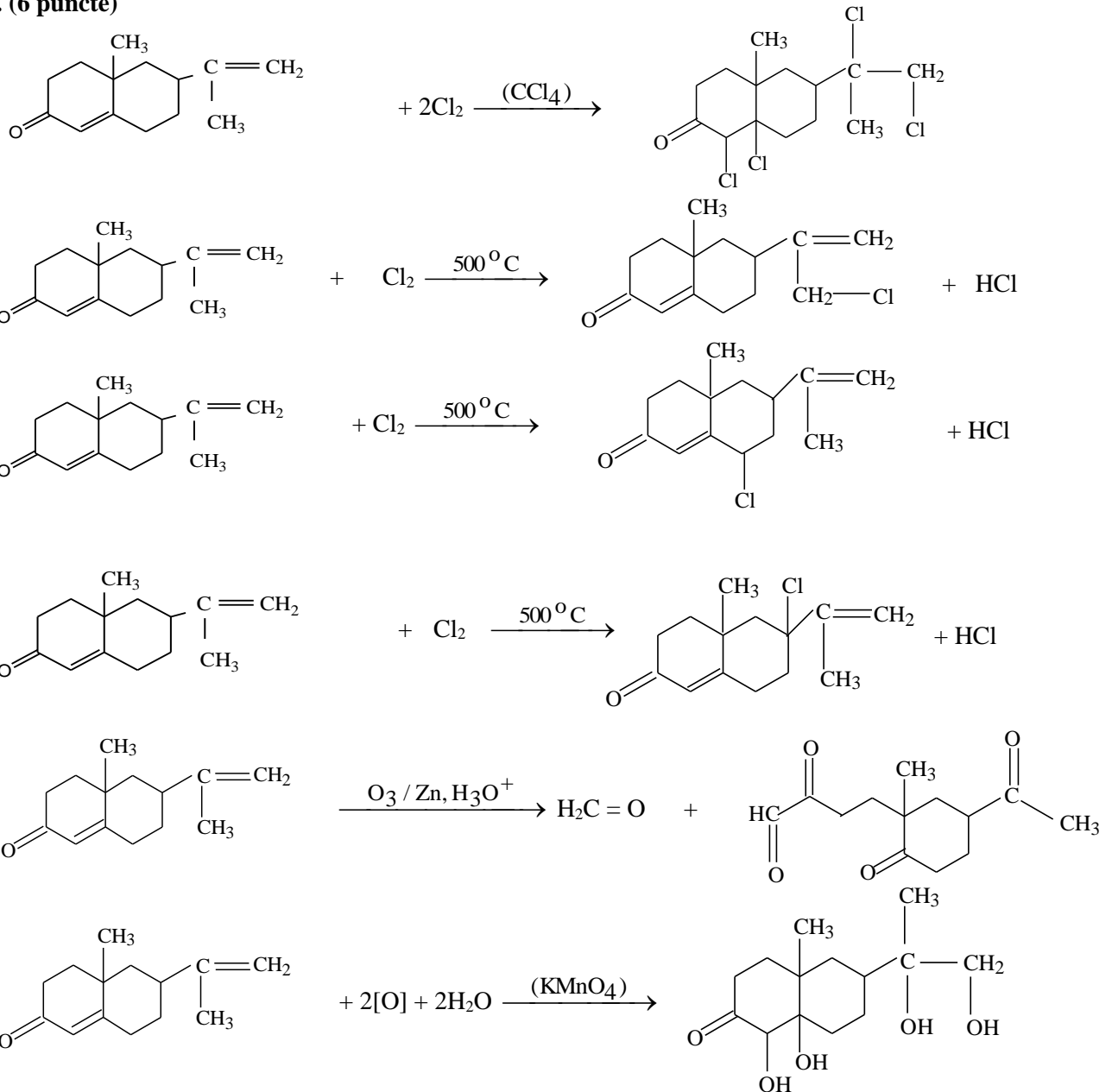


(2 ecuații x 0,5 puncte = 1 punct)

$$V = 0,3 \text{ L soluție KMnO}_4$$

(1 punct)

2. (6 puncte)

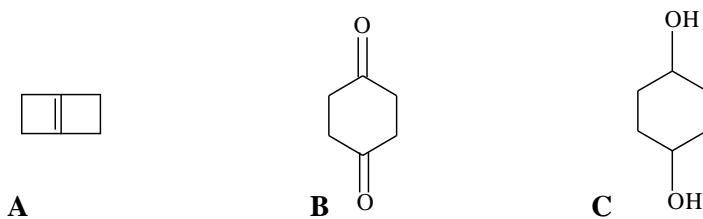


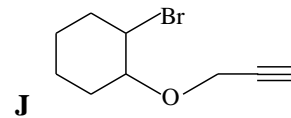
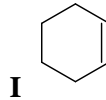
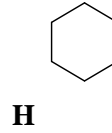
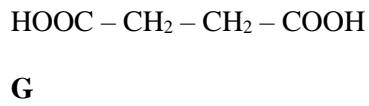
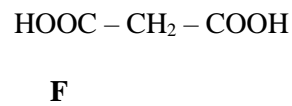
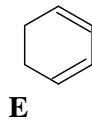
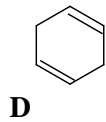
(6 ecuații x 1 punct = 6 puncte)

Subiectul al IV-lea

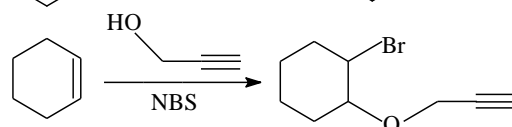
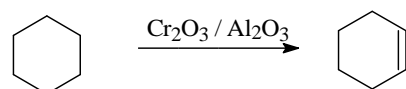
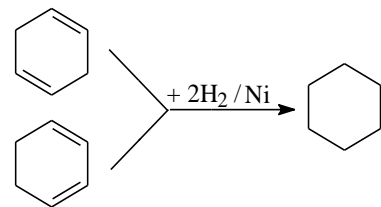
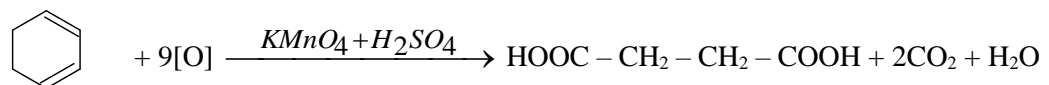
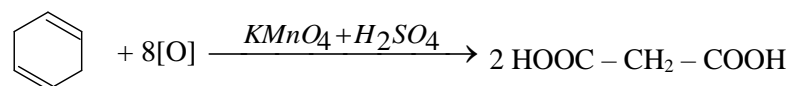
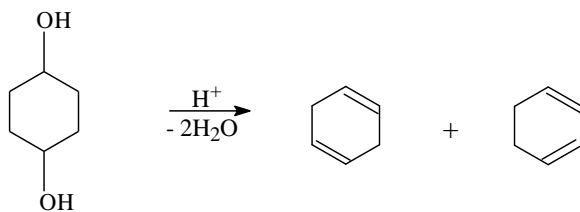
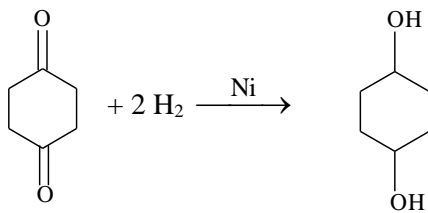
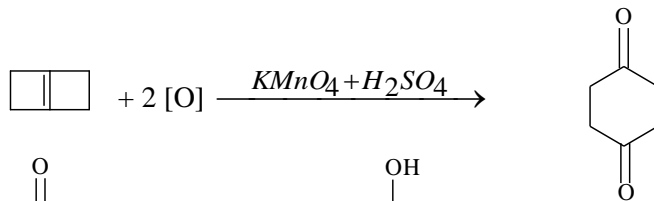
20 de puncte

a) (10 formule de structură x 1,5 puncte = 15 puncte)

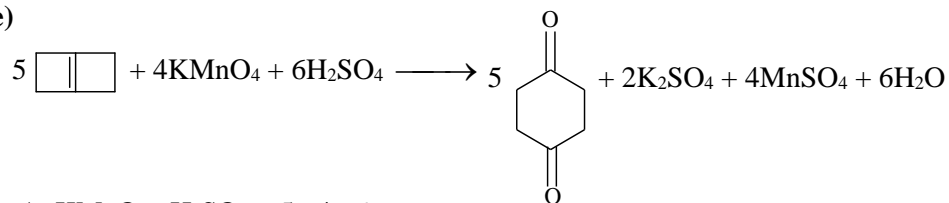




b) (8 ecuații x 0,25 puncte = 2 puncte)



c) (3 puncte)



A: $\text{KMnO}_4 : \text{H}_2\text{SO}_4 = 5 : 4 : 6$

Barem elaborat de:

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