

Capitolul 1- INTRODUCERE ÎN STUDIUL CHIMIEI ORGANICE

Probleme practice

Problema practică 1.1.

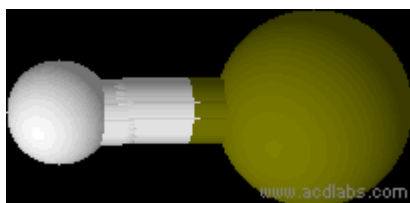
- a. Scrie simbolurile chimice pentru elementele organogene: hidrogen, fluor, clor, brom și iod. Modelează formarea legăturilor chimice dintre elementele organogene enumerate și hidrogen.

Rezolvare: H, F, Cl, Br și I.

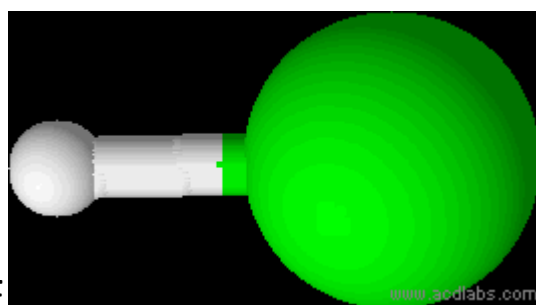
| H ₂ | HF | HCl | HBr | HI |
|----------------|------------------|-----------------|-----------------|----------------|
| hidrogen | acid fluorhidric | acid clorhidric | acid bromhidric | acid iodhidric |



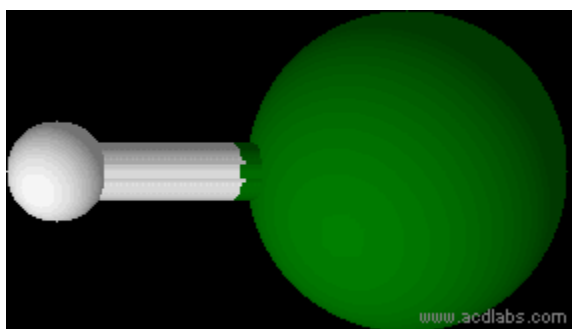
H₂



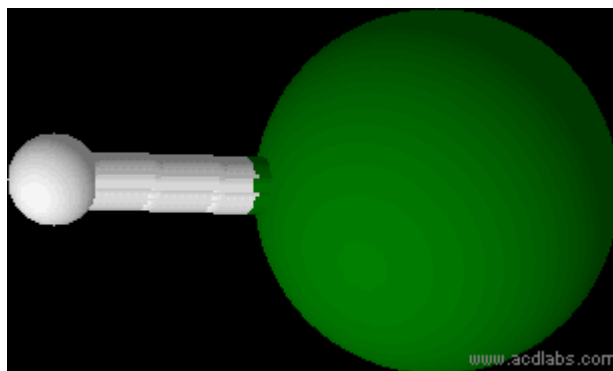
HF



HCl



HBr

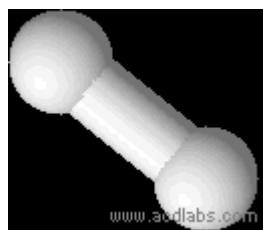


HI

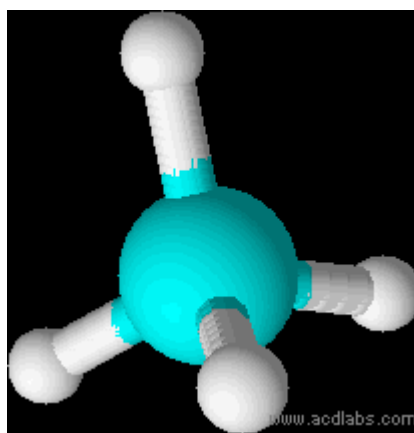
b. Scrie simbolurile chimice pentru elementele organogene: carbon, hidrogen, oxigen, sulf, azot și fosfor Modelează formarea legăturilor chimice dintre elementele organogene enumerate și hidrogen.

Rezolvare: C, H, O, S, N, P.

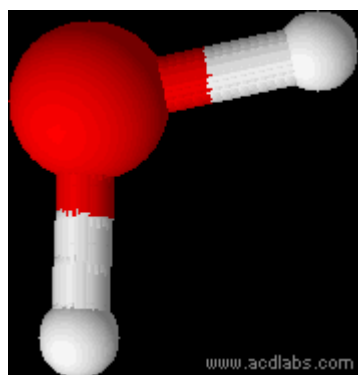
| | | | | | |
|----------|--------|--------|-----------------|---------|---------|
| H_2 | CH_4 | H_2O | H_2S | NH_3 | PH_3 |
| hidrogen | metan | apă | acid sulfhidric | amoniac | fosfină |



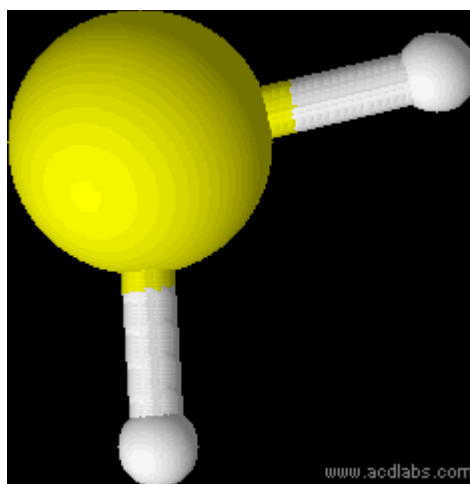
H_2



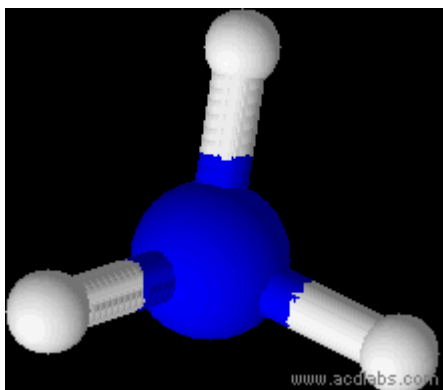
CH_4



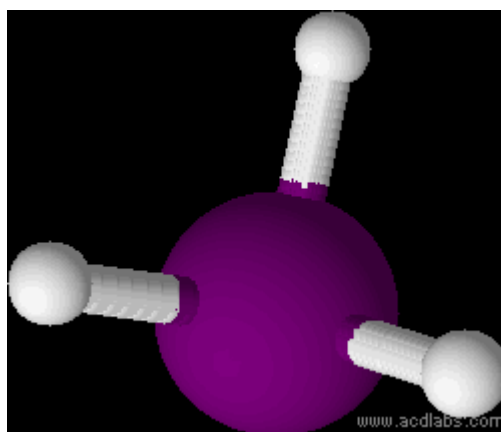
H_2O



H_2S



NH₃



PH₃

Problema practică 1.2.

Ordinea crescătoare a volumelor atomice:



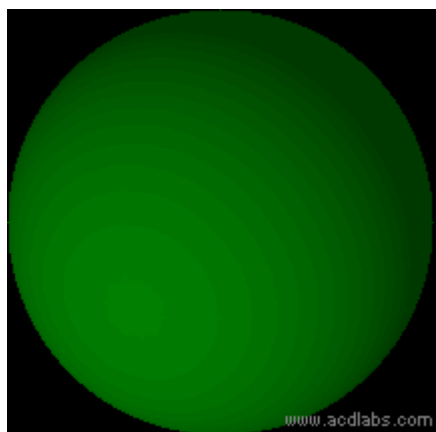
H



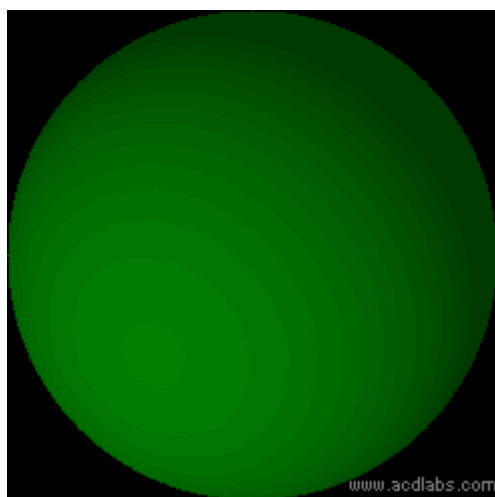
F



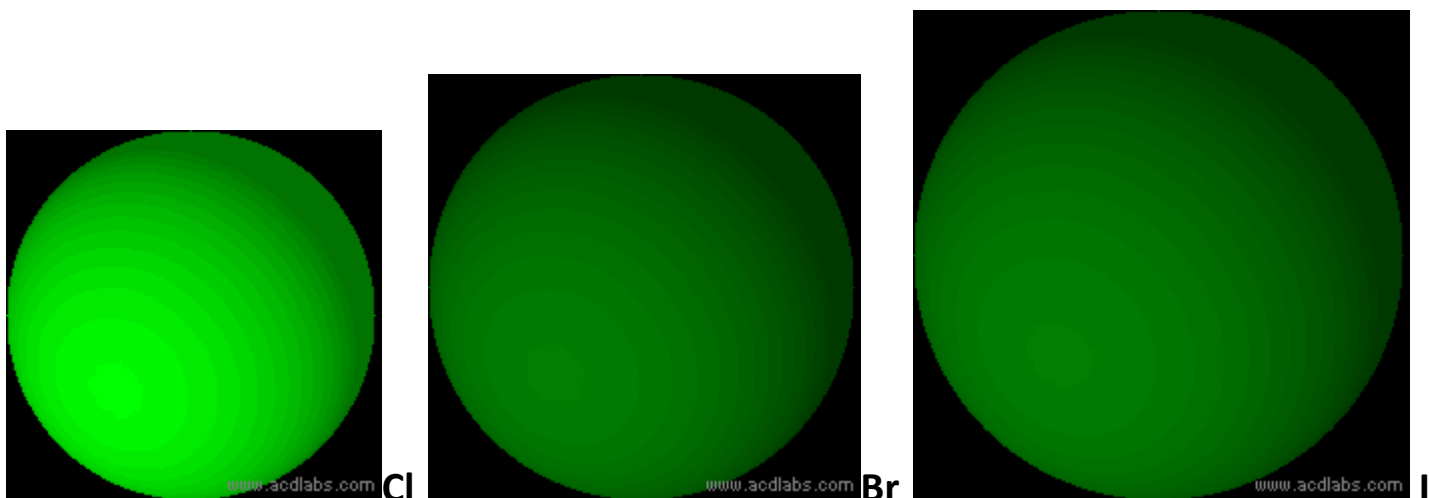
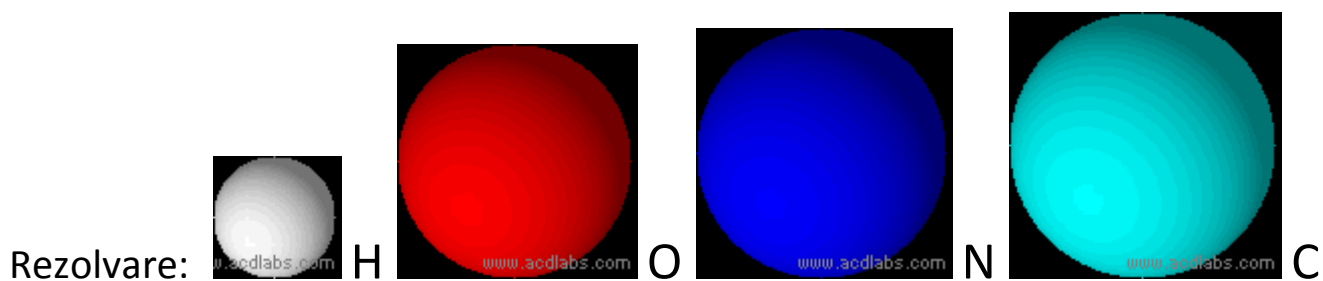
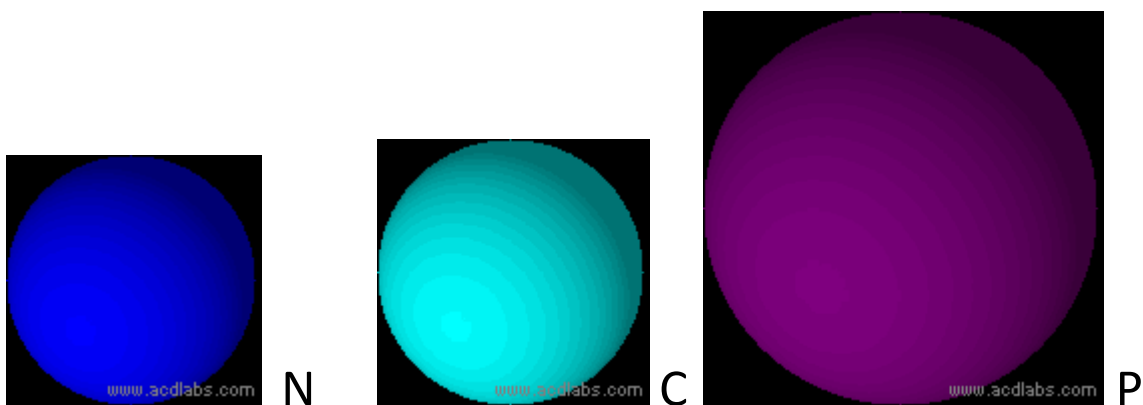
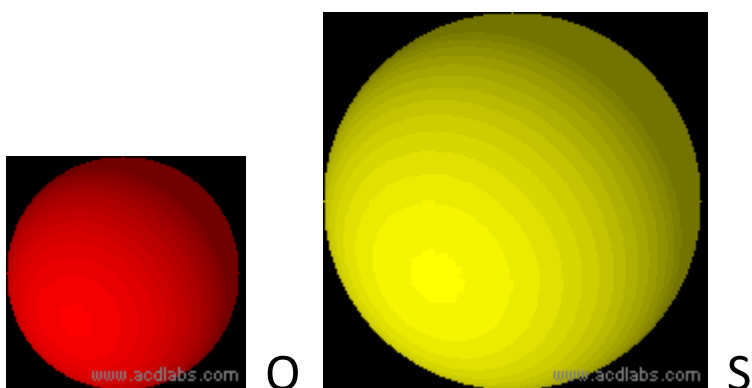
Cl



Br



I



Rezolvare: $H < O < N < C < Cl < Br < I$

Problema practică 1.3.

a. Alege afirmația corectă dintre cele ce urmează și încercuiește-o:

a) Atomii de C se pot lega între ei:

1-numai prin legături simple, $C - C$;

2-numai prin legături duble, $C = C$;

3-numai prin legături triple, $C \equiv C$;

4-atât prin legături simple, $C - C$, cât și prin legături multiple: duble, $C = C$ și triple, $C \equiv C$. – răspuns corect

b) Un atom de C se poate lega de câte un atom de H:

1-numai prin legături simple, $C - H$; - răspuns corect

2-numai prin legături duble, $C = H$;

3-numai prin legături triple, $C \equiv H$;

4-atât prin legături simple, $C - H$, cât și prin legături multiple: duble, $C = H$ și triple, $C \equiv H$.

c) Un atom de C se poate lega de câte un atom de halogen, X (X poate fi Cl, Br sau I):

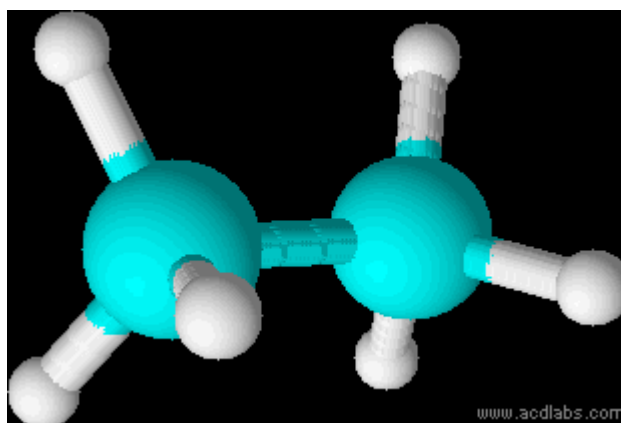
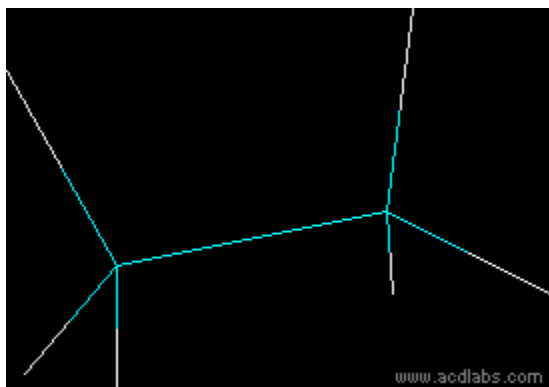
1-numai prin legături simple, $C - X$; - răspuns corect

2-numai prin legături duble, $C = X$;

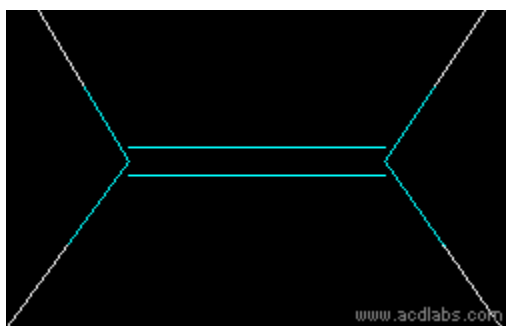
3-numai prin legături triple, $C \equiv X$;

4-atât prin legături simple, $C - X$, cât și prin legături multiple: duble, $C = X$ și triple, $C \equiv X$.

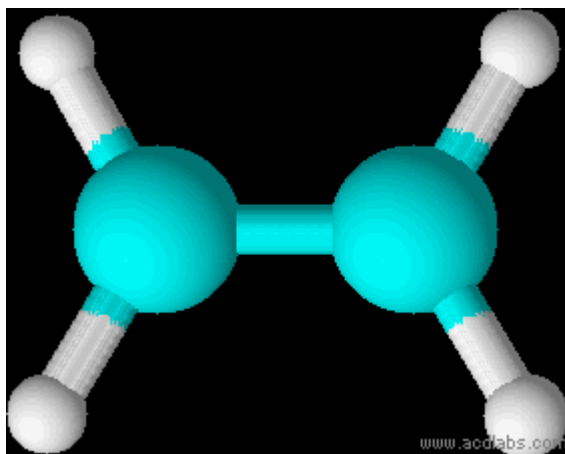
b. Scrie formulele structurale care demonstrează corectitudinea alegerii.



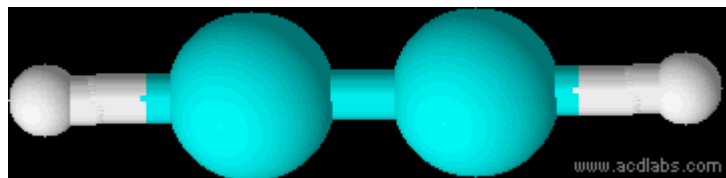
| tipul legăturii | C - C | C = C | C ≡ C |
|-----------------|---------------|---------------|----------------|
| formula plană | $H_3C - CH_3$ | $H_2C = CH_2$ | $HC \equiv CH$ |
| denumirea | etan | etenă | etină |



etenă



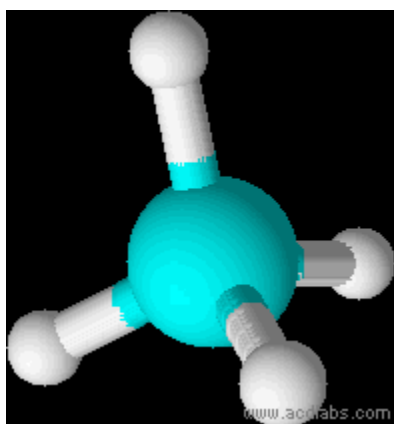
etenă



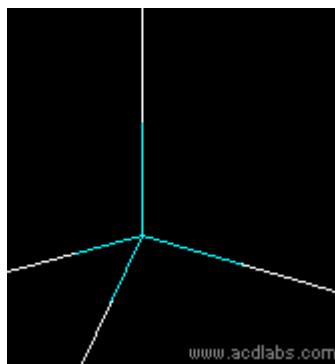
etină



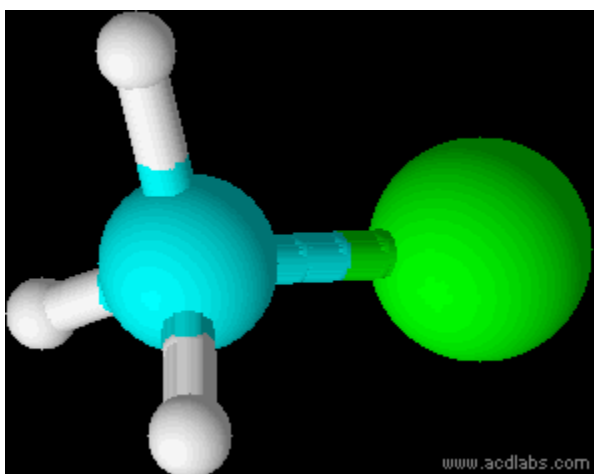
etină



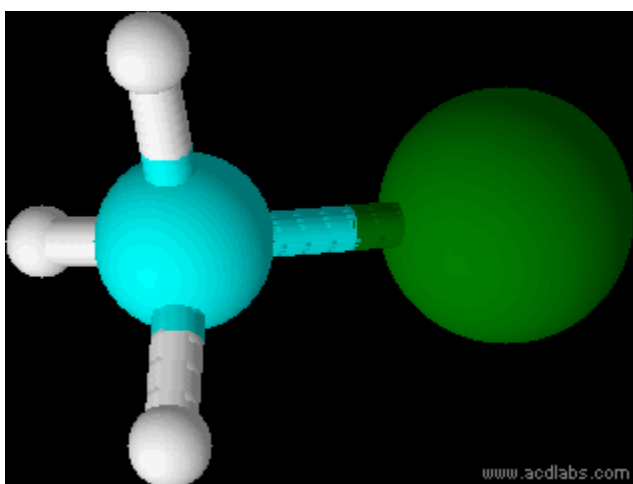
metan



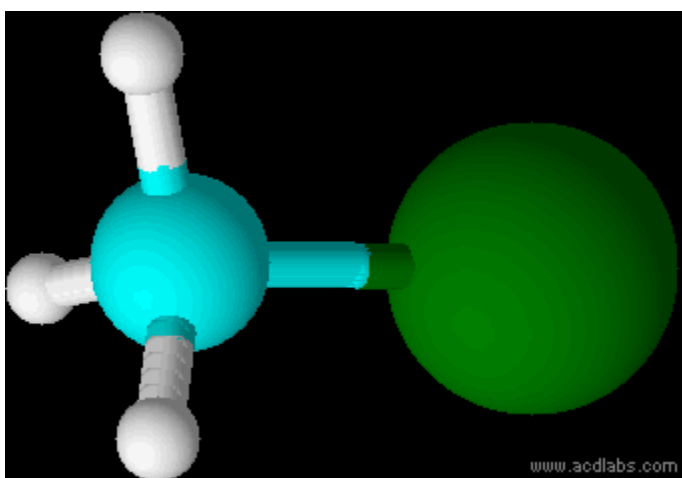
CH_4 metan



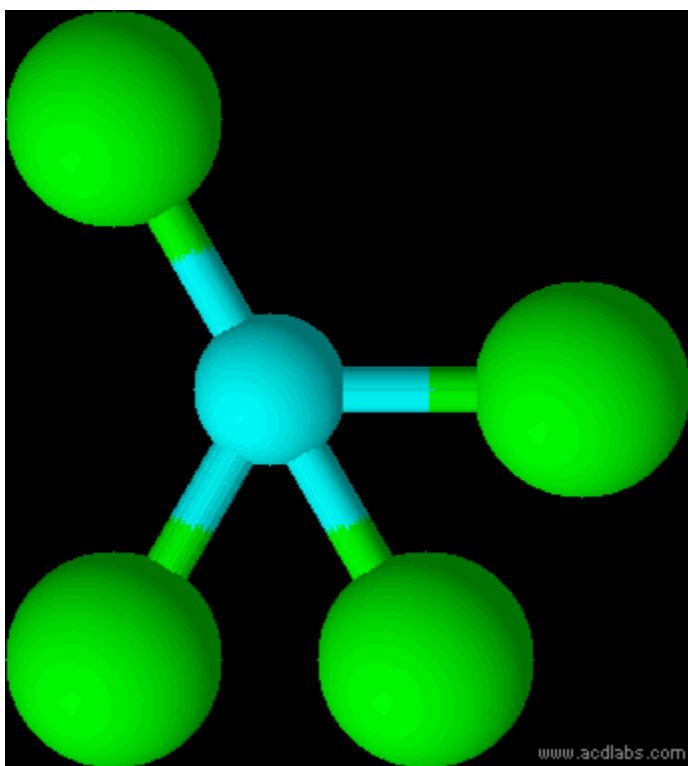
$\text{H}_3\text{C} - \text{Cl}$ clorură de metil



$\text{H}_3\text{C} - \text{Br}$ bromură de metil



$\text{H}_3\text{C} - \text{I}$ iodură de metil



CCl_4 tetraclorura de carbon sau

tetraclorometan

Problema practică 1.4.

a. Alege afirmația corectă dintre cele ce urmează și încercuiește-o:

a) Atomii de carbon se pot lega unii de alții formând catene sub formă de linie continuă;

**b) Atomii de carbon se pot lega unii de alții formând catene liniare în zig-zag; -
răspuns corect**

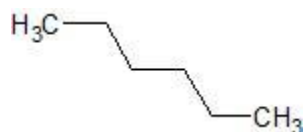
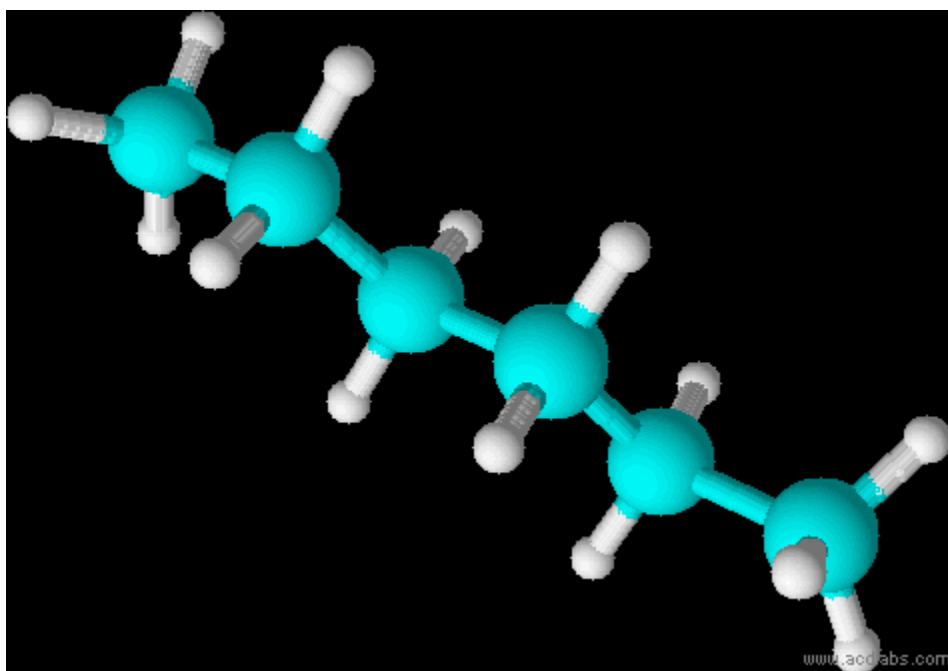
c) Atomii de carbon se pot lega unii de alții formând numai catene ciclice.

b. Pentru a demonstra că alegerea ta a fost corectă, construiește modele deschise ale moleculelor compușilor organici saturați care conțin:

1-patru atomi de C și numărul necesar de atomi de hidrogen;

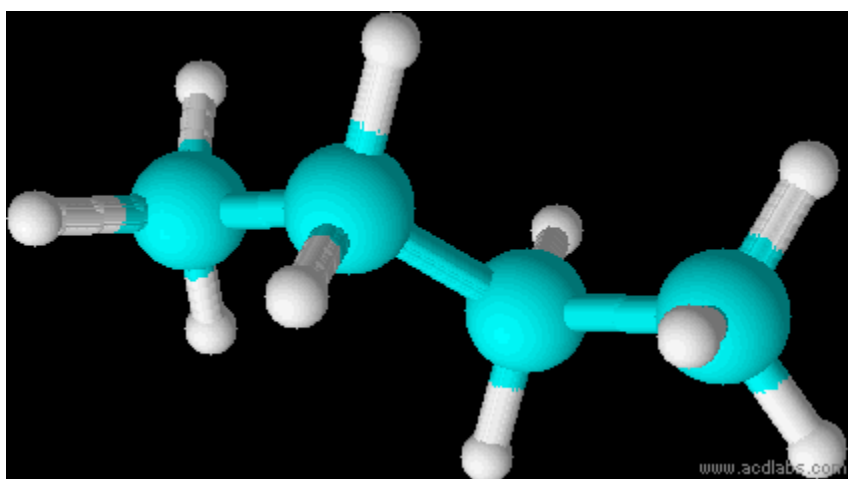
2- șase atomi de C și numărul necesar de atomi de hidrogen.

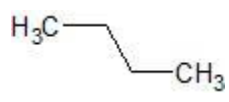
Rezolvare 2:



$\text{H}_3\text{C} - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$ n-hexan Formula moleculară C_6H_{14}

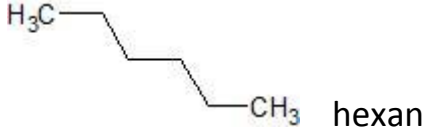
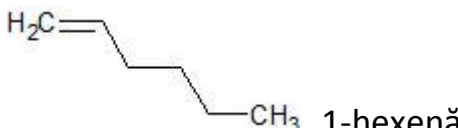
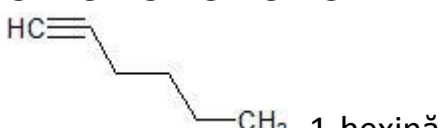
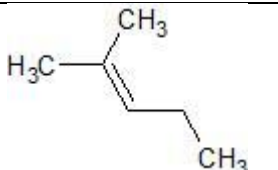
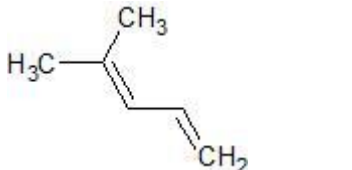
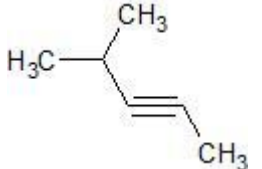
Rezolvare 1:

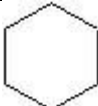
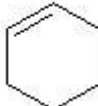
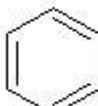
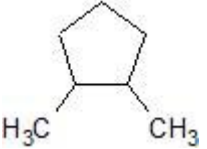
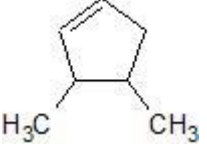
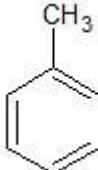
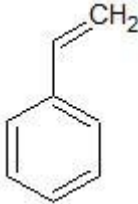


 $\text{H}_3\text{C} - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$ butan Formula moleculară C_4H_{10}

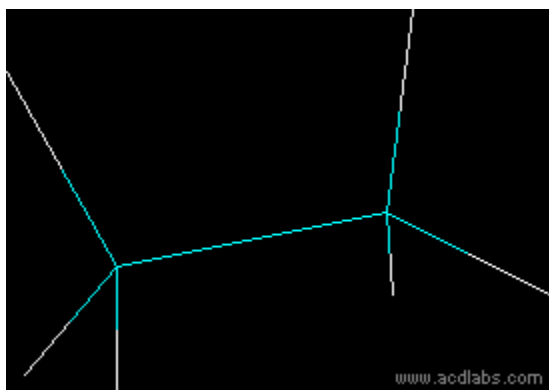
Problema practică 1.5. + 1.6.

CLASIFICAREA CATENELOR

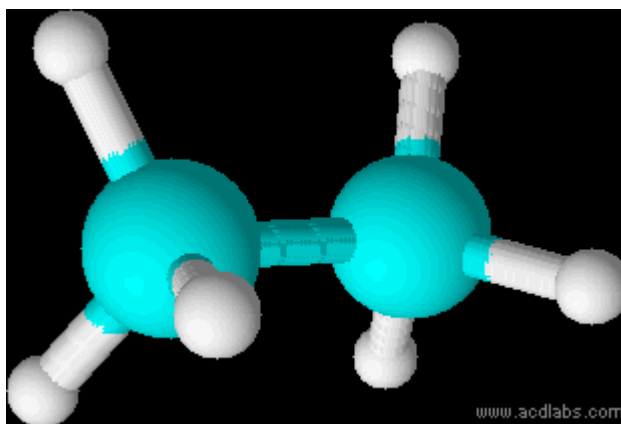
| | | | | |
|--------|----------|------------|------------|--|
| catene | aciclice | liniare | saturate | $C - C - C - C - C - C$  <chem>CCCCCC</chem> hexan |
| | | | nesaturate | $C = C - C - C - C - C$  <chem>C=CCCCC</chem> 1-hexenă $C \equiv C - C - C - C - C$  <chem>C#CCCCC</chem> 1-hexină |
| | | | ramificate | saturate |
| | | ramificate | nesaturate |  <chem>CC(C)=CCC</chem> 2-metil-2-pentenă  <chem>CC(C)=C=CC</chem> 4-metil-1,3-pentadienă  <chem>CC(C)C#CC</chem> 4-metil-2-pentină |

| | | | | |
|--|---------|--------------------------|------------|---|
| | ciclice | ciclu simplu | saturate |  ciclohexan |
| | | | nesaturate |  ciclohexenă  benzen |
| | | ciclu cu catenă laterală | saturate |  1,2-dimetilciclopentan |
| | | | nesaturate |  1,2-dimetil-3-cilopentenă  metilbenzen toluen $C_6H_5 -CH_3$  stiren sau vinilbenzen $C_6H_5 -HC = CH_2$ |

Rezolvare 1.5.:

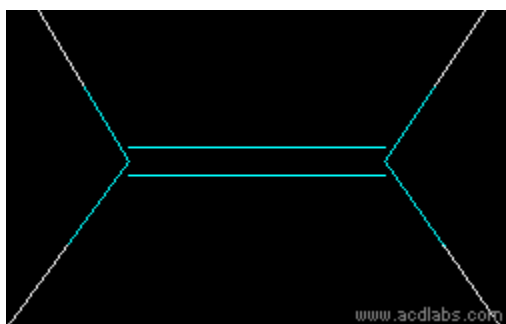


etan

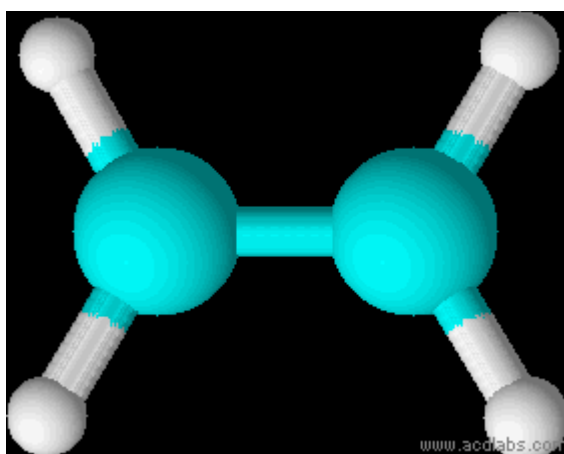


etan

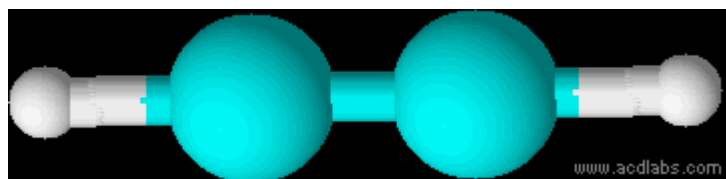
| tipul legăturii | C - C | C = C | C ≡ C |
|-----------------|------------------------------------|------------------------------------|------------------------------|
| formula plană | $\text{H}_3\text{C} - \text{CH}_3$ | $\text{H}_2\text{C} = \text{CH}_2$ | $\text{HC} \equiv \text{CH}$ |
| denumirea | etan | etenă | etină |



etenă



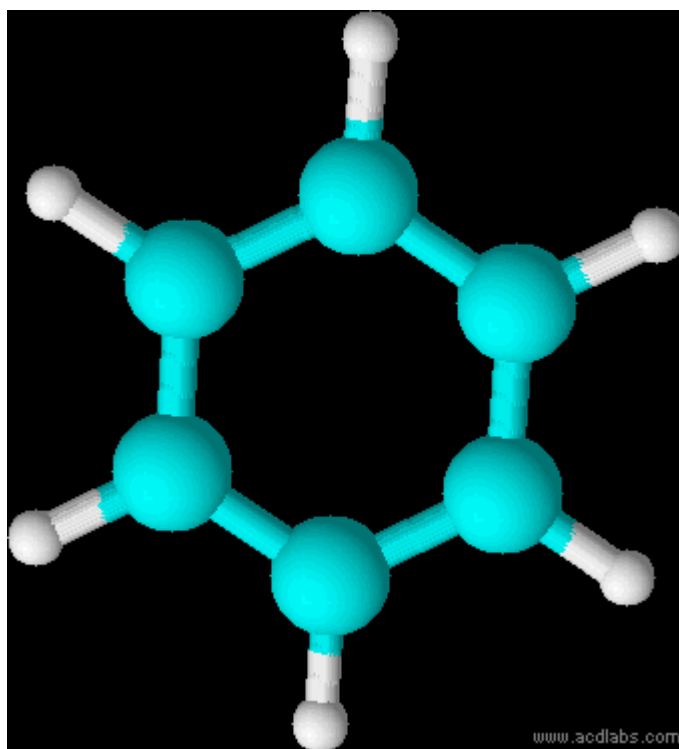
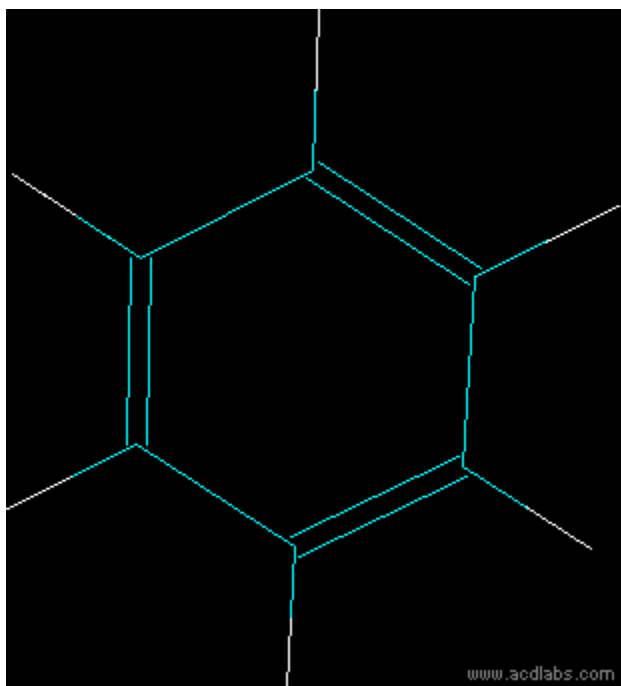
etenă



etină sau acetilenă

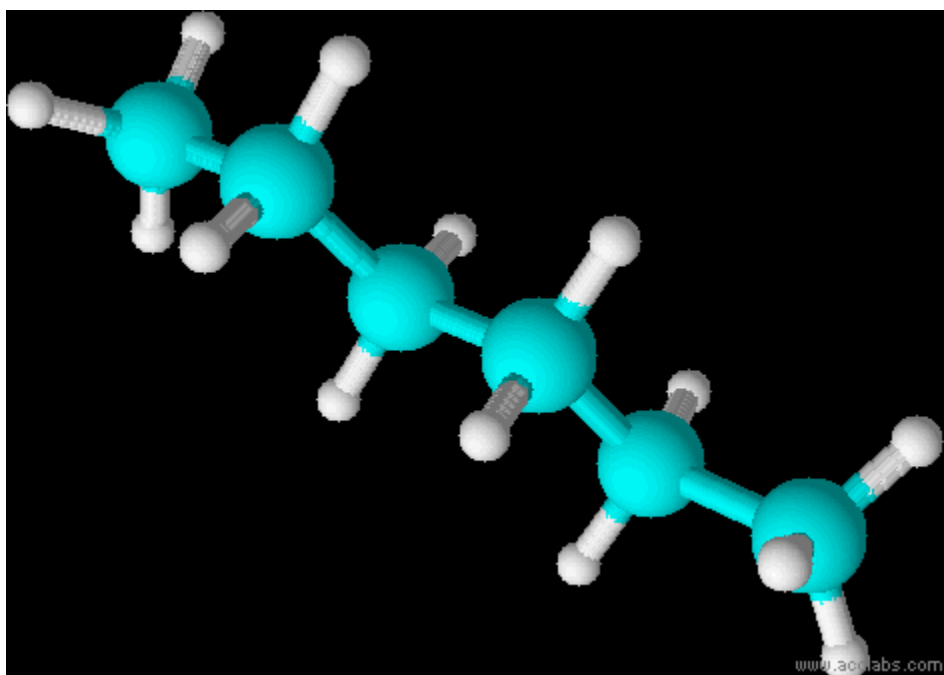


etină $\text{H} - \text{C} \equiv \text{C} - \text{H}$

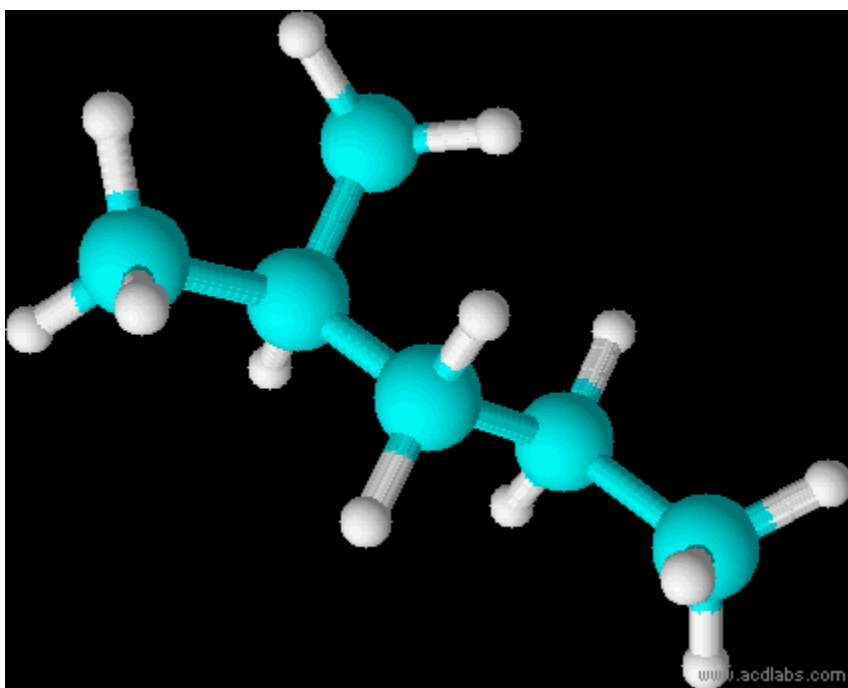


C_6H_6 benzen

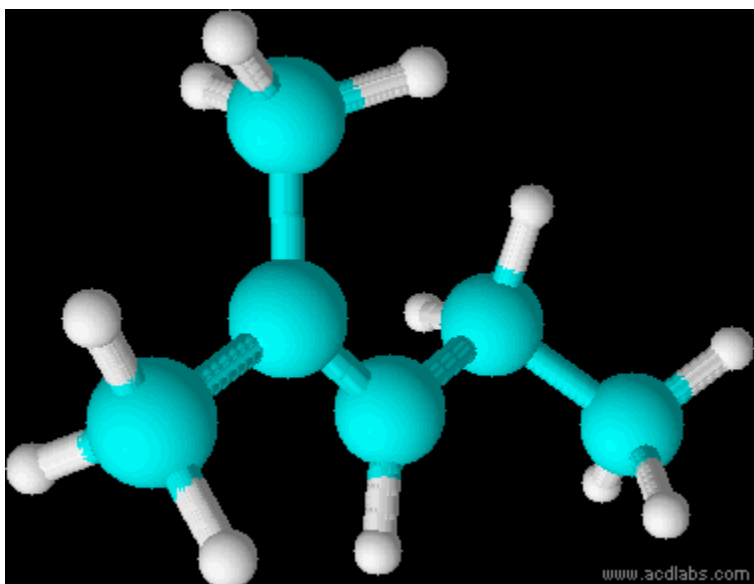
Rezolvare 1.6.:



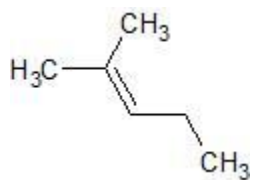
n-hexan



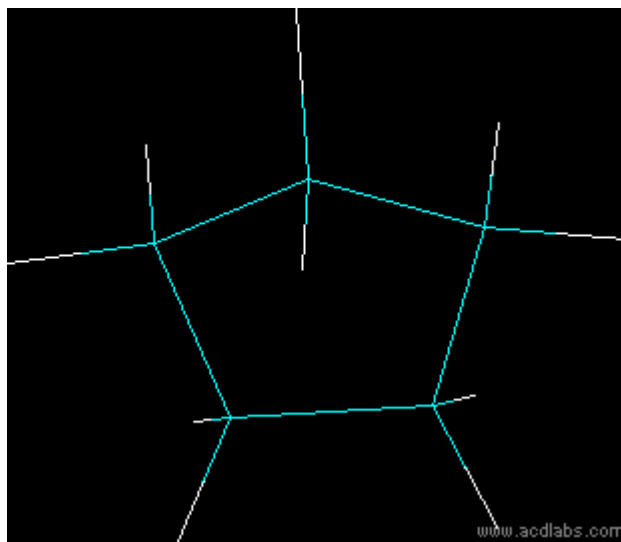
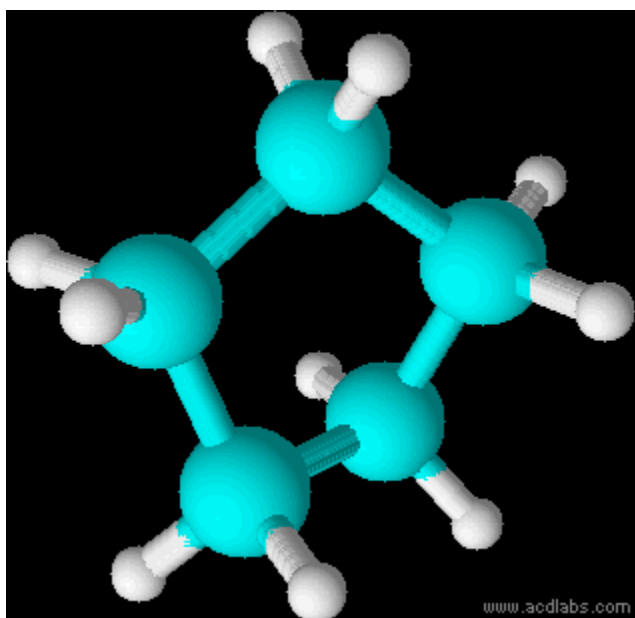
2-metilpentan



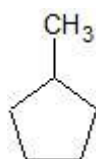
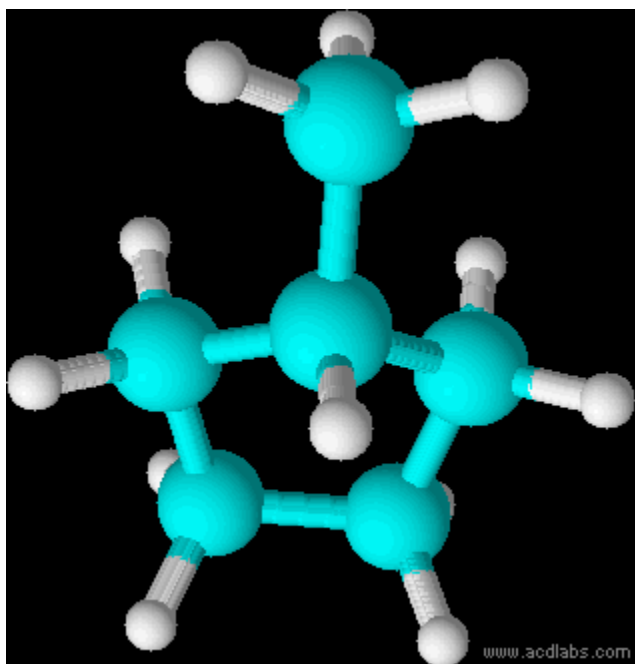
2-metil-2-pentenă



2-metil-2-pentenă



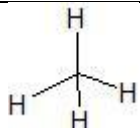
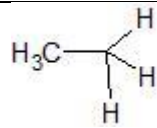
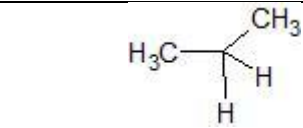
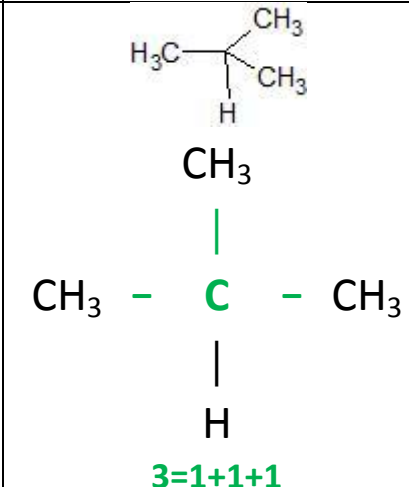
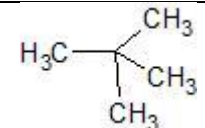
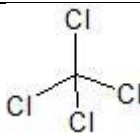
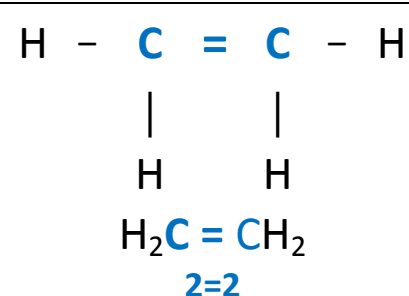
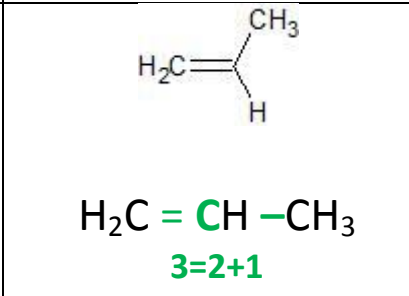
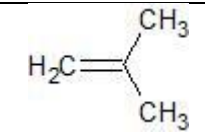
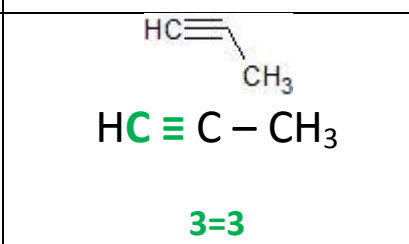
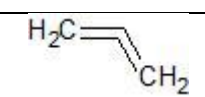
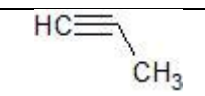
Ciclopentan C_5H_{10}

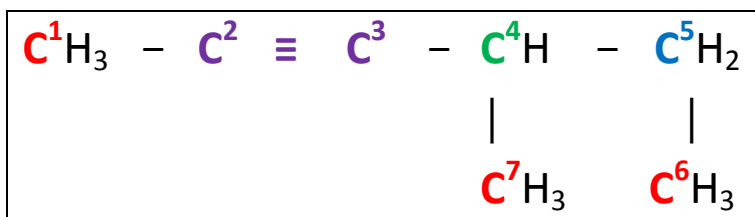


metilciclopentan

Problema practică 1.7.

Natura atomilor de carbon

| ATOM DE CARBON | | | | |
|---|--|---|---|---|
| nular | primar | secundar | terțiar | cuaternar |
| atomul de carbon care nu are nici o legătură cu carbonul | atomul de carbon care are o legătură cu carbonul | atomul de carbon care are două legături cu carbonul | atomul de carbon care are trei legături cu carbonul | atomul de carbon care are patru legături cu carbonul |
|  CH_4 $0=0$ |  $\text{H}_3\text{C}-\text{CH}_3$ $1=1$ |  $\text{H}_3\text{C}-\text{CH}_2-\text{CH}_3$ $2=1+1$ |  CH_3 $ \text{C}-\text{CH}_3$ $ \text{H}$ $3=1+1+1$ |  $4=1+1+1+1$ |
|  CCl_4 $0=0$ | |  $\text{H}-\text{C}=\text{C}-\text{H}$ $ \quad \text{H}\quad\text{H}$ $\text{H}_2\text{C}=\text{CH}_2$ $2=2$ |  $\text{H}_2\text{C}=\text{CH}-\text{CH}_3$ $3=2+1$ |  $4=2+1+1$ |
| | | |  $\text{HC}\equiv\text{C}-\text{CH}_3$ $3=3$ |  $\text{H}_2\text{C}=\text{C}=\text{CH}_2$ $4=2+2$ |
| | | | |  $\text{HC}\equiv\text{C}-\text{CH}_3$ $4=3+1$ |



4-metil-2-hexină

C primar : C¹, C⁶, C⁷

C secundar : C⁵

C terțiar: C⁴

C cuaternar: C², C³

Problema practică 1.8.

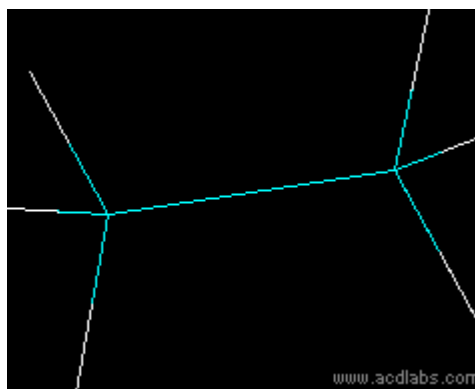
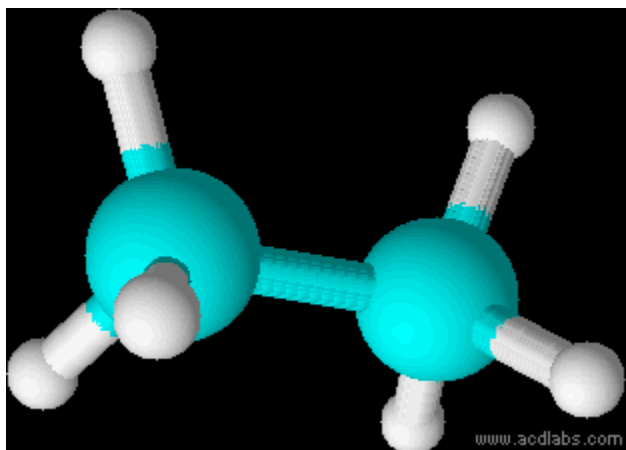
TIPURI DE SCRIERE A FORMULELOR COMPUȘILOR ORGANICI

| 1.Compus | etan |
|--------------------------------|---|
| Formula Lewis | $ \begin{array}{ccc} \text{H} & & \text{H} \\ & \cdot\cdot & \cdot\cdot \\ \text{H} & : \text{C} : & \text{C} : \text{H} \\ & \cdot\cdot & \cdot\cdot \\ \text{H} & & \text{H} \end{array} $ |
| Formula de proiecție plană | $ \begin{array}{ccccccc} & & \text{H} & & \text{H} & & \\ & & & & & & \\ \text{H} & - & \text{C} & - & \text{C} & - & \text{H} \\ & & & & & & \\ & & \text{H} & & \text{H} & & \end{array} $ |
| Formula de proiecție restrânsă | $\text{H}_3\text{C} - \text{CH}_3$ |

| 2.Compūs | propenă |
|--------------------------------|--|
| Formula Lewis | $ \begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \cdot\cdot \quad \cdot\cdot \quad \cdot\cdot \\ \text{H} : \text{C} : \text{C} :: \text{C} : \text{H} \\ \cdot\cdot \\ \text{H} \end{array} $ |
| Formula de proiecție plană | $ \begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H} - \text{C} - \text{C} = \text{C} - \text{H} \\ \\ \text{H} \end{array} $ |
| Formula de proiecție restrânsă | $\text{H}_3\text{C} - \text{HC} = \text{CH}_2$ |

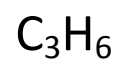
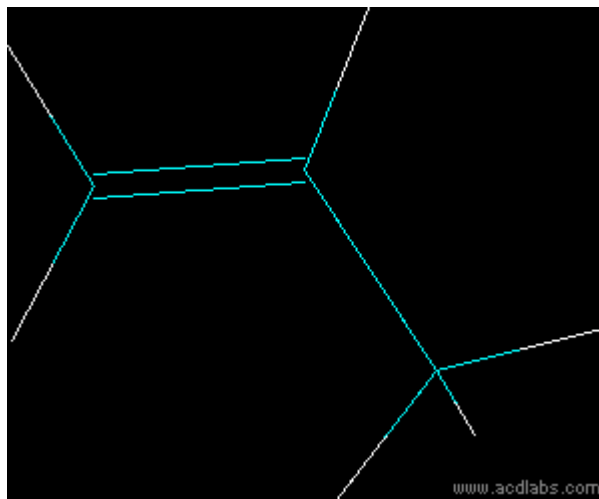
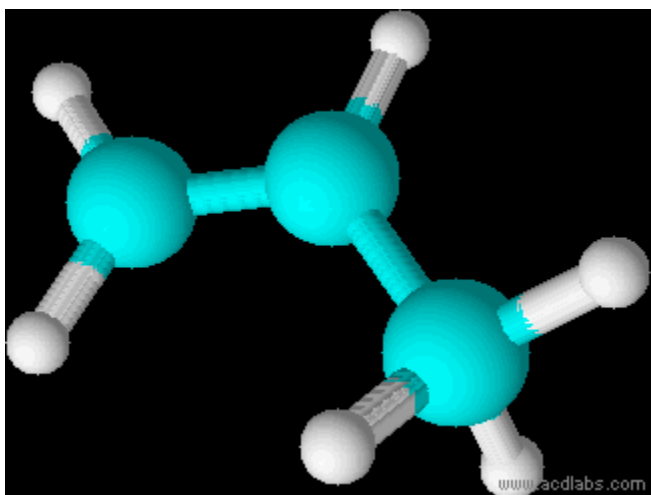
| 3.Compūs | 2-butină |
|--------------------------------|---|
| Formula Lewis | $ \begin{array}{c} \text{H} \quad \quad \quad \text{H} \\ \cdot\cdot \quad \quad \quad \cdot\cdot \\ \text{H} : \text{C} : \text{C} :: \text{C} : \text{C} : \text{H} \\ \cdot\cdot \quad \quad \quad \cdot\cdot \\ \text{H} \quad \quad \quad \text{H} \end{array} $ |
| Formula de proiecție plană | $ \begin{array}{c} \text{H} \quad \quad \quad \text{H} \\ \quad \quad \quad \\ \text{H} - \text{C} - \text{C} \equiv \text{C} - \text{C} - \text{H} \\ \quad \quad \quad \\ \text{H} \quad \quad \quad \text{H} \end{array} $ |
| Formula de proiecție restrânsă | $\text{H}_3\text{C} - \text{C} \equiv \text{C} - \text{CH}_3$ |

| 4.Compūs | 2-cloroetanol |
|--------------------------------|---|
| Formula Lewis | $ \begin{array}{ccccccc} & & \text{H} & & \text{H} & & \\ & & \cdot\cdot & & \cdot\cdot & & \cdot\cdot \\ & & \cdot\cdot & & \cdot\cdot & & \cdot\cdot \\ : & \text{Cl} & : & \text{C} & : & \text{C} & : \text{O} : \text{H} \\ & \cdot\cdot & & \cdot\cdot & & \cdot\cdot & \cdot\cdot \\ & & \text{H} & & \text{H} & & \end{array} $ |
| Formula de proiecție plană | $ \begin{array}{ccccccc} & & \text{H} & & \text{H} & & \\ & & & & & & \\ \text{Cl} & - & \text{C} & - & \text{C} & - & \text{O} - \text{H} \\ & & & & & & \\ & & \text{H} & & \text{H} & & \end{array} $ |
| Formula de proiecție restrânsă | $\text{Cl}-\text{CH}_2-\text{CH}_2-\text{OH}$ |

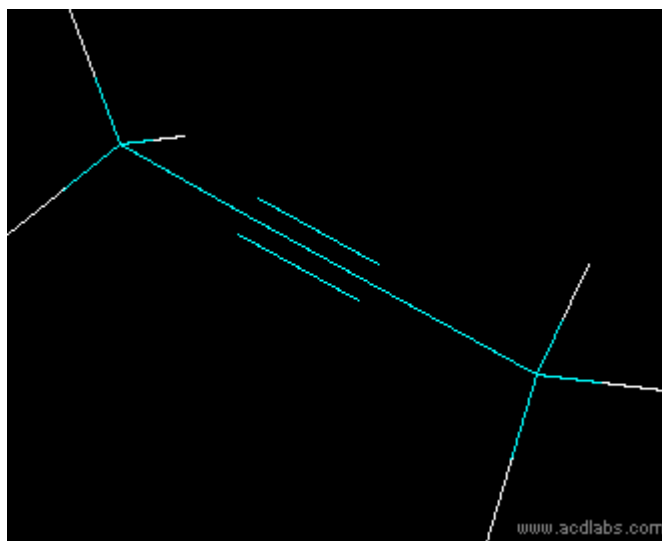
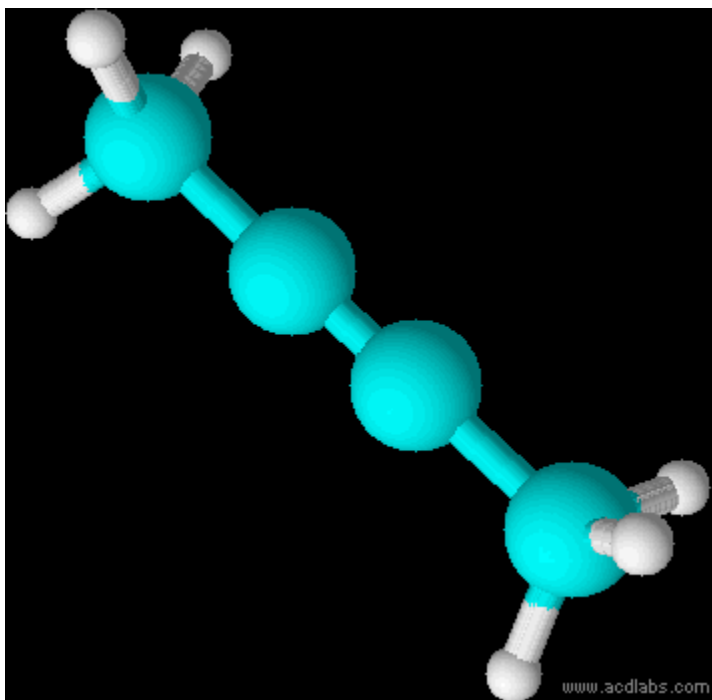


etan C_2H_6

etan $\text{H}_3\text{C}-\text{CH}_3$

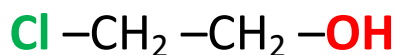
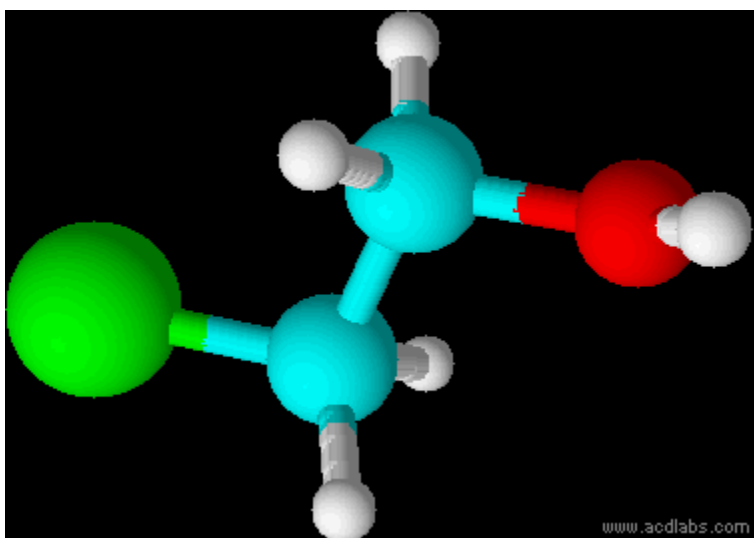


propenă $H_2C = CH - CH_3$



2-butină $H_3C - C \equiv C - CH_3$

formula moleculară C_4H_6



formula moleculară $\text{C}_2\text{H}_5\text{OCl}$

Problema practică 1.9.

Construiește modele spațiale compacte și deschise pentru compușii organici care conțin 2 atomi de C și fac parte din următoarele clase:

a. Hidrocarburi:

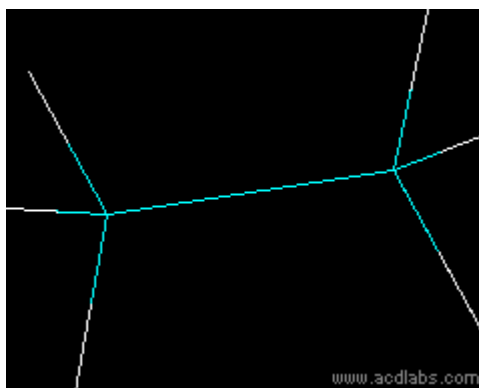
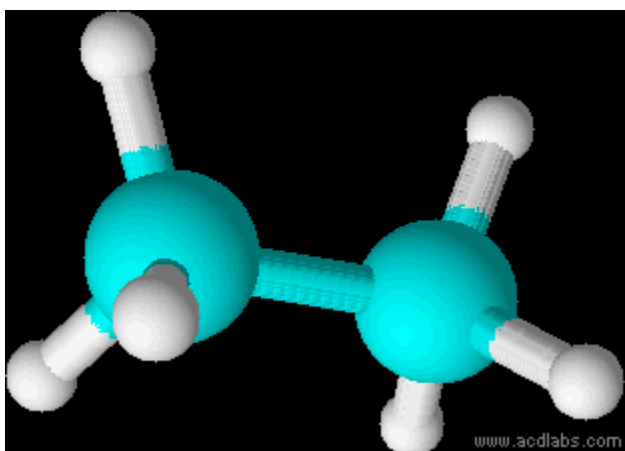
- 1-saturate;
- 2-nesaturate cu o legătură dublă $\text{C}=\text{C}$;
- 3-nesaturate cu o legătură triplă $\text{C}\equiv\text{C}$.

b. Derivați ai hidrocarburilor:

- 4-alcool;
- 5-eter;
- 6-aldehidă;
- 7-acid carboxilic;
- 8-amină

Rezolvare a1:

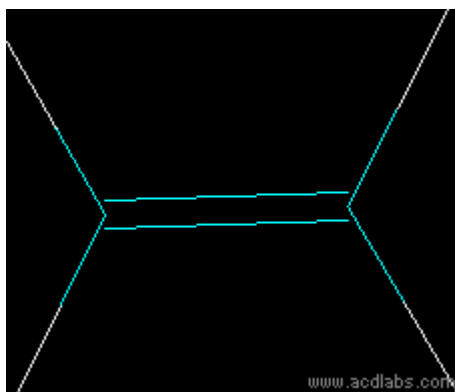
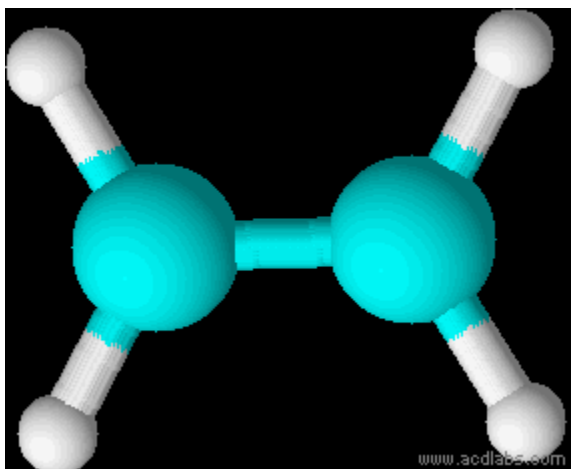
etan $\text{H}_3\text{C}-\text{CH}_3$



etan C_2H_6

Rezolvare a2:

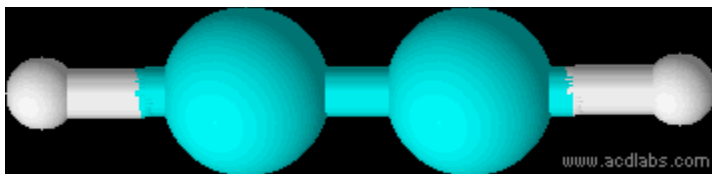
etenă $H_2C = CH_2$



etenă C_2H_4

Rezolvare a3:

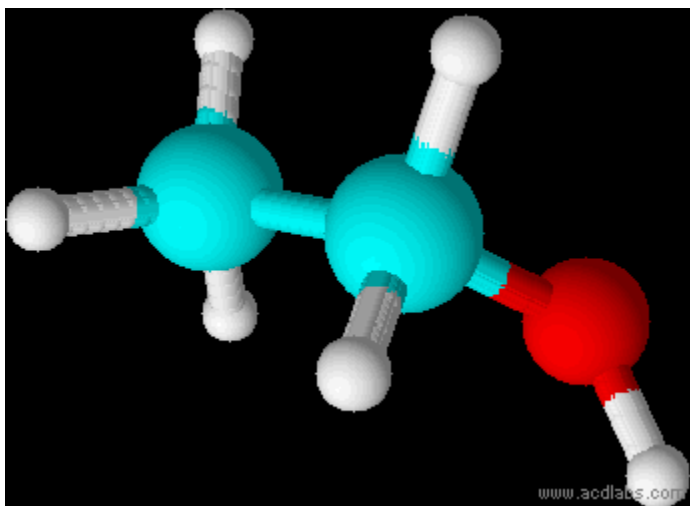
etină $HC \equiv CH$ sau acetilenă



etină C_2H_2

Rezolvare b4:

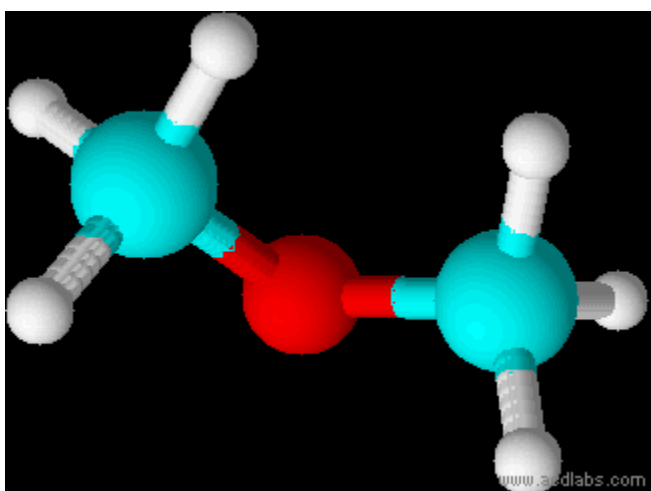
etanol $\text{H}_3\text{C} - \text{CH}_2 - \text{OH}$



etanol $\text{C}_2\text{H}_6\text{O}$ sau alcool etilic

Rezolvare b5:

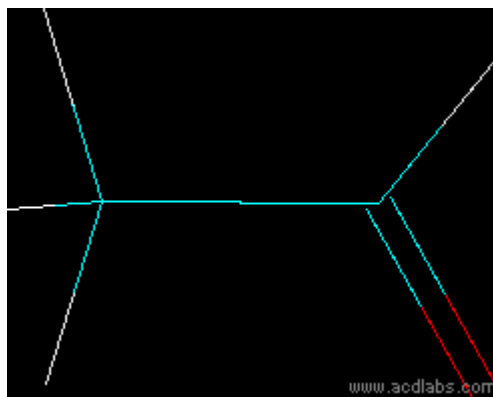
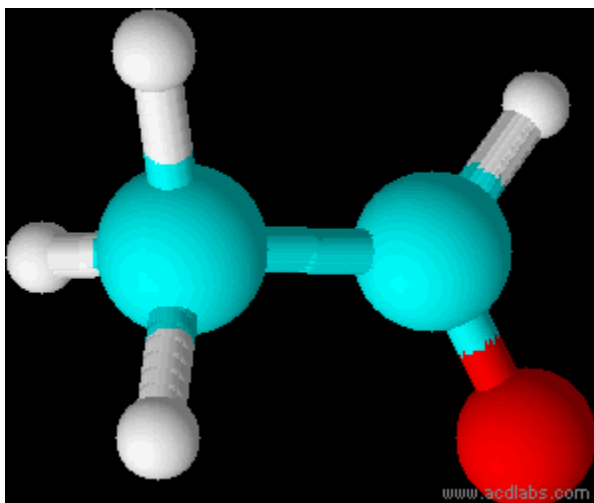
dimetileter $\text{H}_3\text{C} - \text{O} - \text{CH}_3$



eterdimetilic $\text{C}_2\text{H}_6\text{O}$

Rezolvare b6:

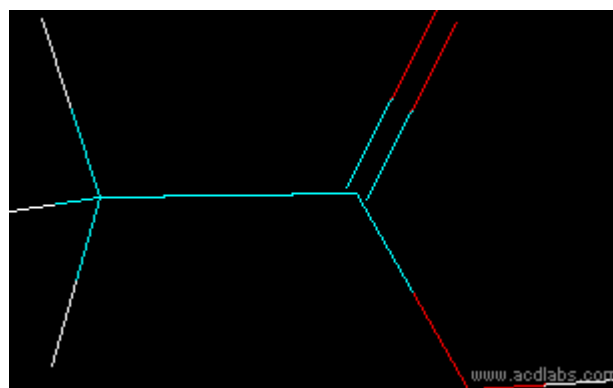
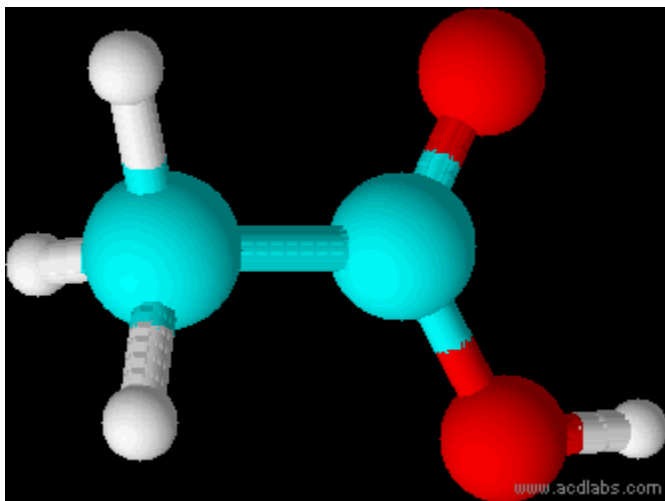
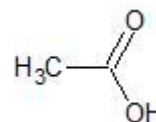
aldehidă acetică $\text{H}_3\text{C} - \text{HC} = \text{O}$ sau etanal



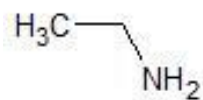
etanal $\text{C}_2\text{H}_4\text{O}$

Rezolvare b7:

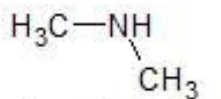
acid acetic $\text{H}_3\text{C} - \text{COOH}$ sau acid etanoic



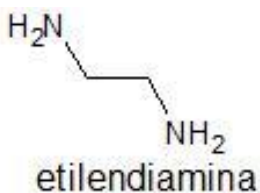
Rezolvare b8:



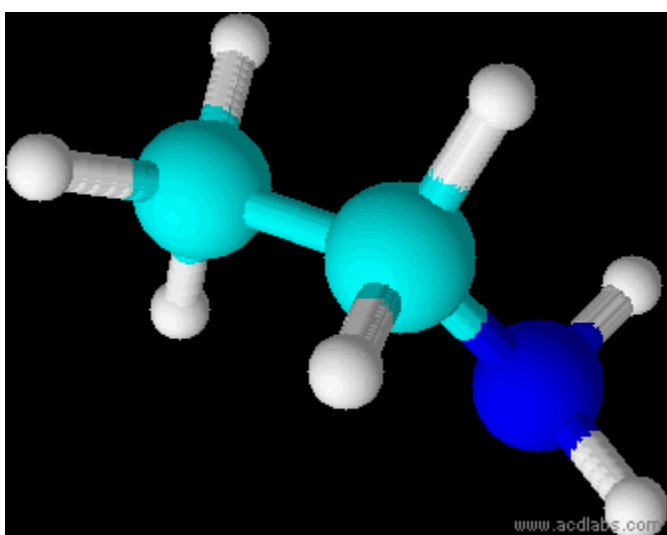
etilamina



dimetilamina

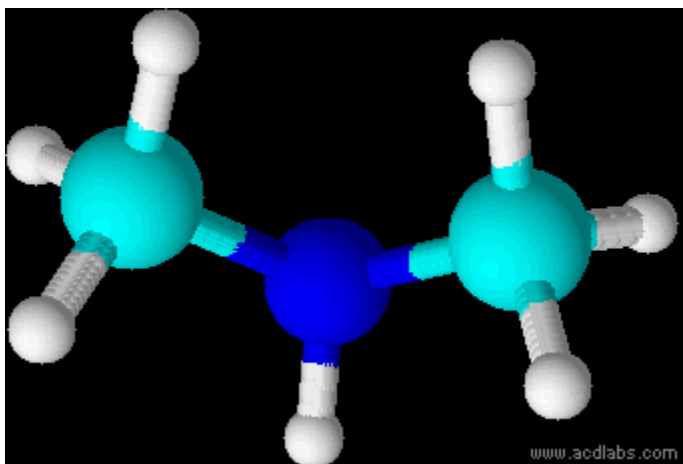


- etilamina $\text{H}_3\text{C} - \text{CH}_2 - \text{NH}_2$



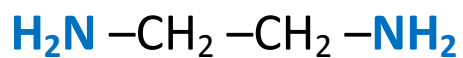
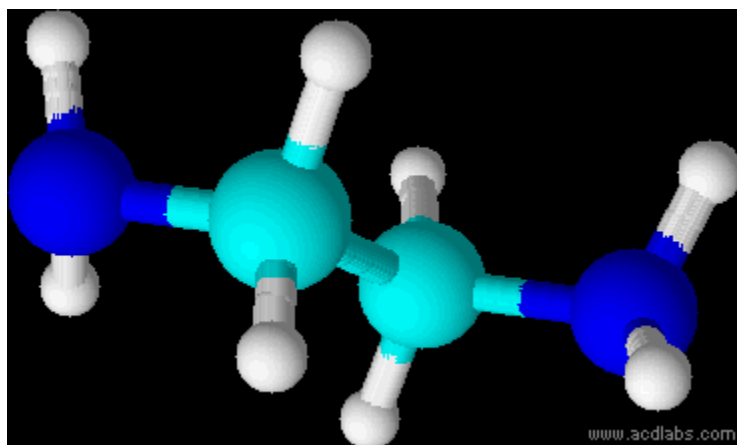
etilamina $\text{H}_3\text{C} - \text{CH}_2 - \text{NH}_2$

- dimetilamina $\text{H}_3\text{C} - \text{NH} - \text{CH}_3$



dimetilamina $\text{H}_3\text{C} - \text{NH} - \text{CH}_3$

- etilendiamina $\text{H}_2\text{N}-\text{CH}_2-\text{CH}_2-\text{NH}_2$



etilendiamina