ESERCIZI DI FINE CAPITOLO

SOLUZIONI

Capitolo D1 – Chimica organica: una visione d'insieme

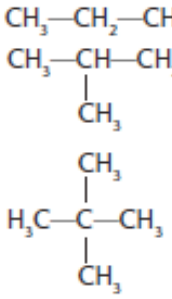
1. A
2. C
3. B
4. D
5. A
6. B
7. C
8. A
9. A
10. B
11. D
12. A
13. C
14. C
15. C
16. B
17. C

18 a. sp^2; b. sp^3; c. sp^2; d. sp

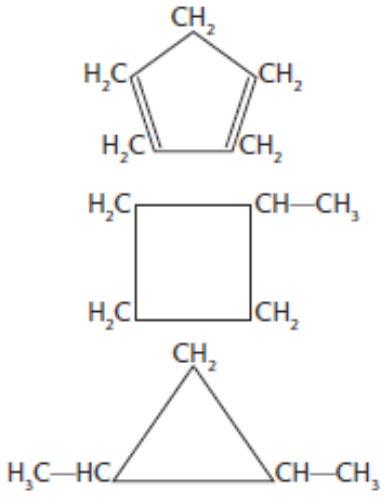
19 a. C–1 = –1; C–2 = –1
b. +2
c. –2
d. C–1 = –3; C–2 = +2; C–3 = –3

20 a. C–1 = –3; C–2 = –2; C–3 = –3
b. C–1 = –3; C–2 = 0; C–3 = –1
c. C–1 = –2; C–2 = –1; C–3 = –3
d. C–1 = –1; C–2 = 0; C–3 = –3

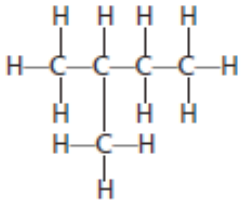
21 1. C_5H_{12}



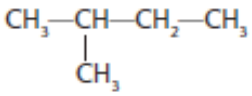
2. C_5H_{10}



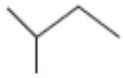
22 a. Lewis



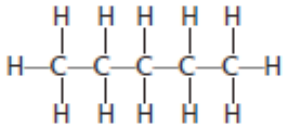
razionale



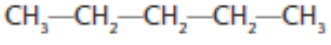
topologica



b. Lewis

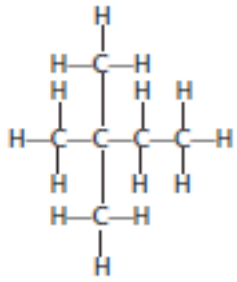


razionale

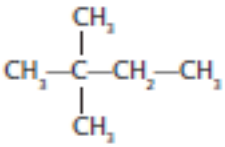


topologica

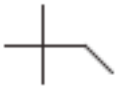
c. Lewis



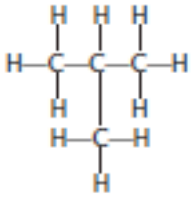
razionale



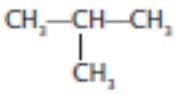
topologica



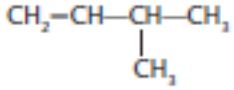
d. Lewis

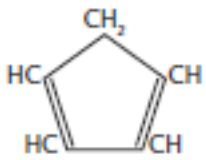


razionale

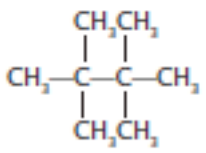


topologica

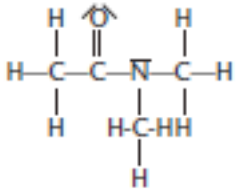
23 a. 

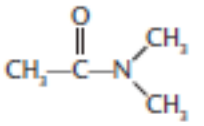
b. 

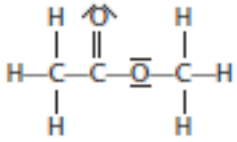
c. $CH_3—CH_2—O—CH_2—CH_3$

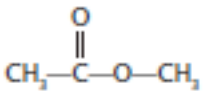
d. 

24 $CH_3CH_2CH(CH_3)C(CH_3)_3$

25 a. 

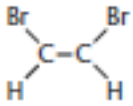


b. 

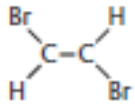


26 a. $CH_3—CH_2—CHCl_2$ $CH_2Cl—CH_2—CH_2Cl$ $CH_3—CHCl—CH_2Cl$ $CH_3—CCl_2—CH_3$

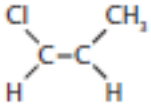
b. $CH_3—CH_2—CH_2I$ $CH_3—CHI—CH_3$

27 a. 

cis



trans

b. 

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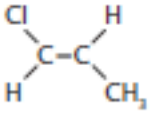
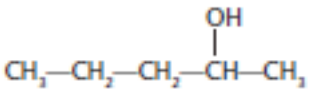


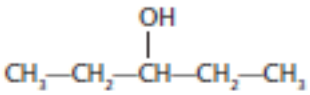
trans

28 a. $CH_3—CH_2—CH_2OH$ $CH_3—CH_2—O—CH_3$

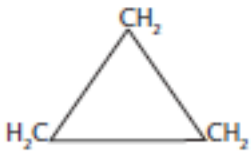
b. $CH_3—CH_2—CH_2—CH_2OH$ $CH_3—CH_2—O—CH_2—CH_3$

29 $CH_3—CH_2—CH_2—CH_2—CH_2—OH$

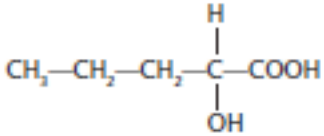


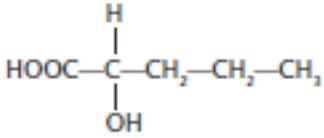


30 $CH_2=CH—CH_3$



31





32 a. (5 isomeri)

1. $CH_3—CH_2—CH_2—CH_2—CH_2—CH_3$
2. $CH_3—CH_2—CH_2—\underset{\displaystyle CH_3}{\underset{|}{CH}}—CH_3$
3. $CH_3—CH_2—\underset{\displaystyle CH_3}{\underset{|}{CH}}—CH_2—CH_3$
4. $CH_3—\underset{\displaystyle CH_3}{\underset{|}{CH}}—\underset{\displaystyle CH_3}{\underset{|}{CH}}—CH_3$
5. $CH_3—CH_2—\underset{\displaystyle CH_3}{\underset{|}{\overset{\displaystyle CH_3}{\overset{|}{C}}}}—CH_3$

b. (9 isomeri)

1. $CH_3—CH_2—CH_2—CH_2—CH_2—CH_2—CH_3$
2. $CH_3—CH_2—CH_2—CH_2—\underset{\displaystyle CH_3}{\underset{|}{CH}}—CH_3$
3. $CH_3—CH_2—CH_2—\underset{\displaystyle CH_3}{\underset{|}{CH}}—CH_2—CH_3$
4. $CH_3—CH_2—\underset{\displaystyle CH_3}{\underset{|}{CH}}—\underset{\displaystyle CH_3}{\underset{|}{CH}}—CH_3$
5. $CH_3—\underset{\displaystyle CH_3}{\underset{|}{CH}}—CH_2—\underset{\displaystyle CH_3}{\underset{|}{CH}}—CH_3$
6. $CH_3—CH_2—CH_2—\underset{\displaystyle CH_3}{\underset{|}{\overset{\displaystyle CH_3}{\overset{|}{C}}}}—CH_3$
7. $CH_3—CH_2—\underset{\displaystyle CH_3}{\underset{|}{\overset{\displaystyle CH_3}{\overset{|}{C}}}}—CH_2—CH_3$
8. $CH_3—\underset{\displaystyle CH_3}{\underset{|}{CH}}—\underset{\displaystyle CH_3}{\underset{|}{\overset{\displaystyle CH_3}{\overset{|}{C}}}}—CH_3$
9. $CH_3—\underset{\displaystyle CH_3}{\underset{|}{\overset{\displaystyle CH_2—CH_3}{\overset{|}{C}}}}—CH_2—CH_3$

33 (6 isomeri)

1. $CH_3—CH_2—CH_2—CH_2—OH$
2. $CH_3—CH_2—\underset{\displaystyle OH}{\underset{|}{CH}}—CH_3$
3. $CH_3—\underset{\displaystyle OH}{\underset{|}{\overset{\displaystyle CH_3}{\overset{|}{C}}}}—CH_3$
4. $CH_3—CH_2—O—CH_2—CH_3$
5. $CH_3—O—CH_2—CH_2—CH_3$
6. $CH_3—O—\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{/}{\underset{\backslash}{CH}}}}$

34 $c = \frac{1\ g}{100\ mL} = 0{,}01\ g/mL$

$[\alpha] = \frac{\alpha}{l \cdot c} = \frac{1{,}33}{2 \cdot 0{,}01} = 66{,}5°$

35 c. < a. < b. < d.

36 a. < d. < c. < b.

37 b. < d. < c. < a.

38 a2. < a1. < a3.; b2. < b3. < b1.

39 a. eteri; b. esteri; c. alchini; d. alogenuri

40 a. ammine; b. alogenuri alchilici; c. chetoni; d. acidi carbossilici; e. esteri; f. aldeidi

41 a. $CH_3—CH_2—CH_2—CH_2—OH$
b. $CH_3—CH_2—O—CH_3$
c. $CH_3—CH_2—CHO$
d. $CH_3—CH_2—CO—CH_3$

42 a.; b.; d.

43 a.; c.

44 1. $CH_3—\overset{+}{C}H_2$

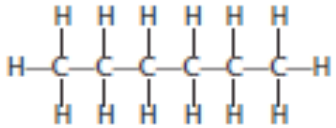
2. $CH_3—\overset{+}{C}H—CH_3$
3. $CH_3—\underset{\displaystyle CH_3}{\underset{|}{\overset{\displaystyle +}{C}}}$

45 a. (E); b. (E); c. (N); d.(E)

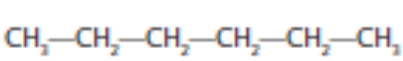
46. C
47. D
48. A
49. C

50 a. sp^2; b. sp^2; c. sp^3; d. sp^2

51 a. Lewis

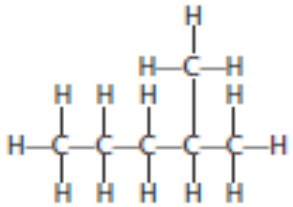


rational



topologic

b. Lewis



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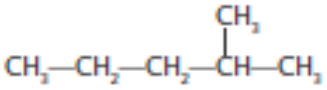
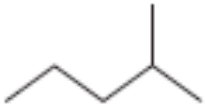
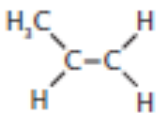


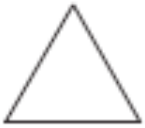
topologic



52

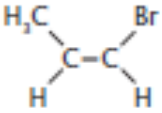


propene

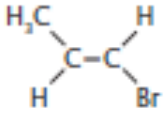


cyclopropane

54



cis



trans

53 a. amides; b. ethers; c. alkynes; d. aldehydes

Capitolo D2 – Gli idrocarburi

1. C
2. C
3. D
4. C
5. B
6. A
7. A
8. C
9. C
10. A
11. A
12. A
13. B
14. C
15. A
16. C
17. D
18. C
19. B
20. A
21. B
22. A
23. B
24. D
25. A
26. A
27. D
28. B
29. A
30. C
31. A
32. B
33. B
34. C
35. A

36 **a.** $CH_3—\underset{\displaystyle CH_3}{\underset{|}{CH}}—CH_2—CH_2—CH_3$

b. $CH_3—\underset{\displaystyle CH_3}{\underset{|}{CH}}—\underset{\displaystyle CH_3}{\underset{|}{CH}}—CH_3$

c. $CH_3—\underset{\displaystyle CH_3}{\underset{|}{\overset{\displaystyle CH_3}{\overset{|}{C}}}}—CH_2—\underset{\displaystyle CH_2—CH_3}{\underset{|}{CH}}—CH_2—CH_3$

d. $CH_3—\underset{\displaystyle CH_3}{\underset{|}{CH}}—CHBr—CH_2—CH_3$

e. $CHCl_2—CH_2—CCl_2—CH_2—CH_3$

f. $CH_3—CHCl—\underset{\displaystyle H_3C\quad CH_3}{\underset{\diagdown\ \diagup}{CH}}—CH_2—CH_2—CH_2—CH_3$

g. $CH_3—\underset{\displaystyle CH_3}{\underset{|}{CH}}—CH_2—CH_2—\underset{\displaystyle CH_3—CH—CH_2—CH_3}{\underset{|}{CH}}—CH_2—\underset{\displaystyle CH_3}{\underset{|}{CH}}—CH_3$

h. $CH_3—CH_2—CH_2—\underset{\displaystyle CH_2\\ |\\ CH\\ \diagup\ \diagdown\\ H_3C\quad CH_3}{\underset{\displaystyle CH_3}{\underset{|}{C}}}—CH_2—CH_2—CH_3$

i. $CH_2Cl—\underset{\displaystyle CH_3}{\underset{|}{CCl}}—\underset{\displaystyle CH_3}{\underset{|}{CH}}—CH_2—CH_2Cl$

37 **a.** 2,2-dimetilbutano
b. 1-iodobutano
c. 1-cloro-4-metilpentano
d. 2-bromo-2-metilpropano
e. 3-metilpentano

38 **a.** $CH_3—CH_2—CH_2—CH_2—CH_3$ pentano

b. $CH_3—\underset{\displaystyle CH_2—CH_3}{\underset{|}{CH}}—CH_2—CH_3$ 3-metilpentano

c. $CH_3—CHBr—CH_2Br$ 1,2-dibromopropano

d. $CH_3—\underset{\displaystyle CH_2—CH_2—CH_3}{\underset{|}{CH}}—CHBr—CH_2—CH_3$ 3-bromo-4-metileptano

39 **a.** $CH_3—CF_2—CH_3$ 2,2-difluoropropano
$CHF_2—CH_2—CH_3$ 1,1-difluoropropano
$CH_2F—CH_2—CH_2F$ 1,3-difluoropropano
$CH_2F—CHF—CH_3$ 1,2-difluoropropano

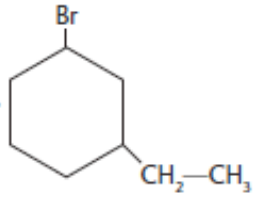
b. $CHBrCl—CHBr_2$ 1,2,2-tribromo-1-cloroetano
$CH_2Cl—CBr_3$ 1,1,1-tribromo-2-cloroetano
$CH_2Br—CBr_2Cl$ 1,1,2-tribromo-1-cloroetano

40 **d.** < **c.** < **a.** < **b.** < **e.**

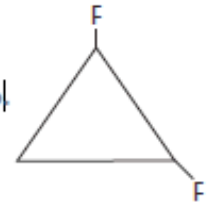
41 **a.** $C_6H_{14} + \frac{19}{2} O_2 \longrightarrow 6CO_2 + 7H_2O\ (-\Delta H)$

b. $C_4H_{10} + Cl_2 \xrightarrow{\text{luce o calore}} \underset{\text{clorobutano}}{C_4H_9Cl} + HCl$

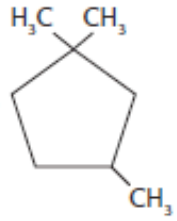
42 a.



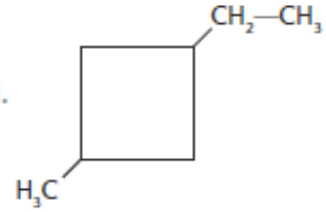
b.



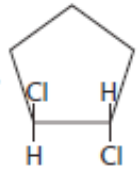
c.



d.

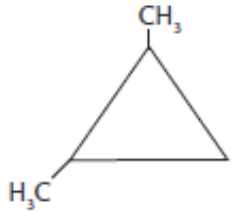


e.



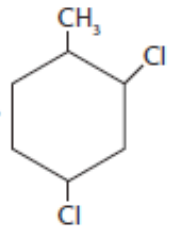
43 a. 1-bromo-2-clorociclobutano
b. 1,2-dietilciclopentano
c. 1,1-dimetilciclopropano
d. 1,3-dimetilciclobutano

44 a.



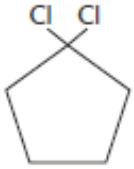
1,2-dimetilciclopropano

b.



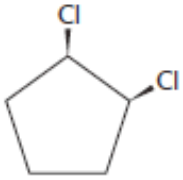
1,5-dicloro-2-metilcicloesano

45 1.



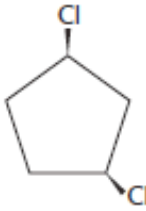
1,1-diclorociclopentano

2.



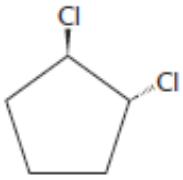
cis-1,2-diclorociclopentano

3.



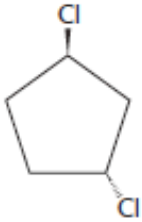
cis-1,3-diclorociclopentano

4.



trans-1,2-diclorociclopentano

5.

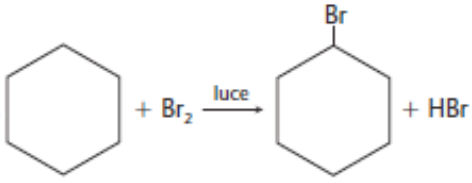


trans-1,3-diclorociclopentano

46 a.

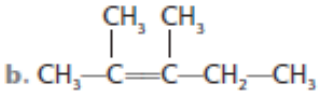
$+ 6\ O_2 \longrightarrow 4\ CO_2 + 4\ H_2O\ (-\Delta H)$

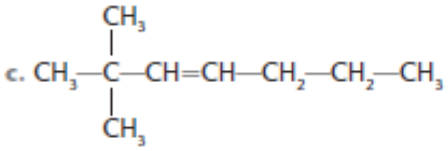
b.

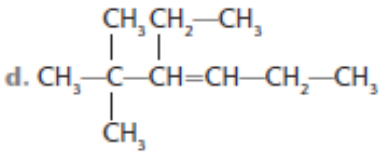


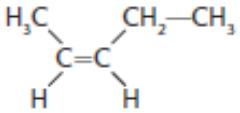
cicloesano — bromocicloesano

47 **a.** $CH_2Cl—CH=CCl—CH_3$

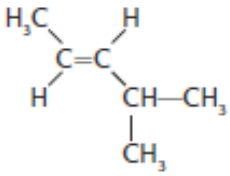
b. 

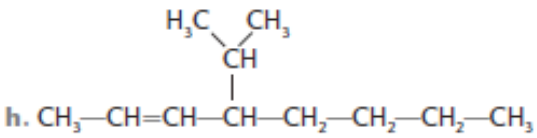
c. 

d. 

e. 

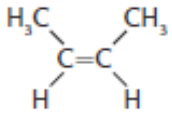
f. $CH_2=CHBr$

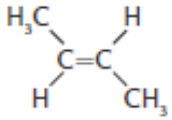
g. 

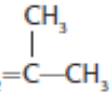
h. 

48 **a.** 2-metil-2-butene
b. 3-cloro-2-metil-1-esene
c. 3-bromo-2,2-dicloro-6-metil-4-ottene
d. *trans*-3,4-dicloroesene
e. 3,3-dibromo-4,4-dicloro-1-pentene
f. 2,3-dimetil-2-esene

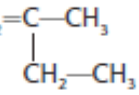
49 **1.** $CH_2=CH—CH_2—CH_3$ 1-butene

2.  *cis*-2-butene

3.  *trans*-2-butene

4.  metilpropene

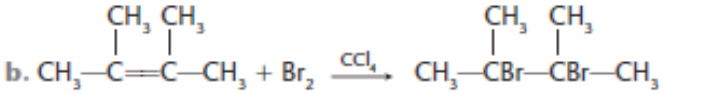
50 **a.** $CH_3—CH_2—CH=CH—CH_3$ 2-pentene

b.  2-metil-1-butene

c. $CH_3—CH_2—CCl=CH_2$ 2-cloro-1-butene

51 Sono isomeri geometrici i composti **b** e **c**.

52 **a.** $CH_3—CH=CH—CH_3 + Br_2 \xrightarrow{CCl_4} CH_3—CHBr—CHBr—CH_3$
2-butene — 2,3-dibromobutano

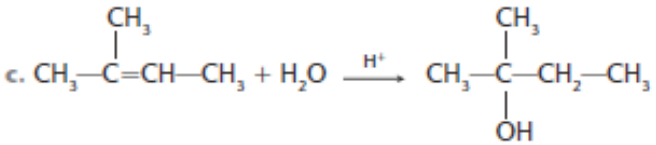
b. 
2,3-dimetil-2-butene — 2,3-dibromo-2,3-dimetilbutano

c. $CH_2=CHCl + Br_2 \xrightarrow{CCl_4} CH_2Br—CHBrCl$
cloruro di vinile (1-cloroetene) — 1,2-dibromo-1-cloroetano

53 **a.** 1-pentene + Br_2 (in una soluzione di CCl_4) **b.** 1-butene + HCl

54 **a.** $CH_3—CH=CH—CH_2—CH_3 + H_2 \xrightarrow{Pt} CH_3—CH_2—CH_2—CH_2—CH_3$
2-pentene — pentano

b. $CH_2=CH—CH_2—CH_3 + HBr \longrightarrow CH_3—CHBr—CH_2—CH_3$
1-butene — 2-bromobutano

c. 
2-metil-2-butene — 2-metil-2-butanolo

55 **a.** $CH_3=C(CH_3)-CH_2-CH(CH_3)-CH_3$

b. $CH_3-CCl_2-C\equiv C-CH_2-CH_3$

c. $CH\equiv C-CH(CH_3)-CH(CH_2-CH_3)-CH_2-CH_3$

d. $CH\equiv C-CBr(CH_3)-CH_2-CH_3$

e. $CHCl_2-C\equiv C-CH_2Cl$

f. $CH_3-C\equiv C-C(CH(CH_3)_2)(CH_2-CH_3)-CH_2-CH_3$

56 **a.** 3,3-dimetil-1-butino

b. 5-metil-3-isopropil-1-eptino

c. 5-fluoro-1-esino

d. 4,5,6-tribromo-1-eptino

57 **a.** $CH_3-CH_2-C\equiv CH$ — 1-butino

b. $CH_3-CH(Cl)-C\equiv C-CH_3$ — 4-cloro-2-pentino

c. $CH_3-CH(CH_2-CH_3)-C\equiv C-CH_3$ — 4-metil-2-esino

58 **1.** $CH\equiv C-CH_2-CH_2-CH_3$ — 1-pentino

2. $CH_3-C\equiv C-CH_2-CH_3$ — 2-pentino

3. $CH\equiv C-CH(CH_3)-CH_3$ — 3-metil-1-butino

59 **a.** 2-pentino + HCl

b. 2-butino + Br_2 (in una soluzione di CCl_4)

60 **a.** $CH\equiv C-CH_2-CH_2-CH_3 + 2H_2 \xrightarrow{Pt} CH_3-CH_2-CH_2-CH_2-CH_3$
n-pentano

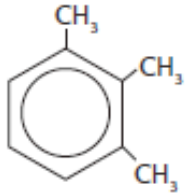
b. $CH\equiv C-CH_2-CH_2-CH_3 + H_2 \xrightarrow{Lindlar} CH_2=CH-CH_2-CH_2-CH_3$
1-pentene

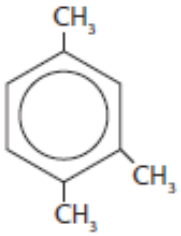
c. $CH\equiv C-CH_3 + Br_2 \xrightarrow{CCl_4}$ *trans*-1,2-dibromopropene
propino

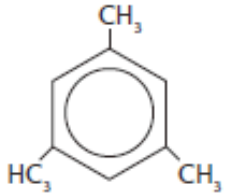
d. $CH_3-C\equiv C-CH_3 + 2Cl_2 \xrightarrow{CCl_4} CH_3-CCl_2-CCl_2-CH_3$
2,2,3,3-tetraclorobutano

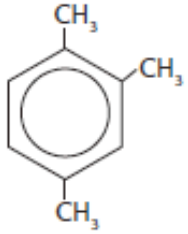
61

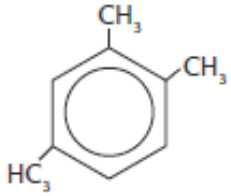
a.


1,2,3-trimetilbenzene

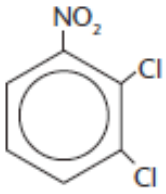

1,3,4-trimetilbenzene


1,3,5-trimetilbenzene

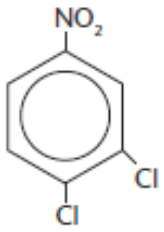

1,2,4-trimetilbenzene


1,2,5-trimetilbenzene

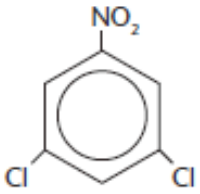
b.



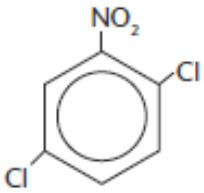
2,3-dicloronitrobenzene



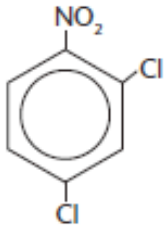
3,4-dicloronitrobenzene



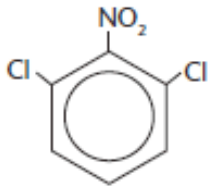
3,5-dicloronitrobenzene



2,5-dicloronitrobenzene

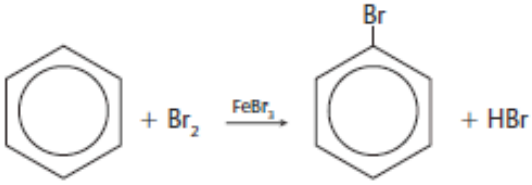


2,4-dicloronitrobenzene

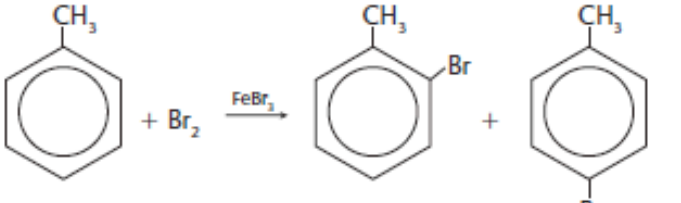


2,6-dicloronitrobenzene

62

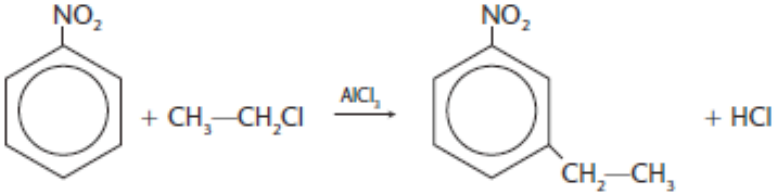


63 a.



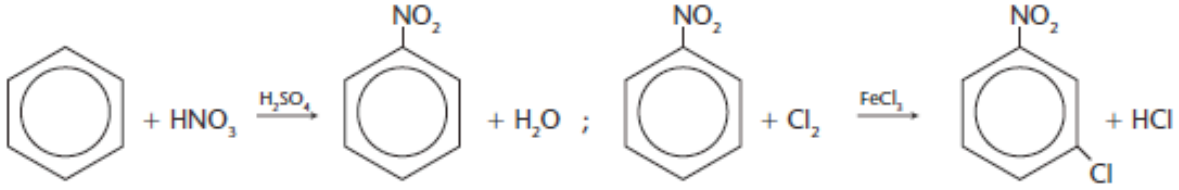
o-bromotoluene *p*-bromotoluene

b.

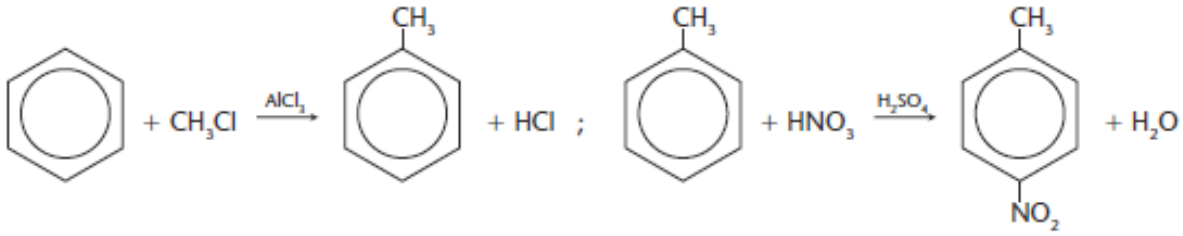


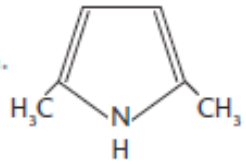
m-etilnitrobenzene

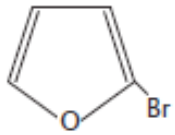
64 a.

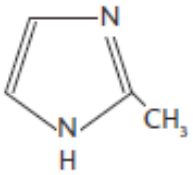


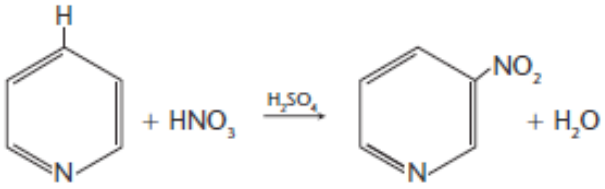
b.



65 a. 

b. 

c. 

66 

3-nitropiridina

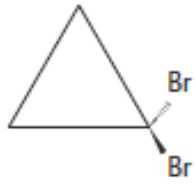
67. A

68. A

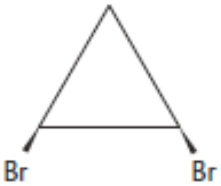
69 a. $C_5H_{12} + 8\ O_2 \longrightarrow 5\ CO_2 + 6\ H_2O\ (-\Delta H)$

b. $C_3H_8 + Br_2 \xrightarrow{\text{luce o calore}} C_3H_7Br + HBr$

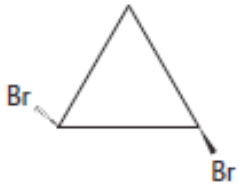
propano — bromopropano

70 

1,1-dibromociclopropano



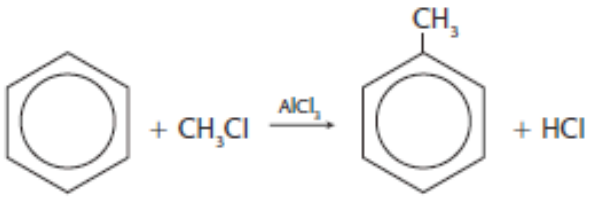
cis-1,2-dibromociclopropano

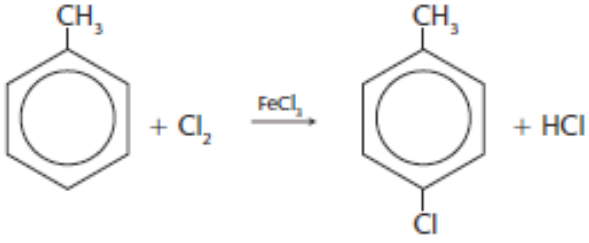


trans-1,2-dibromociclopropano

71 a. 1-butino + 2 HCl

b. propino + HF

72 



Capitolo D3 – I derivati degli idrocarburi

1. A
2. B
3. C
4. D
5. A
6. D
7. C
8. A
9. B
10. A
11. D
12. B
13. C
14. C
15. B
16. B
17. A
18. D
19. C
20. B
21. D
22. C
23. B
24. B
25. A
26. D
27. B
28. C
29. A
30. A
31. B
32. C
33. D
34. B
35. D
36. C
37. A
38. C
39. A
40. B
41. C
42. D
43. B
44. A
45. D
46. B
47. A

48 a. $CH_3—CHCl—CH_2—CH_3$

b. $CH_2Br—CH_2—CH_2—CH_3$

c. $CH_2Cl—CCl_2—CH_2—CH_3$

d. $CH_3—CH(CH_3)—CH(CH_2—CH_3)—CHCl—CH_2—CH_3$

e. $CH_3—CHI—CH(CH_2—CH_3)—C(CH_3)—CH_2—CH_2—CH_3$

f. $CH_3—CCl(CH_3)—CH_3$

g. $CHBr(CH_3)_2$

h. $CH_3—CHBr—CHCl—CH(CH_3)—CH_2—CH_3$

i. $CH_2Cl—C(CH_3)_2—CHCl—CH_2—CH_2Cl$

l. $CH_3—CHI—CH_2—CH_3$

49 a. 1-bromopropano
b. 2-cloropentano
c. 2,3,3-tricloropentano
d. bromuro di *terz*-butile
e. 1-iodo-2,3-dimetilbutano
f. 2-bromo-2-isopropilbutano
g. 3-bromo-2-cloro-1-iodo-4,4-dimetilesano

50 a. $CH_3—CH_2—CH_2Cl$

b. $CH_3—CH_2—CBr(CH_3)—CH_3$

c. $CH_3—CHI—CH_2—CH_2—CH_2—CH_3$

51 a. $CH_3—CH_2—CH_2—CH_2—Cl + CH_3ONa \longrightarrow CH_3—CH_2—CH_2—CH_2—O—CH_3 + NaCl$

butil metil etere — cloruro di sodio

b. $CH_3—\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}—Br + CH_3—CH_2—OH \longrightarrow CH_3—\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}—O—CH_2—CH_3 + HBr$

terz-butil etil etere — acido bromidrico

c. $CH_3—CH_2—\underset{\displaystyle I}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}—CH_3 + H_2O \longrightarrow CH_3—CH_2—\underset{\displaystyle OH}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}—CH_3 + HI$

2-metil-2-butanolo — acido iodidrico

d. $CH_3—CH_2—CH_2—F + NaOH \longrightarrow CH_3—CH_2—CH_2—OH + NaF$

1-propanolo — fluoruro di sodio

52 a. $CH_3—\overset{\displaystyle CH_3}{\overset{|}{C}}Cl—CH_3 + OH^- \longrightarrow CH_3—\overset{\displaystyle CH_3}{\overset{|}{C}}=CH_2 + H_2O + Cl^-$

2-metilpropene — ione cloruro

b. $CH_3—CH_2—CH_2—Br + OH^- \longrightarrow CH_3—CH=CH_2 + H_2O + Br^-$

propene — ione bromuro

53 a. $CH_3—CH_2—\underset{\displaystyle OH}{\overset{|}{CH}}—CH_2—CH_3$

b. $CH_3—CHCl—CHCl—CH_2OH$

c. $CH_3—CH_2—CH_2—CH_2—\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}—CH_2OH$

d. $CH_3—\underset{\displaystyle OH}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}—CH_3$

e. $CH_3—CH_2—CH_2—CH_2—O^-K^+$

f. $CH_2=\overset{\displaystyle CH_3}{\overset{|}{C}}—CH_2OH$

g. $CH_2Br—\overset{\displaystyle OH}{\overset{|}{C}}Br—C\equiv C—CH_3$

h. $CH_3—\underset{\displaystyle OH}{\overset{|}{CH}}—\underset{\displaystyle OH}{\overset{|}{CH}}—CH_2—CH_3$

i. $CH_3—CH_2—\underset{\displaystyle OH}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}—CH_2—CH_2—CH_3$

l. $CH_2Br—\underset{\displaystyle OH}{\overset{|}{CH}}—\overset{\displaystyle CH_3}{\overset{|}{CH}}—CH_3$

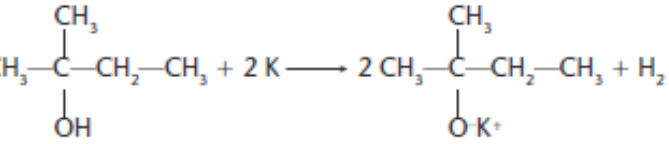
54 a. 3-pentanolo
b. 3-metil-2-butanolo
c. 2-cloro-2-butanolo
d. 3,3-dibromo-2-butanolo
e. 2-buten-1-olo
f. 3-pentin-2-olo

55 a. 2-metil-1-butanolo
b. 2,3-dimetil-2-butanolo
c. 2-propen-1-olo
d. 4-cloro-2-pentanolo

56 a. primario
b. terziario
c. primario
d. terziario

57 a. cloruro di propile < 1-butanolo < 1-propanolo
b. 1-pentanolo < 1,5-pentandiolo < < 1,2,3-pentantriolo

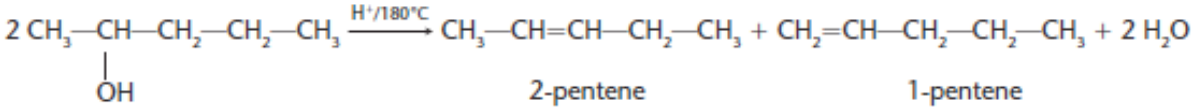
58 c. < a. < b.

59 **a.** 

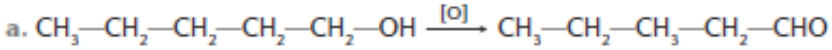
2-metil-2-butanolo 2-metil-2-butossido di potassio

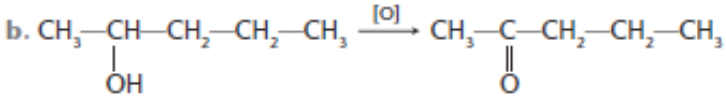
b. 

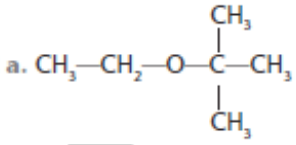
pentossido di sodio

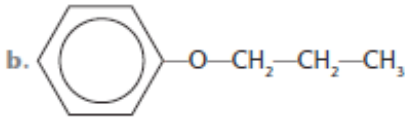
60 

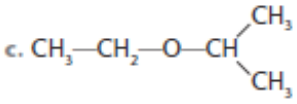
2-pentene 1-pentene

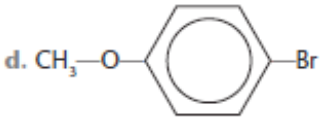
61 **a.** 

b. 

62 **a.** 

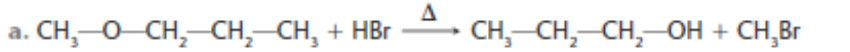
b. 

c. 

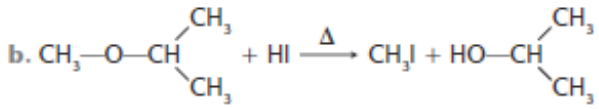
d. 

63 **a.** *p*-clorofenil etil etere **b.** dietil etere **c.** metil propil etere

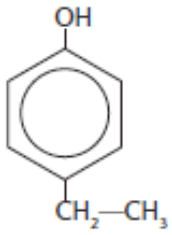
64 **c.** < **a.** < **b.**

65 **a.** 

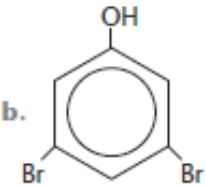
1-propanolo bromometano

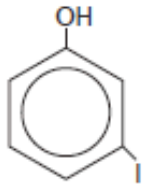
b. 

iodometano alcol isopropilico

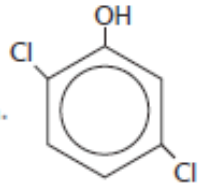
66 **a.** 

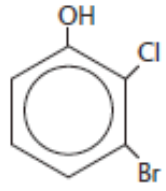
c. 

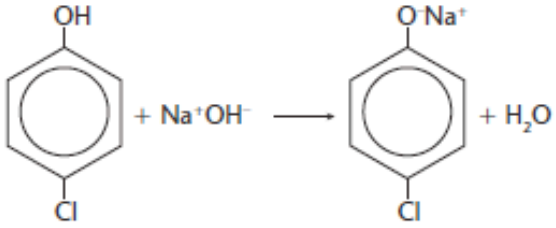
b. 

d. 

67 **a.** 2,4,6-trinitrofenolo
b. 4-etil-3-metilfenolo
c. *p*-bromofenolo
d. 4-bromo-3-clorofenolo

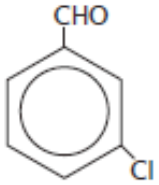
68 **a.** 
2,5-diclorofenolo

b. 
3-bromo-2-clorofenolo

69 

70 **a.** $CH_3—CH_2—CH_2—CH_2—CBr_2—CHO$

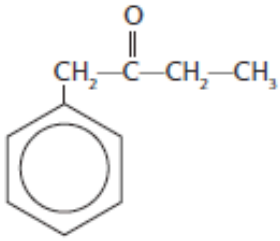
b. $CH_3—CH(CH_3)—CH_2—CH_2—CHO$

c. 

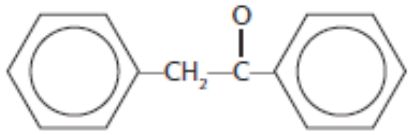
d. $CH_3—CH(CH_3)—CH_2—CHO$

e. $CH_3—CH_2—CH_2—CCl_2—CH(CH_3)—CH_2—CHO$

f. $CH_3—C(=O)—CH_2—CH_2—CH_2—CH_2—CH_2—CH_3$

g. 

h. $CH_3—C(CH_3)(CH_3)—C(=O)—CH_2—CH_3$

i. 

l. $CH_3—C(=O)—CH_2—CH_2—CH_3$

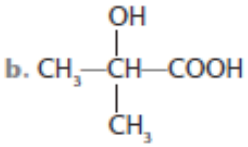
71 **a.** 4,4-dimetilesanale
b. 2-bromo-2-cloropropanale
c. *p*-bromobenzaldeide
d. 3-idrossipentanale
e. 3-bromo-2-metilbutanale
f. 3,3-dicloro-2-pentanone
g. difenil chetone
h. 3,4-dibromo-2-pentanone
i. etil fenil chetone
l. 3-esanone

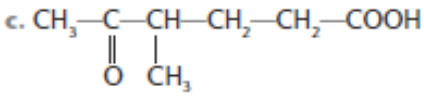
72 **c.** < **b.** < **a.**

73 **a.** $CH_3—C(=O)—CH_2—CH_2—CH_3 \xrightarrow{[H]} CH_3—CH(OH)—CH_2—CH_2—CH_3$
2-pentanolo

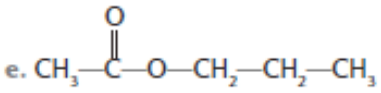
b. $CH_3—CH_2—CH_2—CH_2—C(=O)—H \xrightarrow{[H]} CH_3—CH_2—CH_2—CH_2—CH_2—OH$
1-pentanolo

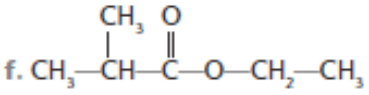
74 **a.** $CH_3—CHCl—CH_2—COOH$

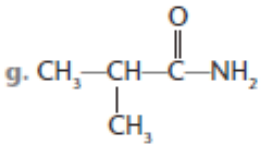
b. 

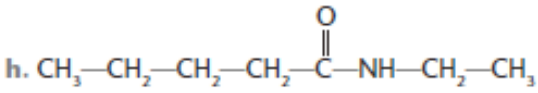
c. 

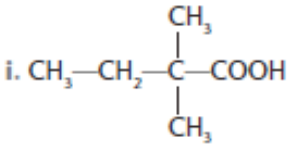
d. $(CH_3—COO^-)_2Ca^{2+}$

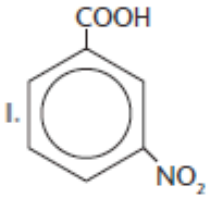
e. 

f. 

g. 

h. 

i. 

l. 

75 **a.** acido 4-bromopentanoico
b. acido 4-idrossi-2-metilpentanoico
c. acido 2-metil-3-ossopentanoico
d. butanoato di potassio
e. etanoato di isopropile
f. N-etil-N-metil-propanammide

76 **b.** < **a.** < **c.**

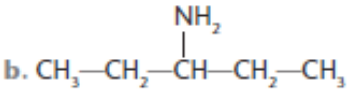
77 **c.** < **a.** < **b.**

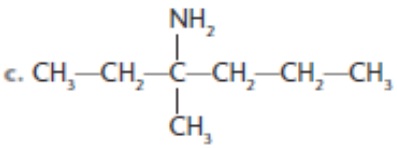
78 **a.** $CH_3—COOH + CH_3—OH \longrightarrow CH_3—COO—CH_3 + H_2O$
etanoato di metile

b. $CH_3—CH_2—COOH + NH_3 \longrightarrow CH_3—CH_2—CO—NH_2 + H_2O$
propanammide

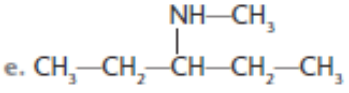
c. $CH_3—CH_2—CH_2—COOH + KOH \longrightarrow CH_3—CH_2—CH_2—COO^-K^+ + H_2O$
butanoato di potassio

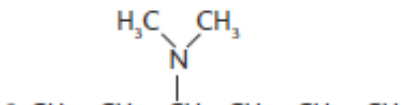
79 **a.** $CH_3—CH_2—CH_2—NH_2$

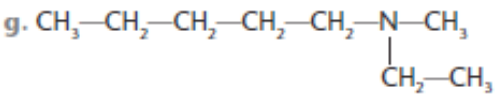
b. 

c. 

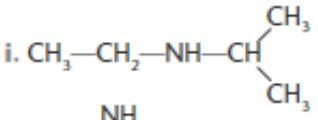
d. $CH_3—CH_2—NH—CH_2—CH—CH_3$

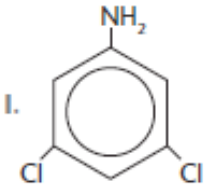
e. 

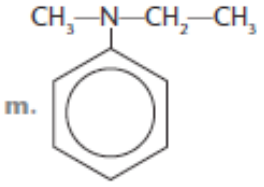
f. 

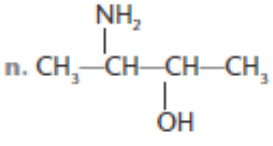
g. 

h. $CH_3—NH—CH_2—CH_2—CH_3$

i. 

l. 

m. 

n. 

80 a. 1-amminobutano
b. 2-amminobutano
c. 2-metil-2-amminopentano
d. N-metilamminoetano
e. N-metil-2-amminobutano
f. N,N-dimetilamminopentano
g. 4-metilanilina
h. 3,5-dibromoanilina

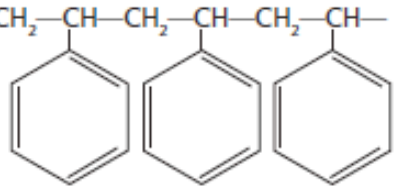
81 c. < a. < b.

82 c. < b. < a. < d.

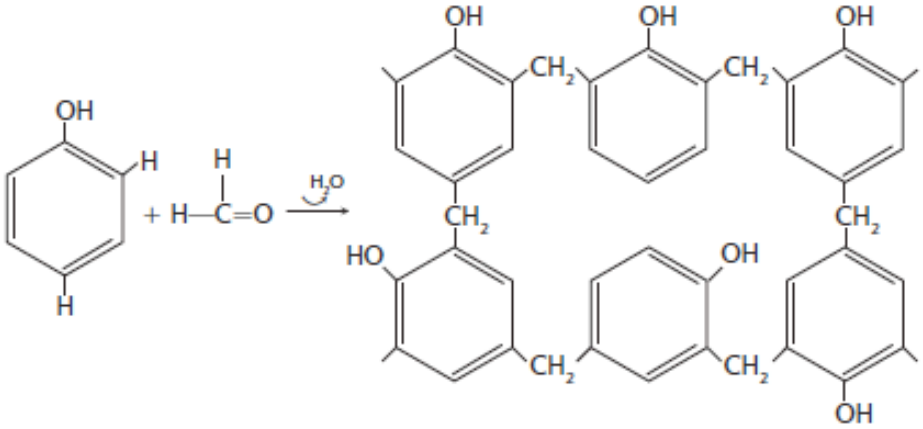
83 a. $CH_3—CH_2—NH_2 + HI \longrightarrow CH_3—CH_2—\overset{+}{N}H_3I^-$ ioduro di etilammonio

b. $CH_3—CH_2—N(CH_2—CH_3)—CH_2—CH_3 + HBr \longrightarrow CH_3—CH_2—\overset{+}{N}H(CH_2—CH_3)—CH_2—CH_3\,Br^-$
bromuro di trietilammonio

84 a. $—CH_2—CH(CH_3)—CH_2—CH(CH_3)—CH_2—CH(CH_3)—$

b. 

85 $—CCl_2—CH_2—CH_2—CHCl—CCl_2—CH_2—CH_2—CHCl—$

86 

87. A
88. E
89. C

90 c. < b. < a. < d.

91 $CH_2(OH)—CH(OH)—CH_2(OH) + 3\,HNO_3 \longrightarrow CH_2(ONO_2)—CH(ONO_2)—CH_2(ONO_2) + 3\,H_2O$
nitroglicerina

92 $H—CHO + CH_3—OH \xrightarrow{H^+} H—C(OH)(H)—OCH_3$
emiacetale

93 b. < a. < c.

94 c. < b. < a.

Capitolo D4 – I polimeri

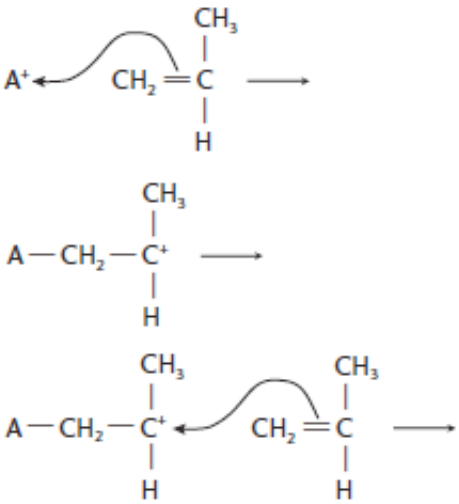
1. A
2. D
3. B
4. PVC: polivinilcloruro
   PE: polietilene
   PS: polistirene
   PP: polipropilene
   PPMA: polimetacrilato di metile (plexiglas)
5. C
6. D
7. B
8. A
9. C
10. C
11. A
12. PET: polietilentereftalato
    PLA: acido polilattico.
13. B
14. B
15. A
16. B
17. B
18. B
19. B
20. C
21. B

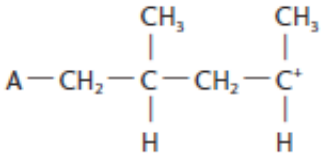
22 **A.** Un polimero atattico presenta un'orientazione casuale nello spazio dei sostituenti legati alla catena polimerica.
B. Le catene di polipropilene isotattico si impacchettano bene e possono dare origine ad ampi domini cristallini all'interno della massa polimerica.

23 **a.** $H_2N—C_6H_4—NH_2$, $HO—OC—C_6H_4—CO—OH$
b. Condensazione.

24 **a.** $CH_3—CH=CH_2$
b. Poliaddizione.
c. Polipropilene.

25





26 C. è favorita dai legami a idrogeno.

27 $—CCl_2—CH_2—CH_2—CHCl—CCl_2—CH_2—CH_2—CHCl—$

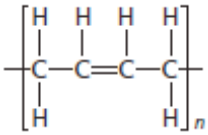
28 **1.** **a.** Polietilene (PE).
b. Etilene.
c. Omopolimero.
d. Polimerizzazione per addizione.

2. **a.** Polistirene.
b. Stirene.
c. Omopolimero.
d. Polimerizzazione per addizione.

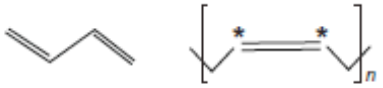
3. **a.** Kevlar®.
b. p-fenilendiammina + acido tereftalico.
c. Copolimero.
d. Polimerizzazione per condensazione.

4. **a.** Polibutilentereftalato (PBT).
b. Glicole butilenico + acido tereftalico.
c. Copolimero.
d. Polimerizzazione per condensazione.

29 **a.**



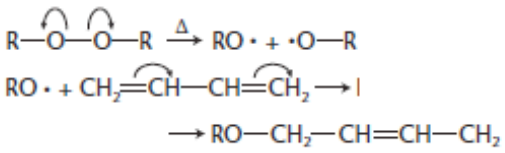
b.



monomero unità ripetente

Nell'*unità ripetente* in posizione 2,3 il carbonio è ibridato sp^2 con geometria planare; in posizione 1,4 è ibridato sp^3 con struttura tetraedrica.
Nel *monomero* l'ibridazionhe del carbonio è sp^2 con geometria planare. Può essere *cis* o *trans*:

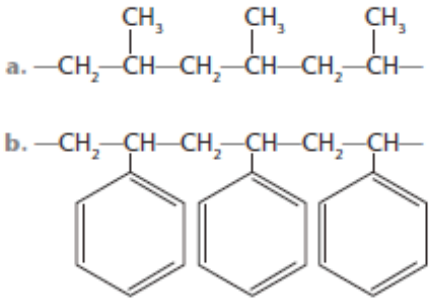
c. Si ha polimerizzazione per addizione radicalica:



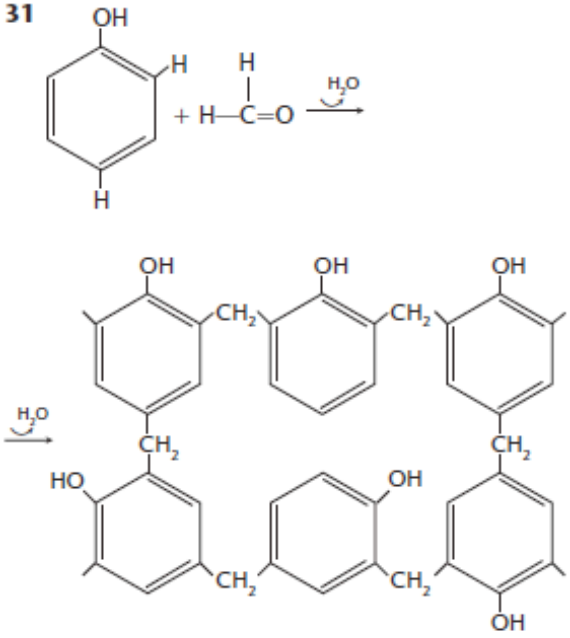
d. Si possono ottenere l'isomero *cis* e l'isomero *trans*:

cis *trans*

30



31



32. B
33. C
34. D
35. C
36. D

Capitolo D5 – I materiali

1. C
2. B
3. D
4. D
5. C
6. D
7. C
8. A
9. C
10. C
11. C
12. D
13. B
14. C
15. A
16. B
17. C
18. D

19. Il mare di elettroni che circonda i cationi metallici si ridistribuisce intorno ai cationi qualora questi vengano sospinti in un'altra posizione e ciò impedisce lo sfaldamento del cristallo.
20. L'acciaio ha una resistenza meccanica maggiore del ferro; l'ottone è più duro del rame e più lucente dello zinco.
21 Gli atomi sono uniti secondo una struttura tetraedrica estesa a tutto il cristallo. Il diamante è molto duro; la durezza deriva dalla forza dei legami σ C—C che uniscono l'uno all'altro tutti gli atomi del cristallo.
22. La grafite è costituita da piani formati da maglie esagonali di atomi di carbonio ibridizzati sp^2. La proprietà lubrificante deriva dal fatto che i piani bidimensionali possono «scivolare» l'uno sull'altro attenuando l'attrito. L'elevata conduttività elettrica si deve agli elettroni presenti negli orbitali *p* non ibridizzati che sono liberi di muoversi da un atomo di carbonio all'altro.
23. C. Motivazione: l'acqua presente tra le lamine di unità tetraedriche SiO_4 o di unità ottaedriche Al_2O_3 di ciascuna scaglia e l'acqua che circonda le scaglie consentono alle scaglie di argilla di scorrere le une sulle altre; durante la cottura viene espulsa l'acqua e si formano forti legami chimici tra i vari gruppi atomici.
24. D. Motivazione: l'atomo drogante ha un elettrone in meno del silicio ma il numero di elettroni che possiede è uguale a quello dei protoni nel nucleo.
25. a. Sono stati sintetizzati nanotubi con elementi diversi, come quelli di nitruro di boro, BN.
    b. Gli elettroni coinvolti nell'estesa trama di legami π hanno in genere una buona mobilità.
    c. Data la vasta estensione superficiale, hanno grande capacità di adsorbimento e possono trattenere al loro interno molti tipi di molecole.
26. a. una reazione chimica
    b. molecole, radiazioni di alta frequenza
    c. fosforescenza, spin
27. Termini da inserire: composito, fosfato di calcio, durezza, collagene, flessibilità, materiali ceramici, dell'acido lattico.
28. Presentano superfici molto estese rispetto al loro volume; gli atomi in superficie tendono a saturare i siti di legame e sono quindi molto più reattivi.
29. L'approccio «top-down» nella fabbricazione dei nanomateriali si riferisce all'assemblaggio fisico delle nanoparticelle secondo il fattore di forma desiderato; l'approccio «bottom-up» sfrutta specifiche interazioni molecolari per innescare l'autoassemblaggio dei nanomateriali.
30. a. La pelle.
    b. Materiali biomimetici.
31. C
32. C
33. B
34. B
35. D
36. C