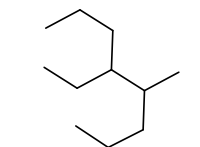


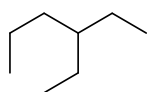
1. Identify and name the parent chain in each of the following compounds:



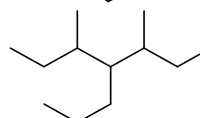
f)



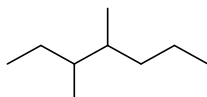
b)



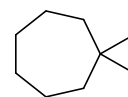
g)



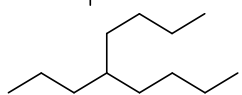
c)



h)



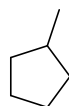
d)



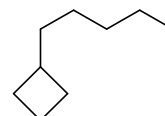
i)



e)

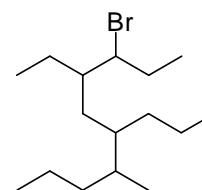


j)

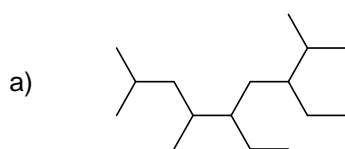


2. Identify and name all substituents in the following compound.

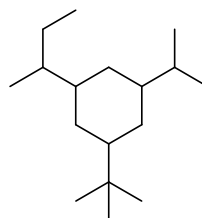
(Note – halogen atoms are always considered substituents)



3. For each of the following compounds, identify and name all groups that would be considered substituents.



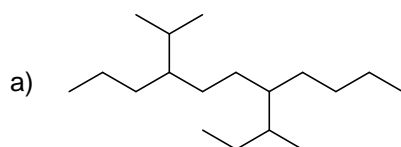
b)



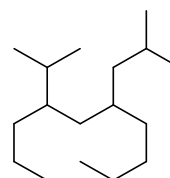
c)



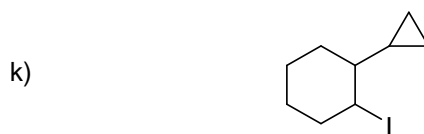
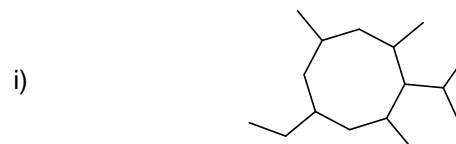
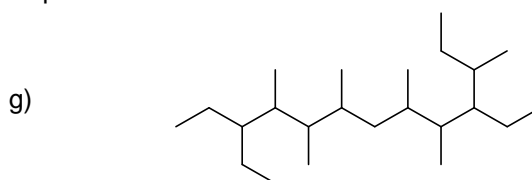
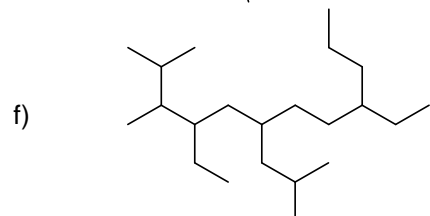
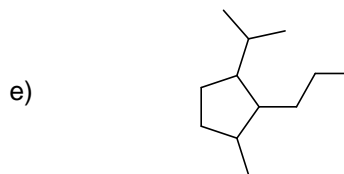
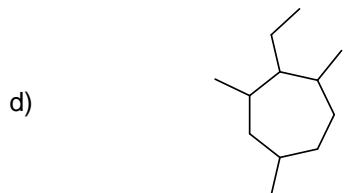
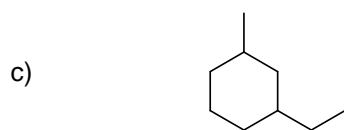
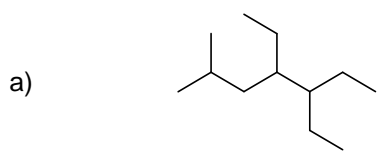
4. In the following compounds, identify all groups that would be considered substituents, and then indicate the systematic name as well as the common name for each substituent.



b)



5. Give IUPAC names for each of the following compound.



6. Write structural formulas in bond-line for the following alkanes and cycloalkanes.

a) 2,2,4-trimethylhexane

b) 2,2-dimethylpropane

c) 2-chloro-3-iodopentane

d) 3-ethyl-2,4,5-trimethyloctane

e) 5-butyl-2,2-dimethylnonane

f) 4-(1-methylethyl)octane

g) 3,3-dimethylpentane

h) 1,3-dimethylcyclopentane

i) 1,2-diethylcyclobutane

j) 5-ethyl-4-methylnonane

k) 4-isopropylheptane

l) 2,2,3-trimethylpentane

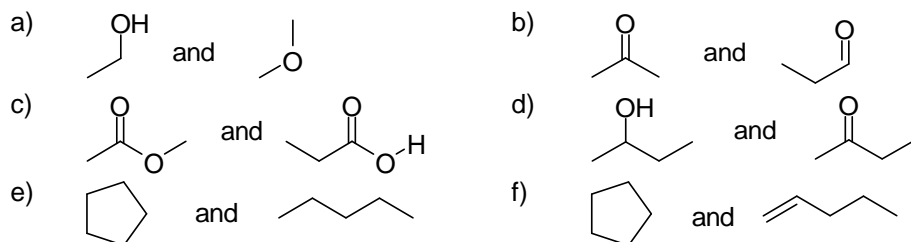
m) 3-ethyl-2-methylhexane

n) 1,4-dicyclopropylhexane

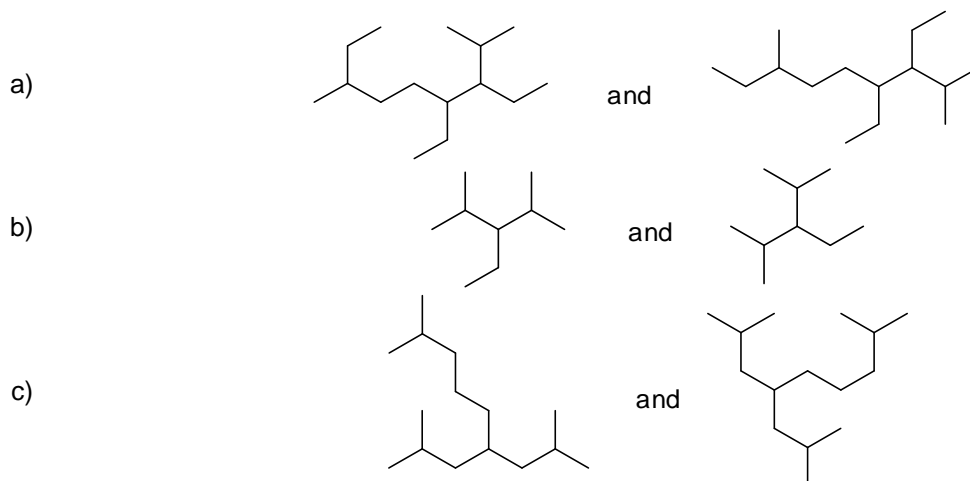
7. Determine if each of the following IUPAC names is correct or incorrect. For those that are incorrect, provide the correct IUPAC names for the intended compounds.

- | | |
|----------------------------|--------------------------------|
| a) 1,3-dimethylbutane | e) 2-propylpentane |
| b) 4-methylpentane | f) 2,2-diethylheptane |
| c) 2,2-diethylbutane | g) 2,2-dimethylcyclopropane |
| d) 2-ethyl-3-methylpentane | h) 1-ethyl-5-methylcyclohexane |

8. Provide the definition of isomers and constitutional isomers, and then for given sets of compounds below, indicate whether the compounds in each set are constitutional isomers or not.



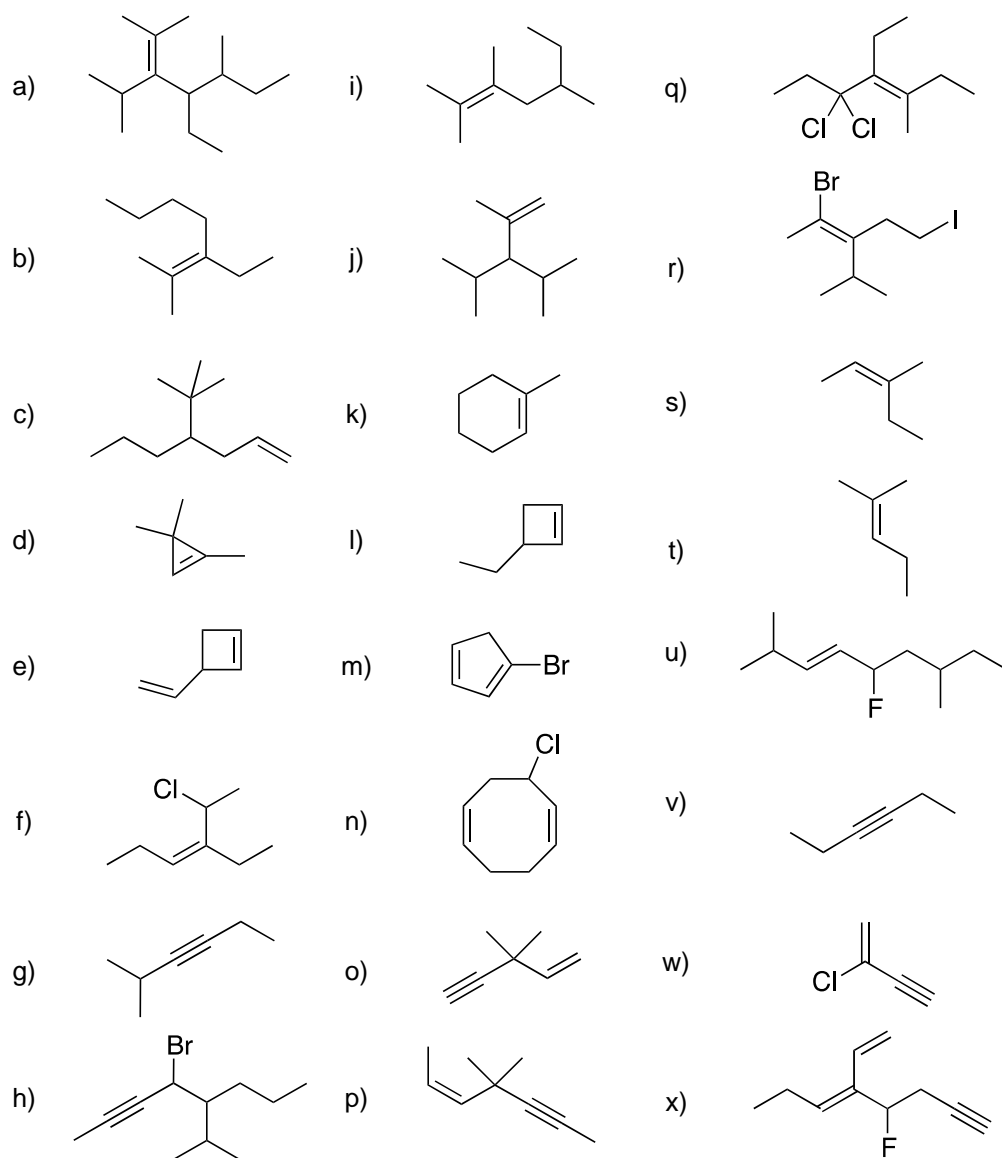
9. For each pair of compounds, identify whether they are constitutional isomers or two representations of the same compound



10. Molecular formula C_7H_{16} has 9 constitutional isomers. Draw each of isomers in bond-line formula.

11. Draw structures for any five constitutional isomers with molecular formula $C_2H_6O_3$.

12. Give IUPAC names for each of the following compound.



13. Draw bond-line structures for the following compounds:

- a) Vinyl bromide
- b) methylacetylene
- c) 4,4-dimethyl-2-pentyne
- d) 5-ethyl-2,5-dimethyl-3-heptyne
- e) (*Z*)-3-fluoro-2-methyl-3-hexene
- f) 2,6-diethyl-1,7-octadien-4-yne
- g) *trans*-3-bromo-7-isopropyl-5-decene
- h) 5-chloro-4-iodo-6-methyl-1-heptyne

14. Determine if each of the following IUPAC names is correct or incorrect. For those that are incorrect, provide the correct IUPAC names for the intended compounds.

- a) 2-vinylpentane
- b) 5-chloro-2-methyl-6-vinyldecane
- c) 2-methylcyclopentene
- d) 5-chloro-3-hexene
- e) 2-methyl-3-hexyne
- f) 3-isopropyl-1-pentyne
- g) 4-methyl-6-hepten-1-yne
- h) (*E*)-3-propyl-2,5-hexadiene

Solutions

1. Identify and name the parent chain in each of the following compounds:

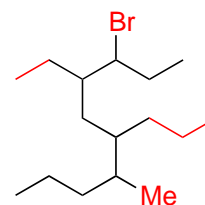
- a) 3-methylhexane
- b) 3-ethylhexane
- c) 3,4-dimethylheptane
- d) 5-propylnonane
- e) methylcyclopentane
- f) 4-ethyl-5-methyloctane
- g) 3,5-dimethyl-4-propylheptane
- h) 1,1-dimethylcycloheptane
- i) methylcyclopropane
- j) 1-cyclobutylpentane

*The name of the parent chain is indicated underlined in the full name of each compound below:

2. Identify and name all substituents in the following compound.

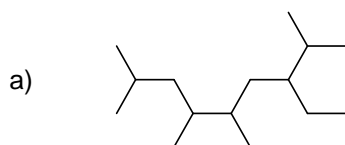
(Note – halogen atoms are always considered substituents)

*Substituents are in red.

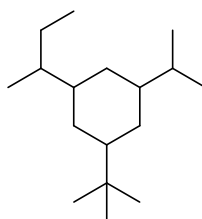


3-bromo-4-ethyl-7-methyl-6-propyldecane

3. For each of the following compounds, identify and name all groups that would be considered substituents.



b)



c)

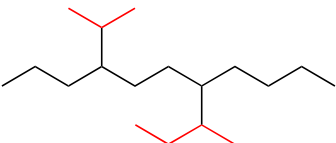
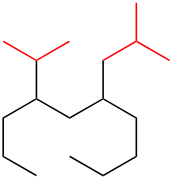


*the full names of the compounds are provided. Check the names of substituents within them. Common and systematic names can be in different alphabetic orders

- a) 3,5-diethyl-2,6,8-trimethylnonane
- b) Common: 1-*sec*-butyl-3-*tert*-butyl-5-isopropylcyclohexane
Systematic: 1-(1,1-dimethylethyl)-3-(1-methylethyl)-5-(1-methylpropyl)cyclohexane
- c) 1,1-dimethylcyclopropane

4. In the following compounds, identify all groups that would be considered substituents, and then indicate the systematic name as well as the common name for each substituent.

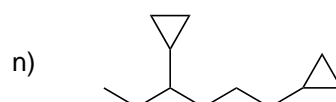
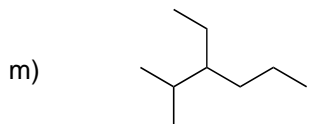
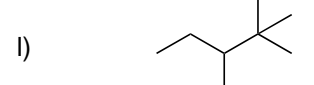
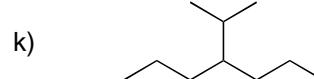
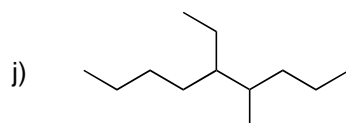
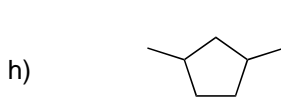
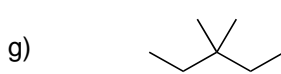
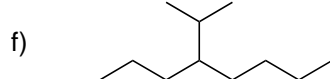
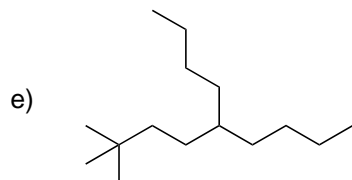
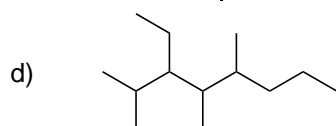
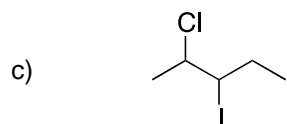
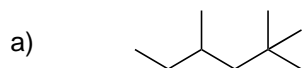
*Substituents are in red.

Structure	When using common names of substituents,	When using the systematic names of substituents
a) 	7-sec-butyl-4-isopropylundecane	4-(1-methylethyl)-7-(1-methylpropyl)undecane
b) 	6-isobutyl-4-isopropyldecane	4-(1-methylethyl)-6-(2-methylpropyl)decane

5. Give IUPAC names for each of the following compound.

- 4,5-diethyl-2-methylheptane
- 4-chloro-2,2-dimethylpentane
- 1-ethyl-3-methylcyclohexane
- 2-ethyl-1,3,5-trimethylcycloheptane
- Common: 1-isopropyl-3-methyl-2-propylcyclopentane
Systematic: 1-methyl-3-(1-methylethyl)-2-propylcyclopentane
- Common: 4,9-diethyl-6-isobutyl-2,3-dimethyldodecane
Systematic: 4,9-diethyl-2,3-dimethyl-6-(2-methylpropyl)dodecane
- 3,10-diethyl-4,5,6,8,9,11-hexamethyltridecane
- 1-bromo-2-fluorobutane
- Common: 5-ethyl-2-isopropyl-1,3,7-trimethylcyclooctane
Systematic: 5-ethyl-1,3,7-trimethyl-2-(1-methylethyl)cyclooctane
- 1-cyclopropyl-2-methylbutane
- 1-cyclopropyl-2-iodocyclohexane
- 4,4-dibromo-1-chloropentane

6. Write structural formulas in bond-line for the following alkanes and cycloalkanes.



7. Determine if each of the following IUPAC names is correct or incorrect. For those that are incorrect, provide the correct IUPAC names for the intended compounds.

- a) 1,3-dimethylbutane
 b) 4-methylpentane
 c) 2,2-diethylbutane
 d) 2-ethyl-3-methylpentane

- e) 2-propylpentane
 f) 2,2-diethylheptane
 g) 2,2-dimethylcyclopropane
 h) 1-ethyl-5-methylcyclohexane

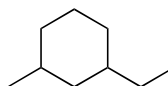
All provided names are incorrect.

	Correct name	Structure
a)	2-methylpentane	
b)	2-methylpentane	
c)	3-ethyl-3-methylpentane	
d)	3,4-dimethylhexane	
e)	4-methylheptane	
f)	3-ethyl-3-methyloctane	

g) 1,1-dimethylcyclopropane



h) 1-ethyl-3-methylcyclohexane



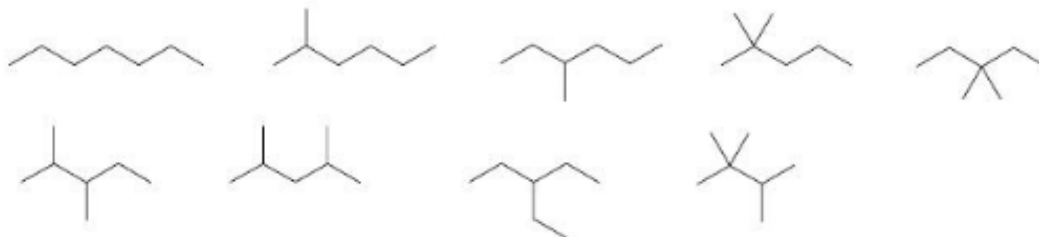
8. Provide the definition of isomers and constitutional isomers, and then for given sets of compounds below, indicate whether the compounds in each set are constitutional isomers or not.

Compounds are related to each other as,

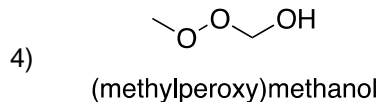
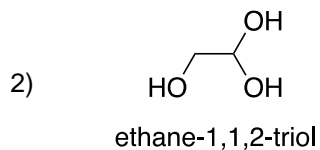
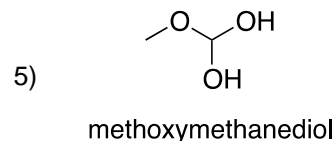
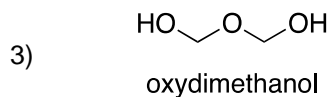
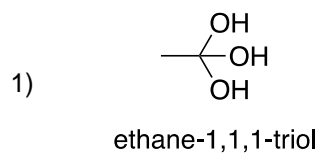
- Constitutional isomers
 - Constitutional isomers
 - Constitutional isomers
 - Not related. They have different molecular formula
 - Not related. They have different molecular formula
 - Constitutional isomers
9. For each pair of compounds, identify whether they are constitutional isomers or two representations of the same compound

Compounds are related to each other as,

- Two representations of the same compound
 - Two representations of the same compound
 - Two representations of the same compound
10. Molecular formula C_7H_{16} has 9 constitutional isomers. Draw each of isomers in bond-line formula.



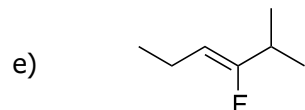
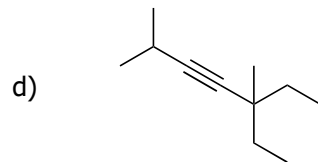
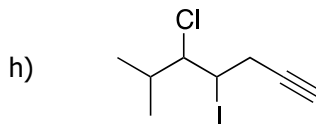
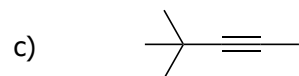
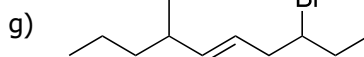
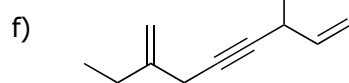
11. Draw structures for any five constitutional isomers with molecular formula $C_2H_6O_3$.



12. Give IUPAC names for each of the following compound (stereochemistry included in name for completeness).

- 4-ethyl-3-isopropyl-2,5-dimethylhept-2-ene
- 3-ethyl-2-methylhept-2-ene
- 4-(*tert*-butyl)hept-1-ene
- 1,3,3-trimethylcycloprop-1-ene
- 3-vinylcyclobut-1-ene
- (*Z*)-2-chloro-3-ethylhex-3-ene
- 2-methylhex-3-yne
- 4-bromo-5-isopropyloct-2-yne
- 2,3,5-trimethylhept-2-ene
- 3-isopropyl-2,4-dimethylpent-1-ene
- 1-methylcyclohexene
- 3-ethylcyclobut-1-ene
- 1-bromocyclopenta-1,3-diene
- (1*Z*,5*Z*)-3-chlorocycloocta-1,5-diene
- 3,3-dimethylpent-1-en-4-yne
- (*Z*)-4,4-dimethylhept-2-en-5-yne
- (*E*)-5,5-dichloro-4-ethyl-3-methylhept-3-ene
- (*E*)-2-bromo-5-iodo-3-isopropylpent-2-ene
- (*Z*)-3-methylpent-2-ene
- 2-methylpent-2-ene
- (*E*)-5-fluoro-2,7-dimethylnon-3-ene
- 3-hexyne
- 2-chlorobut-1-en-3-yne
- (*E*)-4-fluoro-5-vinyloct-5-en-1-yne

13. Draw bond-line structures for the following compounds:



14. Determine if each of the following IUPAC names is correct or incorrect. For those that are incorrect, provide the correct IUPAC names for the intended compounds.

	Correct name	Structure
a)	3-methylhex-1-ene	
b)	4-chloro-7-methyloct-1-ene	
c)	1-methyl-1-cyclopentene	
d)	(E)-2-chloro-3-hexene	
e)	Given name is correct	
f)	3-ethyl-4-methyl-1-pentyne	
g)	4-methylhept-1-en-6-yne	
h)	(4E)-4-propylhexa-1,4-diene	