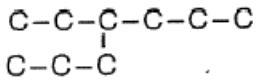
KEY

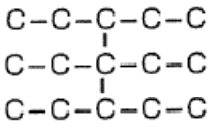
Organic Naming

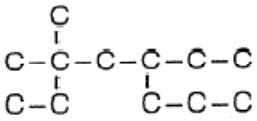
Name - _____KEY_____

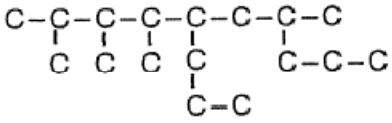
Alkanes and Alkyl Groups

1.) Determine the number of carbon atoms in the longest chain of each of the following, and name the parent hydrocarbon represented by the longest chain.

(a) 

(b) 

(c) 

(d) 

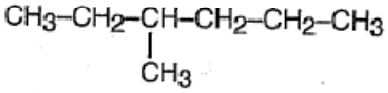
a.) 7 carbons - heptane

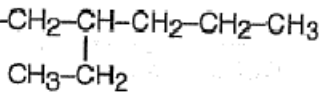
b.) 7 carbons - heptane

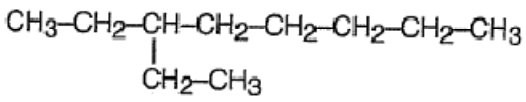
c.) 8 carbons - octane

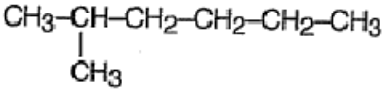
d.) 10 carbons - decane

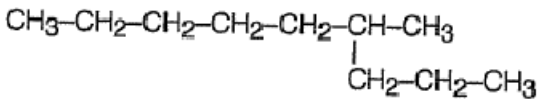
2.) Name the following hydrocarbons. Care: e and f are tricky!

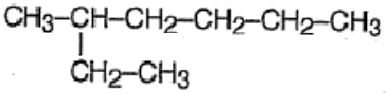
(a) 

(b) 

(c) 

(d) 

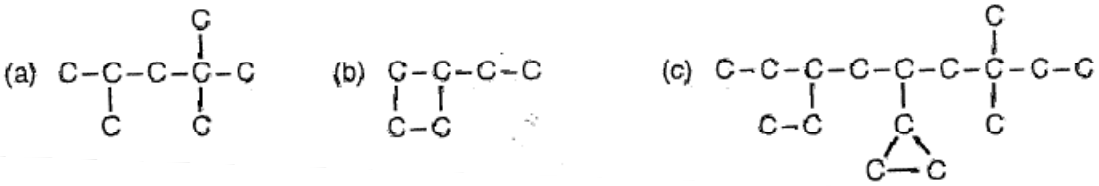
(e) 

(f) 

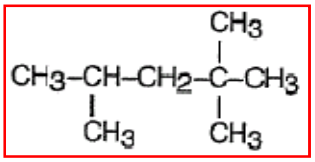
(a) 3–methylhexane	(d) 2–methylhexane
(b) 4-ethylheptane	(e) 4–methylnonane
(c) 3-ethyloctane	(f) 3–methylheptane

KEY

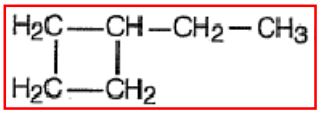
3.) Re-write the following structures to show the hydrogens attached.



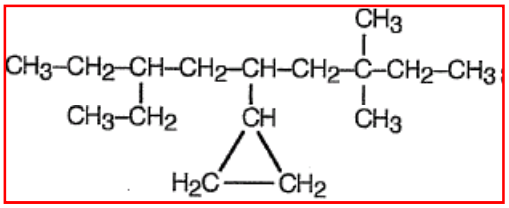
a.)



b.)

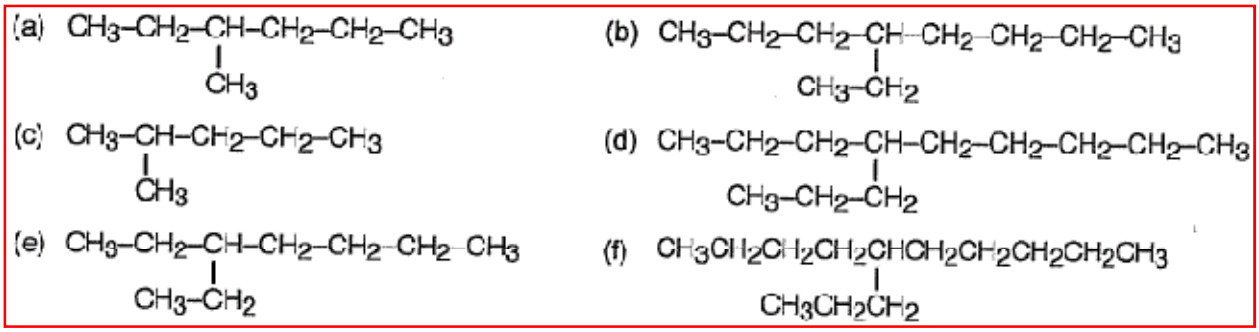


c.)



4.) Draw the following hydrocarbons. Include all hydrogens.

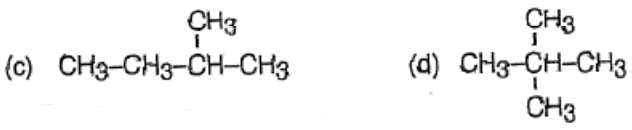
(a) 3-methylhexane
(b) 4-ethyloctane
(c) 2-methylpentane
(d) 4-propylnonane
(e) 3-ethylheptane
(f) 5-propyldecane



(b) 4-ethyloctane

5.) What is wrong with each of the following? (You may have to sketch the molecule to see the error in some cases.)

(a) 6-methylheptane
(b) 1-ethylbutane



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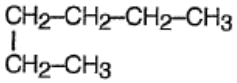
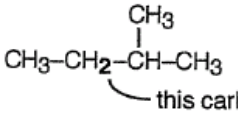
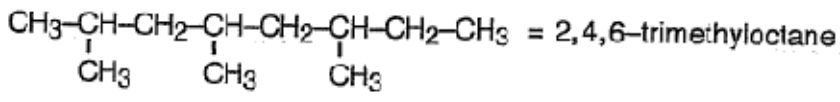
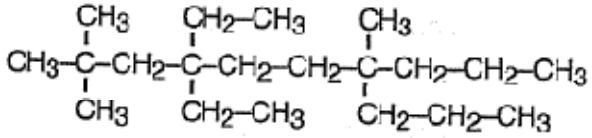
(a) the molecule is numbered from the wrong end; it should be 2–methylheptane

(b) 1–ethylbutane is  which is just hexane

(c) 

(d) the carbon at the 2–position of the propane chain should have NO hydrogens

6.)  = 2,4,6–trimethyloctane

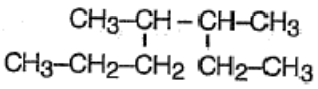


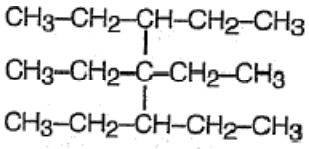
= 4,4–diethyl–2,2,7–trimethyl–7–propyldecane

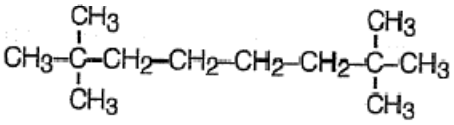
Count up the number of carbons and hydrogens in the two example molecules above. The general formula for a simple straight–chain hydrocarbon (methane, ethane, etc.) is C_NH_{2N+2}. What is the general formula for a branched hydrocarbon?

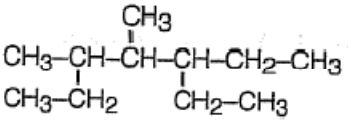
C_NH_{2N+2} (unchanged from straight–chain alkanes)

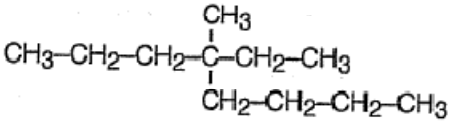
7.) Name the following molecules.

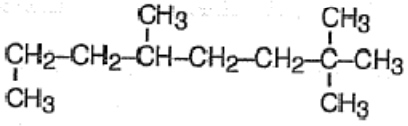
(a) 

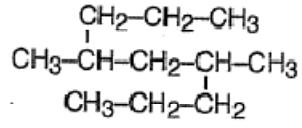
(b) 

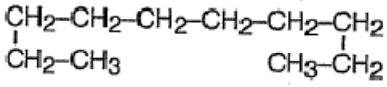
(c) 

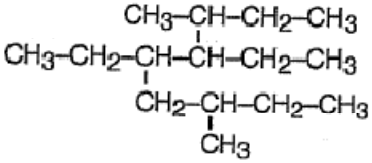
(d) 

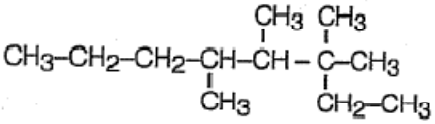
(e) 

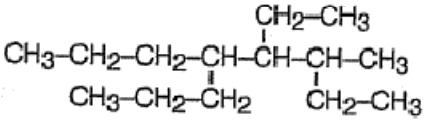
(f) 

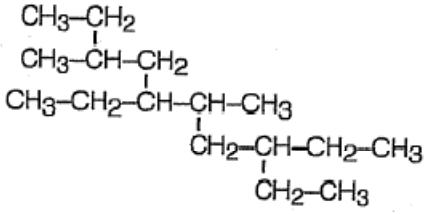
(g) 

(h) 

(i) 

(j) 

(k) 

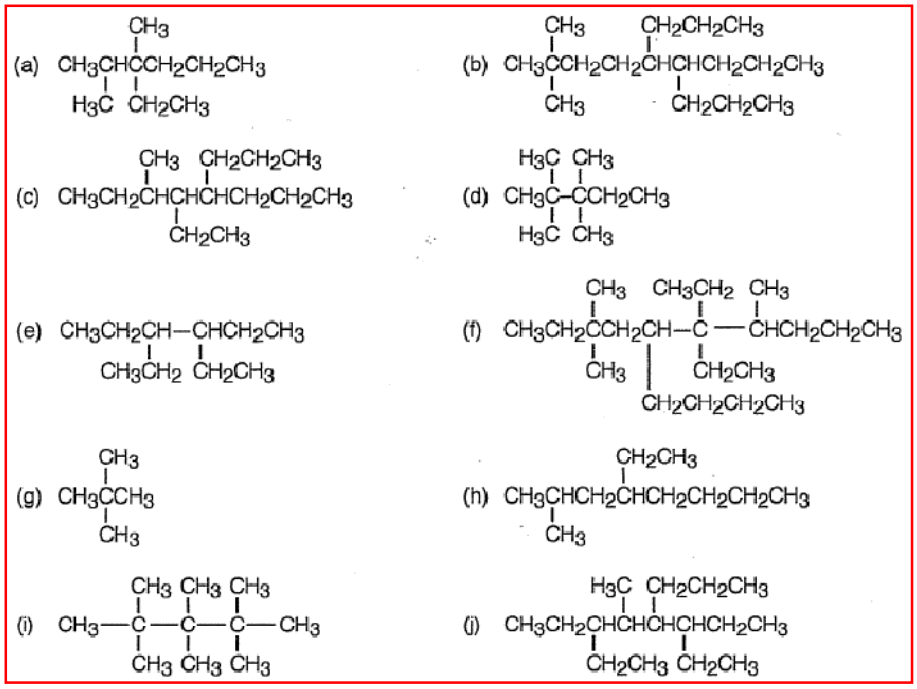
(l) 

KEY

(a) 3,4–dimethylheptane
(b) 3,4,4,5–tetraethylheptane
(c) 2,2,7,7–tetramethyloctane
(d) 5–ethyl–3,4–dimethylheptane
or 3–ethyl–4,5–dimethylheptane
(e) 4–methyl–4–ethyloctane
(f) 2,2,5–trimethyloctane
(g) 4,6–dimethylnonane
(h) decane
(i) 4,5–diethyl–3,7–dimethylnonane
(j) 3,3,4,5–tetramethyloctane
(k) 4–ethyl–3–methyl–5–propyloctane
(l) 3,6–diethyl–5,8–dimethyldecane
or 5,8–diethyl–3,6–dimethyldecane

8.) Sketch the following molecules.

(a) 3–ethyl–2,3–dimethylhexane
(b) 2,2–dimethyl–5,6–dipropylnonane
(c) 4–ethyl–3–methyl–5–propyloctane
(d) 2,2,3,3–tetramethylpentane
(e) 3,4–diethylhexane
(f) 5–butyl–6,6–diethyl–3,3,7–trimethyldecane
(g) dimethylpropane (why were no numbers used?)
(h) 4–ethyl–2–methyloctane
(i) hexamethylpentane
(j) 3,6–diethyl–4–methyl–5–propyloctane



9.) Write the condensed structure and name for the three structural isomers having the molecular formula C_5H_{12}.

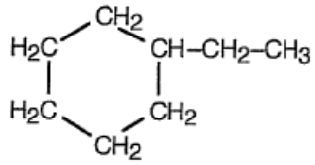
Write the condensed structure and name for the two structural isomers that involve a single methyl group attached to hexane.

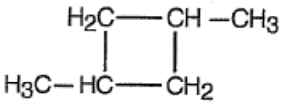
Write the condensed structure and name of the four structural isomers that involve two methyl groups attached to pentane.

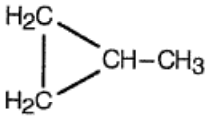
How many isomers of C_8H_{18} contain no side chains other than a single methyl group?

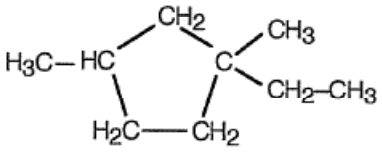
KEY

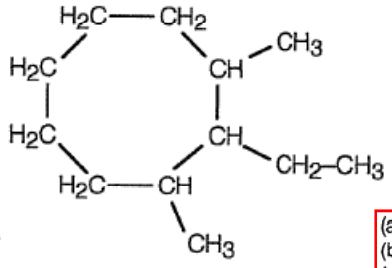
10.) Name the following compounds.

(a) 

(b) 

(c) 

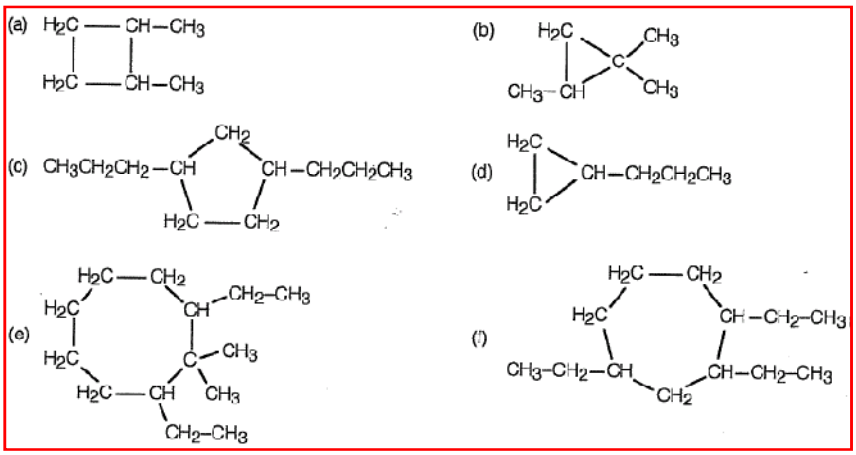
(d) 

(e) 

(a) ethylcyclohexane
(b) 1,3–dimethylcyclobutane
(c) methylcyclopropane
(d) 1–ethyl–1,3–dimethylcyclopentane
(e) 2–ethyl–1,3–dimethylcyclooctane

11.) Sketch the following compounds.

(a) 1,2–dimethylcyclobutane
(b) 1,1,2–trimethylcyclopropane
(c) 1,3–dipropylcyclopentane
(d) propylcyclopropane
(e) 1,3–diethyl–2,2–dimethylcyclooctane
(f) 1,2,4–triethylcycloheptane



12.) Draw the condensed structure for the following.

(a) 1–hexene
(b) 4–nonyne
(c) 3–decene
(d) 2–heptyne
(e) 2–octene
(f) 1–octyne

(a) $CH_2{=}CHCH_2CH_2CH_2CH_3$
(b) $CH_3CH_2CH_2C{\equiv}CCH_2CH_2CH_2CH_3$
(c) $CH_3CH_2CH{=}CHCH_2CH_2CH_2CH_2CH_2CH_3$
(d) $CH_3C{\equiv}CCH_2CH_2CH_2CH_3$
(e) $CH_3CH{=}CHCH_2CH_2CH_2CH_2CH_3$
(f) $HC{\equiv}CCH_2CH_2CH_2CH_2CH_2CH_3$

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13.) Name the following.

(a) $CH_3–CH_2–CH=CH–CH_2–CH_3$

(b) $CH_3–CH_2–CH_2–CH_2–CH_2–C\equiv CH$

(c) $CH_3–CH_2–CH_2–C\equiv C–CH_2–CH_2–CH_2–CH_2–CH_3$

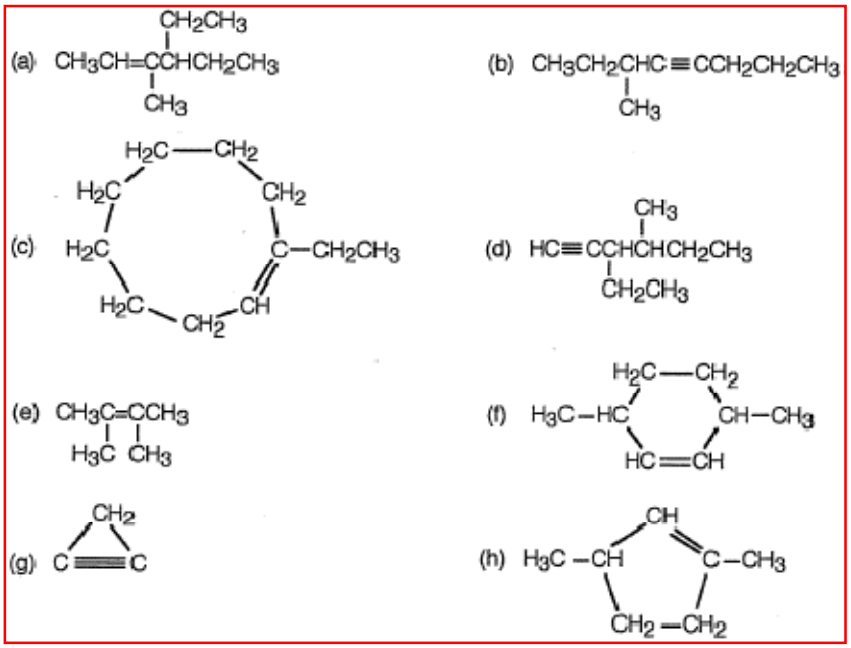
(d) $CH_3–CH_2–CH=CH–CH_2–CH_2–CH_3$

(a) 3–hexene (b) 1–heptyne

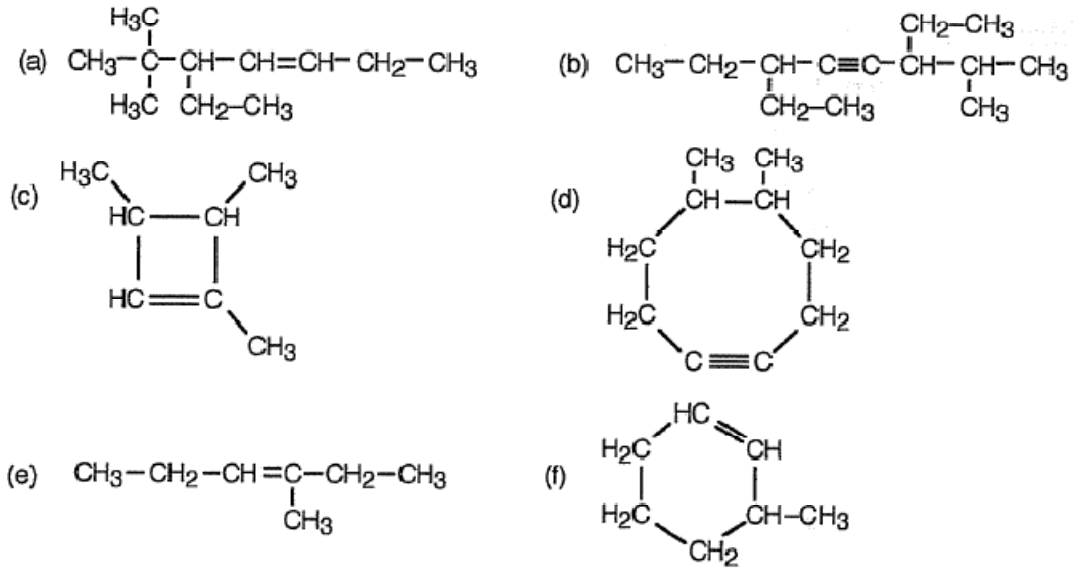
(c) 4–decyne (d) 3–heptene

14.) Draw the condensed structure for each of the following.

(a) 4–ethyl–3–methyl–2–hexene
(b) 3–methyl–4–octyne
(c) 1–ethyl–1–cyclononene
(d) 3–ethyl–4–methyl–1–hexyne
(e) dimethyl–2–butene
(f) 3,6–dimethyl–1–cyclohexene
(g) cyclopropyne
(h) 1,3–dimethyl–1–cyclopentene



15.) Name the following compounds.



(a) 5–ethyl–6,6–dimethyl–3–heptene
(b) 3,6–diethyl–2–methyl–4–octyne
(c) 1,3,4–trimethyl–1–cyclobutene
(d) 5,6–dimethyl–1–cyclooctyne
(e) 3–methyl–3–hexene
(f) 3–methyl–1–cyclohexene