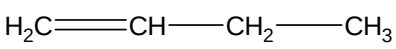
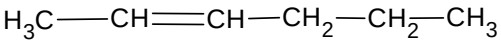
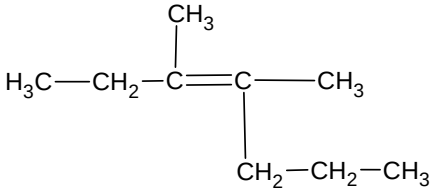
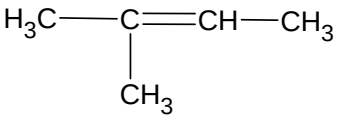
Alkenes

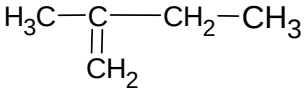
(1) Give IUPAC names for compounds with the following structures.

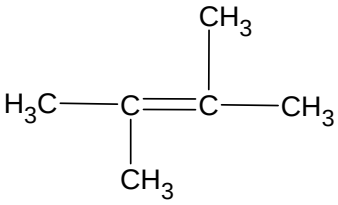


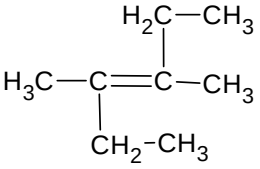


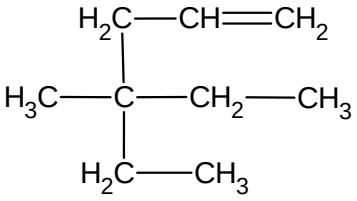


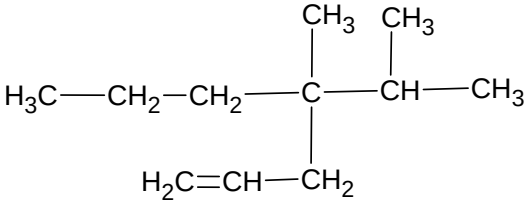


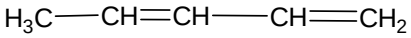


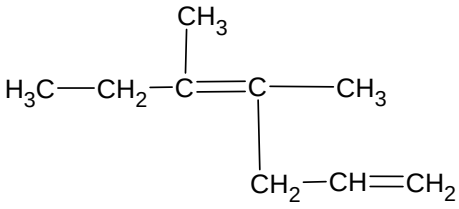


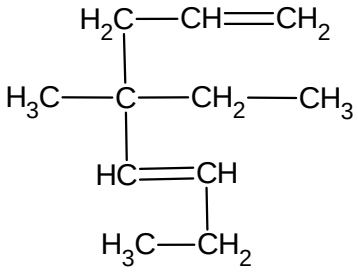












(2) Draw structures corresponding to the following IUPAC names. If you think the name is incorrect, write the correct name.

i. hex-2-ene
ii. 2-methylpentene
iii. hept-2,3-diene
iv. 2,4-dimethylhex-1-ene
v. 2,4-dimethylpent-2-ene
vi. 4,4-diethylpent-2-ene
vii. 2-methylprop-1-ene
viii. 3-methyl-1-butene
ix. 4-ethyl-4,5,5-trimethyl-2-heptene
x. 2-ethyl-3-methylhexene

(3) Draw the structures of the products of the following reactions.

a) $CH_3\text{-}CH{=}CH_2 \xrightarrow{Br_2 / CCl_4}$

b) $CH_3CH{=}CH_2 \xrightarrow[2.\ H^+ / H_20,\ Heat]{1.Cold\ conc.H_2SO_4}$

c) $(CH_3)_2C{=}CHCH_3 \xrightarrow{Br_2 / CCl_4}$

d) $CH_3CH_2CH{=}CH_2 \xrightarrow{HBr}$

e) $(CH_3)(CH_2CH_3)C{=}CHCH_3 \xrightarrow[(peroxide)]{HBr}$

f) $CH_2{=}CH\text{-}CH{=}CH\text{-}CH_3 \xrightarrow{Br_2 / CCl_4}$

g) $CH_2{=}CH\text{-}CH{=}CH_2 \xrightarrow[2.\ H^+ / H_20,\ Heat]{1.Cold\ conc.H_2SO_4}$

h) $CH_2{=}CH\text{-}CH{=}CH_2 \xrightarrow{HBr}$

i) $CH_2{=}CH\text{-}CH{=}CH_2 \xrightarrow[(peroxide)]{HBr}$

(4) Do the following conversions.

I. $CH_3CH_2Cl \longrightarrow CH_2=CH_2$

II. $CH_3CH_2CH(OH)CH_3 \longrightarrow CH_3CH=CHCH_3$

III. $CH_3CH(OH)(CH_3) \longrightarrow CH_3CH=CH_2$

IV. $CH_3CH_2CH_2OH \longrightarrow CH_3CH(OH)(CH_3)$

V. $CH_3CH=CH_2 \longrightarrow CH_3CHBrCH_2Br$

VI. $CH_3CH_2CH_2Br \longrightarrow CH_3CHBrCH_2Br$

VII. $CH_3CH(OH)(CH_3) \longrightarrow CH_3CH(OH)CH_2OH$

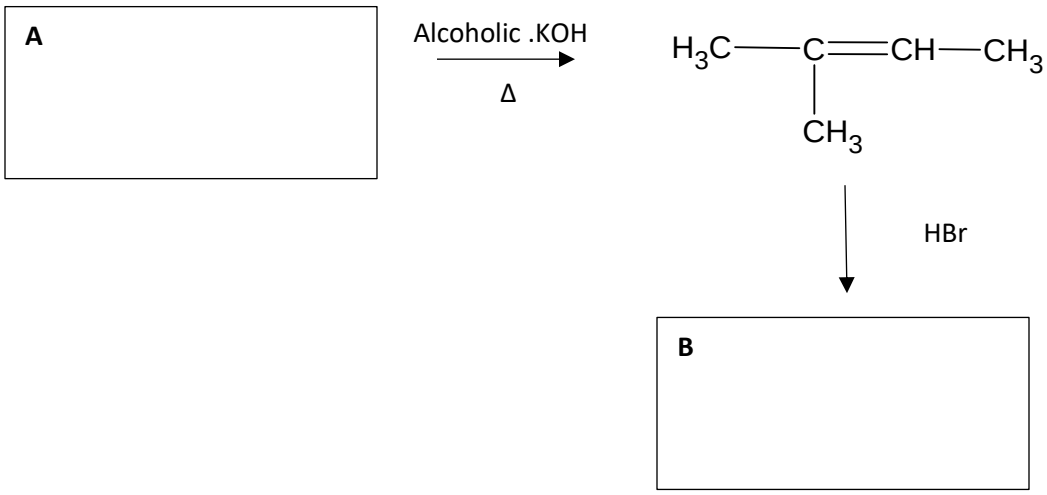
VIII. $CH_3CH_2CH_2Br \longrightarrow C_3H_8$

IX. $CH_3CH_2CH_2OH \longrightarrow C_3H_8$

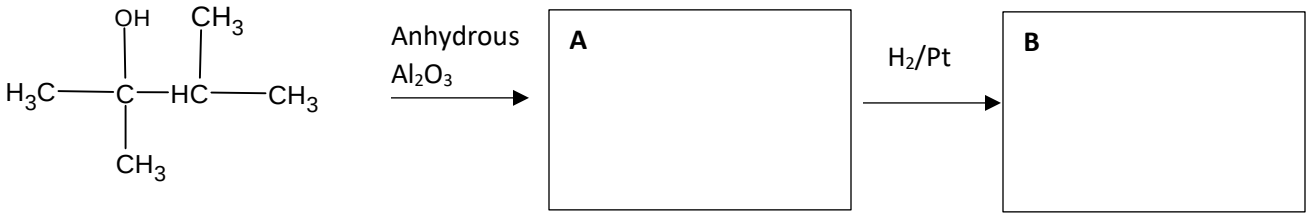
X. $CH_3CH(Br)(CH_3) \longrightarrow CH_3CH_2CH_2Br$

(5) Draw the corresponding structures in the boxes given below.

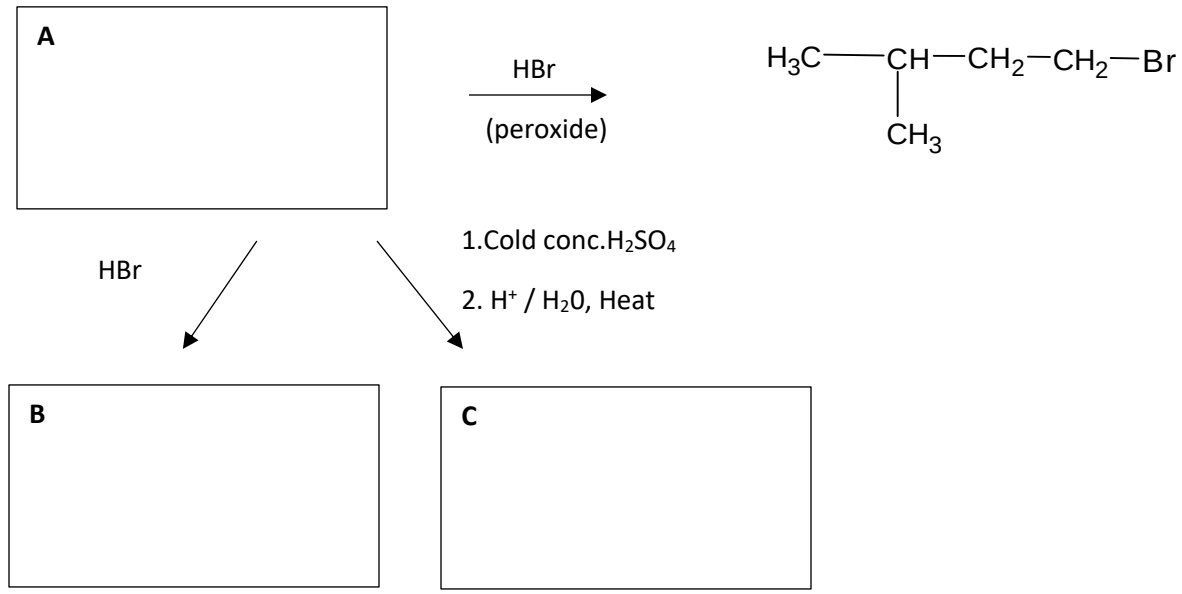
a)



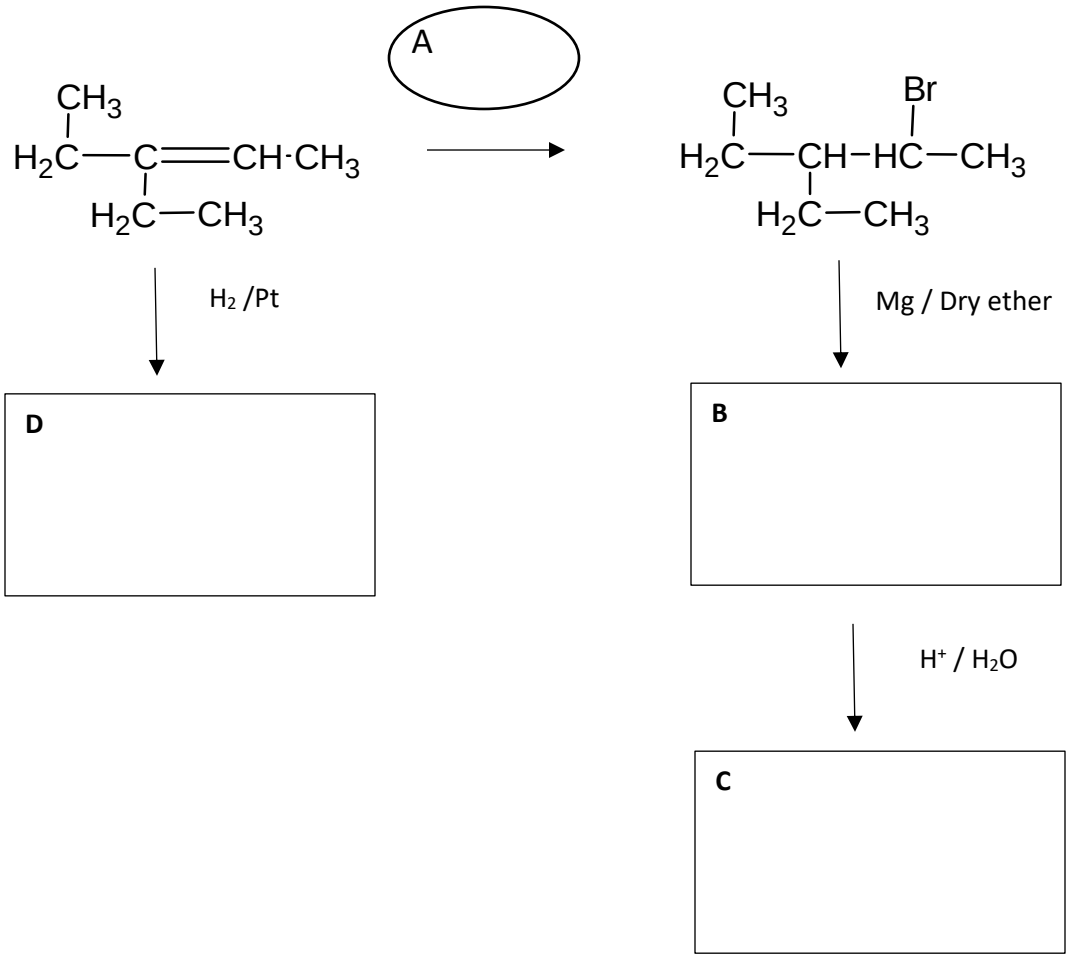
(b)



(c)


A
HBr
(peroxide)
$H_3C—CH(CH_3)—CH_2—CH_2—Br$
HBr
1.Cold conc.H_2SO_4
2. H^+ / H_20, Heat
B
C

(d)


A
CH_3
$H_2C—C=CH·CH_3$
$H_2C—CH_3$
H_2 /Pt
D
CH_3
Br
$H_2C—CH—HC—CH_3$
$H_2C—CH_3$
Mg / Dry ether
B
H^+ / H_2O
C

(6) Write a test to distinguish following compounds.

I. $CH_3CH_2CH_3$ and $CH_3CH=CH_2$
II. $CH_3CH=CH_2$ and $CH_3CH=CH\text{-}CH_3$
III. methane and propene
IV. pentene and 2-pentene

(7) Draw the possible structures for the following compounds.

I. Compound with $1SP^3$ hybridized C with 2 SP^2 hybridized C.
II. Compound with $3SP^3$ hybridized C with 2 SP^2 hybridized C.
III. Compound with $2SP^3$ hybridized C with 4 SP^2 hybridized C.

(8) Write the mechanisms for the following reactions.

I. propene with Br_2/CCl_4
II. propene with HBr
III. 2-methylpent-2-ene with HBr

(9) State whether the following statements are true or false.

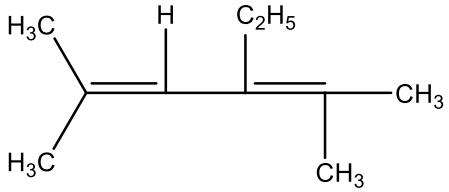
i. Acyclic alkenes with one double bond but without any other functional groups follow C_nH_{2n-2} general formula. ( )
ii. Ethyne is the simplest alkene. ( )
iii. Carbon-carbon double bond of an alkene and is longer than a carbon-carbon single bond. ( )
iv. Intermolecular forces of alkenes become stronger with increase In the size of the molecules. ( )
v. All the C atoms of butene are in the same plane. ( )

Additional Questions.

1. Write the reaction between ethene and Potassium Manganate (VII) to produce glycol.

2. What are the advantages of this reaction?

3. Consider the following compound

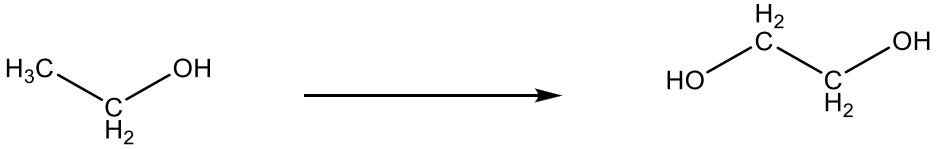


(a) Write the IUPAC name of the compound.

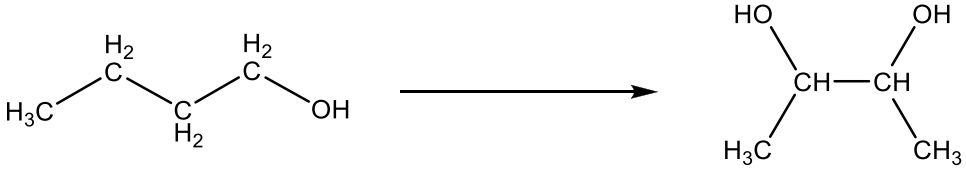
(b) Write down all the products formed when this diene is reacted with acidified $KMnO_4$.

4. How would perform the following conversions. (Reagents and conditions must be stated clearly to award maximum marks)

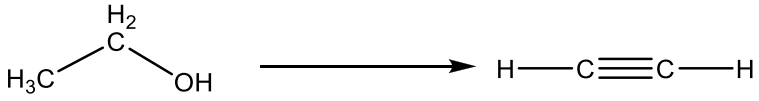
a.



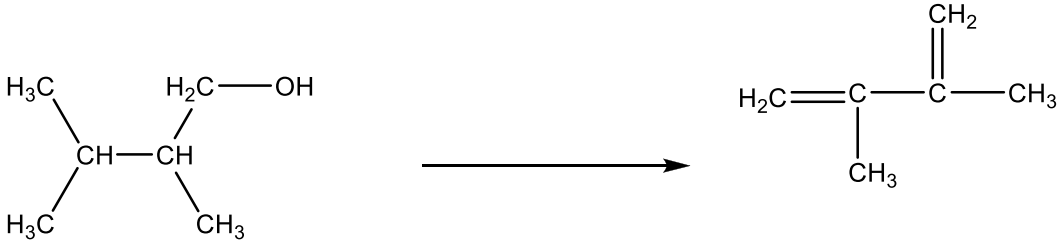
b.



c.

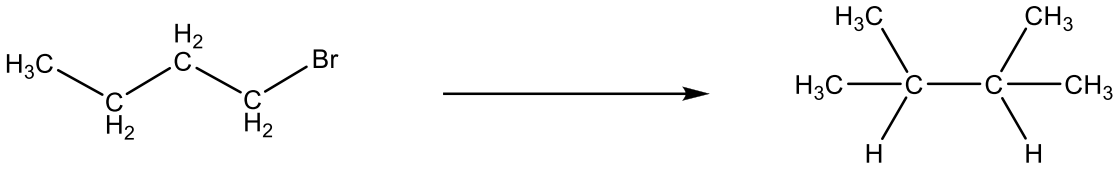


d.



e.

f.



g.

5. The hydrocarbon A contains 87.8 % of C and 12.2 % of hydrogen. The relative molecular weight of A is 82. A decolourise Bromine and reacts with Ni and Hydrogen to give the compound B. To react with 0.1 g of A 27.3 mL of H_2 gas is requires at standard temperature and pressure. However, B does not decolourise Bromine.
   a. What is the empirical formula of A?
   b. What is the molecular formula of A?
   c. Calculate the amount of hydrogen that would react with A.
   d. Calculate the number of double bonds in a single molecule of A.
   e. What is the molecular formula of B?
   f. Deduce the structures for A and B.

6. Consider a hydrocarbon with a molecular formula of C_XH_Y. A certain volume of this hydrocarbon was mixed with excess oxygen at room temperature and pressure which has a total volume of 200 mL. This was ignited by an electrical means and was cooled to room temperature which yielded a volume of 140 mL. The resulting gaseous mixture was passed through excess KOH and the resulting gas has a volume of 80 mL.
   a. Show that y=4(x-1)
   b. Determine the most probable molecular formula of the compound.
   c. If the hydrocarbon decolourises Bromine, then what would be the accurate molecular formula of the hydrocarbon.