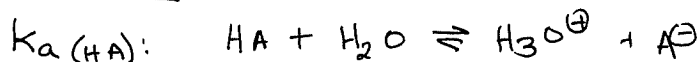
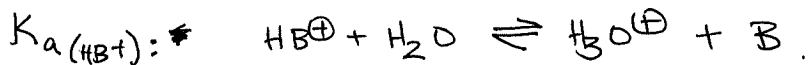


1b) 
$$K_{eq} = \frac{[\text{HB}^{\oplus}][\text{A}^{\ominus}]}{[\text{HA}][\text{B}]}$$



$$K_a(\text{HA}) = \frac{[\text{H}_3\text{O}^{\oplus}][\text{A}^{\ominus}]}{[\text{HA}]}$$



$$K_B(\text{HB}^{\oplus}) = \frac{[\text{H}_3\text{O}^{\oplus}][\text{B}]}{[\text{HB}^{\oplus}]}$$

Substitute in  
w known expressions

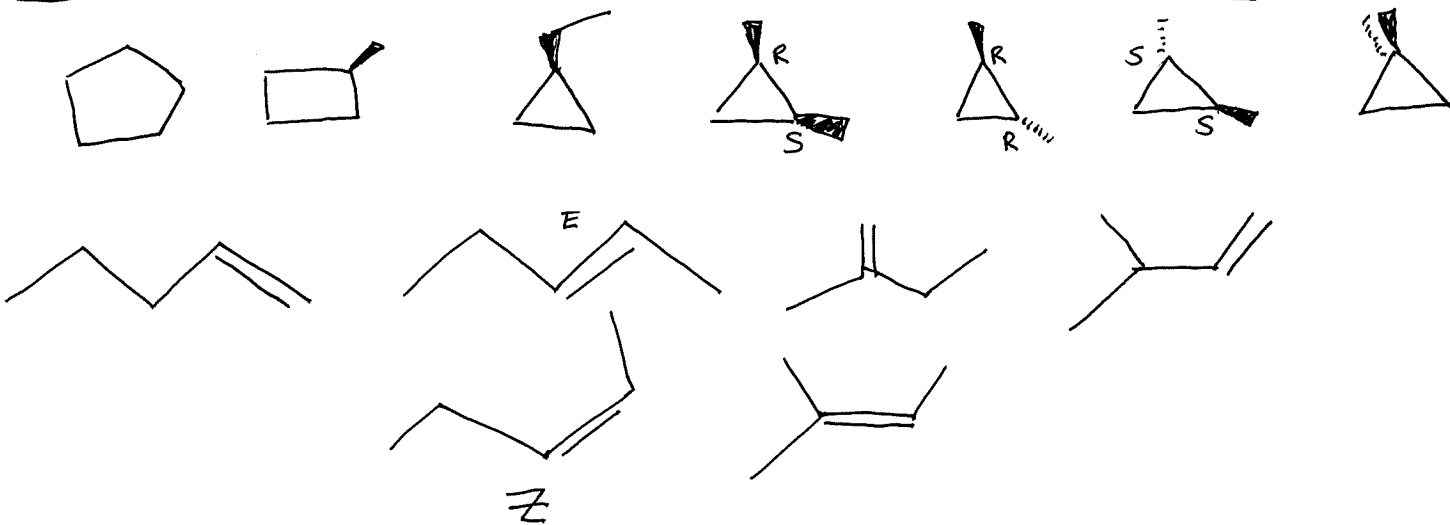
$$\frac{K_a(\text{HA})}{K_a(\text{HB}^{\oplus})} = K_a(\text{HA}) \cdot \frac{1}{K_a(\text{HB}^{\oplus})}$$

$$= \frac{[\text{H}_3\text{O}^{\oplus}][\text{A}^{\ominus}]}{[\text{HA}]} \cdot \frac{[\text{HB}^{\oplus}]^*}{[\text{H}_3\text{O}^{\oplus}][\text{B}]}$$

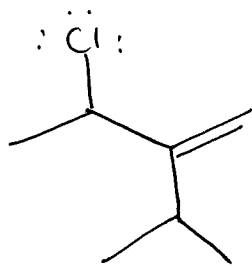
$$\frac{[\text{HB}^{\oplus}][\text{A}^{\ominus}]}{[\text{HA}][\text{B}]} = \frac{[\text{HB}^{\oplus}][\text{A}^{\ominus}]}{[\text{HA}][\text{B}]}$$

1c) The side of the acid-base equilibrium with the weaker acid is favoured.

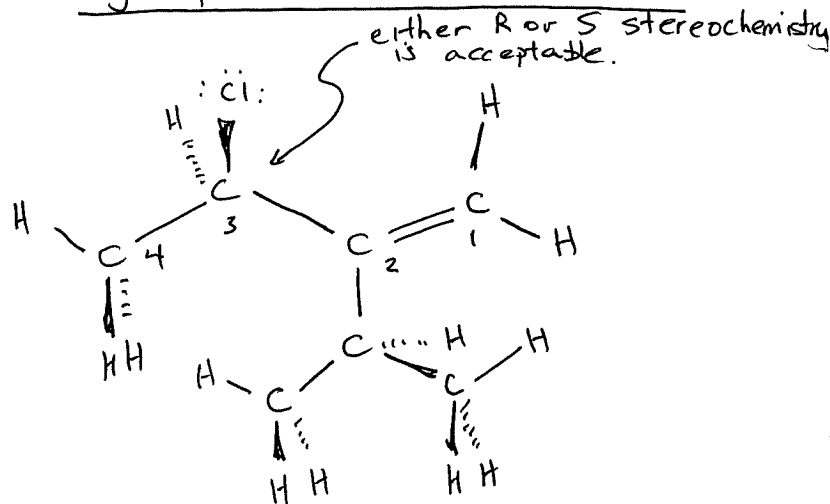
2.



3. Line structure:

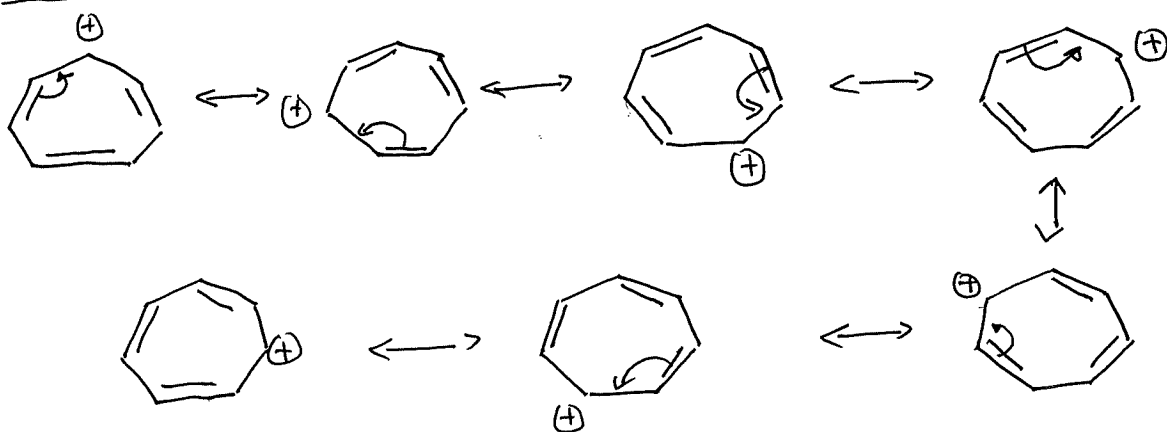


Fully Expanded Lewis Structure:

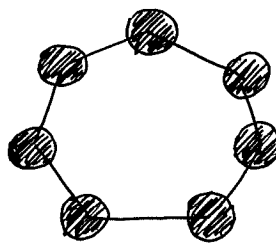


Correct IUPAC Name: 3-chloro-2-isopropyl-1-butene

4.



$\pi$  e<sup>-</sup> density map:



← all circles are the same size.

5a) A, D

b) A, C

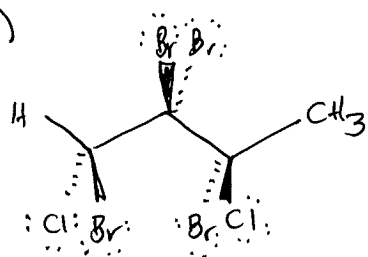
c) A, C

d) G

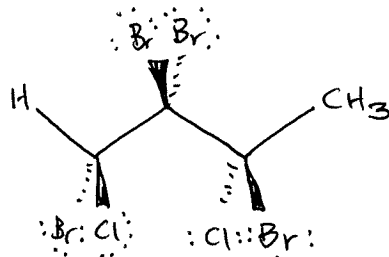
e) F

6a) Chiral

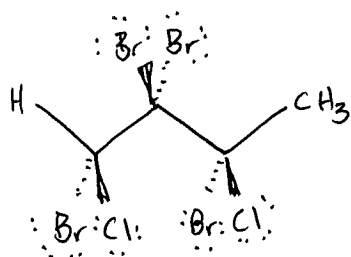
6b)



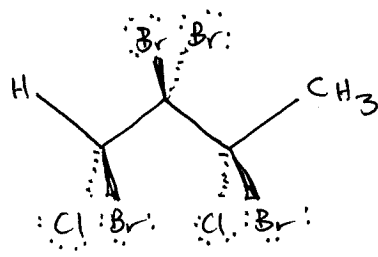
1



2



3



4

Enantiomers

1 + 2

3 + 4

Diastereomers

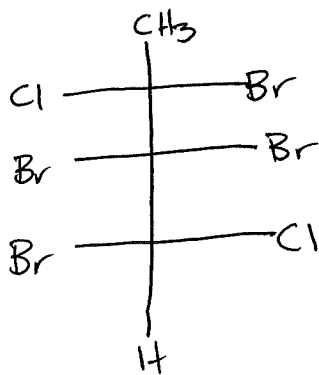
1 + 3

1 + 4

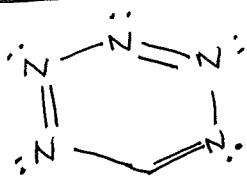
2 + 3

2 + 4

6c)

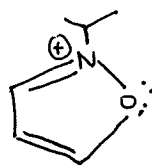


7a)



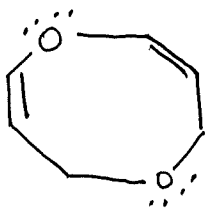
Aromatic  $6\pi e^-$

b)



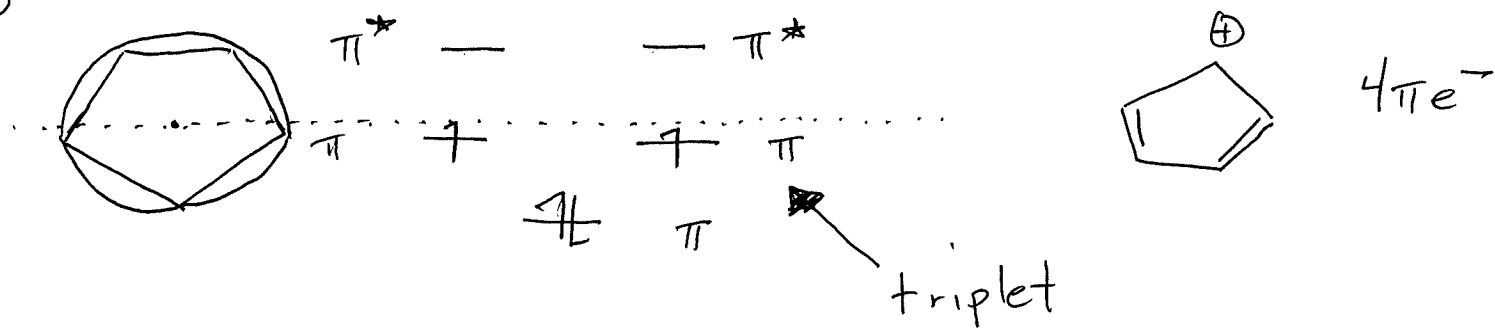
Aromatic  $6\pi e^-$

c)



Nonaromatic.

8



$$4n = 4$$

$$n = 1 \therefore \text{antiaromatic}$$

No, I would not expect this ion to be stable.  
It is a triplet and meets all requirements to be considered antiaromatic.

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9. a) Reduction

b) Addition

c) Substitution

Bonus A : Jacques Dubochet    Joachim Frank    Richard Henderson

→ The development of cryoelectron microscopy for the high resolution structure determination of biomolecules in solution

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Bonus B :

C : 2.5

O : 3.5

N : 3.0

F : 4.0.