

1. Which of the following diatomic molecule do not absorb in IR region?

HCl

HBr

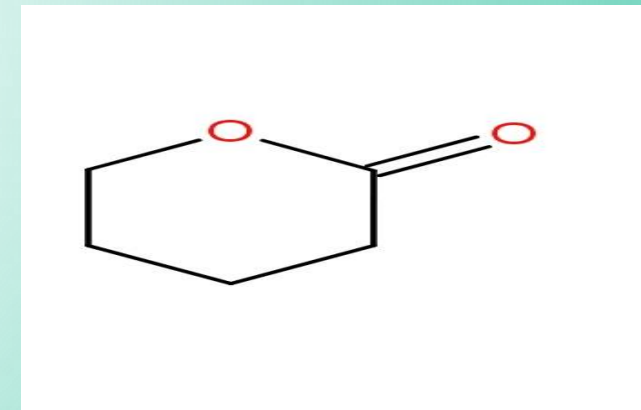
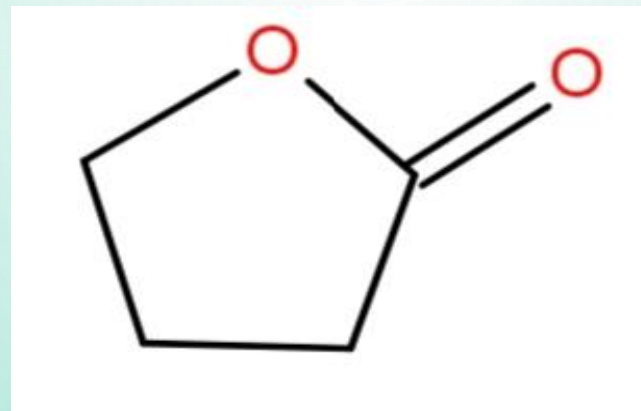
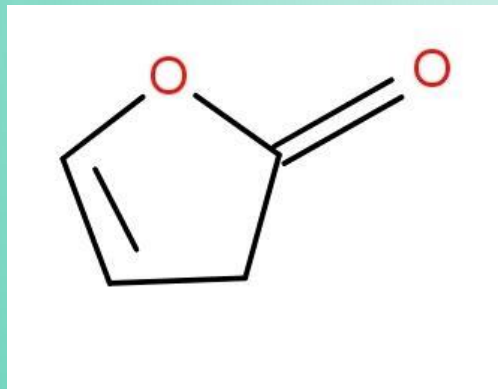
N₂

O₂

H₂

- **N₂, O₂ and H₂ these diatomic molecules do not have dipole moment**
- **There is no change in dipole moment**
- **Therefore N₂, O₂ and H₂ do not absorb in IR region.**

2. Arrange, the following lactones in order of their decreasing carbonyl frequency and give reasons.



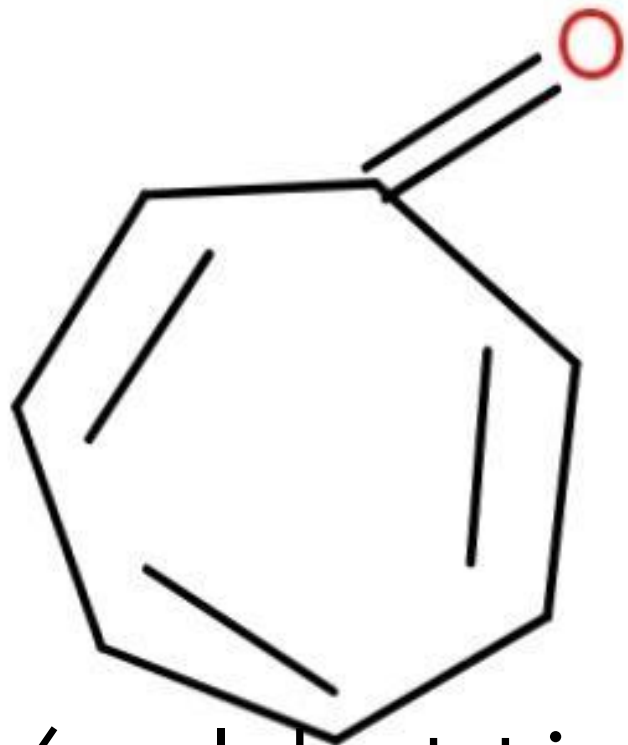
Decreasing order of CO stretching frequency I > II > III

- In structure I due to mesomeric effect, double bond adjacent to single bonded oxygen atom of lactone I raises the C=O stretching frequency. So 5 membered ring absorbs at higher frequency than 6 membered ring.

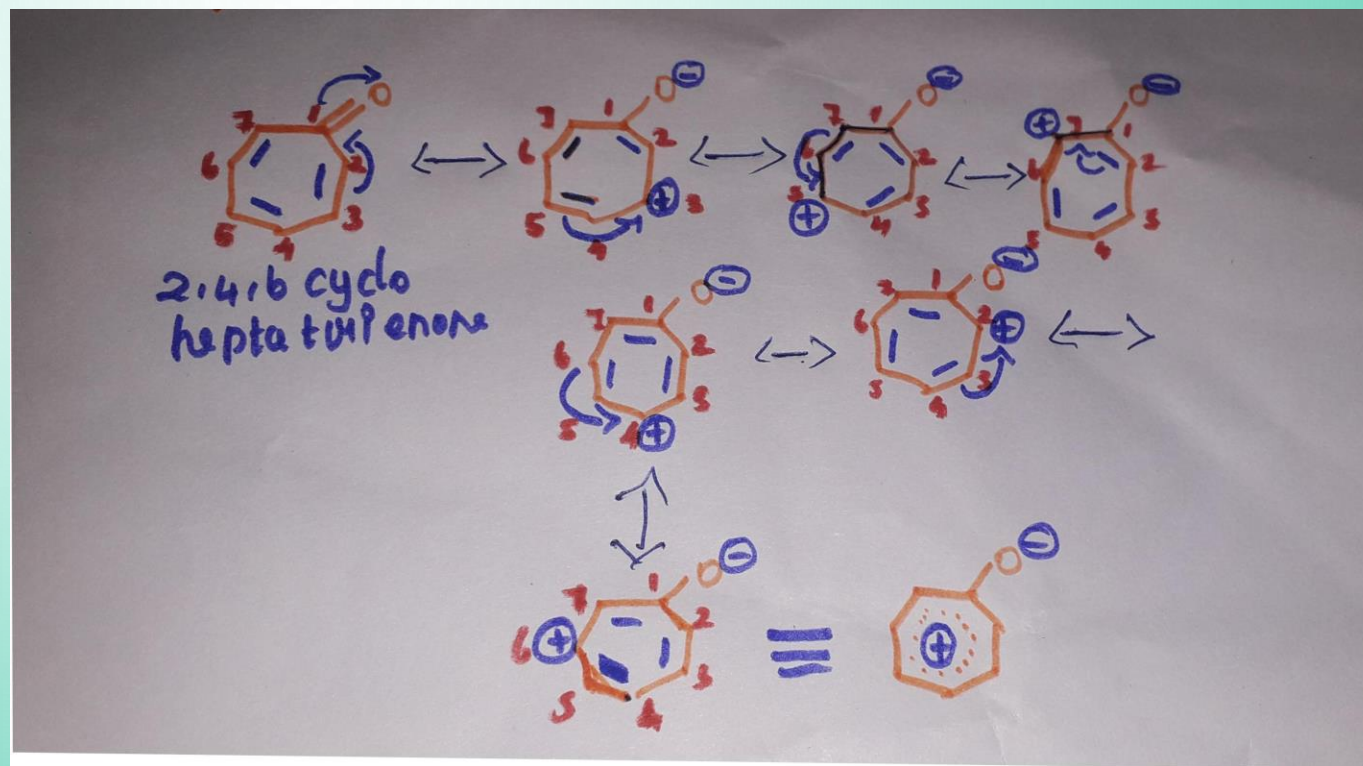
Structure II & III bond angle related.

- In structure(II) bond angle will be lower than structure(III).so bond angle is less and bond strain will be more bond strength is high Therefore stretching frequency is high for structure(II).
- InStructure(III)bond angle more compared to structure(II)bond strain is less bond strength is low and so stretching frequency is low.

3. C=O stretching frequency of 2,4,6-cycloheptatrienone is low why?

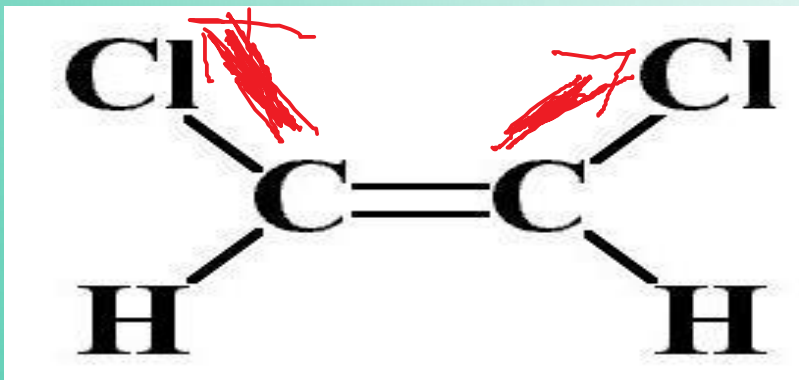


2,4,6-cyclo heptatrienone

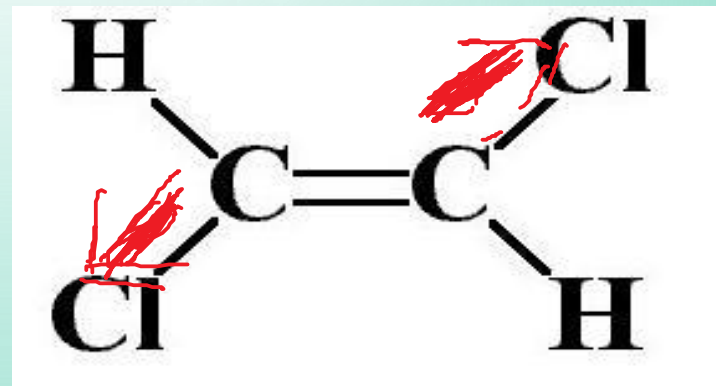


Due to 6 resonance structures C=O bond is weakened much and so low C=O stretching frequency.

4. Cis -1,2 dichloro ethylene is infrared active why? Trans 1,2 dichloro ethylene Ir inactive Explain.



Cis -1,2-dichloro ethylene



trans-1,2-dichloro ethylene

Condition: There will be change in dipole moment

- Dipole moment is a vector quantity
- It is a directional property
- In trans isomer two chlorine atoms are on opposite sides, dipole moment values are cancelled. Therefore trans-1,2-Dichloroethylene **IR inactive**.
- In cis isomer two chlorine atoms are on the same side, so that vector quantity is added and it will be added. There will be change in dipole moment. Therefore cis 1,2-Dichloroethylene **IR active**.