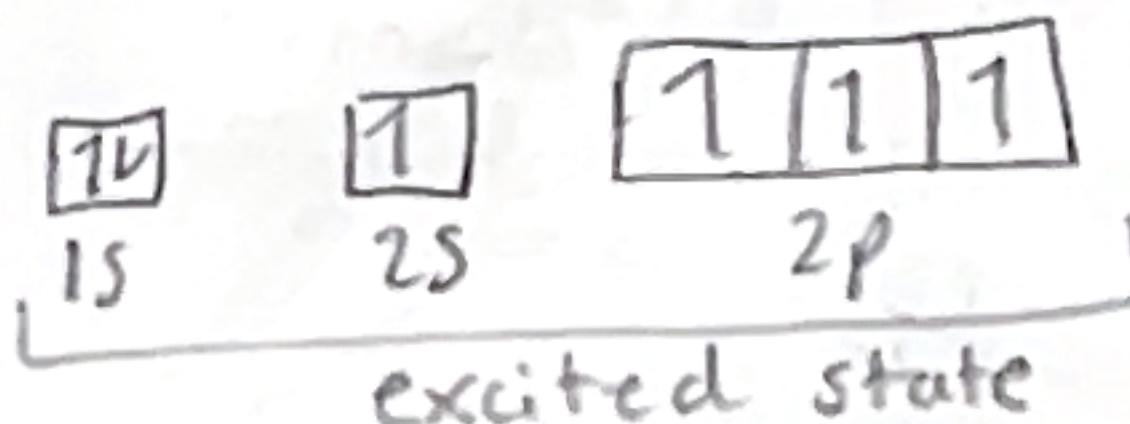
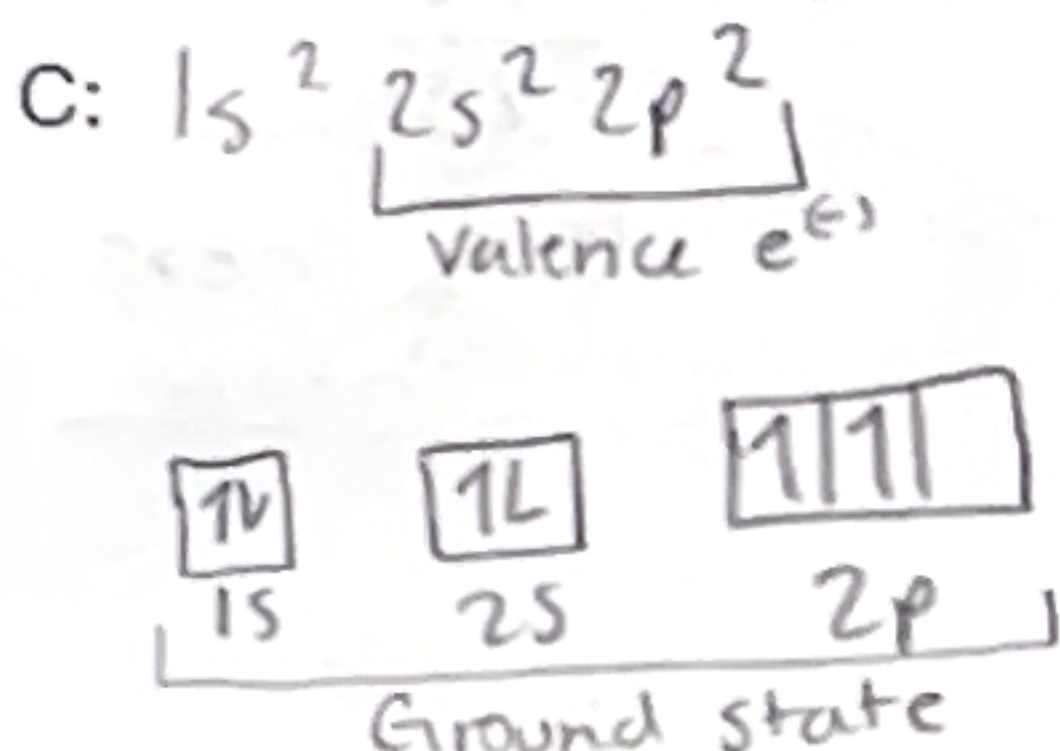
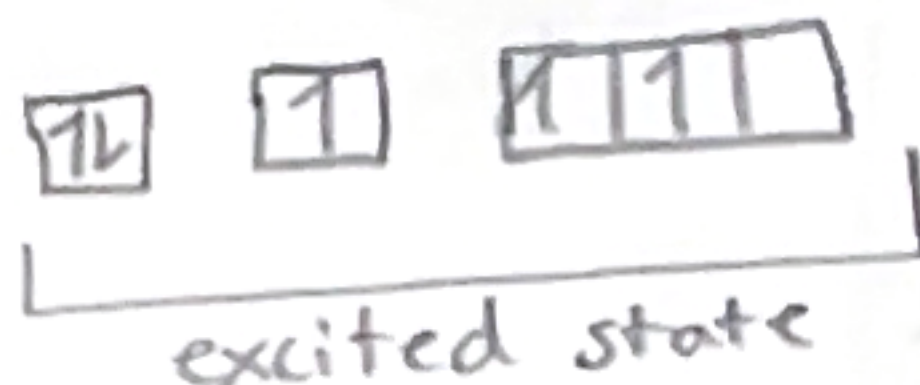
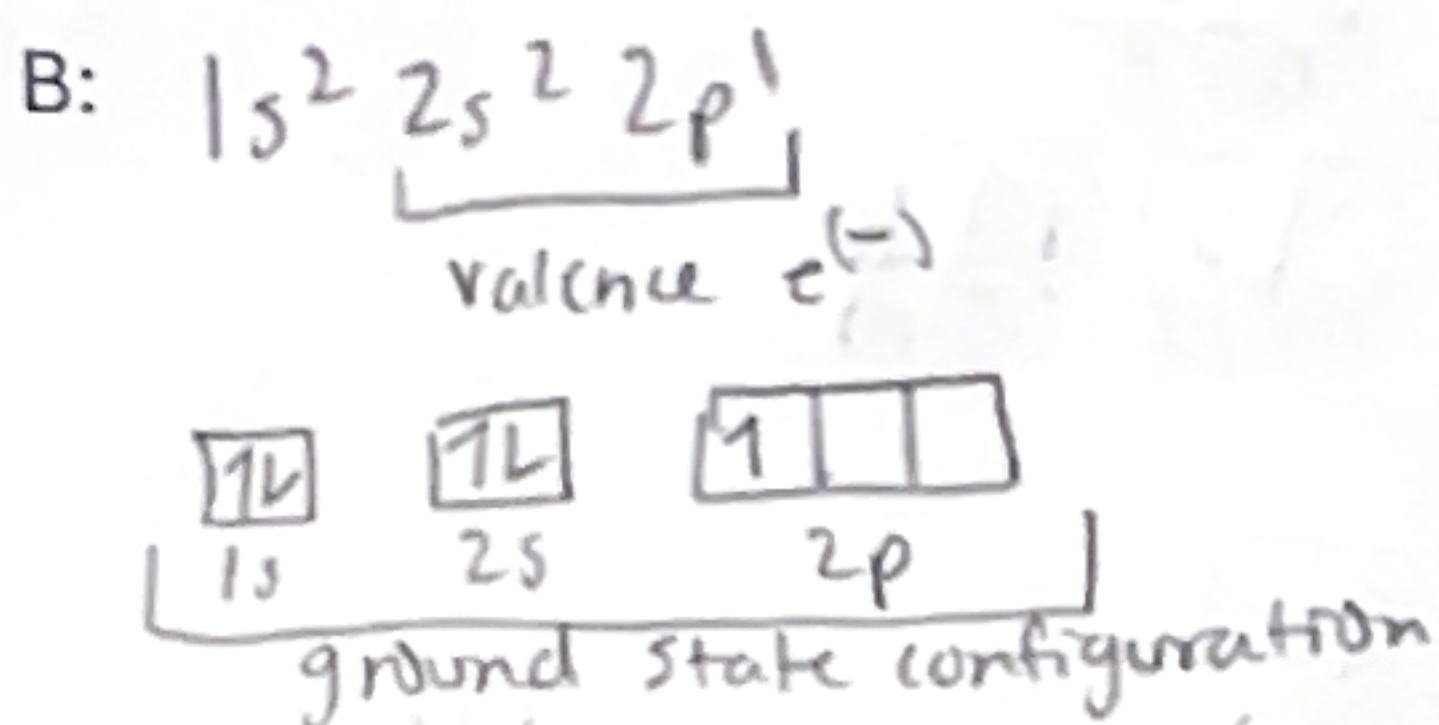


Key!

Ch. 9 Hybridization and Molecular Orbital Theory

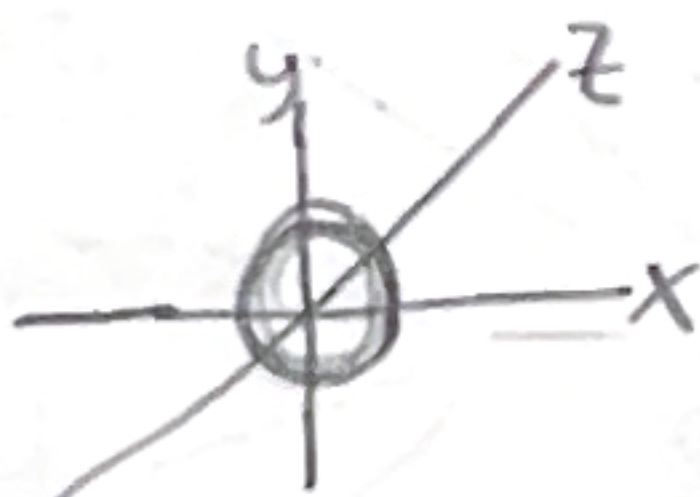
What is Hybridization?

Hybrid orbitals form by "mixing" valence-bond theory atomic orbitals to create new orbitals of equal energy.



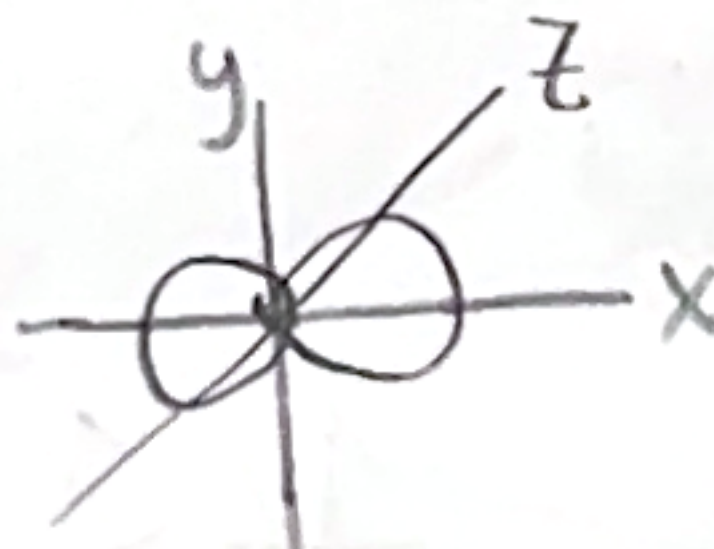
What is the shape of s orbitals?

Spherical



What is the shape of p orbitals?

dumbbell / hourglass



What are the characteristics of Sigma bonds?

- head-to-head overlap

- cylindrical symmetry of e^- density along the internuclear axis.

(Single bonds ALWAYS sigma bonds)

What are the characteristics of Pi bonds?

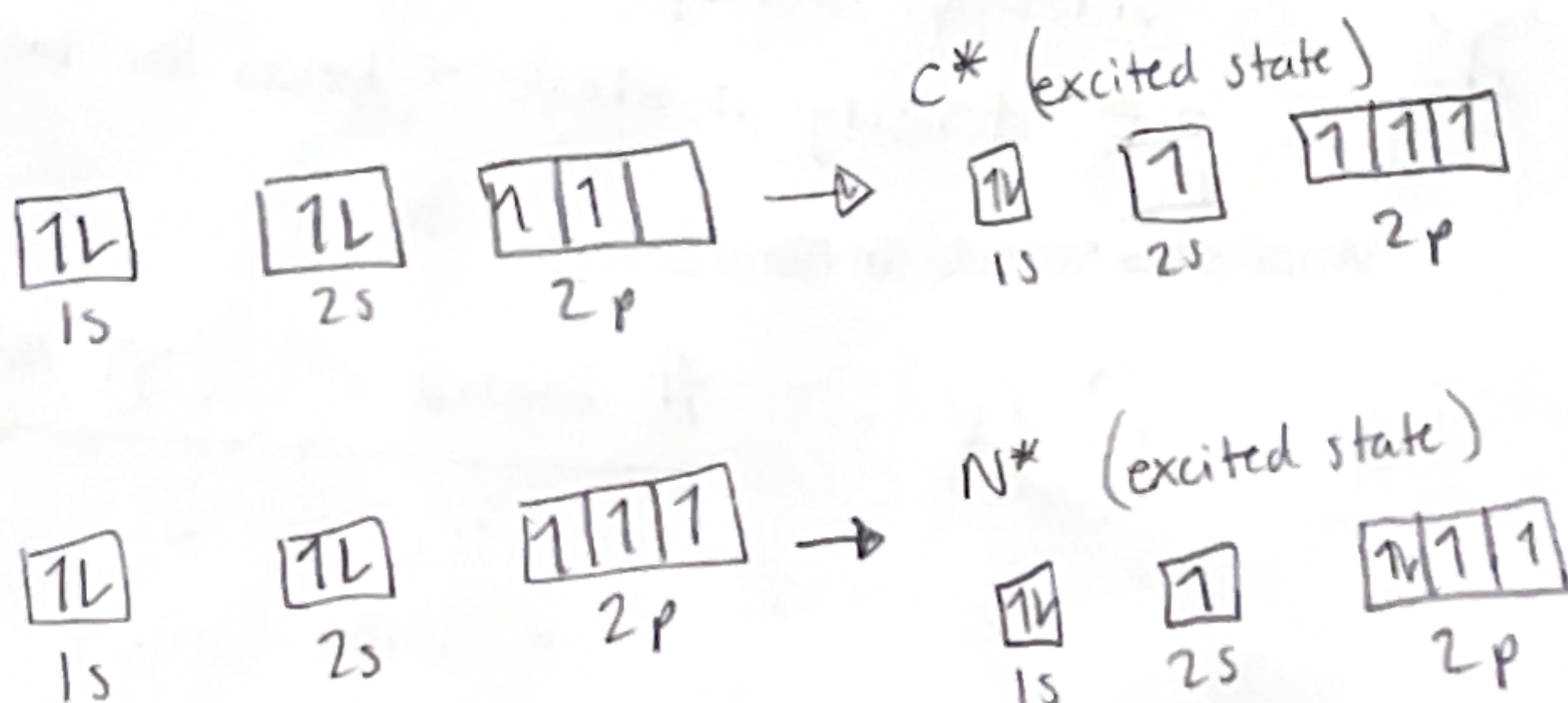
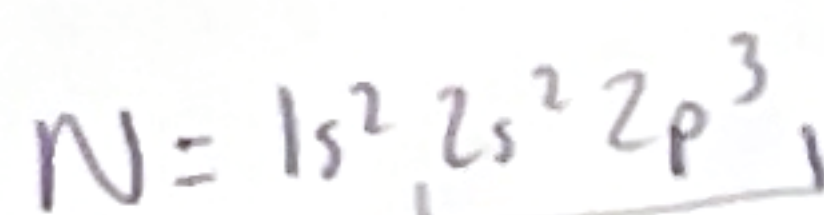
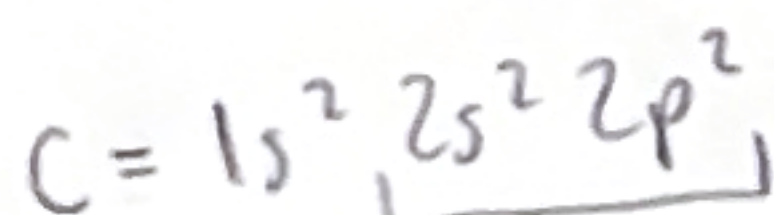
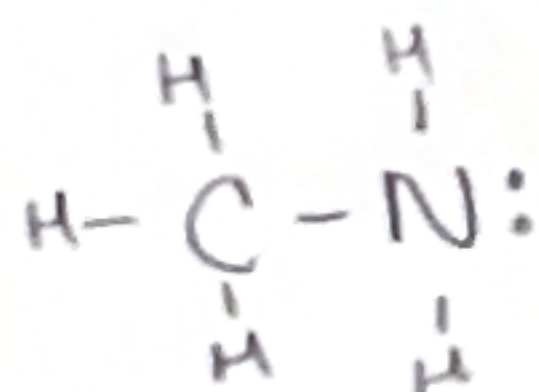
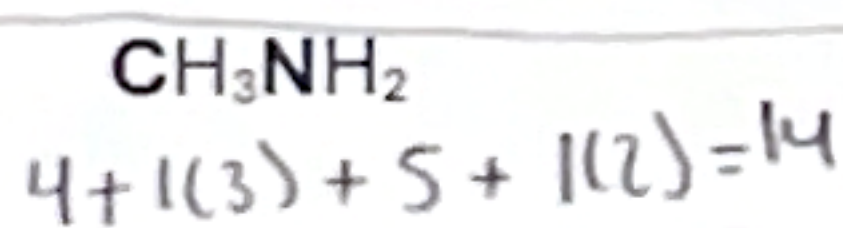
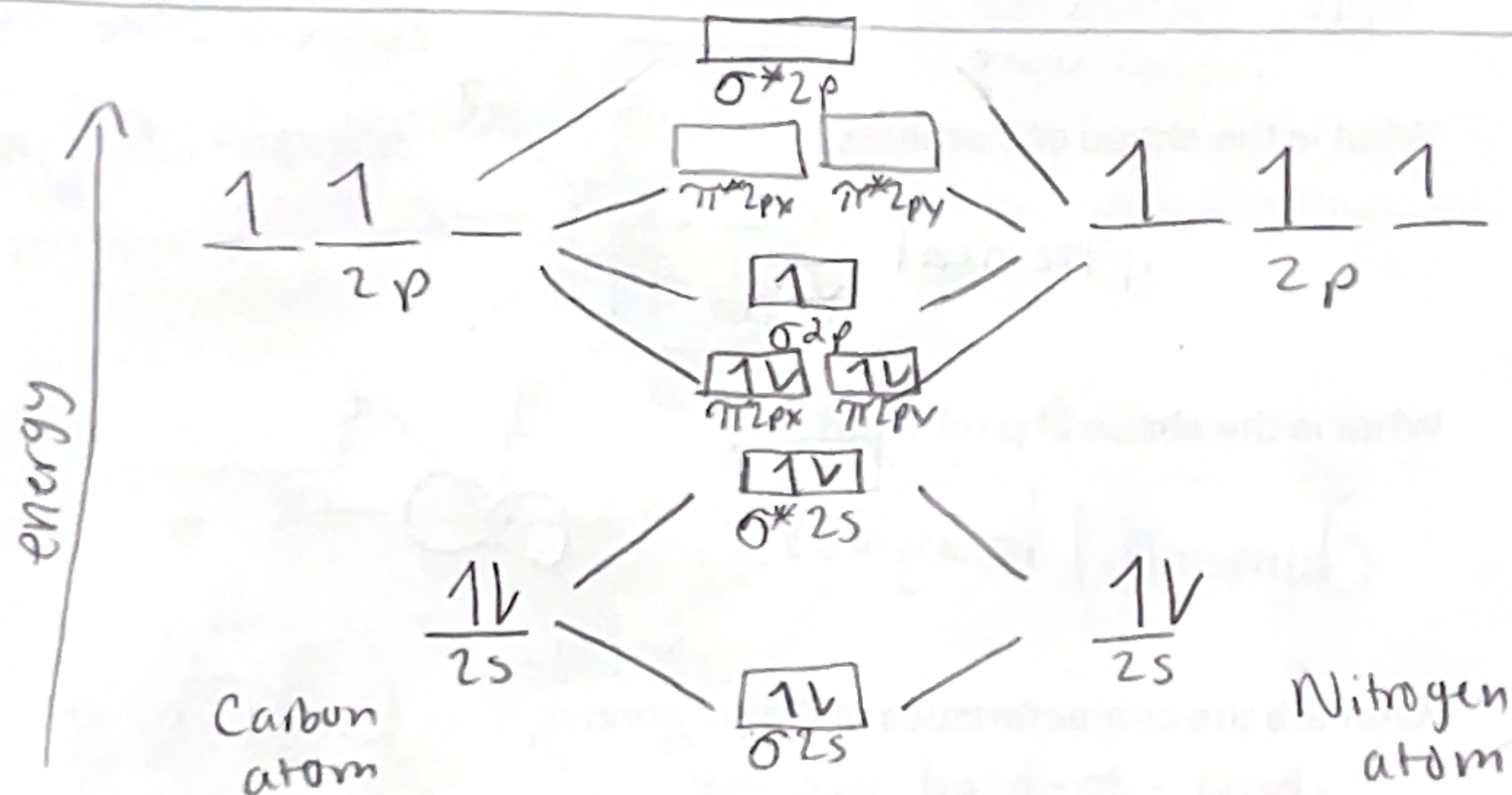
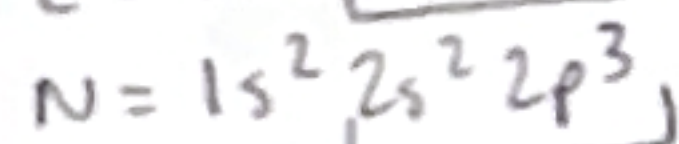
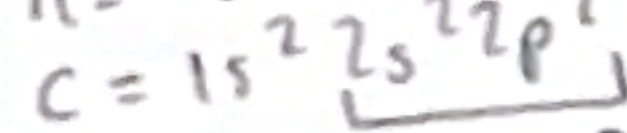
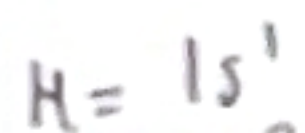
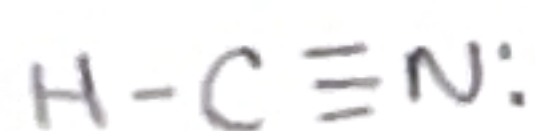
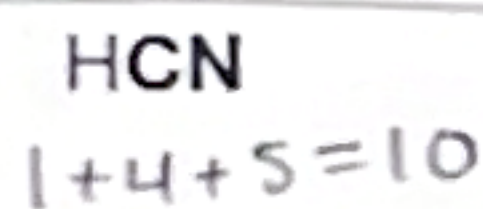
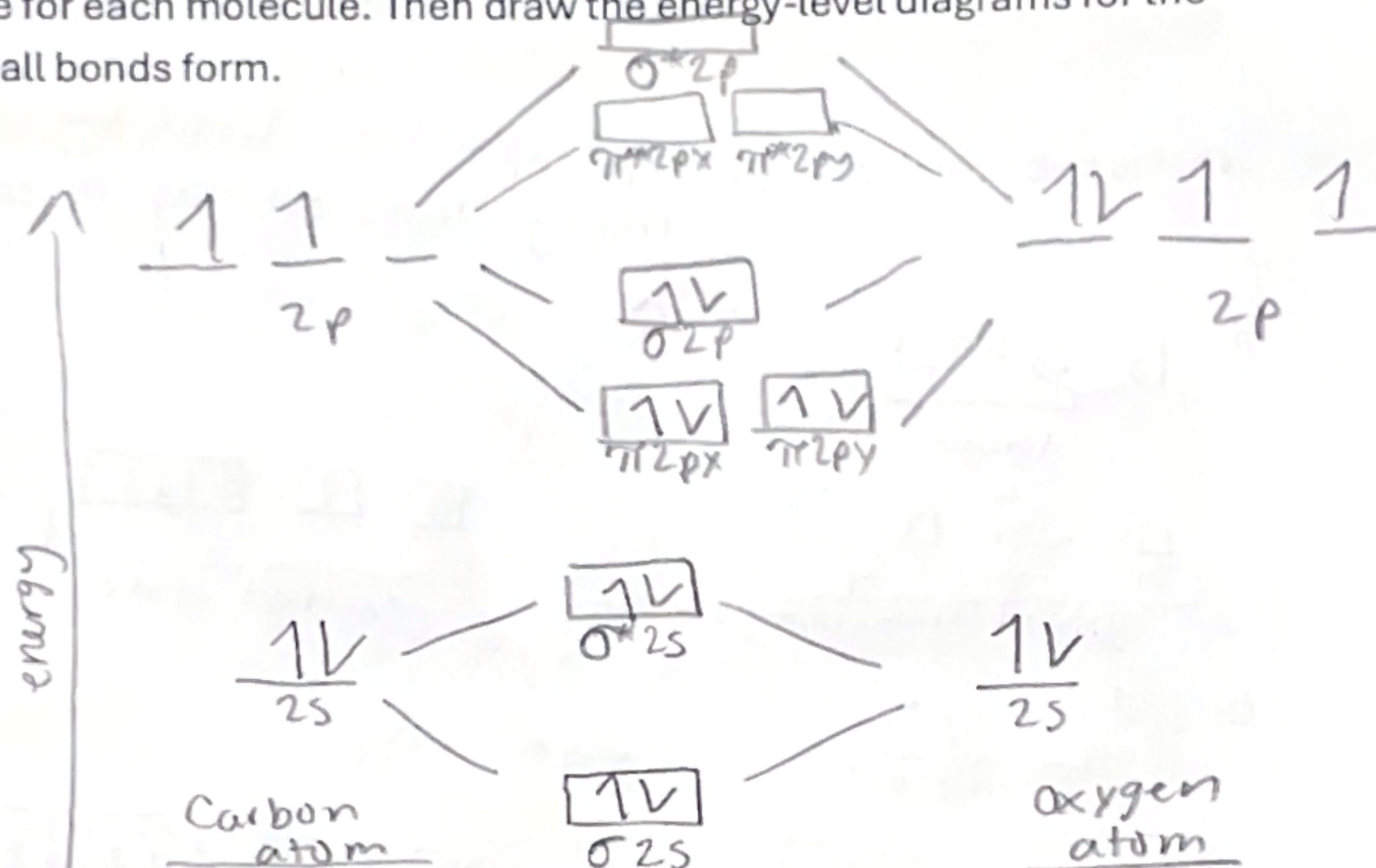
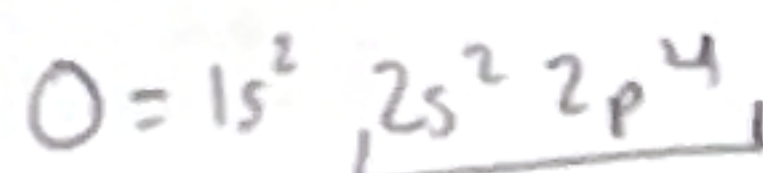
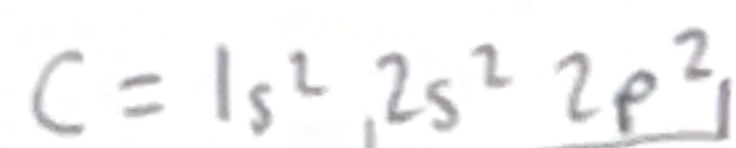
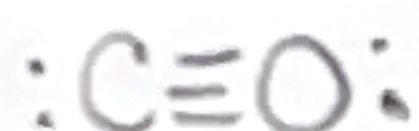
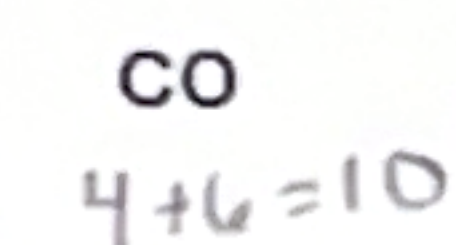
- Sideways overlap

- e^- density is above & below the internuclear axis.

What is the formula for Bond Order?

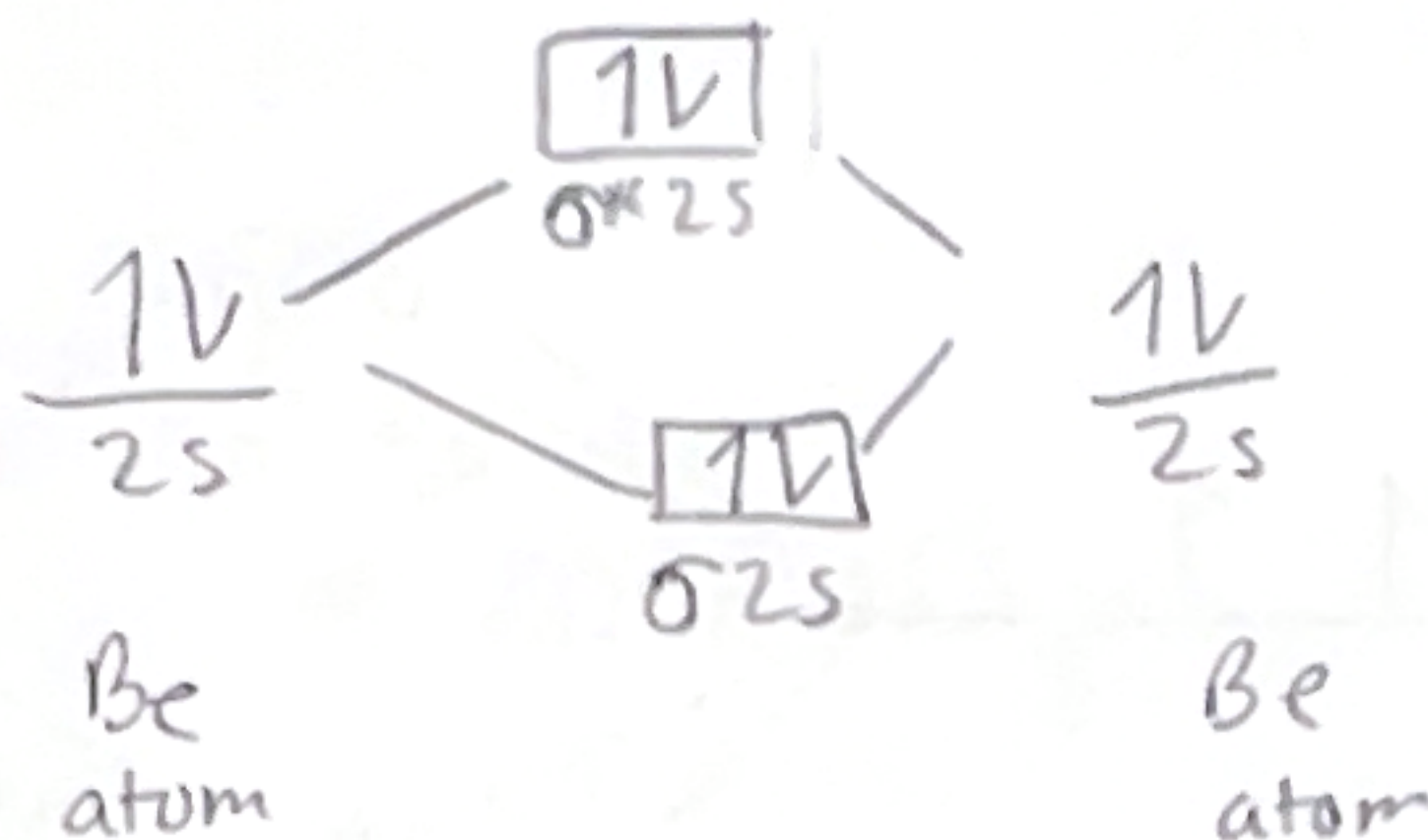
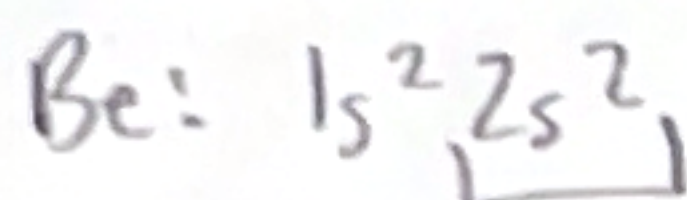
$$B.O = \frac{\# \text{ bonded } e^- - \# \text{ antibonding } e^-}{2}$$

Draw a Lewis Structure for each molecule. Then draw the energy-level diagrams for the bolded and show how all bonds form.



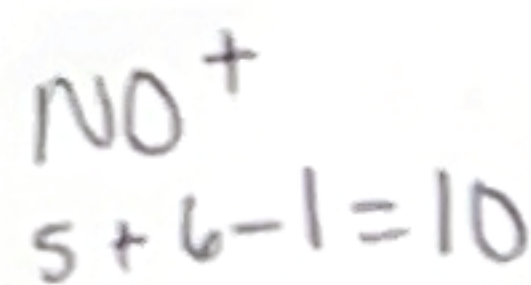
Draw the energy-level diagrams for the following molecules, determine the bond order of the covalent bond in each. Determine whether it's paramagnetic or diamagnetic.

1) Be_2

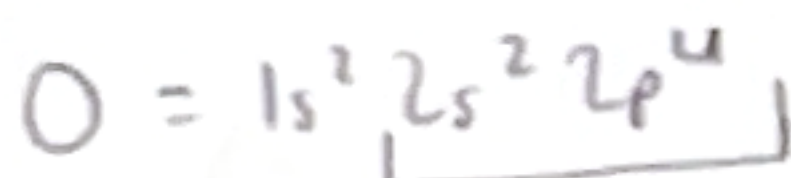
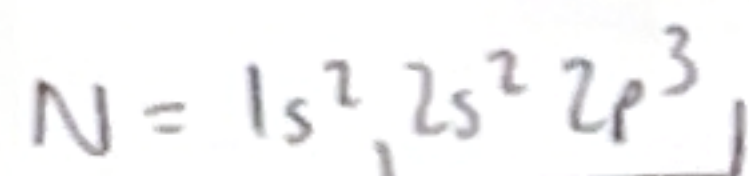
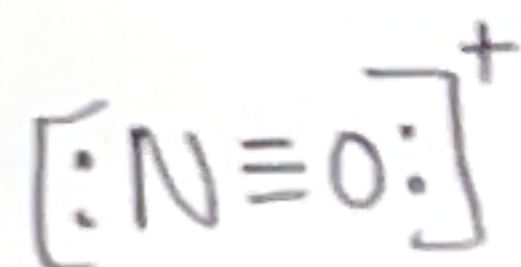


$$\text{Bond Order} = \frac{2-2}{2} = 0$$

Diamagnetic

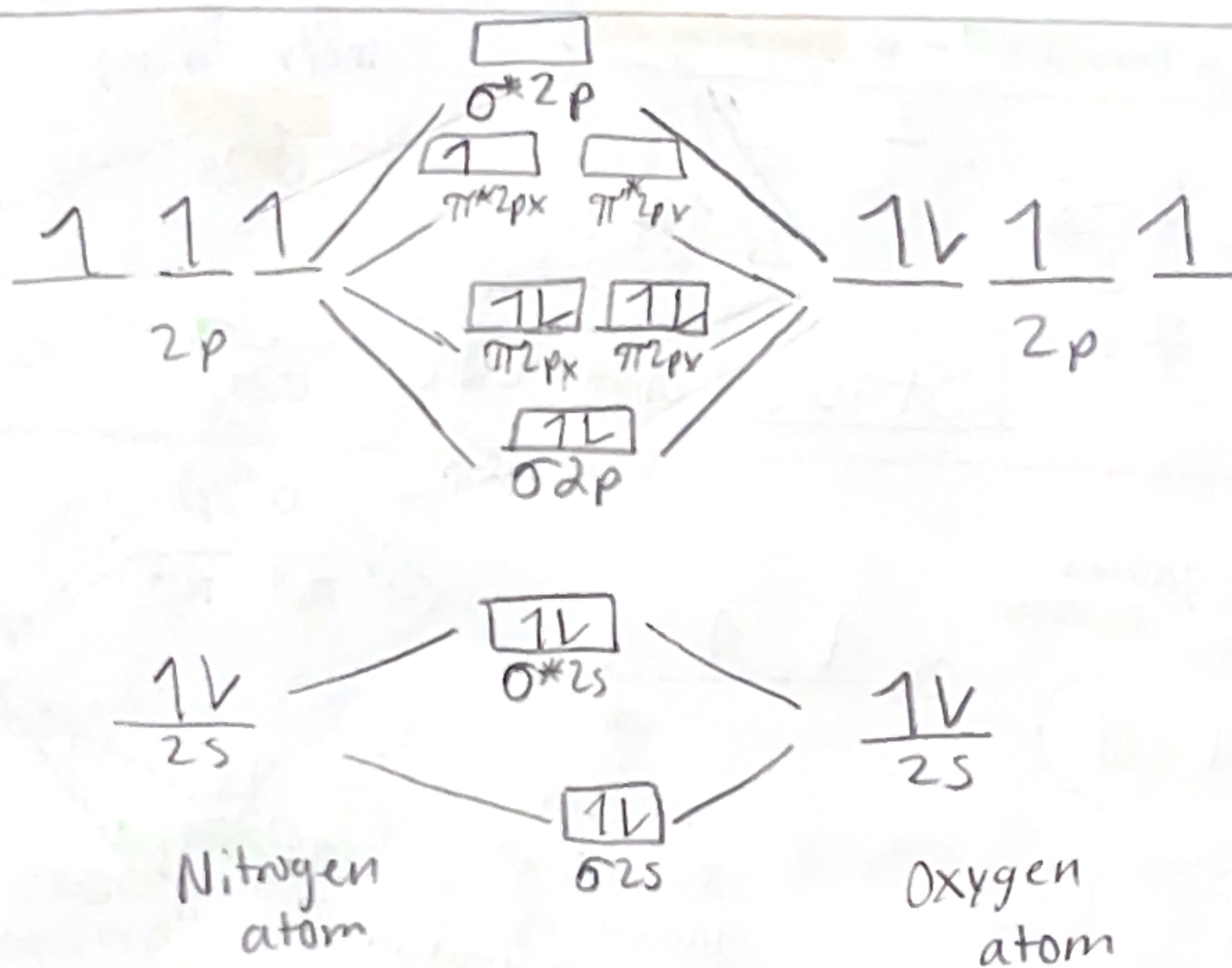


2) NO^+ Mistake!
Should be $\oplus$



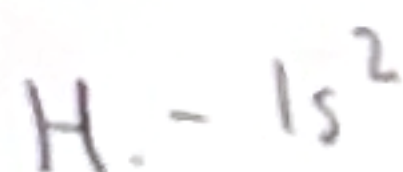
$$\text{B.O} = \frac{8-3}{2} = 2.5$$

Paramagnetic



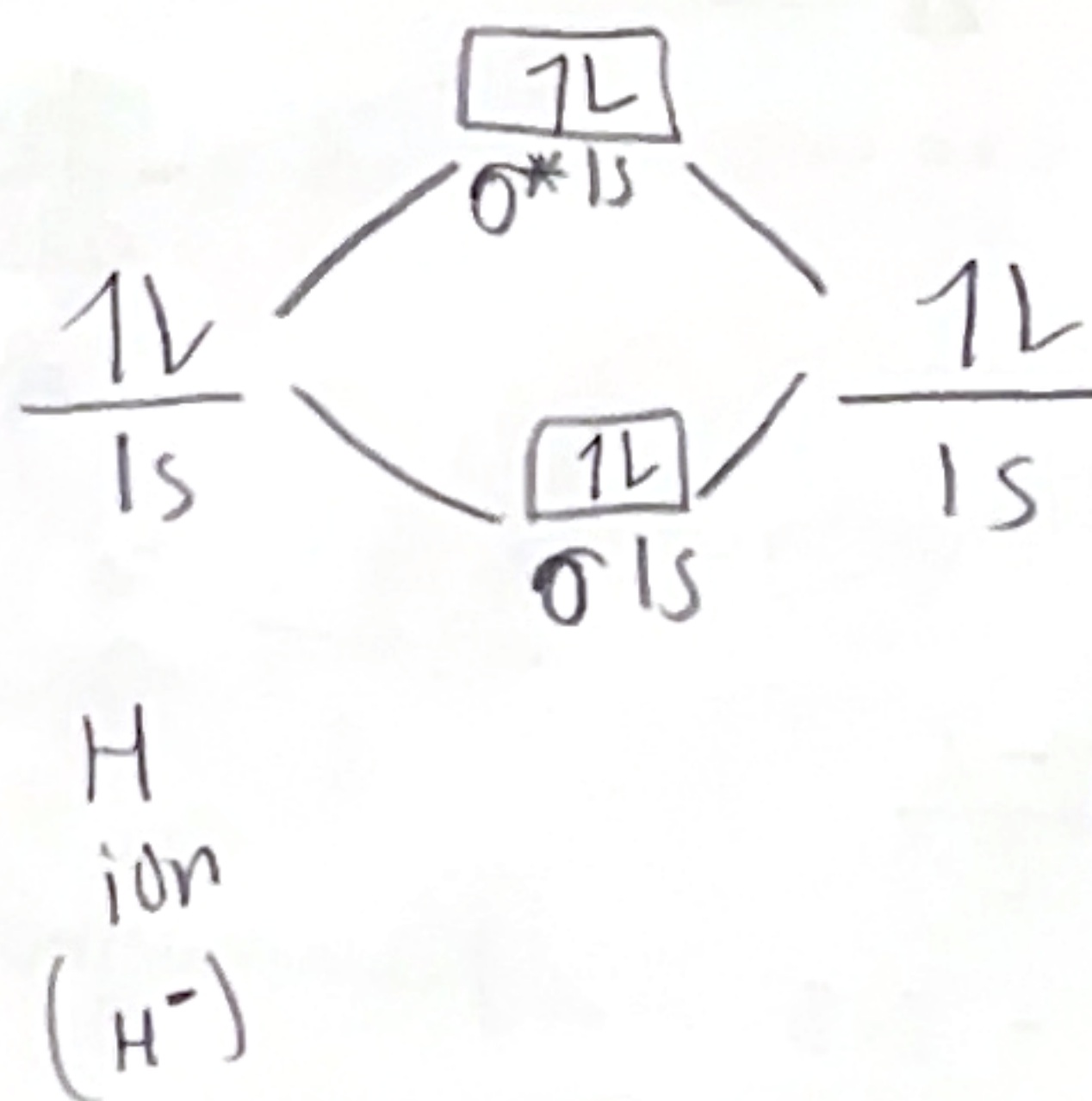
3) H_2^{2-}

$$1(2)+2=4$$



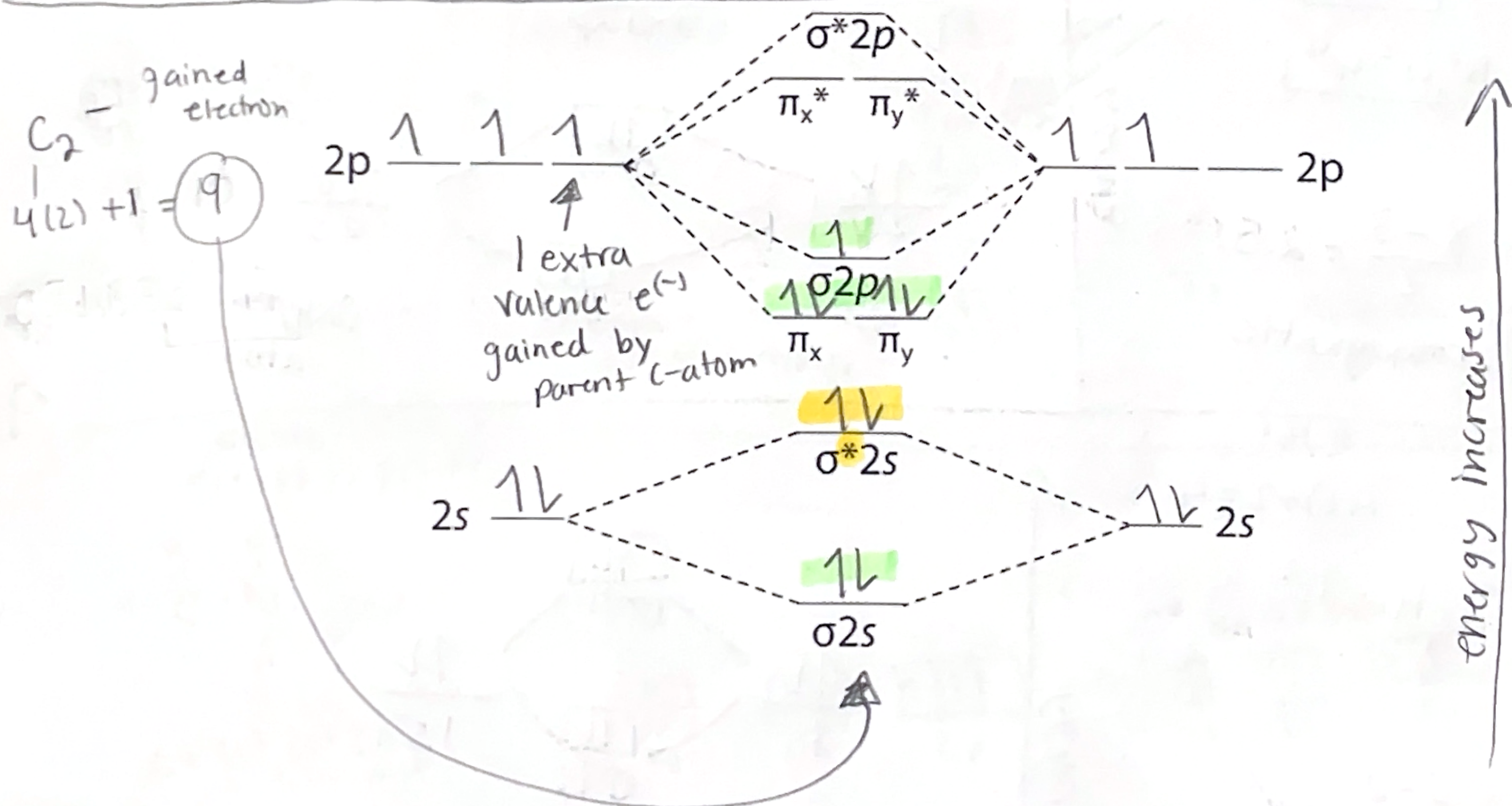
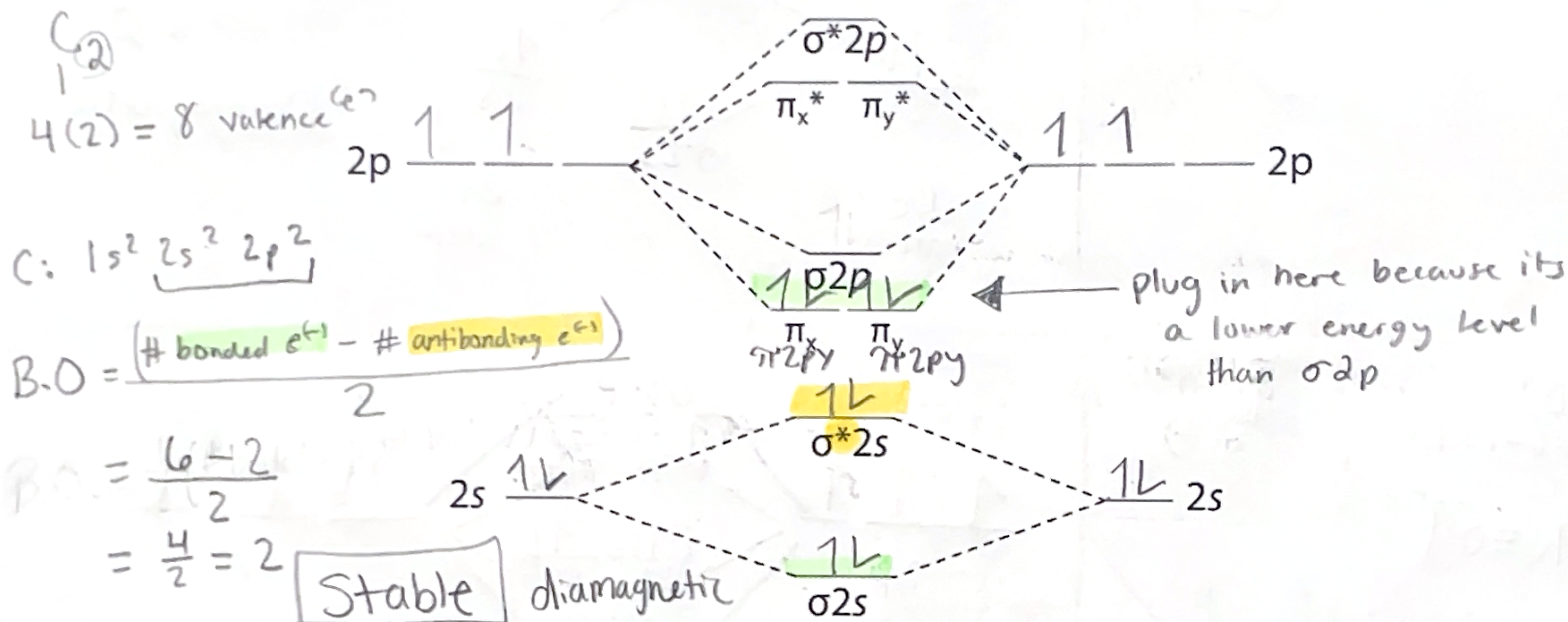
$$\text{B.O} = \frac{2-2}{2} = 0$$

Not stable
not possible



Use the following outline to diagram the species C_2 , C_2^- . Determine the bond order of each and indicate whether they are stable. Note that C is one of the exceptions in which the $\pi 2p$ orbital will fill before the $\sigma 2p$ orbitals.

* Follow Aufbau Principle & Hund's Rule



Bond Order = $\frac{7 - 2}{2}$

$= \frac{5}{2} = 2.5$

Paramagnetic - there's a lone e^-