LIVE

CHEMICAL BONDING

In JEE-MAIN

8:15 PM Tonight

By VJ Sir

Nishant Jindal

XeF_2

XeF_4

XeF_6

$XeOF_4$

XeO_2F_2

Bartlett (1962)

$$O_2 + [Pt F_6] \longrightarrow O_2^{+}[Pt F_6]^{-}$$

Red col. Ionic Compound

$$[O_2 \approx Xe]$$

1175 KJ/mole ~ 1170 KJ/mole

$$Xe + [Pt F_6] \longrightarrow Xe^{+}[Pt F_6]^{-}$$

first discov. comp.

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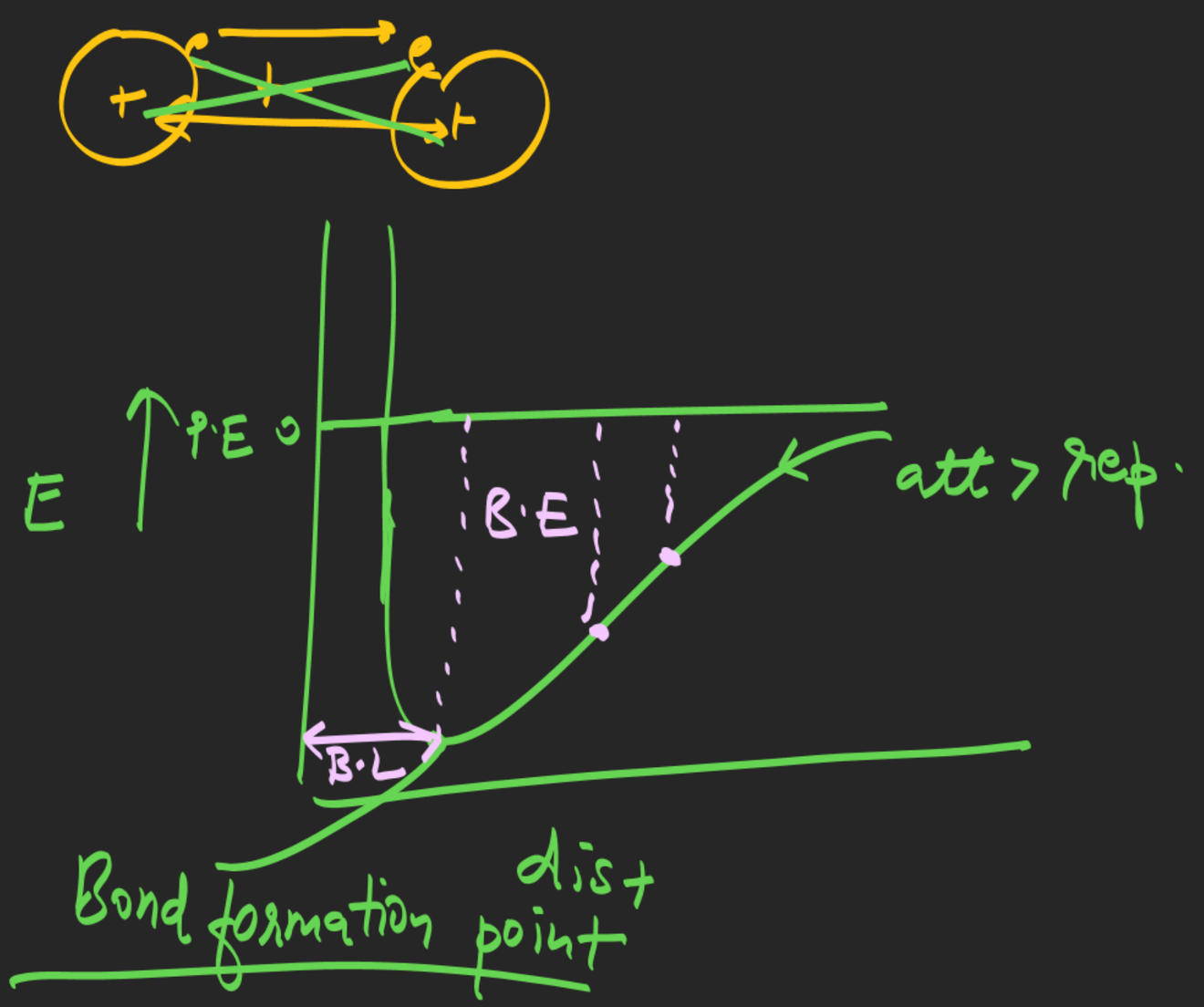

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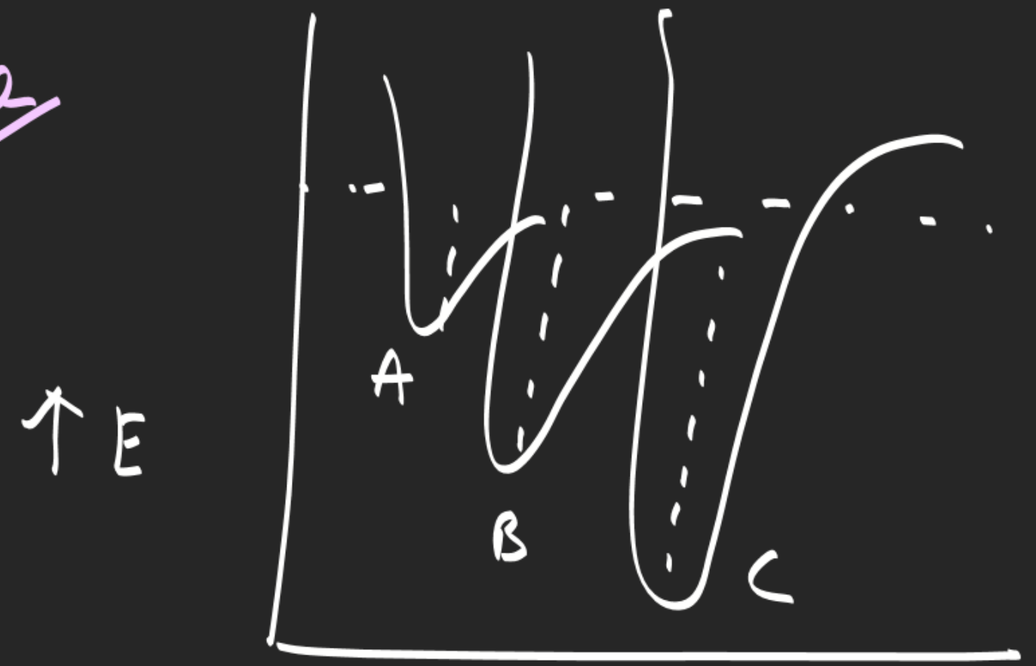
Que



Que Which of the following molecule is more stable

(1) A (2) B (3) C (4) none

Chemical bonding

CHEMICAL BOND

The attractive force which holds various constituents (atoms, ions, etc.) together in different chemical species is called a chemical bond.

1. Tendency to acquire minimum energy:

(a) When two atoms approach to each other-Nucleus of one atom attracts the electrons of another atom.

(b) Two nuclei and electrons of both the atoms repel each other.

(c) If net result is attraction, then the total energy of the system (molecule) decreases. A chemical bond is formed when the net energy of system is least

(d) The amount of energy released during bond formation is known as 'Bond Energy'.

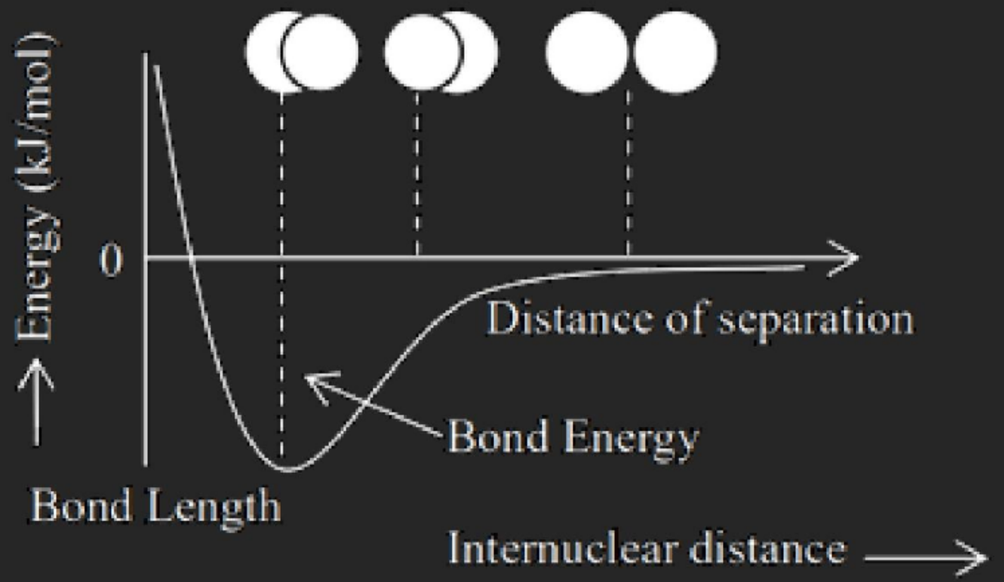
(e) Bond formation is an exothermic process.

Chemical bonding

2. **Tendency to acquire noble gas configuration (Octet rule):**

   Atoms combine to complete an octet of electrons in their outer most shell.

Hence all atoms have a tendency to acquire octet (s^2p^6) configuration or to attain nearest noble gas configuration in their outermost orbit. This can be achieved by combining with other atom or ion.



Potential Energy diagram

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Chemical bonding

EXCEPTIONS TO OCTET RULE

1. **Transition metal ions**

	Cr^{3+}	Mn^{2+}	Fe^{2+}
	$[Ar]3\ d^3$	$[Ar]3\ d^5$	$[Ar]3\ d^6$
	$[2,8,11]$	$[2,8,13]$	$[2,8,14]$

2. **Pseudo inert gas configuration** $[s^2p^6d^{10}]$

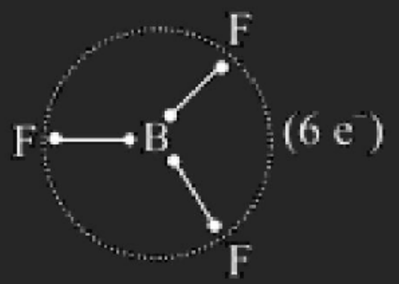
Zn^{2+}	Cd^{2+}
$[Ar]3\ d^{10}$	$[Kr]4\ d^{10}$

3. **Contraction of octet (incomplete octet)**

$\underline{BeF_2}$ $\underline{BF_3}$ $\underline{AlCl_3}$ $\underline{BCl_3}$

$(4e^-)(6e^-)(6e^-)(6e^-)$

These compounds arc hypovalent.



Chemical bonding

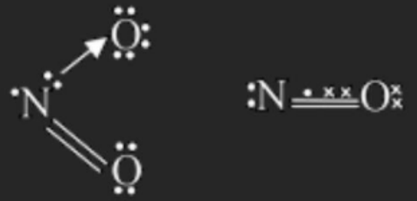
4. **Expansion of Octet (due to empty d-orbitals)**

PCl_5	SF_6	ClF_3	ICl_5	IF_7
↓	↓	↓	↓	↓
$(10e^-)$	$(12e^-)$	$(10e^-)$	$(12e^-)$	$(14e^-)$

These compounds are hypervalent

5. **Odd electron species**

Species which contain odd number of electrons are called Odd electron species. Ex. NO, NO_2, ClO_2 etc.



6. **Compounds of Noble gases**

Noble gases which have already completed their octet (or duplet in case of He.) should not form compounds. However, their compounds like $XeF_2, XeF_6 \& KrF_2$ etc., have been actually prepared.

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Chemical bonding

Que. Find the number of chemical specie(s) which does not follow oetet rule.

$BF_3, PCl_5, SF_4, AlF_3, CH_4, SnCl_2, NO_2$

Sol. $BF_3, PCl_5, SF_4, SnCl_2, NO_2$

Classification of Bonds

(On the basis of bond energy)

Types of Bonds

Chemical Bond

1. Ionic Bond
2. Covalent Bond
3. Co–ordinate Bond
4. Metallic Bond

Force of attraction

Hydrogen Bond

1. Inter–molecular Hydrogen Bond
2. intra–molecular Hydrogen Bond

Vander Waal's Bond

1. Dipole – Dipole Interaction
2. Dipole – Induced Dipole Interaction
3. Instantaneous dipole – Induced dipole Interaction

Other Interaction

1. Ion –Dipole Interaction
2. Ion – Induced Dipole Interaction

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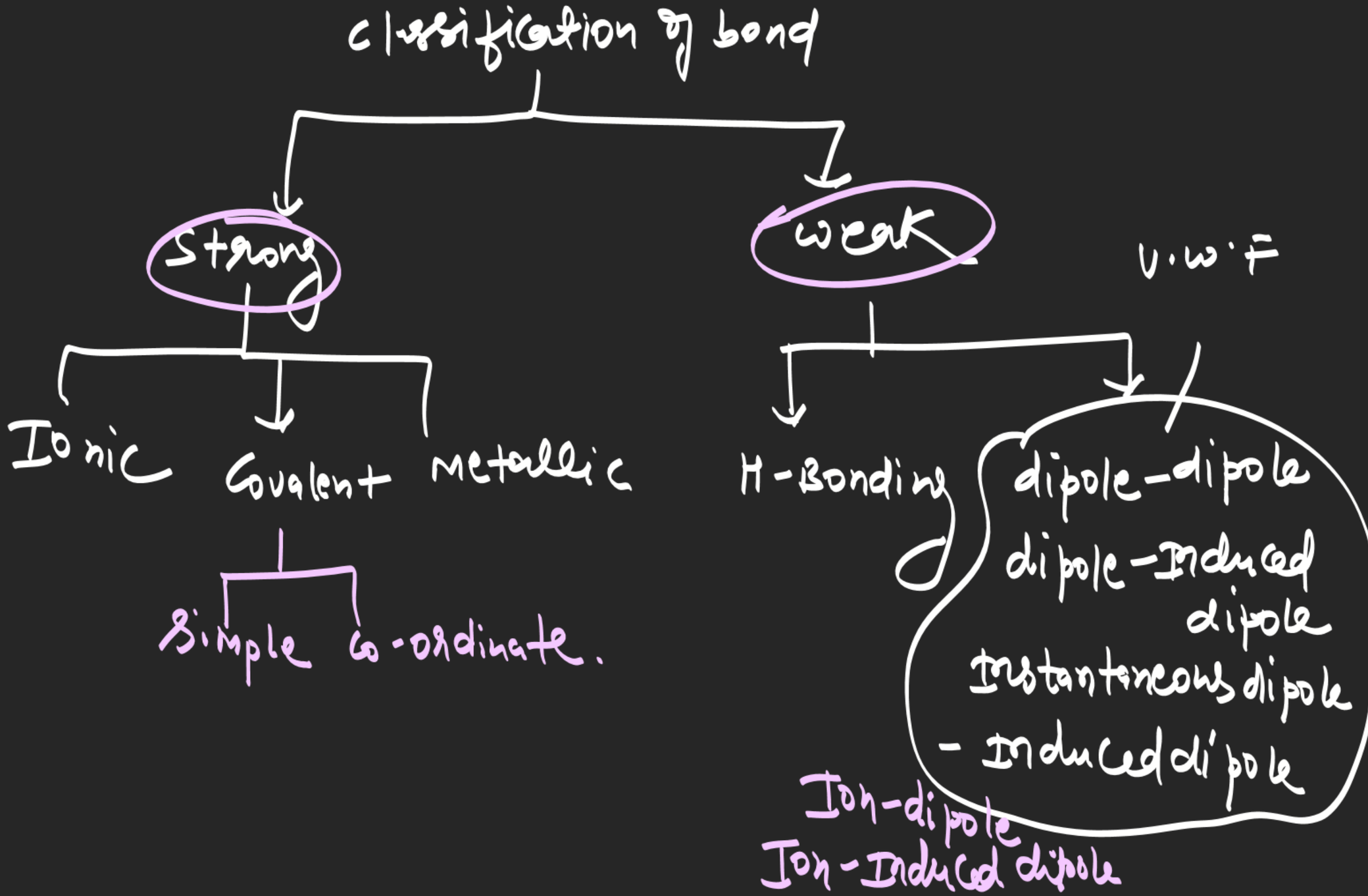
classification of bond



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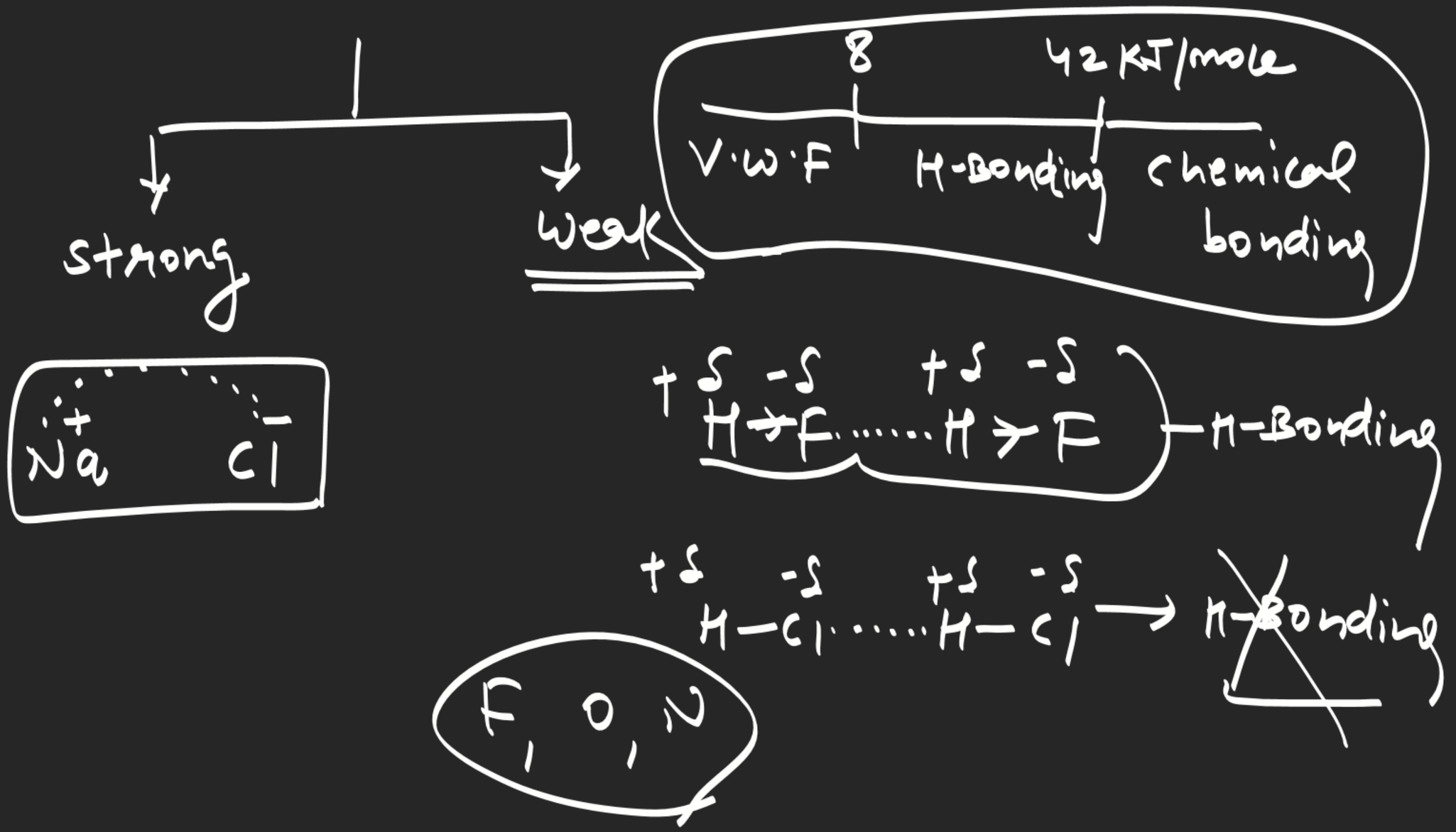


Que Which of the following is not Hypo valent

① $AlCl_3$

② $AlBr_3$

③ AlI_3

④ AlF_3

$AlF_3 \rightarrow Al^{+3} + F^{(-)}$

$1s^2 2s^2 2p^1$

Hypo valent ⇒ molecule in which less than 8 e⁻

Types → Molecule in which More than 8 e⁻

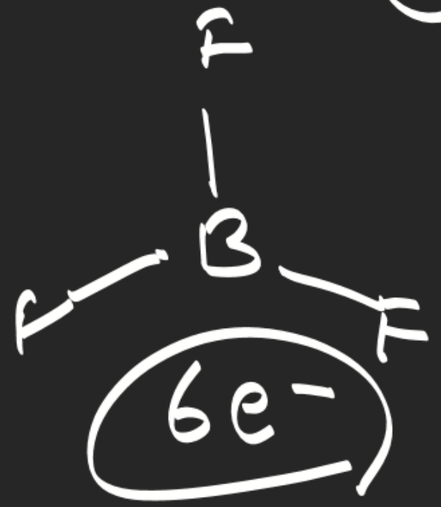
Ans Which of the following is lewis acid

① CH_4

② $SiCl_4$

③ BF_3

④ H_2O



Lewis acid →

l.p accepting specie is called Lewis acid

L.B → l.p donating species

Q find the number of lewis base Compound

BF_3 H_2O NH_3 CH_4 B_2H_6 $R\ddot{O}H$

(3)

find no. odd e- molecule

NO_2 NH_3 H_2O NO O_2^- ClO_2 ClO_3

https://t.me/vjsiroffcial

total number of e^-

NO_2 $7+16$

NO $= 7+8$

ClO_2 $= 17+8\times2$

ClO_3^- $= 17+8\times3$

O_2^{2-} $= 8+8+1$

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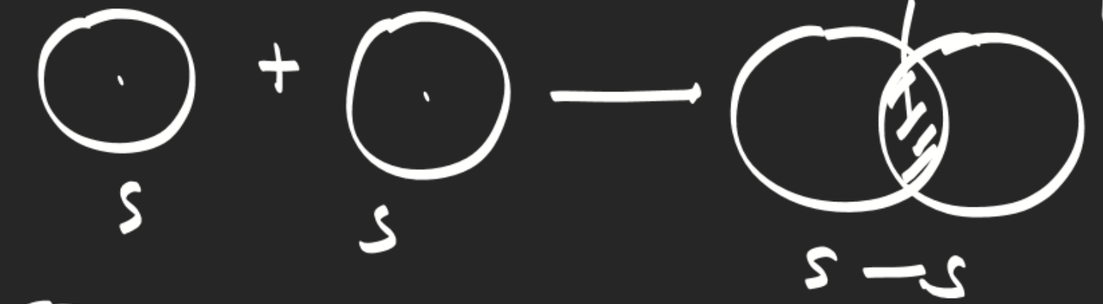
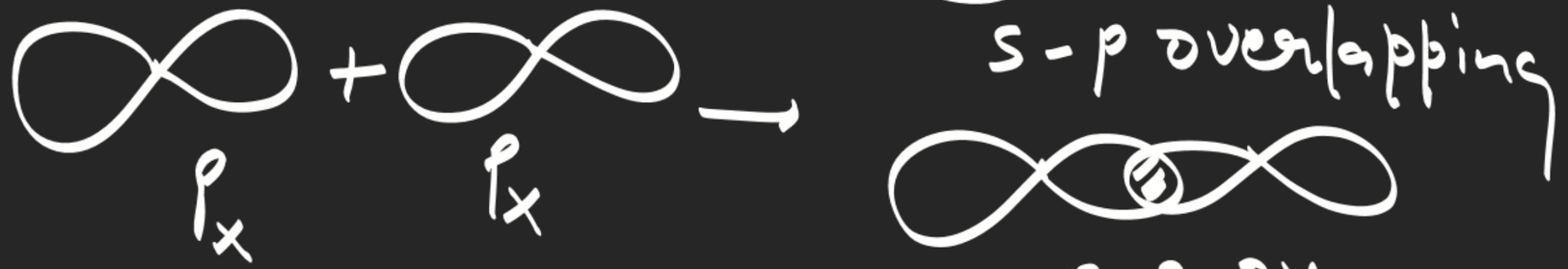
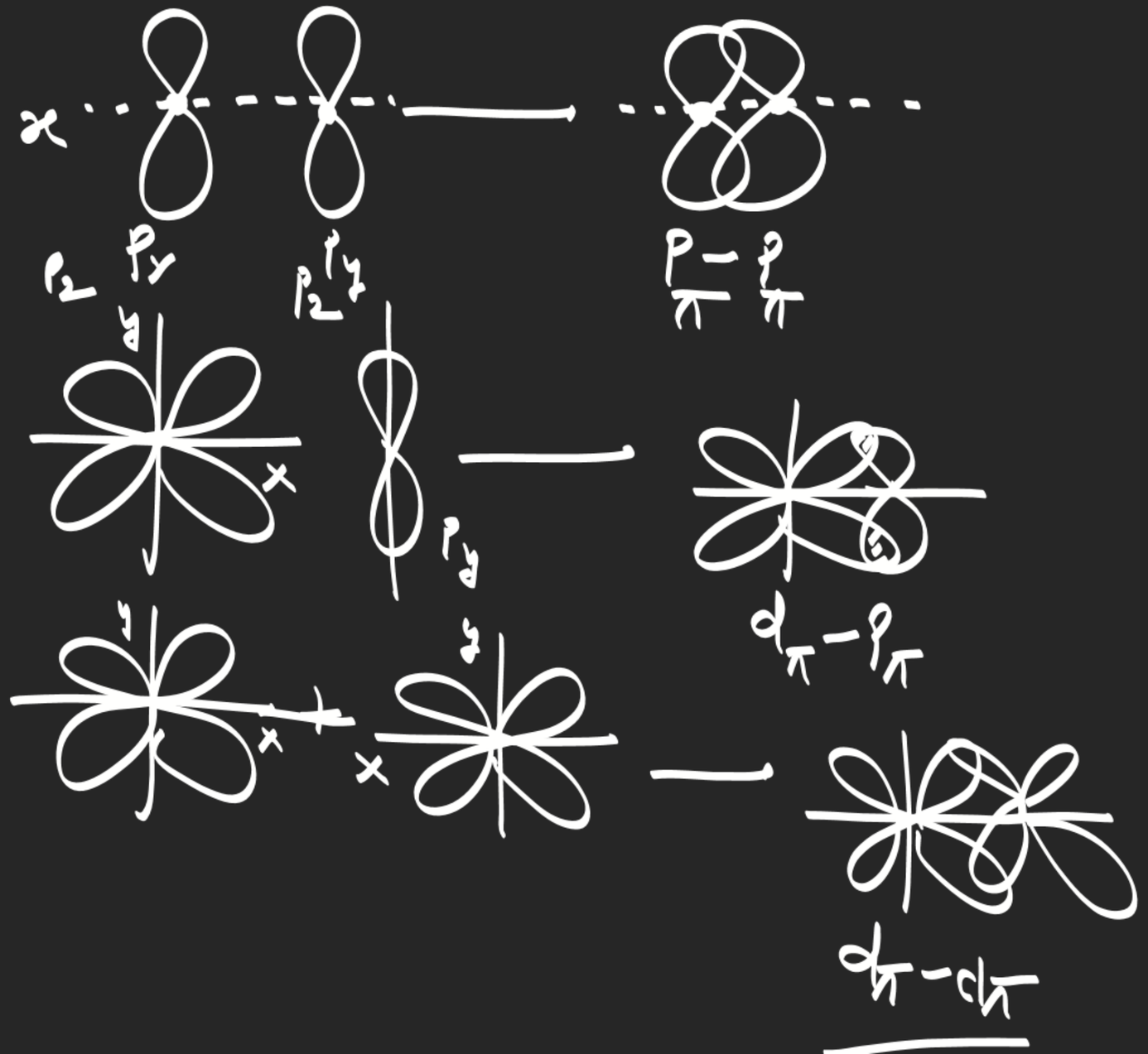
V.B.T — overlapping { axial, sideways

Internuclear axis X axial

overlapping area







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if internuclear axis $= x$

$s - s \rightarrow \sigma$

$s - p_x \rightarrow \sigma$

$s - p_y \rightarrow x$

$s - p_z \rightarrow x$

$p_x + p_y \rightarrow x$

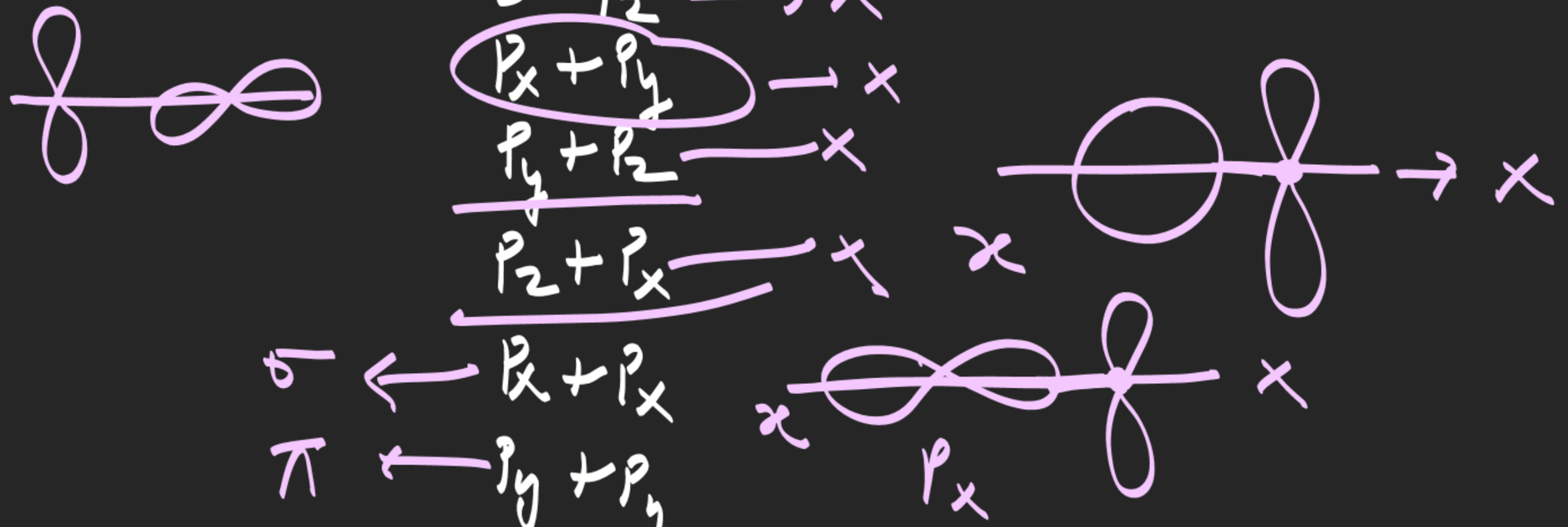
$p_y + p_z \rightarrow x$

$p_z + p_x \rightarrow x$

$\sigma \leftarrow p_x + p_x$

$\pi \leftarrow p_y + p_y$

$\pi \leftarrow p_z + p_z$



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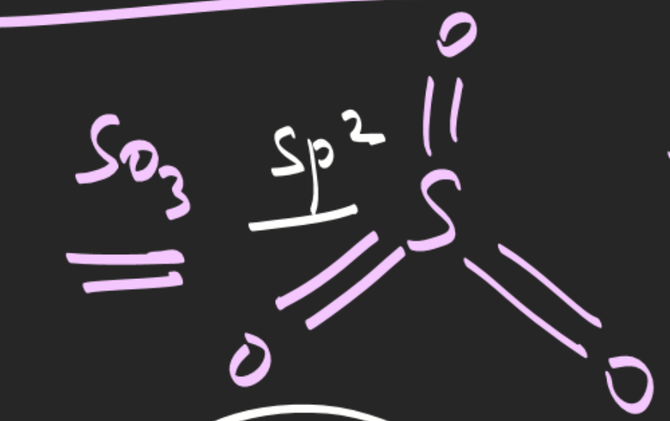
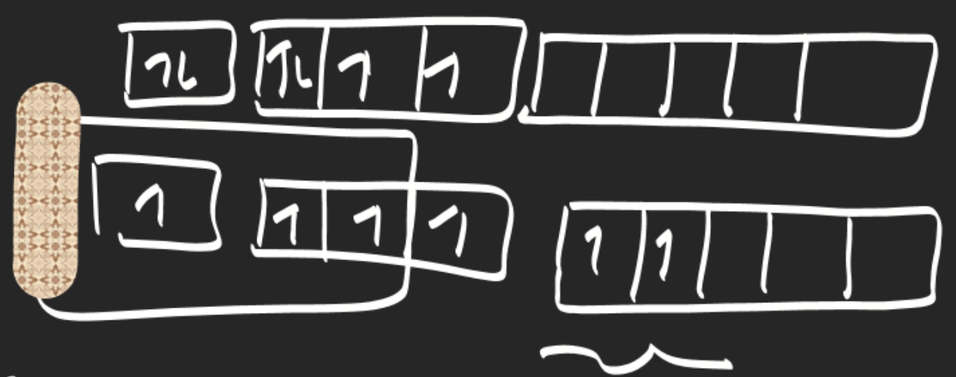
eg Find the number of $d_\pi - p_\pi$ bond

ClO_3^-

SO_3 sp^2



S = $3s^2 3p^4$ 3d



$p_\pi - p_\pi$ = one

two $d_\pi - p_\pi$ =

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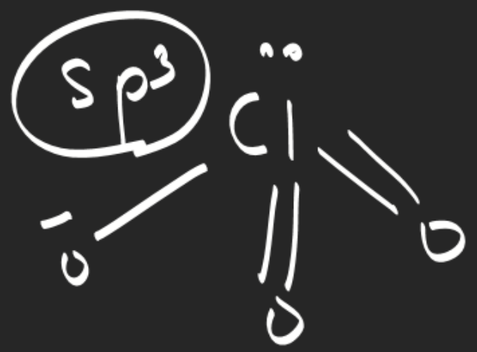
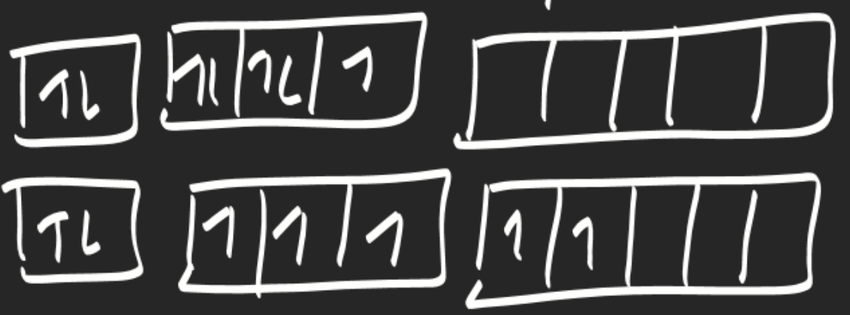
ClO_3^-



two → $d_\pi - p_\pi$

Cl = $3s^2$ $3p^5$ $3d$



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