~~Combine (a)~~

Combine sheet-(3)

Atomic structure

electronic configuration

Quantum numbers

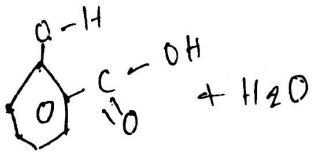
* Ionic ~~co-valent~~ } Fajans rule
* co-valent
* coordination

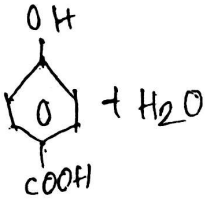
(I) Hybridization

(II) MOT → Molicular orbital Theory

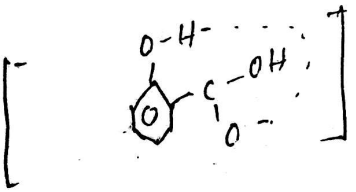
* HF, HCl, HBr, HI

$HI \rightleftharpoons H^+ + I^-$ (stable) Dilocalization high.





Asitidy low.



Asitidy high. stable high

CH_4
NH_3
H_2O
HF
} boiling point

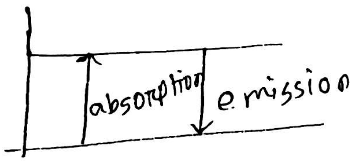
2

small size and এর অত্যধিক তড়িৎঋণাত্মকতা বেশি আছে।
H_2O এর H-বন্ধন ৪টা। যদিও তড়িৎঋণাত্মকতা C_2 এর কম। সেই জন্যর কারণে এটার boiling point বেশি। HF এ H-bond 2টা থাকে। তাই তার boiling point কম।

2

Atomic structure

Ground state → energy minimum, very stable



excitation state.

→ 1টা e^- ঘোরার সময় 2টা Force কাজ করে।

(1) Electrostatic force of attraction $F_A = \frac{1}{4\pi\epsilon_0}\frac{e^2}{r^2}$ —(i)

(2) centrifugal force $F_c = \frac{mv^2}{r}$ —(ii)

C.G.S - unit —

$F_A = F_c$

$\Rightarrow \frac{e^2}{r^2} = \frac{mv^2}{r}$

$\Rightarrow \frac{e^2}{r} = mv^2$

$\Rightarrow v^2 = \frac{e^2}{mr}$

i = e

do
{
while (-1)
}

$$\therefore mvr = \frac{nh}{2\pi} \Rightarrow v = \frac{nh}{2\pi mr}$$

$$\Rightarrow v^2 = \frac{n^2h^2}{4\pi^2 m^2 r^2} \quad \text{---} (iv)$$

$$\therefore r = \frac{n^2h^2}{4\pi^2 me^2} \quad \text{---} (v)$$

$$r_n = \frac{n^2h^2}{4\pi^2 me^2}$$

$$r_1 = \frac{h^2}{4\pi^2 me^2}$$

$$r_n = r_1 \times n^2$$

$r_1 = .532$ Å Bohr's radius

→ NaCl

$Na^+ + Cl^- \rightarrow$ electrostatic force of attraction

$U = \frac{1}{r_0}$

↓

lattis energy

H_2O এর চেয়ে সোলাবিলিটি 4 গুণ বেশি অর্থ- দ্রবীভূত হয়না।

$Cu^{2+}SO_4 \rightarrow$ is ~~Colo~~ color $Zn^{2+}SO_4$ is color less

$Sc^{3+} \rightarrow$ is colorless $Cu^{2+}SO_4$ " color

5

$$\frac{1}{4\pi\epsilon_0}\frac{e^2}{r^2} = \frac{mv^2}{r}$$

$$\Rightarrow \frac{1}{4\pi\epsilon_0}\frac{e^2}{r} = mv^2$$

$$\Rightarrow v^2 = \frac{e^2}{4\pi\epsilon_0 mr} \quad \text{---(I)}$$

$$mvr = \frac{nh}{2\pi}$$

$$v = \frac{nh}{2\pi mr}$$

$$\Rightarrow v^2 = \frac{n^2h^2}{4\pi^2m^2r^2} \quad \text{---(II)}$$

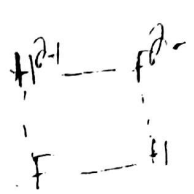
$$\frac{n^2h^2}{4\pi^2m^2r^2} = \frac{e^2}{4\pi\epsilon_0 mr}$$

$$\Rightarrow \frac{n^2h^2}{4\pi^2mr^2} = \frac{e^2}{4\pi\epsilon_0 mr}$$

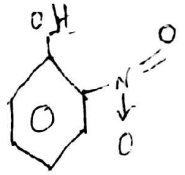
$$\Rightarrow \frac{n^2h^2}{\pi mr} = \frac{e^2}{\epsilon_0}$$

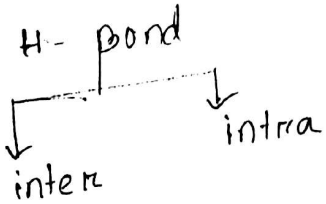
$$\Rightarrow \pi mre^2 = \epsilon_0 h^2 n^2$$

$$\therefore r = \frac{\epsilon_0 h^2 n^2}{\pi me^2}$$



Dipoi / ডাইপোল





effect — (I) solubility

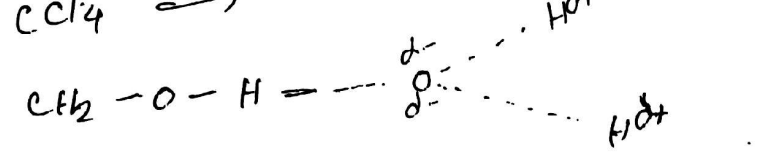
(II) m.p → matric point

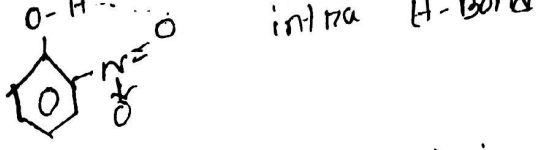
(III) Viscosity

(IV) strength of acid

C_2H_5OH → H_2O -এ soluble

CCl_4 → x





intra H-Bond

inter এর boiling, matric point as well as high.

(II) matric point

Factors that affect the strength of H-Bond matric point and boiling point high.

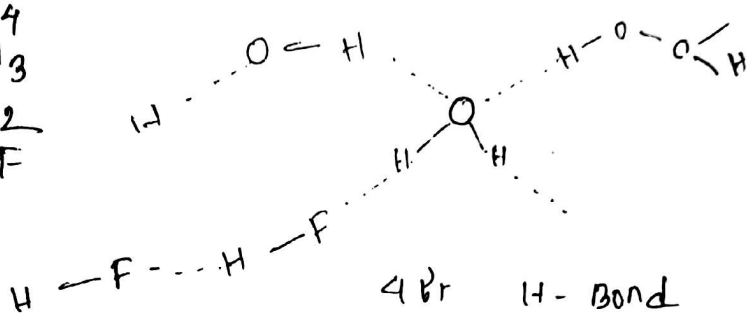
৬

Depending on 2 factors.
যে element এ এগুলো থাকে-

1. electro negativity should be higher.
2. size should be small

compound যে পদার্থ- H- বন্ধন বেশি তার ফুটনাঙ্ক 3 রকমের।

CH_4
NH_3
OH_2
HF



H — F ··· H — F

এর H- Bond melting point high.

(iii) Viscosity

H_3PO_4
H_2SO_4 Pete compound যেগুলোর H - Bond high?

→ H - Bond কারণে। depending on proton.

$$H_2O + HCl \longrightarrow [H_3O^+] + [Cl^-]$$

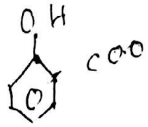
হাইড্রোনিয়াম আয়ন

(iv) Acidity —

HF
HCl
HBr
HF → high
$H^+ + I^-$ → conjugate base (weak)

* effect of H-Bond on the strength of organic acid

- COOH



2 - Hydroxy - Benzoic acid

conjugate base weak, intra H-bond এর Acidity High.

* Energy of an electron in various orbit in H-atom.

$K.E = \frac{1}{2}mv^2$

$P.E = \frac{-e^2}{r}$

$\therefore E = K.E + P.E$

$= \frac{1}{2}mv^2 - \frac{e^2}{r}$ ——(I)

* $f_A = \frac{e^2}{r^2}$ ——(II)

$f_C = \frac{mv^2}{r}$ ——(III)

* According to Bohr

$f_A = f_C$

$$\frac{e^2}{r^2} = \frac{mv^2}{r}$$

$$\frac{\pi e^2}{r^2} = mv^2$$

$$\frac{e^2}{r} = mv^2 \quad \text{---(1)}$$

$$\therefore E = \frac{1}{2}\frac{e^2}{r} - \frac{e^2}{r} \quad \text{---(A)},$$

$$= -\frac{1}{2}\frac{e^2}{r}$$

As from H. atom

$$r = \frac{h^2 n^2}{4\pi^2 me^2}$$

$$\therefore E = -\frac{1}{2} \cdot e^2 \frac{4\pi^2 e^2 m}{h^2 n^2}$$

$$E_n = -\frac{2\pi^2 e^4 m}{n^2 h^2}$$

if E_n is the energy of the n orbit of atom the n $E_n = -\frac{2\pi^2 me^4}{n^2 h^2}$

$E_1 = ?$

$E_2 = ?$ H. W

Question (1)

(1) Write down the postulates of Bohr atomic model.

(2) Limitations of Bohr atomic model.

(3) What do you understand by quantum numbers?

(4) How many quantum number has an electron in an orbital? Name and explain them.

(5) explain the significance of each quantum numbers. How they related to each other?

(6) Write short notes on the followings:

(i) Aufbau principle

(ii) Hund's rule

(iii) Pauli's exclusion principle.

(7) Derive and expression for the energy of an electron in the n^{th} orbit of H-atom.

(8) Derive and expression for the radius of an electron in the n^{th} orbit of H-atom.

2 question

(1) Define the quantum numbers write down their significant.

(ii) Find out the four quantum numbers of 11^{th} electron of Na-atom - 3.

p

$n = 3$

$l = 0, 1, 2$

4

Find out the four value of four Quantam number of (I) 15th electron of P

(II) 11th electron of Na

(III) 12th electron of Mg

(IV) 15th electron of Cl

(V) third shell of P(15) atom.

$Na = 1s^2 2s^2 2p^6 3s^1$

$n = 3$
$l = 0, 1, 2$
$m = 0, \pm 1, \pm 3$
$s = \pm \frac{1}{2}$

$n = 3$
$l = 0$
$m = 0$
$s = -\frac{1}{2}$

(IV) $Cl \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^5$

$= 1s^2 2s^2 2p^6 3s^2 3p_x^2 3p_y^2 3p_z^1 \rightarrow 15^{th}, e^-$

$n = 3$
$l = 0, 1, 2$
$m = 0, \pm 1, \pm 2$
$s = \pm \frac{1}{2}$

$+1, \quad 0, \quad -1$.
$p_x^1 \quad p_y^1 \quad p_z^1$

Cl এর জন্য: $n = 3$, $l = 1$, $m = -1$, $s = +\frac{1}{2}$

$+$ l $\begin{cases} +1 \\ 0 \\ -1 \end{cases}$

+1	0	-1
⇅	⇅	↑

অথবা $-1, 0, +1$

অথবা $0, -1, +1$.

Mg ⇒ $1s^2 2s^2 2p^6 3s^2$

$n = 3$

$l = 0, 1, 2,$

$m = 0, \pm 1, \pm 2$

$s = \pm \frac{1}{2}$

$n = 3$

$l = 0$

$m = 0$

$s = -\frac{1}{2}$

∴ 17 – 15 পর্যন্ত যে কোনো একটি exam এ আসবে।

(i) Define Hybridization –

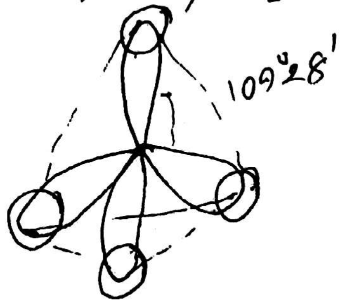
(ii) The required for Hybridization

(iii) Classification of Hybridization.

C = $1s^2 2s^2 2p^2$

C* : $1s^2 2s^1 2p_x^1 2p_y^1 2p_z^1$

sp^3



The phenomenon of mixing up of orbitals of an atom of nearly equal energy giving raise entirely new orbitals equal in numbers to the mixing orbitals and having same energy contains an identical shape.

for hybridization :-

(i) Orbitals on a single atom only would undergo hybridization.

(ii) There are should be very little difference of energy levels between the orbitals mixing to form hybrid orbitals.

(iii) Number of Hybrid orbitals generated is equal to number of Hybridizing orbitals.

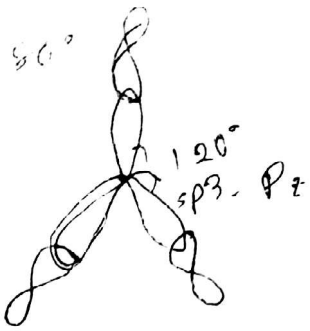
(iv) The hybrid orbitals assume the direction of the ~~demon~~ domenating orbitals.

(v) It is the orbitals that undergoes Hybridizatio and not the electrons.

(vi) The electron in hybrid orbitals repel each other, and thus trend to be furthest apart.

$BeCl_2$ ⟶ sp — 180°

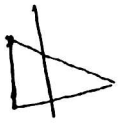
BF_3 ⟶ sp^2



CH_4
NH_3
H_2O } sp^3

arrange the following hybrides in order to there increasing of bond angles CH_4, NH_3 H_2O and explain the trend.

dsp^2 ⟶ square planner ⟶ $[Ni(CN)_4]^{2-}$

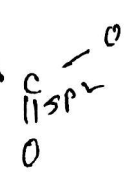
sp^3d ⟶ 

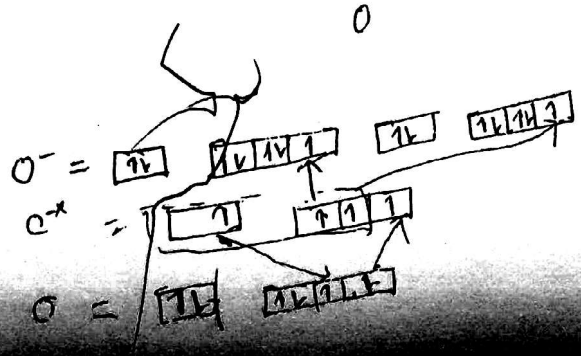
sp^3d^2 ⟶ octagonal

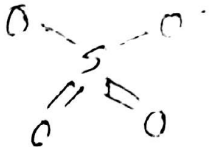
sp^3d^3 ⟶ Pentagonal or IF_7 } ×

(i) SF_6 (ii) PCl_5 (iii) SiF_6^{2-} (iv) PF_6^-

* CO_3^{2-}

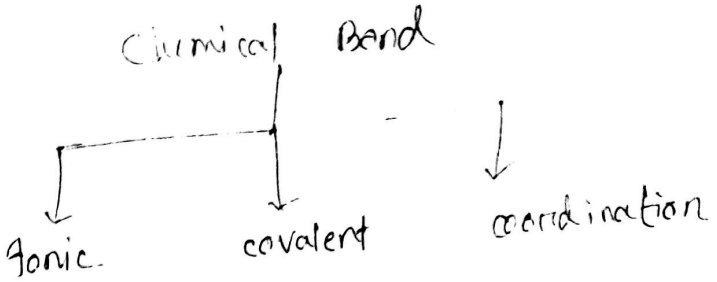




की SO_4^{2-} 

H.W

" SiF_6^{2-}, ClF_3, PCl_5, SF_6,



Question:-

1. Ionic solids are brittle.
2. NaCl does not conduct electricity in solid state.
3. NaCl is ~~soluab~~ soluble in water.

Thermal stability } $BeCO_3$, $MgCO_3$, $CaCO_3$, $SrCO_3$, $BaCO_3$. which are thermal stability is big.)
solubility

Matalic Bond:-

Question:-

1. metals are good conductor of electricity.
2. " " " heat.
3. Explain matalic bond.

Question:- classify the elements with the help of electronic configuration.

Periodicity of elements:

1. What do you understand by periodicity?
2. left to right atomic radius – ex: (Na, Na$^+$, Cl, Cl$^-$)
3. electron affinity of F is less than Cl.

Compare the ionization potential between N and O.

) Al^{3+}, Cr, Ag, As, Ba, La
electronic configuration.

The last electron of K (19) enters in 4s orbital instead of 3rd orbital.

The last 2 electrons of Ca (20) enter the 4s orbital. Explain it.

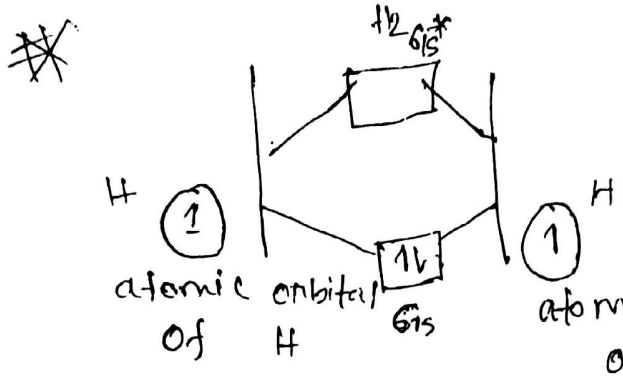
(1)

MOT Molecular Orbital Theory

e- প্রবেশ করবে নিচ থেকে

* = anty bonding
b = bonding

σ_{1s}^{b} σ_{1s}^{*} $\pi_y = \pi_z$ $\sigma 2p_x$ $\pi y^* = \pi z^*$



bond order = $\frac{2-0}{2} = 1$ H - H

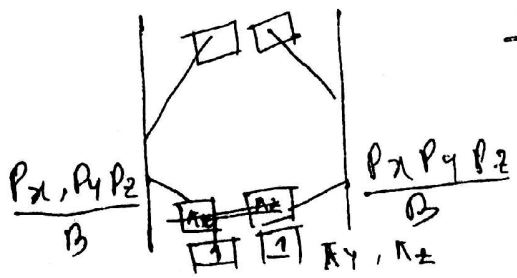
This is exist

H+ এর 6 bond = $\frac{1}{2}$ This is not exist

He এর ক্ষেত্রে, $\frac{2-2}{2} = 0$

Di- He does not exist

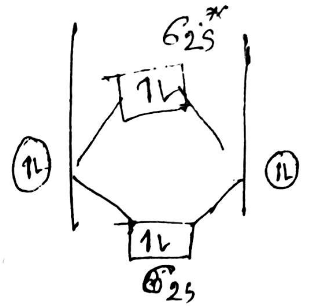
B = $1s^2 2s^2 2p_x^1$



$\frac{2-0}{2} = 1$ B-B

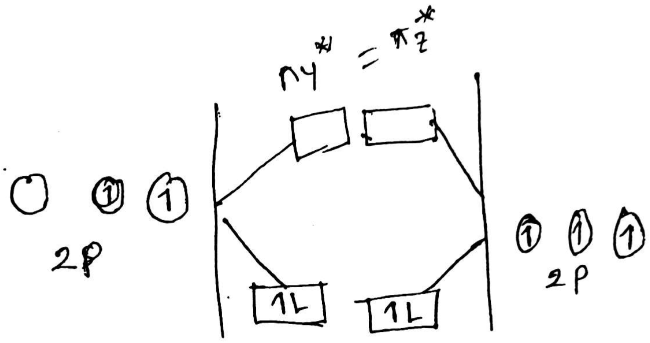
1 non pair electron
তাই Paramagnetic

B - এর 2s এর ক্ষেত্রে



Bond pair = 0.

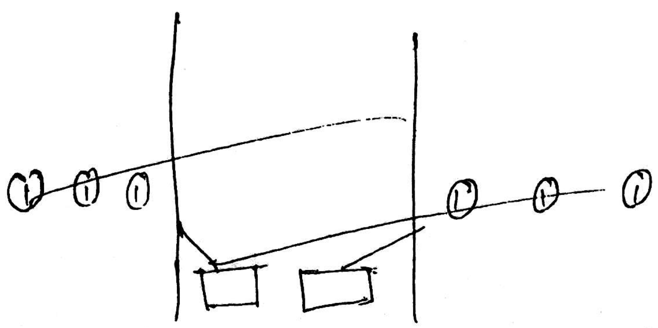
* C - এর ক্ষেত্রে,

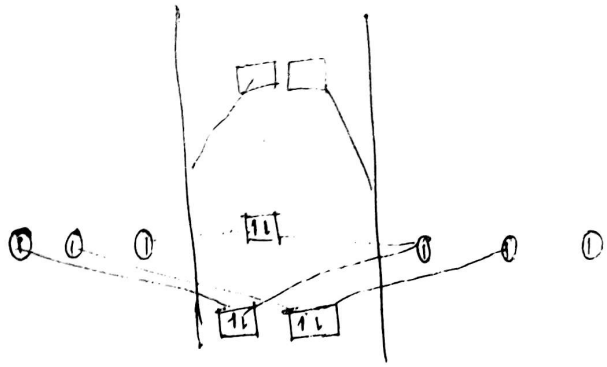


Bond pair = $\frac{4-0}{2} = 2$

Dimagnatic.

* N - এর ক্ষেত্রে,



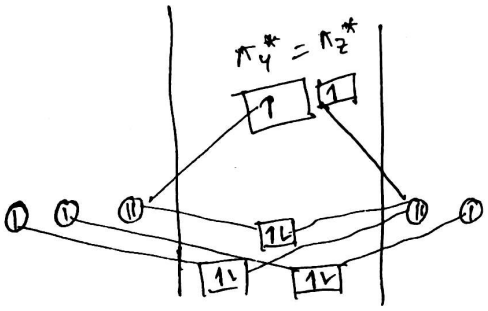


∴ bond pair = $\frac{6-0}{2} = 3$.

$N \equiv N$

Dimagnatic

* O_2 এর ক্ষেত্রে.

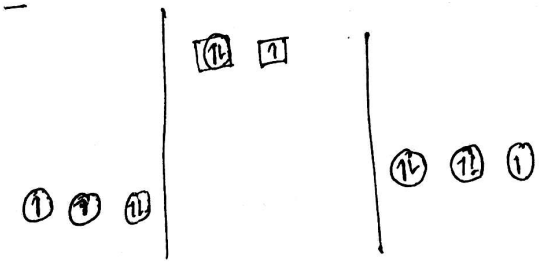


$\frac{6-2}{2}$

$O = 2$ $O=O$

paramagnatic

* O^-



$O_2^- = 1.5$ paramagnetic

C_2^{2-} = 1 bond pair Diamagnetic

Question:

(I) CO Bond pair

(II) Bond energy of He^{2+} is 57 kcal/mol. But in case of H_2 103 kcal/mole compare bond order. Number of electron in bond - Number of electron anty bond divided by 2.

(III) N_2 is diamagnetic but O_2 Paramagnetic explain it.

(IV) Di-atomic Be_2 does not exist explain why? on the basis of MOT.

(V.I) (V) Write down the difference between bonding and anty-bonding orbitals

(vi) Half what do you mean radio activity write down its SI unit.

D-block chapter

Question:

① What are d block elements? Write down their position in periodic table.

② Why are d block elements called transition elements?

③ Write down the electronic configur of 1st and 2nd series of d-block elements.

④ Metaric and boiling point-

⑤ $Zn = 419.5^\circ C$
$Cd = 320.9^\circ C$
$Hg = -38.4^\circ C$
$Cu = 108^\circ C$
$Ni = 1453^\circ C$

⑤ Metaric point of Cu or Au > Ag is greater

-lhan of si Hg

Ionization potential

Question :-

(1) The values of sc → cr differ very slidely. The values power for fe, co, Ni to one and cu are fainly very closed another.