CHAPTER SEVEN OBJECTIVES

- TO UNDERSTAND HOW THE FOLLOWING VARY IN A PERIODIC TREND
- USE IE, EA, AND AR. TO PREDICT AND EXPLAIN CHEMICAL BEHAVIOR

- EFFECTIVE NUCLEAR CHARGE
- ATOMIC/IONIC RADIUS
- IONIZATION ENERGY
- ELECTRON AFFINITY

CHAPTER EIGHT

WHAT IS/ARE ?

LATTICE ENERGY ?
FORMAL CHARGE ?
ELECTRONEGATIVITY ?

BOND POLARITY ?
COVALENT BONDS ?
LEWIS STRUCTURES ?
RESONANCE ?
BOND ENTHALPIES ?

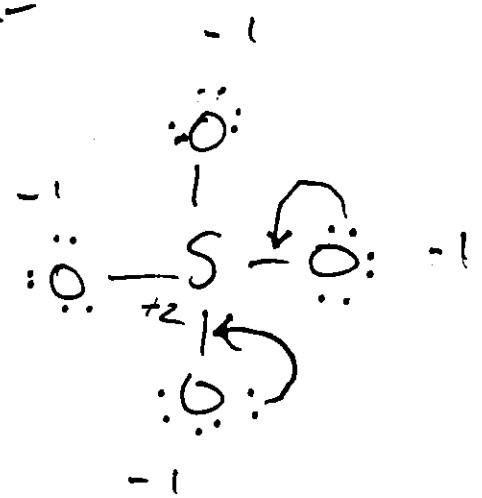
Cl_2

NaCl
0.9 3
$\Delta EN = 2.1$

H–Cl
2.1 – 3
$\Delta EN = 0.9$

Cl–Cl
3–3
$\Delta EN = 0$

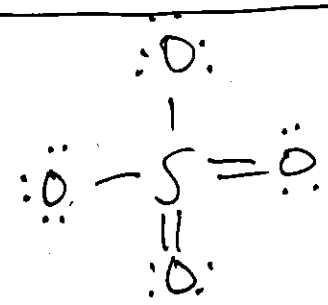
SO_4^{2-}



VE = 32
8
24
-24
0

5/5 – FC ≠ 0

$FC = 6 - \left[\frac{1}{2}(8) + 0\right]$
$= +2$

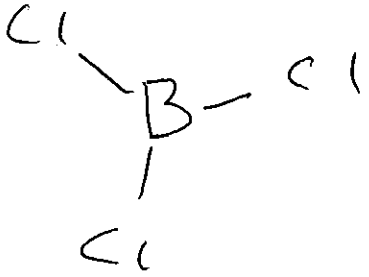


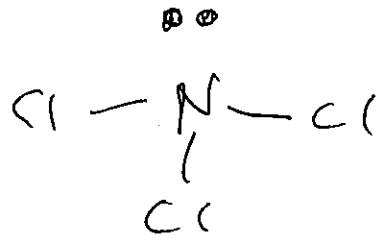
3 2/5 – FC ≠ 0

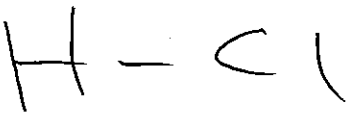
$FC = 6 - \left[\frac{1}{2}(12) + 0\right]$
$FC = 0$

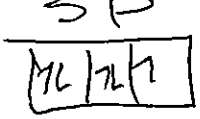
AB_3 AB_3E

BCl_3 NCl_3

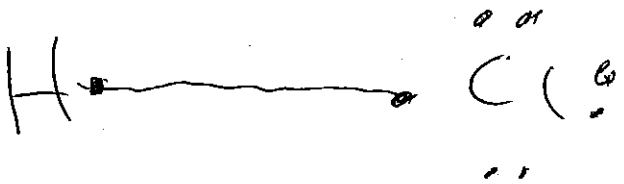


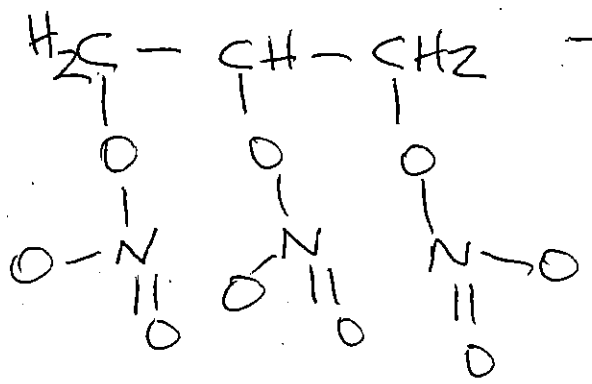






HF
HCl
HBr
HI



4  $\longrightarrow 6N_2 + 12CO_2 + 10H_2O + O_2$

BONDS BROKEN PER MOLECULE

2	C-C	348
5	C-H	413
3	C-O	358
3	N=O	607
6	N-O	201
		6862

× 4 moles

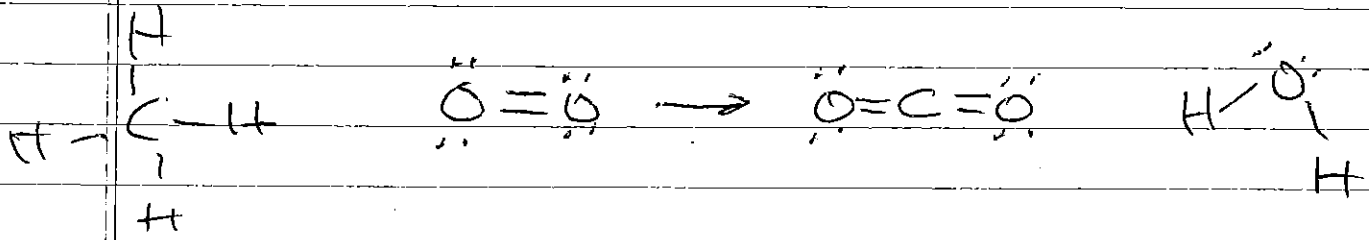
27,448

BONDS FORMED

6	N≡N	(941)
24	C=O	(799)
20	O-H	(463)
1	O=O	(495)
		34577

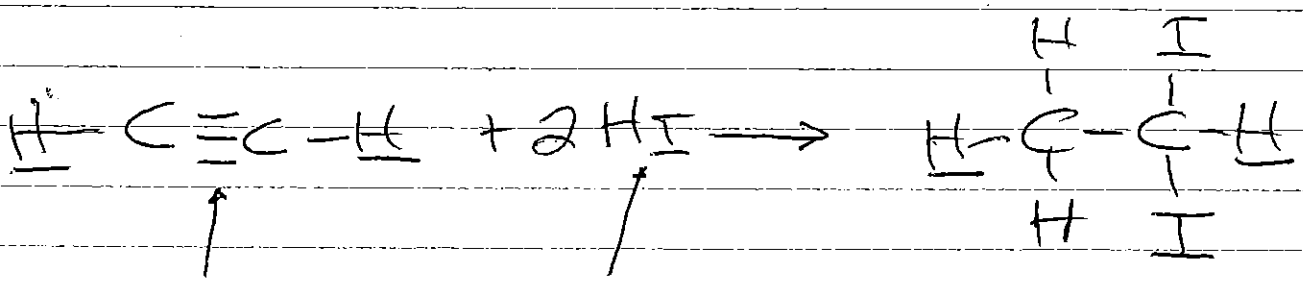
$\Delta H = -7,129$ KJ

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$



C-H 413
O=O 495
C=O 799
O-H 463

$\Delta H_{RXN} = -808$

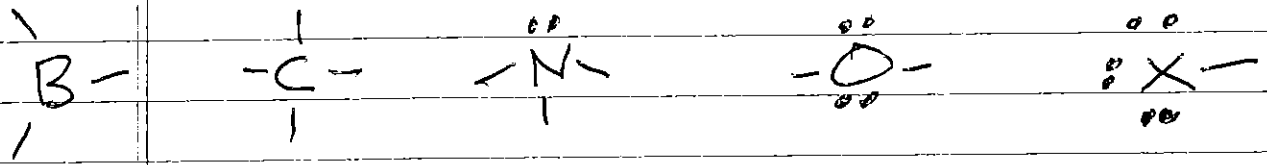


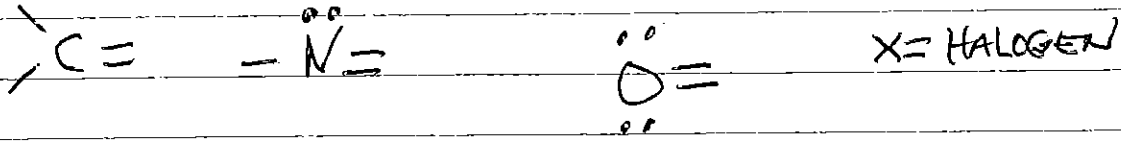
C≡C 839
C-C 348
H-I 299
C-I 240
C-H 413

839
299
~~299~~
1437

2(413) 826
2(240) 480
1306
~~348~~
1654

COMMON BONDING PATTERNS FOR ZERO FORMAL CHARGE





X = HALOGEN

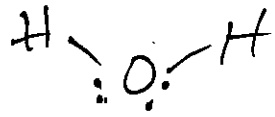
PREDICTING ΔH OF REACTION FROM BOND ENTHALPIES

$$\Delta H_{RXN} = \sum \text{BONDS BROKEN} - \sum \text{BONDS FORMED}$$

VE = 7

3p ↑↓ | 3s ↑↓

H_2O

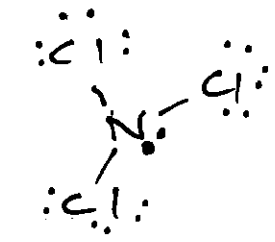


VE = 8
- 4
4

$$FC = VE - [\tfrac{1}{2}BE + NBE]$$
$$6 - [\tfrac{1}{2}(4) + 4]$$

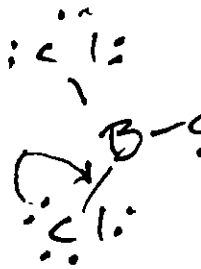
NCl_3

26
-6
20
18
2
-2
0



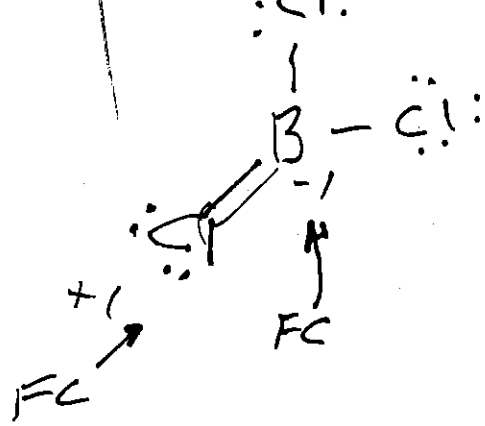
OCTETS ✓
All FC = 0 ✓

BCl_3



24
-6
18
-18
0

All FC = 0
B < 8 e



OCTETS ✓

CHAPTER NINE

- HYBRIDIZATION REVIEW
- SIGMA VS. Pi
- BONDING VS. ANTIBONDING

CO_2

44 g/mole

BP = -78°C

H_2O SOL. = SLIGHT

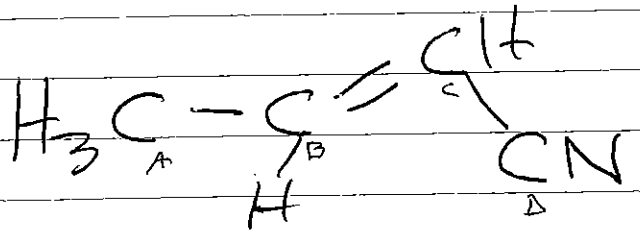
O=C=O

HCOOH

46 g/mole

BP = 101°C

H_2O SOL. = INFINITE



SINGLE	7
DOUBLE	1
TRIPLE	1

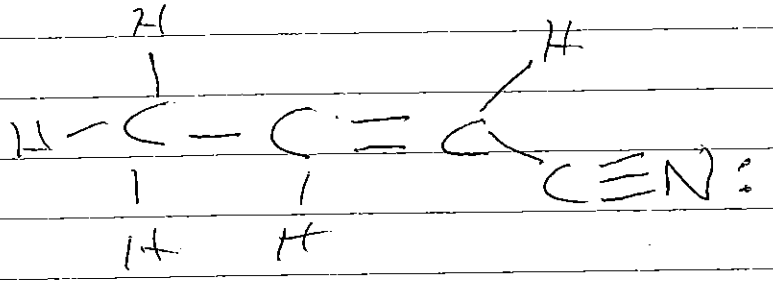
HYBRID

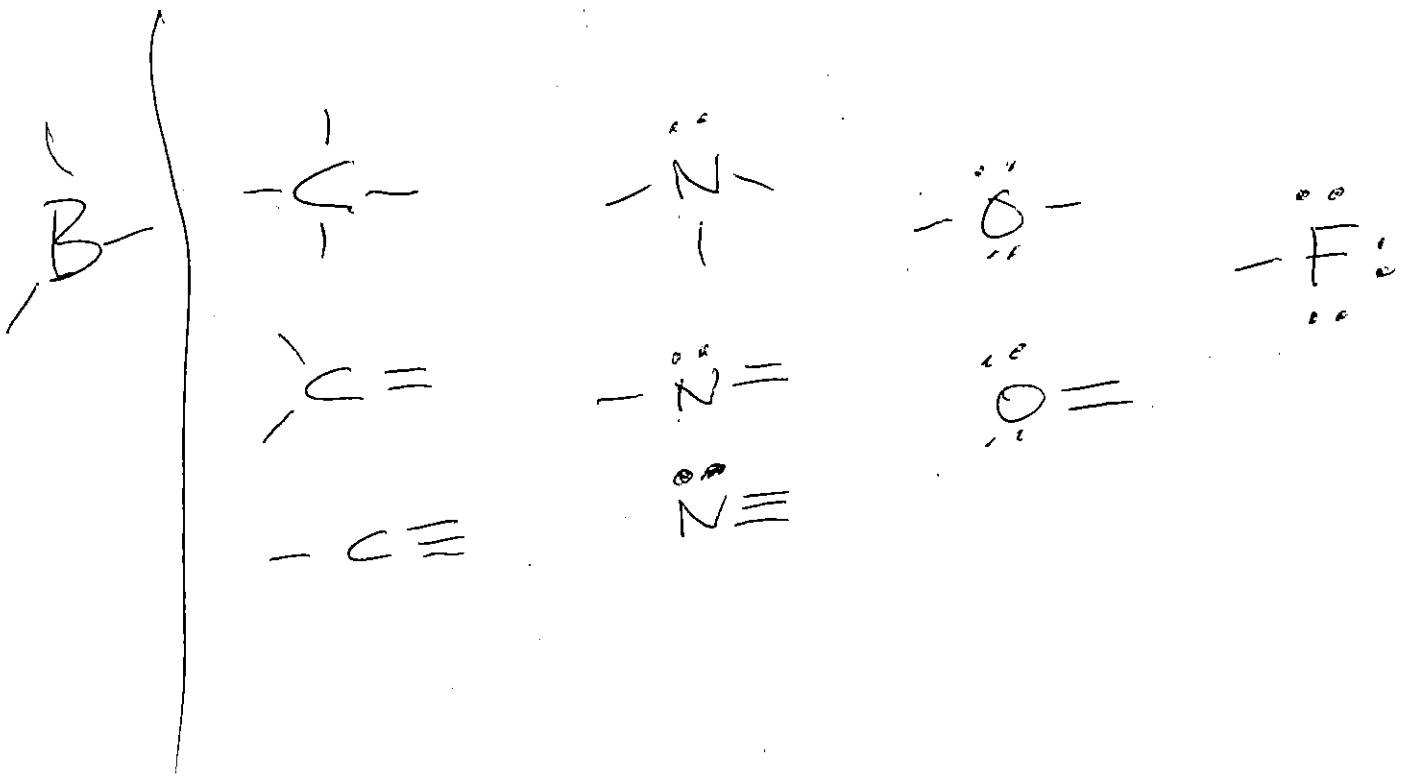
C_A ——

C_B ——

C_C ——

C_D ——





- PICTURING HYBRID ORBITALS
- BONDING IN BENZENE
- M.O. THEORY

  SIGMA VS PI

  BONDING VS ANTI BONDING

  CALCULATING BOND ORDER

POLARITY TRENDS FOR DIATOMICS / 3+ ATOMS ETC.

NEVER POLAR

XX

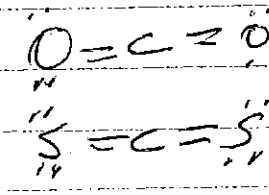
H_2 Cl_2
O_2 Br_2
N_2 F_2

ALWAYS POLAR

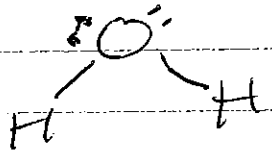
XY

H-Cl :C≡O:
H-F ⊖
H-Br C≡N
H-I

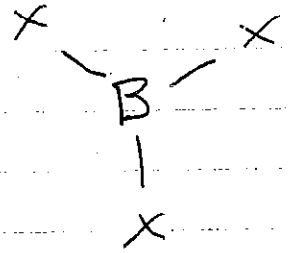
AB_2 LINEAR



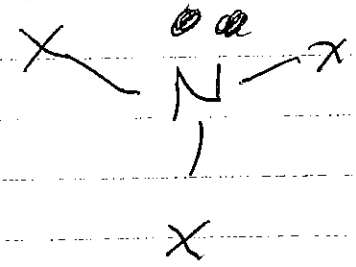
AB_2E_2 BENT



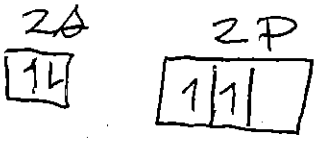
AB_3 TRIG PLANAR



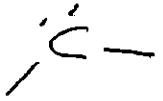
AB_3E TRIG PYRAM.



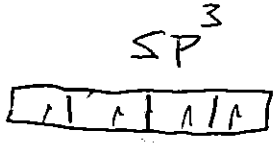
CARBON HYBRIDIZATION



CARBON IS NOT



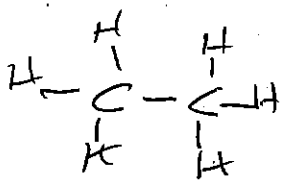
3 DIFFERENT BLENDS OF ORBITALS

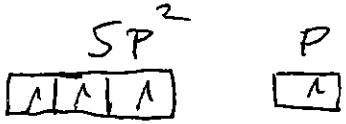


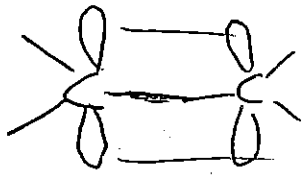
4 SINGLE BONDS

109.5°

TETRAHEDRAL



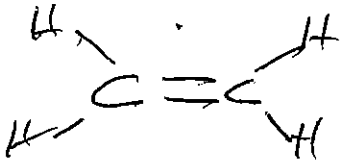


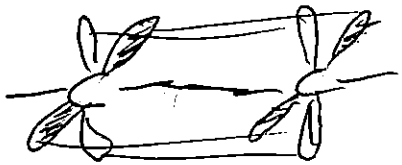


2 SINGLE
1 DOUBLE

120°

TRIGONAL PLANAR

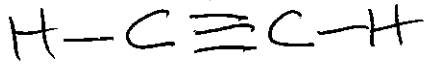




1 SINGLE
1 TRIPLE

180°

LINEAR



WHAT IS/ARE ??

VSEPR

& DOMAINS

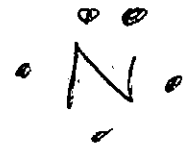
MOLECULAR GEOMETRY

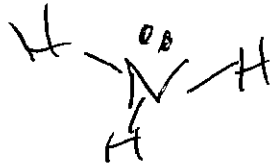
CARBON HYBRIDIZATION

SIGMA BONDS

Pi BONDS

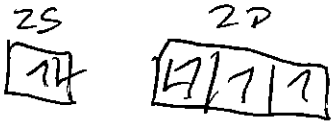
N

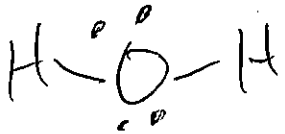




NH_3

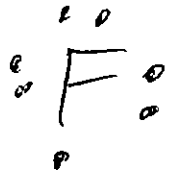
O

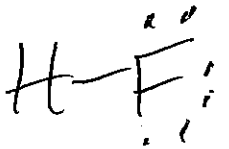




H_2O

F





HF