

LEC (3)

CHEM 30A

Oct 6th

(1)

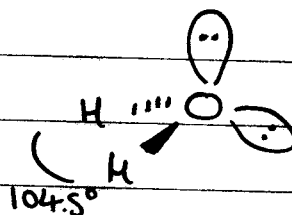
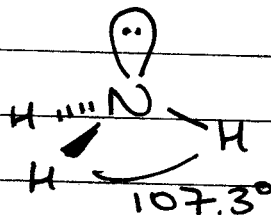
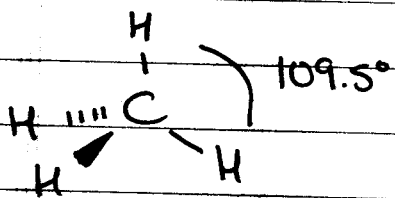
- ① SHAPES OF MOLECULES
- ② DRAWING ORGANIC STRUCTURES
- ③ RESONANCE

HMK Problems 1.15 - 1.17
1.50 - 1.54

Read the rest of Chapter 1

① SHAPES OF MOLECULES

- PAIRS OF ELECTRONS IN VALENCE SHELL
BONDED & NON-BONDED



TETRAHEDRAL

PYRAMIDAL

BENT

BUT: GEOMETRY AROUND C, N, O IS
STILL DESCRIBED AS TETRAHEDRAL

REPULSION NB-NB > NB-B > B-B

of e⁻ pairs

②

2 LINEAR

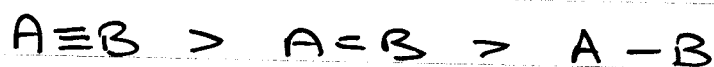
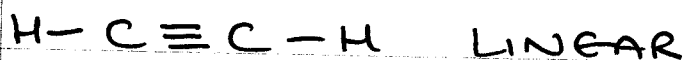
3 TRIGONAL PLANAR

4 TETRAHEDRAL

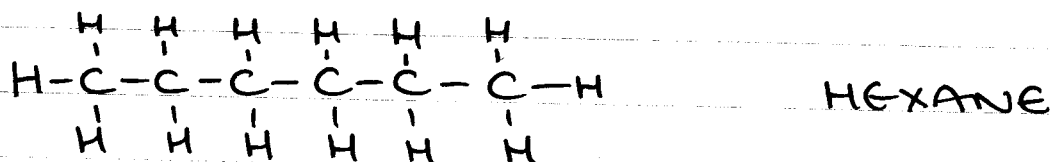
5 TRIGONAL BIPYRAMIDAL

6 OCTAHEDRAL

FOR SAME OF GEOMETRY TREAT MULTIPLE BONDS AS SINGLE BONDS, i.e. JUST 1 e⁻ PAIR

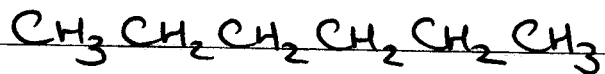


② DRAWING ORGANIC STRUCTURES



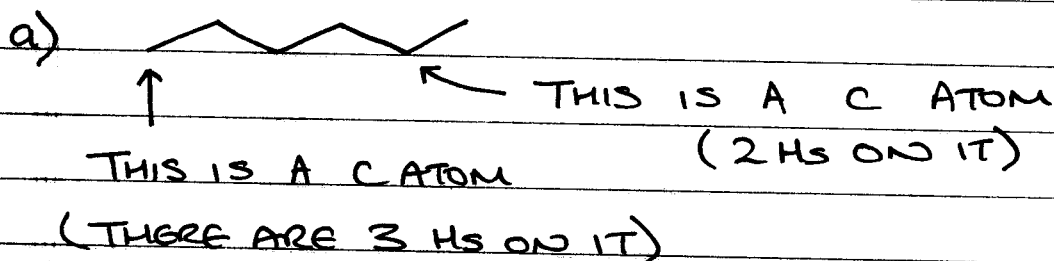
STRUCTURAL FORMULA

- CONDENSED FORMULA



- LINE FORMULA

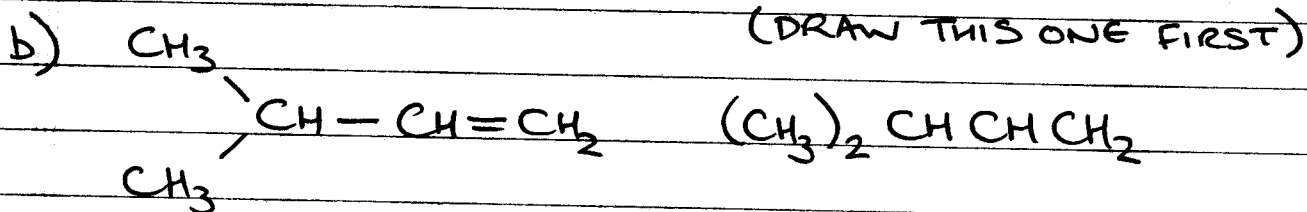
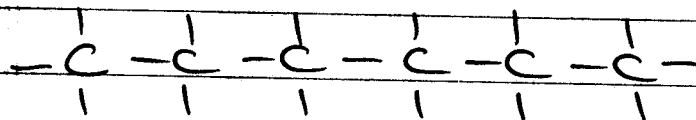
- DRAW CHAINS AS ZIG-ZAGS
- LEAVE OUT ANY HS ATTACHED TO CS
- DRAW NON-BONDED ELECTRONS (LONE PAIRS)

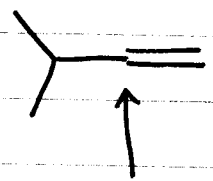


Do NOT WRITE



OR

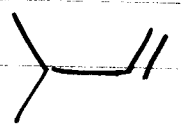




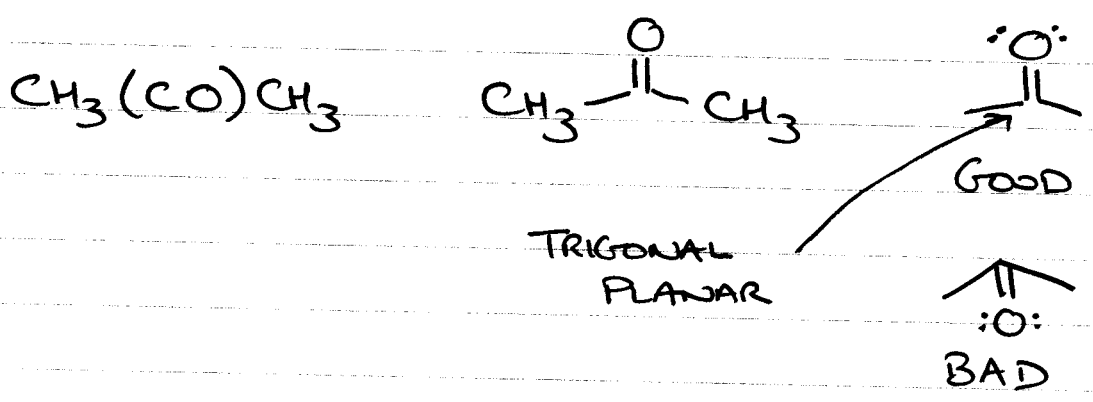
MAYBE YOU WOULD DRAW THIS

GEOMETRY OF THIS C ATOM?

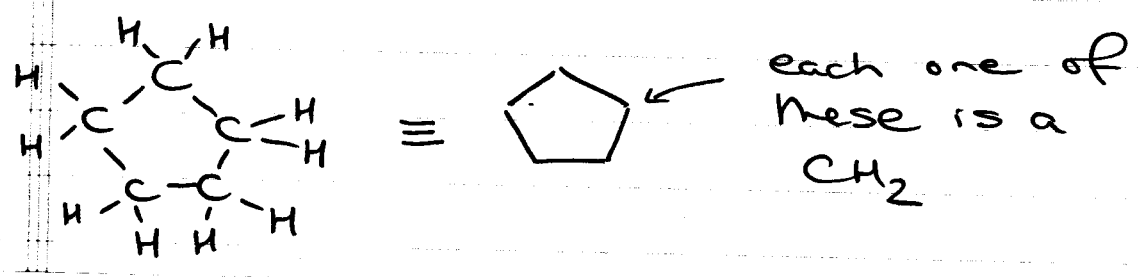
TRIGONAL PLANAR, SO:



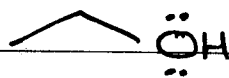
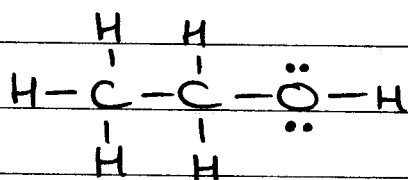
TRY TO BE AS TRUE TO MOLECULAR SHAPE AS POSSIBLE



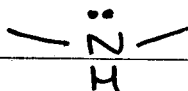
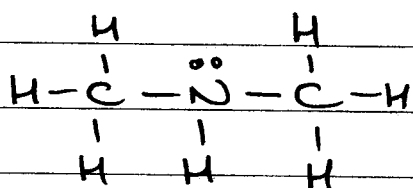
RINGS



- HETEROATOMS



not

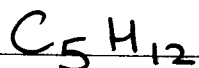


not

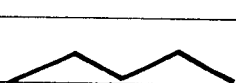


DRAW HS ON HETEROATOMS

- EXAMPLE



DRAW ALL REASONABLE STRUCTURES WITH THIS FORMULA



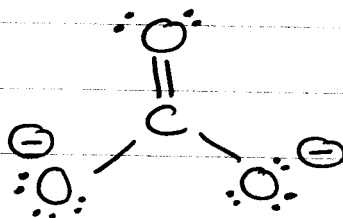
CONSTITUTIONAL ISOMERS - same formula different arrangements of atoms

R GROUPS !!

③ RESONANCE

6

consider CO_3^{2-}



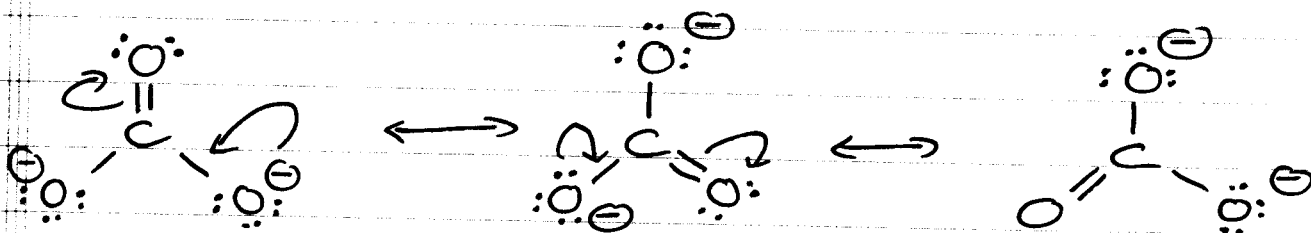
one $\text{C}=\text{O}$ BOND

two $\text{C}-\text{O}$ BONDS

$\text{C}=\text{O}$ SHORTER THAN $\text{C}-\text{O}$
(STRONGER)

IN CO_3^{2-} HOWEVER, ALL CARBON-OXYGEN
BONDS ARE IDENTICAL

WHY?



RESONANCE CONTRIBUTORS
(ALL EQUIVALENT)

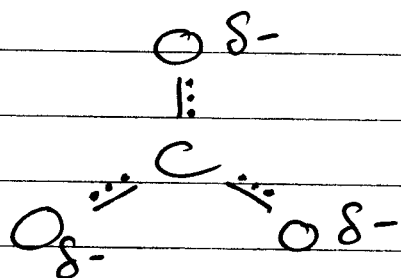
ARROWS

\longleftrightarrow SEPARATES RESONANCE CONTRIBUTORS

\curvearrowright CURLY ARROW - MOVEMENT OF A
PAIR OF ELECTRONS

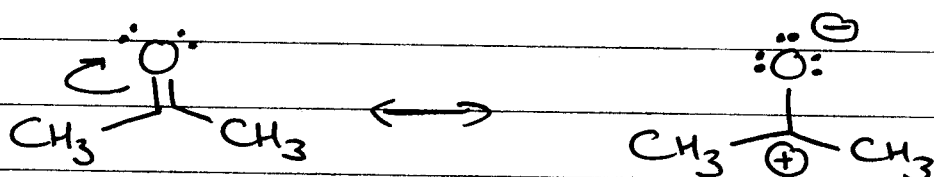
NONE OF THESE CONTRIBUTORS
ACTUALLY EXIST!!

(4)



RESONANCE HYBRID

NOT ALL RESONANCE CONTRIBUTORS ARE
NECESSARILY EQUIVALENT

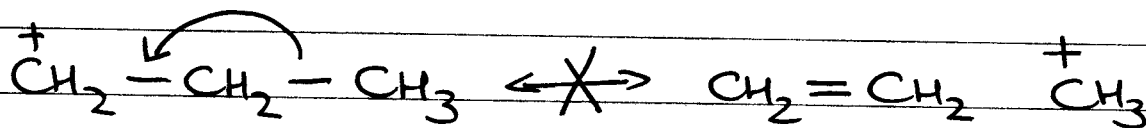


WHICH ONE OF THESE IS MOST STABLE?

— RULES FOR WRITING RESONANCE STRUCTURES

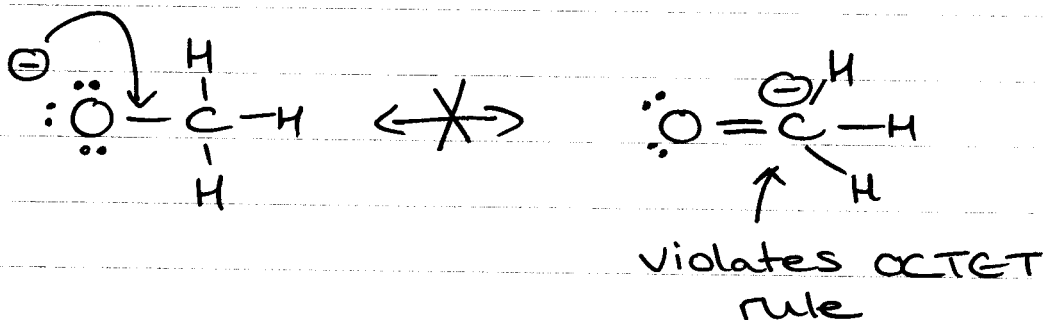
DO NOT

(1) BREAK ANY SINGLE BONDS



② DO NOT VIOLATE THE OCTET RULE

⑧



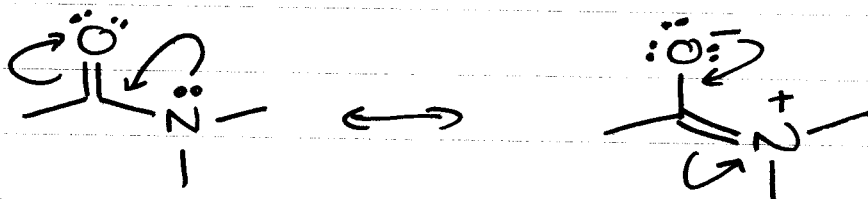
- DRAWING RESONANCE STRUCTURES

We cannot break single bonds, so we can only move electrons from double bonds, triple bonds (π) and lone pairs

PATTERNS

① LONE PAIR NEXT TO π BOND

"NEXT TO" MEANS ONE SINGLE BOND AWAY

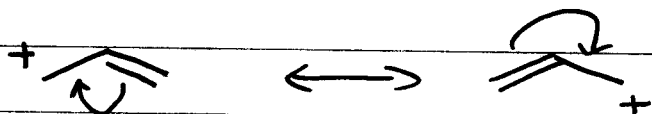


② LONE PAIR NEXT TO +ve CHARGE

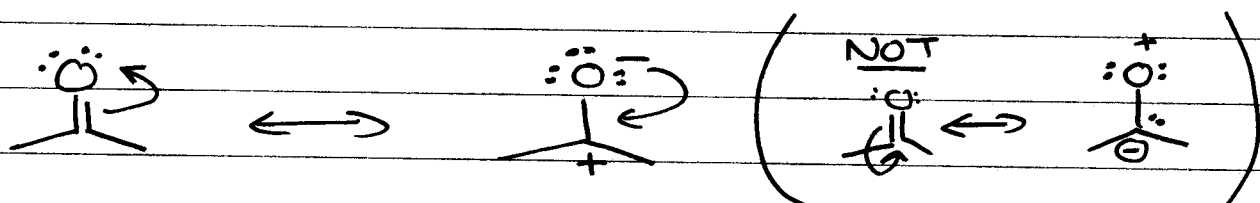


③ π BOND NEXT TO A +ve CHARGE

9

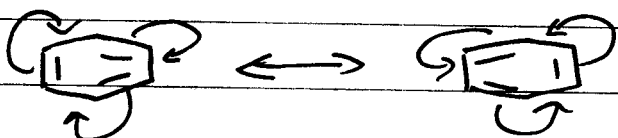


④ π BOND BETWEEN TWO ATOMS WHERE ONE IS QUITE ELECTRONEGATIVE



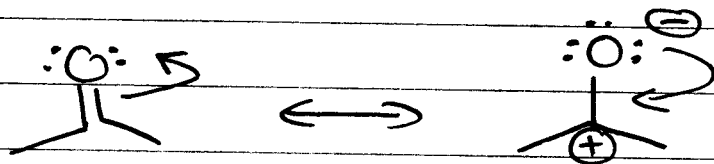
ELECTRONS GO TO MORE ELECTRONEGATIVE ATOM

⑤ ALTERNATING π BONDS IN A RING



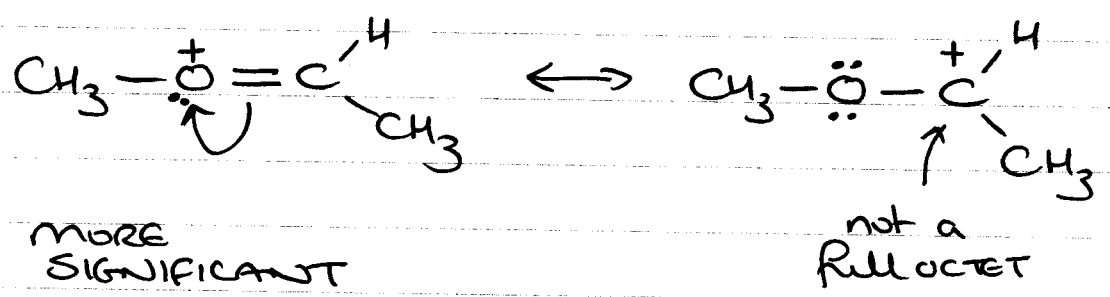
RELATIVE IMPORTANCE OF CONTRIBUTING STRUCTURES

① MINIMIZE CHARGES

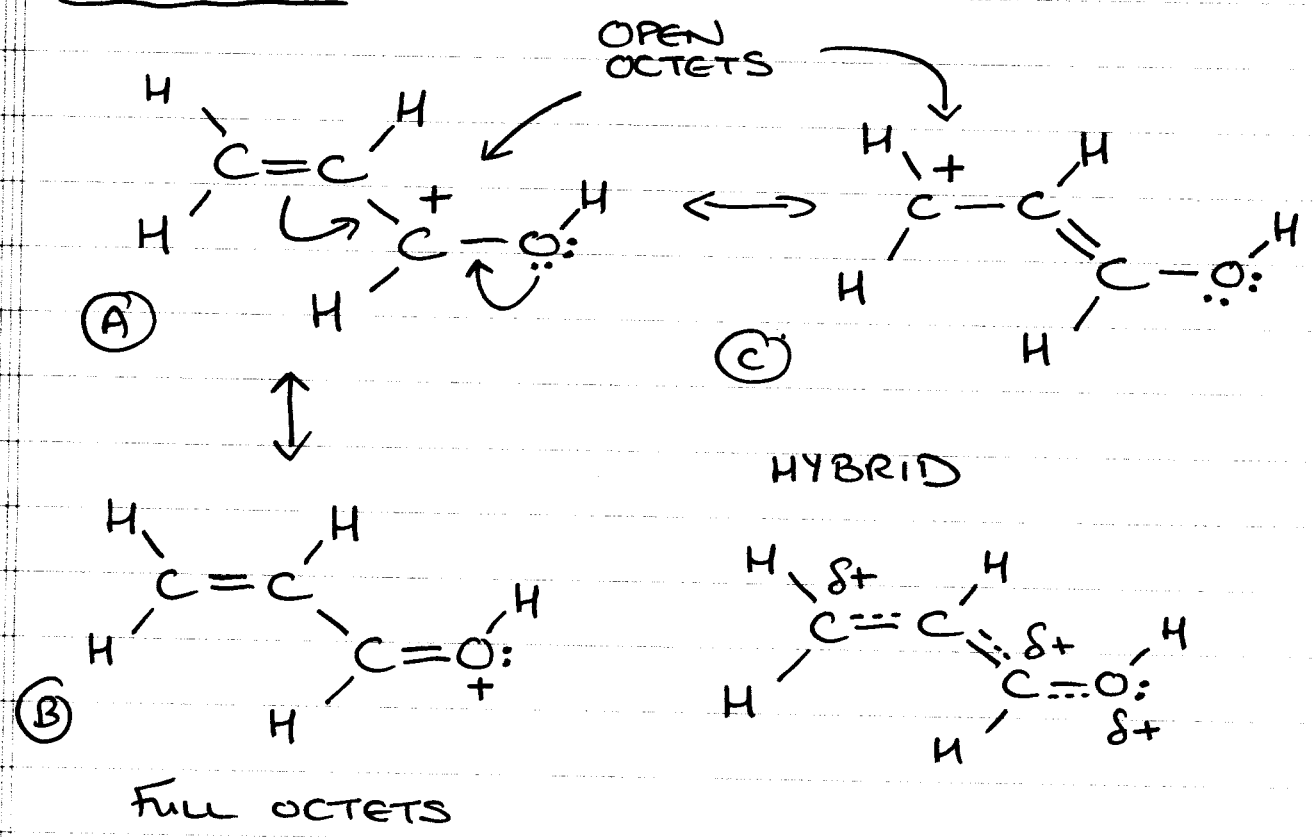


MORE SIGNIFICANT

② MAXIMIZE OCTETS



EXAMPLE



③ NEGATIVE CHARGE ON MORE EN ELEMENT

