Unit 3 Study Guide – KEY

1) Ionic Bonds → between metals and nonmetals.
One atom takes electrons from the other.
Oppositely charged ions attract.
metal → cation
nonmetal → anion
Covalent Bonds → between two nonmetals
Atoms share electrons.

2) a.) ionic → metal + nonmetal
b.) covalent → nonmetal + nonmetal
(exceptions Be & B)

3) Atoms form bonds to become more stable (gain an octet).

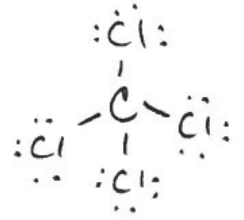
4) a) Mg^{2+} $2\left[:\ddot{Cl}:\right]^-$

b) $2\,Al^{3+}$ $3\left[:\ddot{O}:\right]^{2-}$

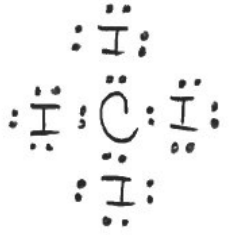
c) Ba^{2+} $\left[:\ddot{S}:\right]^{2-}$

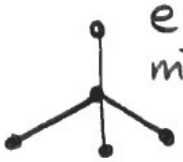
5) a) CI_4

N	$8+4(8)=40$
A	$4+4(7)=32$
S	8
U	24



Lewis →



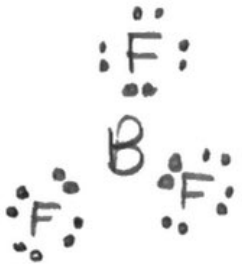


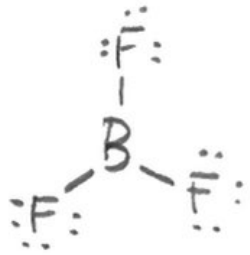
eg: tetrahedral
mg: tetrahedral
$\measuredangle = 109.5°$
nonpolar

b) BF_3

↓

exception to the octet rule!





eg: trigonal planar

mg: trigonal planar

∢ 120°

nonpolar

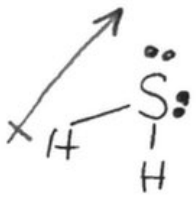
c) H_2S

N 2(2) + 8 = 12

A 2(1) + 6 = 8

S 4

U 4



eg: tetrahedral

mg: bent

∢ 104.5°

polar

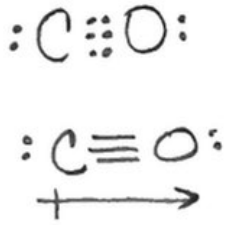
d) CO

N 8 + 8 = 16

A 4 + 6 = 10

S 6

U 4



eg: linear

mg: linear

polar

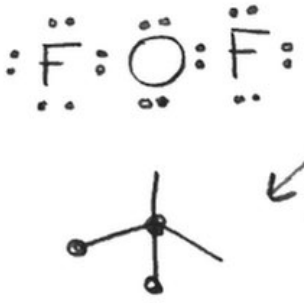
e) OF_2

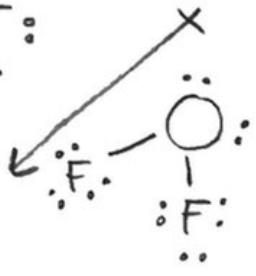
N 8 + 2(8) = 24

A 6 + 2(7) = 20

S 4

U 16





eg: tetrahedral

mg: bent

∢ 104.5°

polar

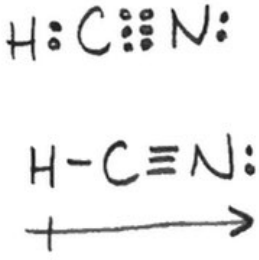
f) HCN

N 2 + 8 + 8 = 18

A 1 + 4 + 5 = 10

S 8

U 2



eg: linear

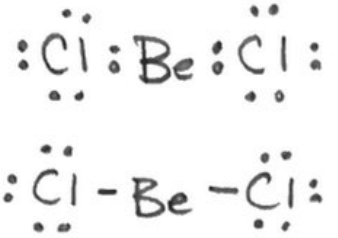
mg: linear

∢ 180°

polar

g) $BeCl_2$

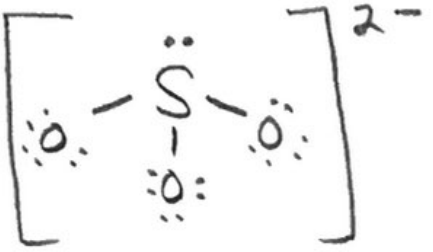
↓ exception to octet rule



eg: linear
mg: linear
∢ 180°
nonpolar

h) SO_3^{2-}

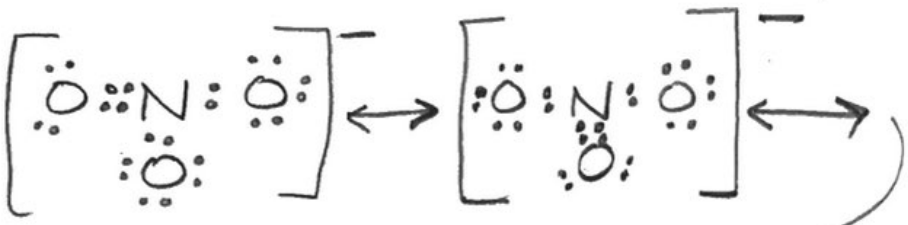
N $8+3(8)=32$
A $6+3(6)+2=26$
S $\underline{6}$
$\quad 20$



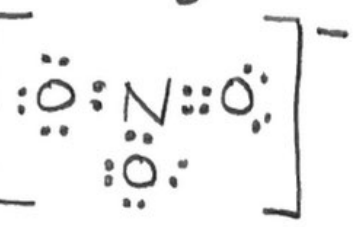
eg: tetrahedral
mg: trigonal pyramid
∢ 107°

i) NO_3^-

N $8+3(8)=32$
A $5+3(6)+1=24$
S $\underline{8}$
$\quad 16$



RESONANCE!



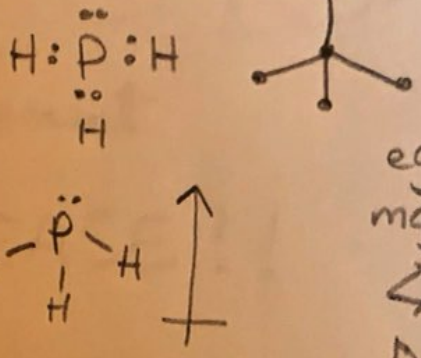
eg: trigonal planar
mg: trigonal planar
∢ 120°

6) A bond in which the electrons are not shared equally between the two atoms. One atom has greater attraction for the shared electrons. This is called <u>electronegativity</u>.

7) a) See #5 :)

b) PH_3

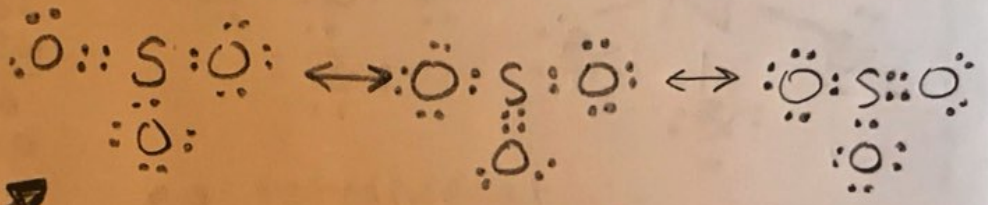
N $8 + 3(2) = 14$
A $5 + 3(1) = 8$
S 6
U 2



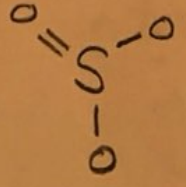
eg: tetrahedral
mg: trigonal pyramid
∢ 107°
polar

c) SO_3

N $8 + 3(8) = 32$
A $6 + 3(6) = 24$
S 8
U 16

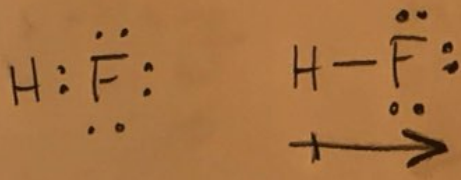


Resonance



eg: trigonal planar
mg: trigonal planar
∢ 120°
nonpolar

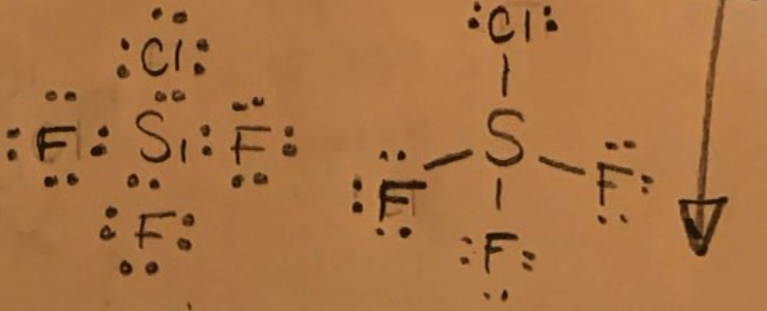
d) HF



linear
polar

e) SiF_3Cl

N $8 + 3(8) + 8 = 40$
A $4 + 3(7) + 7 = 32$
S 8
U 24



eg & mg: tetrahedral
polar

f) Cu → Cu: ← 2 valence electrons

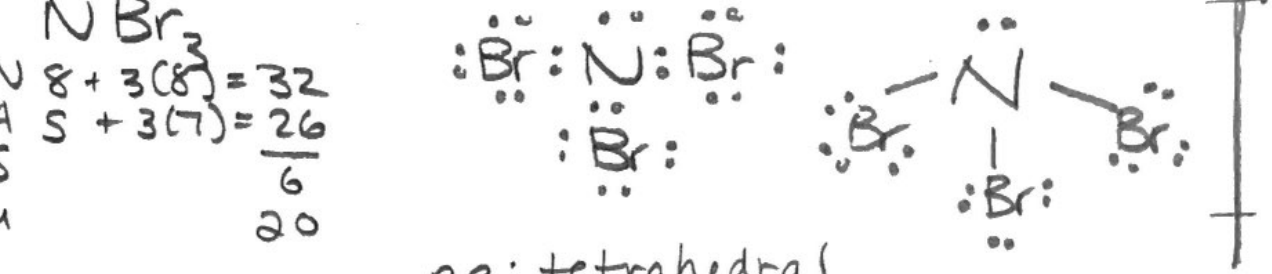
atoms are not polar

just an atom of an element

g) OMIT PLEASE!!

h) NBr_3

N $8 + 3(8) = 32$
A $5 + 3(7) = 26$
S 6
U 20



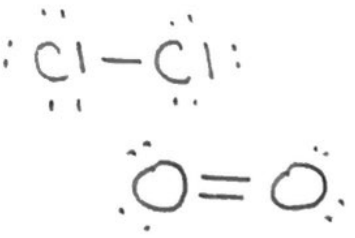
eg: tetrahedral
mg: trigonal pyramid
∢ 107°
polar

i) HOCl

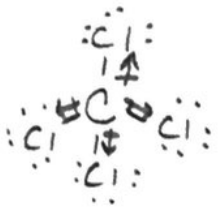
N $2+8+8 = 18$
A $1+6+7 = 14$
S 4
U 10

eg: tetrahedral
mg: bent
∢ 104.5°
polar

8) single → 2 e's
double → 4 e's
triple → 6 e's



9) Polar bonds can "cancel" each other out if they are identical and an equal distance apart.



All bonds are polar.
But molecule is symmetrical.
Electrons are evenly distributed.
Therefore the molecule is nonpolar overall.

10) Electronegativity is an atom's ability to attract the electrons in a covalent bond.

F O Cl N Br I S C

Most →

11) 1. Li – F → ionic! "ultra" polar → most polar

Look at difference in electro-negativity

2. C – F
3. F – Cl
5. F – F → nonpolar, same electronegativity → least polar
4. O – F

12) a) hydroiodic acid
b) copper (I) chloride
c) trinitrogen heptaoxide
d) magnesium sulfate pentahydrate
e) nitric acid

13) a) $HC_2H_3O_2$
b) K_2O
c) HBr
d) $BaCl_2 \cdot 2H_2O$
e) P_2Cl_4