Book Exercises Ch 4/14

Chapter 4.1

1) a) lead(II) nitrate $Pb(NO_3)_2$
b) barium hydroxide $Ba(OH)_2$
c) potassium hydrogencarbonate $KHCO_3$
d) magnesium carbonate $MgCO_3$
e) copper(II) sulfate $CuSO_4$ copper(I) sulfate Cu_2SO_4
f) calcium phosphate $Ca_3(PO_4)_2$
g) ammonium chloride NH_4Cl

2) a) KBr
b) Zn_2O
c) Na_2SO_4
d) $CuBr_2$
e) $Cr_2(SO_4)_3$
f) AlH_3

3) a) tin(II) phosphate
b) titanium(IV) sulfate
c) manganese hydrogencarbonate
d) Barium sulfate
e) mercury(I) sulfide

4) a) Sn^{2+}
b) Ti^{4+}
c) Mn^{2+}
d) Ba^{2+}
e) Hg^{+}

5) $A^{2+} + B^{3-} \longrightarrow A_3B_2$

6) Mg has $2e^-$ to donate to 2 Br atoms. The 2 Br atoms will take the Mg electrons so Mg will be isoelectronic with Ne and each Br with an added electron will be isoelectronic with Kr

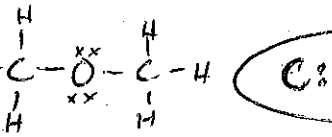
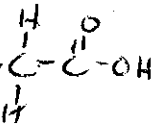
7) B (CsF)

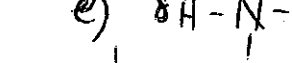
8) D ($K + Cl_2$)

9) - see if high m.p. or b.p.
- see if soluble in H_2O or ionic solvent and if not soluble in non-polar solvent
- if soluble in H_2O, see if conducts electricity
- test if brittle/shatters on impact.

Chapter 4.2

10) D $CaCl_2$

11) A: $O=C=O$ B:  C: $:C\equiv O:$ D: 

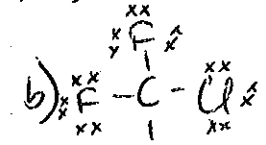
12) a) $\overset{\delta+}{H}-\overset{\delta-}{Br}$ c) $\overset{\delta+}{Cl}-\overset{\delta-}{F}$ e) 

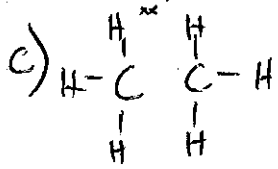
b) $\overset{\delta-}{O}=\overset{\delta+}{C}=\overset{\delta-}{O}$ d) $O=O$ non-polar

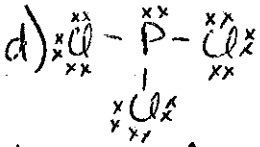
13) a) C-Cl b) Si-Cl c) N-Mg

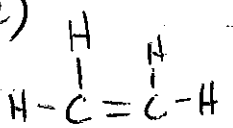
Chapter 4.3

14) a) $H-F$

b) 

c) 

d) 

e) 

f) $H-C\equiv C-H$

15) a) $BeCl_2 \rightarrow 2+7+7 = 16e^-$

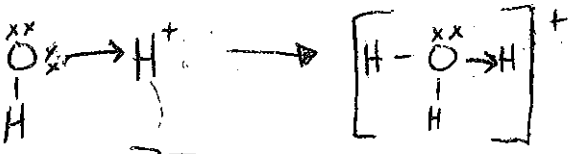
b) $BCl_3 \rightarrow 3+7+7+7 = 24e^-$

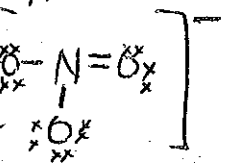
c) $CCl_4 \rightarrow 4+7+7+7+7 = 28e^-$

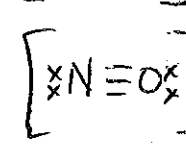
d) $PH_3 \rightarrow 5+1+1+1 = 8e^-$

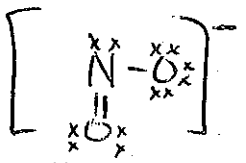
e) $SCl_2 \rightarrow 6+7+7 = 20e^-$

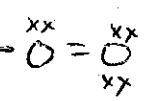
f) $NCl_3 \rightarrow 5+7+7+7 = 26e^-$

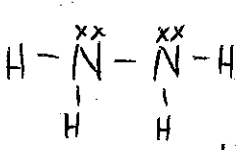
16) 

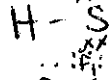
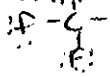
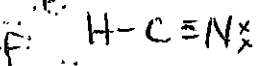
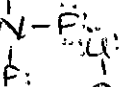
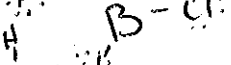
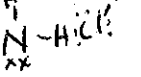
17) a) 

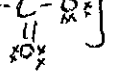
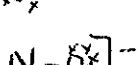
b) 

c) 

d) 

e) 

18) molecule	shape	bond angle
a) 	bent	105°
b) 	tetrahedral	109.5°
c) 	linear	180°
d) 	trigonal pyramidal	107°
e) 	trigonal planar	120°
f) 	trigonal pyramidal	107°
g) 	bent	105°

19) ion	shape	bond angle
a) 	trigonal planar	120°
b) 	trigonal planar	120°

ion	shape	bond angle
c) $[\ddot{O}=N=\ddot{O}]^+$	linear	180°
d) $[\ddot{O}-\ddot{N}=\ddot{O}]^-$	bent	117°
e) $[\ddot{F}-\ddot{Cl}-\ddot{F}]^+$	bent	105°
f) $[\ddot{Cl}-\ddot{Sn}(\ddot{Cl})-\ddot{Cl}]^-$	trigonal pyramidal	107°

20) a) 4 b) 3 or 4 c) 2 d) 4 e) 3

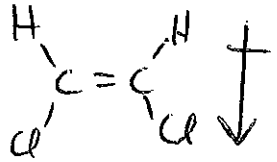
21) a) H–P(H)–H polar b) CF_4 non-polar

c) $\ddot{N}\equiv C-H$ polar d) $\ddot{Cl}-Be-\ddot{Cl}$ non-polar

e) H–C(H)=C(H)–H non-polar f) $\ddot{Cl}-\ddot{F}$ polar

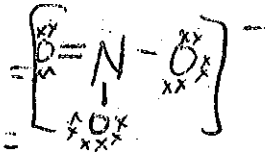
g) $\ddot{F}-\ddot{F}$ non-polar h) $\ddot{F}$–B(–$\ddot{F}$)–$\ddot{F}$ non-polar

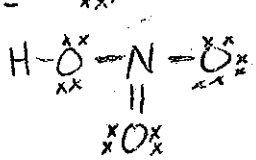
22) cis has a net dipole moment as the Cls both on one side will "pull" most of the electrons in that direction



23) Inc. in bond length ≡ , = , –

$C\equiv O < O=C=O < [O-C(=O)-O]^{2-} < CH_3-OH$

24) NO_3^- =  18+5+1 = 24 e⁻ 1.3 bond order

HNO_3 =  18+5+1 = 24 e⁻ 1.5 bond order

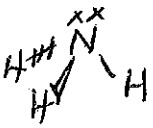
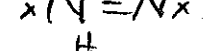
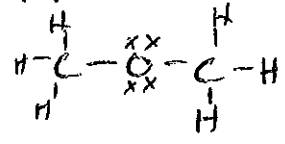
HNO_3 has shorter, stronger bonds than NO_3^-

25) Similar structure - sp^3 hybrid / tetrahedral - high m.p, non-conduct of electricity, insol. in H_2O, strong, brittle (not malleable)
differences - Si can use O_2 to make quartz, diamond has more value - more rare.

26) Graphite/graphene have delocalized e^- so can conduct electricity. Diamond has rigid, sp^3 hybrid structure w/ no delocalized e^-, so cannot conduct electricity.

27) A) metal
B) giant molecular
C) polar molecular solid
D) non-polar molecular solid
E) ionic compound

28) A CH_3OH

29) a) $CO_{2(s)}$ = LDF 
b) $NH_{3(l)}$ = LDF, H-bonding 
c) $N_{2(l)}$ = LDF 
d) CH_3OCH_3 = LDF, dipole-dipole 

30) a) C_2H_6 c) Cl_2
b) H_2S d) HCl

chapter 4.5

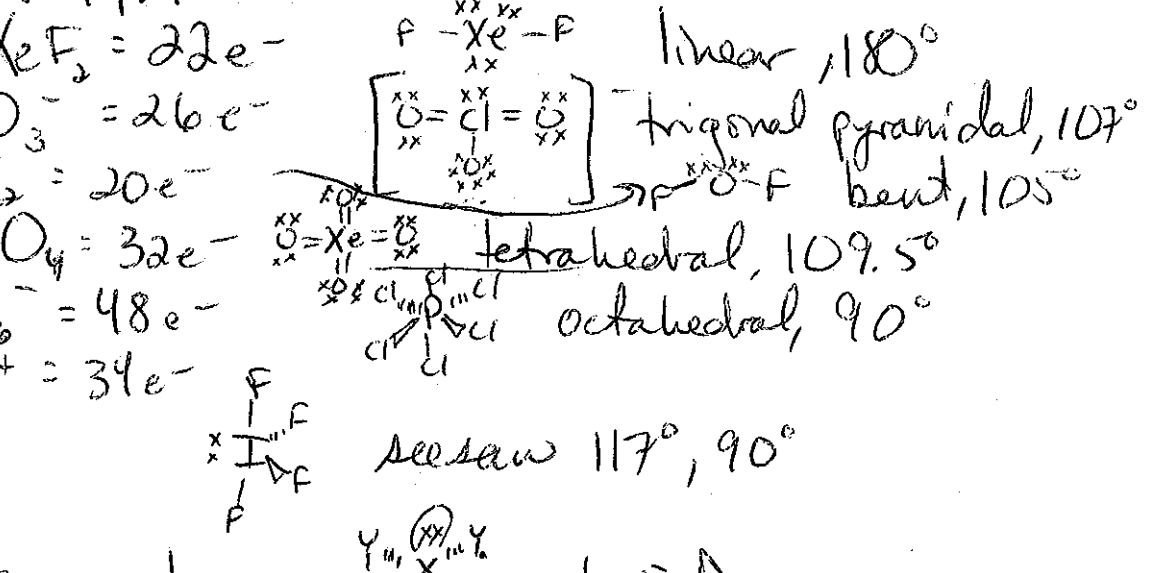
31) B cations + delocalized e⁻

32) a) malleable, conduct thermal E, thermal stability
b) light, strong, forms alloys
c) conduct thermal E, thermal stability, non-corrosive
d) light, strong, non-corrosive

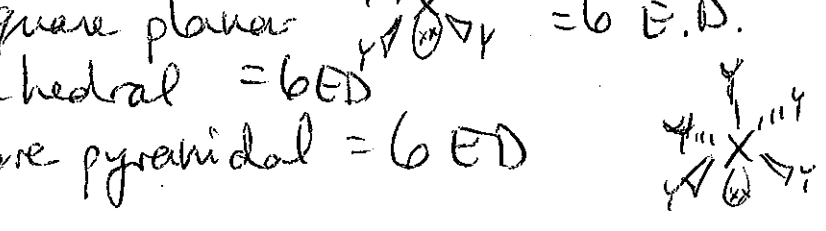
33) 1) alloys - increase hardness + strength + corrosive resistance
2) anodize - layer on surface to improve corrosive resistance and increase thickness

Chapter 14.1

34) a) XeF_2 = 22e⁻ linear, 180°
b) ClO_3^- = 26 e⁻ trigonal pyramidal, 107°
c) OF_2 = 20 e⁻ bent, 105°
d) XeO_4 = 32 e⁻ tetrahedral, 109.5°
e) PCl_6^- = 48 e⁻ octahedral, 90°
f) IF_4^+ = 34 e⁻ seesaw 117°, 90°



35) a) square planar = 6 E.D.
b) octahedral = 6 ED
c) square pyramidal = 6 ED



35 continued
d) trigonal bipyramidal = 5 ED.
e) linear = 5 ED or 2 ED

36) a) KrF_4 = 36e⁻ square planar 90° F, Kr, F

b) PCl_3 = 26e⁻ trigonal pyramidal 107° Cl, P, Cl

c) SF_6 = 48e⁻ octahedral 90° F, S, F

37) pg 158 q. 14 a-f
a) polar Hf b) CF_3Cl polar c) C_2H_6 non-polar
d) PCl_3 polar e) C_2H_4 non-polar f) C_2H_2 non-polar

38) a) polar b) N/A c) non-polar d) N/A e) N/A f) N/A

39) BF_3

	B	F
val e⁻ =	3	7
e⁻ assigned =	3	7
Formal chg =	0	0

= most stable form

40) SO_4^{2-} = 32e⁻ ← more stable

F chg. S = 6 − 4 = +2 S = 6 − 6 = 0
4 × O = 6 − 7 = −4 O double bonded = 6 − 6 = 0 (×2)
−2 O single bonded = 6 − 7 (×2)
−2

41) Stronger O=O bonds need higher E to break, bond order of 1.5 for ozone requires less E to break and ∴ a longer wavelength.

42) CFCs: $CCl_2F_{2(g)} \rightarrow CClF_2^{\bullet}{}_{(g)} + Cl^{\bullet}{}_{(g)}$

$Cl^{\bullet} + O_3 \rightarrow O_2 + ClO^{\bullet}$

$ClO^{\bullet} + O^{\bullet} \rightarrow O_2 + Cl^{\bullet}$

NO_x: $NO^{\bullet} + O_3 \rightarrow NO_3^{\bullet} + O_2$

$NO_3^{\bullet} + O^{\bullet} \rightarrow NO^{\bullet} + O_2$

Chapter 14.2

43) σ bonds have concentrated e⁻ along bond axis
π bonds have concentrated e⁻ above + below bond axis.

44) b) s-p H-Cl in HCl
c) p-p endon Cl-Cl in Cl_2
d) sp^3-s C-H in CH_4
e) sp^2-s C-H in C_2H_4
f) sp-s C-H in C_2H_2
g) sp^2-p C-Cl in CH_3Cl

45) a) sp^2 b) sp^3 c) sp^2 d) sp e) sp^2

46) cyclohexane has tetrahedral carbons (109.5°) while benzene has trigonal planar (120°) carbons. cyclohexane also has sp^3 hybrid C bonds and benzene has sp^2