Ch. 13 ~~3~~, ~~5~~, ~~6~~, ~~10~~, ~~13~~, ~~14~~, ~~28~~, ~~39~~, ~~40~~, ~~42~~, ~~43~~, ~~45~~, ~~57~~, ~~59~~, ~~61~~, ~~63~~, ~~89~~, ~~91~~, ~~114~~, ~~115~~, ~~117~~, ~~122~~, ~~125~~, ~~129~~, ~~136~~, ~~149~~, ~~165~~

(3) $HC_2H_3O_2$ miscible w/ H_2O
$CH_3(CH_2)_2COOH$ would become less soluble as you are increasing the nonpolar character of the molecule. as ↑ #C ↓ polarity

(5) Hexane = nonpolar molecule > immiscible as gases = misicble
methanol = polar

(6) $HCl_{(g)}$ more soluble in H_2O than propane because it has dipole-dipole forces & is a polar molecule like water

(10) (a) $Cu_{(s)}$ in $Ag_{(s)}$ Metallic bonding
(b) CH_3Cl in CH_3OCH_3 d, dd
(c) CH_3CH_3 in $CH_3CH_2CH_2NH_3$ dipole induced
np polar

(12) (a) C_6H_{14} in C_8H_{18} dispersion
(c) Br_2 in CCl_4 dispersion
(b) $H_2C=O$ in CH_3OH hydrogen bonding attracted to O in $H_2C=O$

(14) which more soluble in water?
(a) $CH_3CH_2OCH_3$ because it has 1 less CH_3 group, smaller size
(b) CH_2Cl_2 because it is a polar molecule
(c) tetrahydropyran because it has an O atom making it polar & O can hydrogen bond w/ water

(28) NH_4Cl added to H_2O
(a) endothermic
(b) $\Delta H_{lattice}$ is larger
(c) entropy increases

(39) (a) ↑

(b) ↓

(c) $s \rightarrow g$ ↑

(40) $AgNO_3 + NaCl \rightarrow AgCl_{(s)}$

$\Delta H = 822$ lattice

$\Delta H_{hyd} = -799$ ↓ releases energy when goes into solution

$\Delta H_{sol} = \Delta H_{latt} + \Delta H_{hydration} = 822 - (799) = 23$ KJ/mol

↓ break − make

(42) $KMnO_4$ 6.4g/100g H_2O at 20C

heat solution past 20C, dissolve more $KMnO_4$, slowly cool back down to $KMnO_4$ w/o disturbing

(43) Why does solubility of gas ↓ w/ ↑ temp

gas molecules gain more KE as temp ↑ giving them more energy to escape the liquid phase

(45) saturated solution @ 20C and 1 atm, what happens to solubility?

(a) $He_{(g)}$ ↓ temp ↑ solubility

(b) $RbI_{(s)}$ ↑ pressure sol. stays the same, pressure does not effect (s)

(57) 0.82g ethanol in 10.5mL C_2H_5OH

$0.82g \times \frac{1\ mol}{46.07\ g} = 0.0178$

$M = \frac{0.0178\ mol}{0.0105\ L} = \boxed{1.695M}$

(b) 1.27g NH_3 in 33.5mL

$1.27g \times \frac{1\ mol}{17\ g} = 0.0747 mol$

$M = \frac{0.0747 mol}{0.0335 L} = \boxed{2.23M}$

59 (a) $M_1V_1 = M_2V_2$

$6.25(25.5) = M_2(500mL)$

$M_2 = \boxed{0.319\,M}$

(b) $M_1V_1 = M_2V_2$

$(2\times10^{-2})(8.25) = M_2(12)$

$M_2 = \boxed{0.014\,M}$

61 (a) 2.5L of 0.65 M NaCl

$2.5L \times \frac{0.65mol}{1L} \times \frac{58.44g}{1mol} =$ $\boxed{94.97g\ NaCl \text{ diluted to } 2.5L \text{ w/ } H_2O}$

(b) $M_1V_1 = M_2V_2$

$0.3(15.5) = 2.1(V_2)$

$V_2 = 2.1L$

add 2.1L of urea to enough water to make 15.5 L of solution

63 (a) 57.5mL of $1.53\times10^{-3}M\ Cr(NO_3)_3$

$0.0575L \times \frac{1.53\times10^{-3}mol}{1L} \times \frac{238.03g}{1mol} =$ 0.021g diluted to 57.5mL w/ H_2O

(b) $M_1V_1 = M_2V_2$

$1.45(5.8\times10^3m^3) = 2.5(V_2)$

$V_2 = 3364m^3$ of 2.5M solution diluted w/ H_2O to make $5.8\times10^3m^3$

89 (a) $NaMnO_4$ strong, ionic, dissolves

(b) acetic weak, weak acid

(c) methanol non-polar covalent, no ions

(d) $Ca(C_2H_3O_2)_2$ strong, ionic, dissolves

? moles particles in 1mL of each

11 (a) 0.02 M $CuSO_4$ $CuSO_4 \rightarrow Cu^{2+} + SO_4^{2-}$

$\frac{0.02\,mol}{1\,L} \quad \frac{0.02\,mol}{1\,L} = \frac{0.04\,mol}{1\,L}$

so $1mL \times \frac{1\,L}{1000mL} \times \frac{0.04\,mol}{1\,L} =$ **4×10^{-5} mol of particles in 1mL**

(b) 0.004M $Ba(OH)_2$ $Ba(OH)_2 \rightarrow Ba^{2+} + 2OH^-$

$0.004 + 2(0.004) = \frac{0.012\,mol}{1\,L}$

$1mL \times \frac{1\,L}{1000mL} \times \frac{0.012\,mol}{1\,L} =$ **1.2×10^{-5} mol of particles in 1mL**

(c) 0.08M (C_5H_5N) no ions so 0.08 mol/L

$1mL \times \frac{1}{1000mL} \times \frac{0.08\,mol}{1\,L} =$ **8×10^{-5} mol of particles in 1mL**

(d) 0.05M $(NH_4)_2CO_3$ $(NH_4)_2CO_3 \rightarrow 2\,NH_4^+ + CO_3^{2-}$

$2(0.05) + 0.05 = 0.15\,mol/L$

$1mL \times \frac{1\,L}{1000mL} \times \frac{0.15\,mol}{1\,L} =$ **1.5×10^{-4} mol ions in 1mL**

114 Brownian motion - erratic change of speed + direction exhibited by particles. It is caused by particles colliding w/ particles in the dispersing medium

115 Why do we see the beam of projected light?

- light reflecting off of dust particles in air
- air can be considered a colloid w/ suspended dust particles

(117) (A) 25mL (B) 50.0mL (C) 100mL sphere = 0.010 mol ions

(a) total molarity = $\frac{\text{mol ions}}{\text{L solution}}$

(A) $\frac{8 \times 0.01}{0.025} = \boxed{3.2M}$ (B) $\frac{10 \times 0.01}{0.050} = \boxed{2M}$ (C) $\frac{12 \times 0.01}{0.100} = \boxed{1.2M}$

(b) (A) $\frac{4 \times 0.01}{0.025} = \boxed{1.6M}$ green or brown

4 molecules solute ↑ highest molarity

(B) $\frac{5 \times 0.01}{0.050} = \boxed{1M}$ blue or yellow

5 molecules solute

(C) $\frac{4 \times 0.01}{0.1} = \boxed{0.4M}$ light cat

4 molecules of solute

(c) (A) Lowest molality solute = $\frac{\text{mol solute}}{\text{kg solvent}}$

same as part (B), C has lowest molality

(d) highest osmotic pressure = highest molality (A)

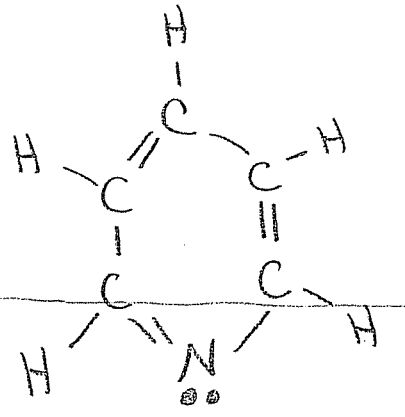
↑ concentration ↑ colligative property

(122) Ionic compound in aqueous solution (C)

anions - large, surrounded by H_2O w/ δ^+ near ion

cation - smaller, surrounded by H_2O w/ δ^- near ion

(125)



nonpolar portion of molecule likes to dissolve in nonpolar solvent

→ lone pair associates w/ hydrogen bonding of H_2O molecules

(129) N_2 = blue Cl_2 = green Ne = purple

(a) Smallest mole fraction of N_2

(A) $\frac{3}{8}$ = 0.375

(B) $\frac{4}{10}$ = 0.4

(C) $\frac{4}{12}$ = 0.333

(b) Same mole fraction of Ne

(A) $\frac{2}{8}$ = 0.25

(B) $\frac{4}{10}$ = 0.4

(C) $\frac{3}{12}$ = 0.25

(c) ↑ mole fraction of Cl_2

(A) $\frac{3}{8}$ = 0.375

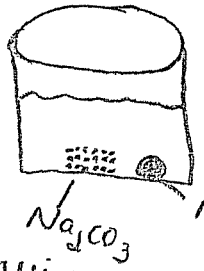
(B) $\frac{2}{10}$ = 0.2

(C) $\frac{5}{12}$ = 0.417

B < A < C

(136) saturated Na_2CO_3

yes I would expect some radioactivity because solute/solvent equilibrium has been established. There is a dynamic exchange between ions in solution recrystallizing to solid



(149) 5.66g NH_4NO_3 and 4.42g $(NH_4)_3PO_4$ to make 20.0 L of solution. What are M of NH_4^+ & PO_4^{3-} in solution?

$5.66g \times \frac{1\ mol}{80.05\ g} = 0.071\ mol\ NH_4NO_3 \rightarrow NH_4^+ + NO_3^-$

$(0.071\ mol) \quad (0.071)$

$4.42g \times \frac{1\ mol}{149.10g} = 0.0296\ mol\ (NH_4)_3PO_4 \rightarrow 3\ NH_4^+ + PO_4^{3-}$

$3(0.0296) \quad (0.0296)$

$$\frac{0.1598\ mol\ NH_4^+\ total}{20.L} = \boxed{7.99 \times 10^{-3} M\ NH_4^+}$$

$$\frac{0.0296\ PO_4^{3-}\ total}{20.L} = \boxed{1.48 \times 10^{-3} M\ PO_4^{3-}}$$

(165) $O_{2(g)}$ in H_2O @ 283K

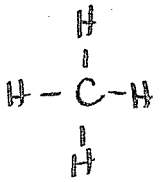
(a) @ 298K more KE = ↑ vapor pressure = more O_2 gas
C, O_2 leaves water & becomes gas

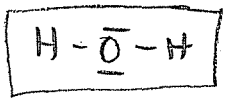
(b) pressure O_2 ↑ by ½ = (B)

Ch. 14 HW ~~4, 14, 23, 24, 28, 72, 74, 85, 101, 105~~

(4) (a) NH_3 $5+3=8$ AsH_3 $5+3=8$

(b)





(19) up the group
- (a) melting point – increases
- (b) bond length – decreases
- (c) hardness – increase
- (d) molar volume – decreases
- (e) lattice energy Element – Br increases

(23) mass % Li

(a) $C_{17}H_{35}COOLi$ $\frac{6.941}{290.401} \times 100 =$ **2.39% Li**

(b) LiC_4H_9 $\frac{6.941}{64.053} \times 100 =$ **10.84%**

(24) Group IA is more reactive w/ water.

(28) (a) $BaCO_{3(s)} \rightarrow BaO_{(s)} + CO_{2(g)}$

(b) $2HCl + Mg(OH)_2 \rightarrow 2HOH + MgCl_2$

(73) N_2O = laughing gas

$3- \; 1+ \quad 5+ \; 2-$
$NH_4NO_3 \rightarrow 2H_2O + N_2O$
$3- \; 4+ \quad 5+ \; 6-$
$1+ \quad 1-$
$1+ \; 2-$

★ would not have to predict products on own

★ Should be able to do oxidation #'s

(74) ↑ electrical conductivity $S < Se < Po$

S — nonmetal; Se — Metalloid; Po — Metal

(85) Oxidation of S

(a) S_8 (b) SF_4 (4+, 1−) (c) SF_6 (6+, 1−) (d) H_2S (+1, 2−)

★ (e) FeS_2 (2+, 1−; 2−) (f) H_2SO_4 (1+, 6+, 2−; 2+, 8−) (g) $Na_2S_2O_3 \cdot 5H_2O$ (+1, 2+, 2−; 2+, 6−)

hard to know if 2− or 1− (iron prefers to lose 2e− over 4e− so more likely to be 1− ox # on sulfur)

(101) Xe can show oxidation states of +8, +6, +4, +2

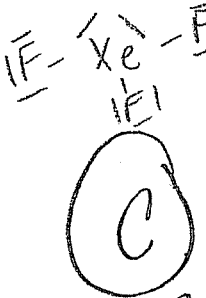
★ Used chart in chapter

(105) $XeF_4 + SbF_5 \rightarrow [XeF_3]^+[SbF_6]^-$

8+ 28=36 ; 5+ 35=40 ; 8+ 21=29−1=28

square planar

trigonal bipyramidal



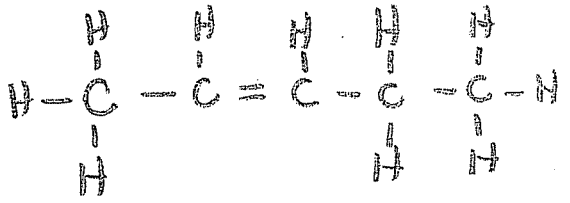
C

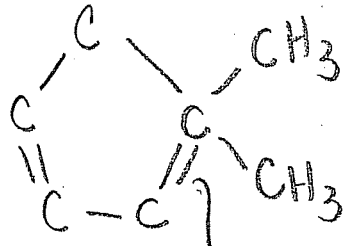
Xe starts sp^3d^2 ends sp^3d

Ch. 15 ~~4~~, ~~18~~, 60, 62

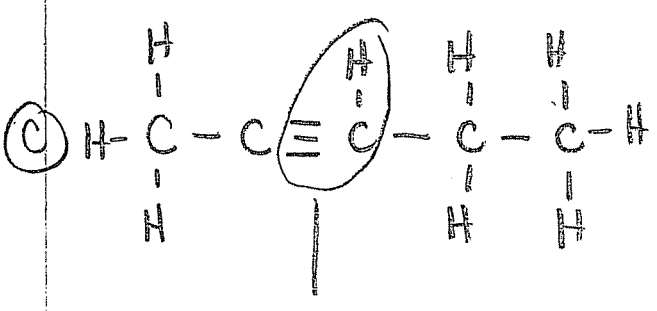
(4) Silicon is larger so has more difficulty overlapping orbitals, resulting in fewer compounds.

(18)

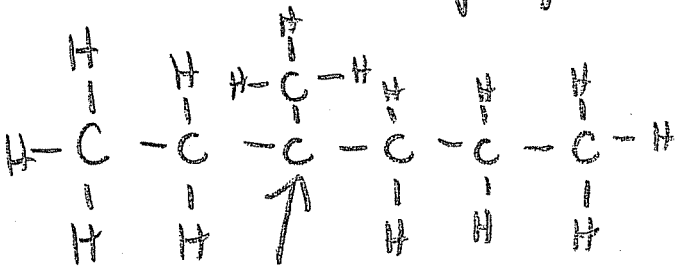
(a)  Correct as written

(b) 

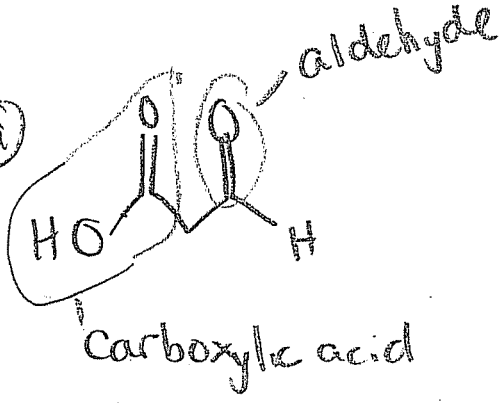
☆ remove double bond, carbon has too many bonds around it

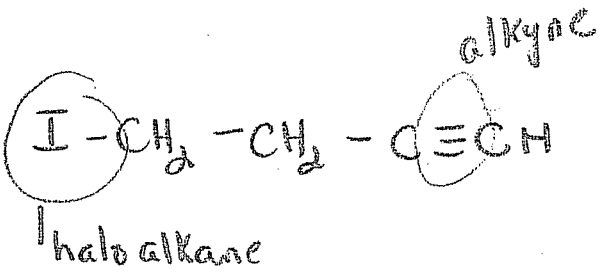
(c) 

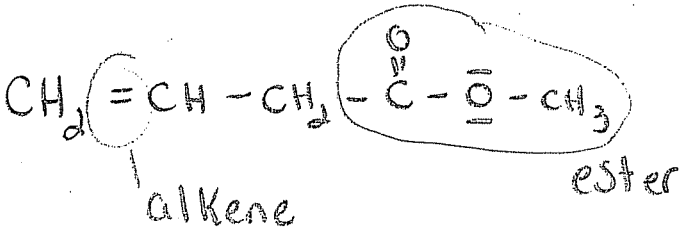
remove Hydrogen to keep triple bond

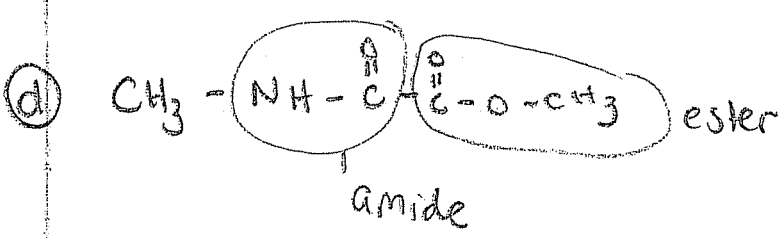
(d) 

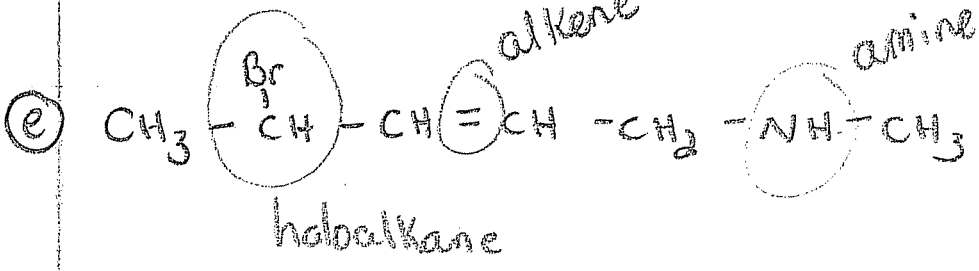
Missing a Hydrogen

(a) 

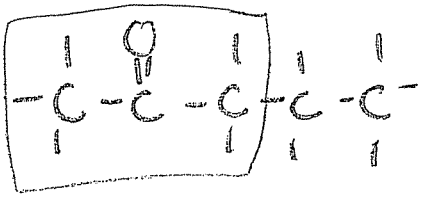
(b) 

(c) 

(d) 

(e) 

(a) $C_5H_{10}O$

Ketone example 

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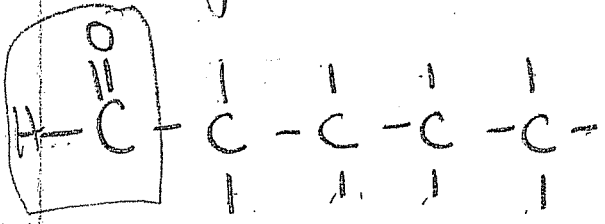
aldehyde example



or