Ch.12 HW ~~3~~, ~~6~~, ~~8~~, ~~10~~, ~~20~~, 29, ~~33~~, ~~35~~, ~~40~~, ~~42~~, ~~44~~, ~~46~~, ~~48~~, ~~50~~, ~~52~~, ~~54~~, ~~56~~, ~~57~~, ~~60~~, ~~64~~, ~~66~~, ~~69~~, ~~76~~, ~~77~~, ~~101~~, ~~102~~, ~~104~~, ~~116~~, ~~144~~

3 (a) intermolecular force
(b) intermolecular force
(c) intermolecular force
(d) intramolecular forces

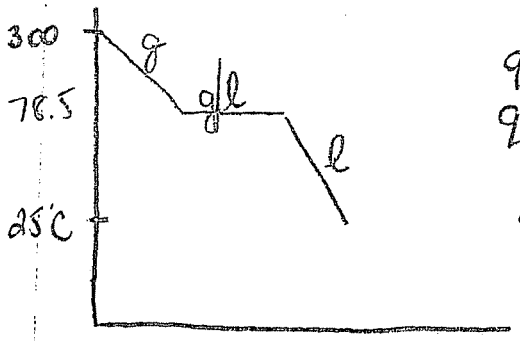
6 (a) inter
(b) intra
(c) inter
(d) inter

8 (a) $g \rightarrow s$ deposition
(b) $s \rightarrow g$ sublimation
(c) $l \rightarrow s$ freezing (crystallization)

10 (a) $s \rightarrow g \rightarrow s$ sublimation then deposition

20 0.333 mol ethanol C_2H_5OH @ 300°C → 25°C

$0.333\,mol \times \frac{46.08\,g}{1\,mol} = 15.34\,g$



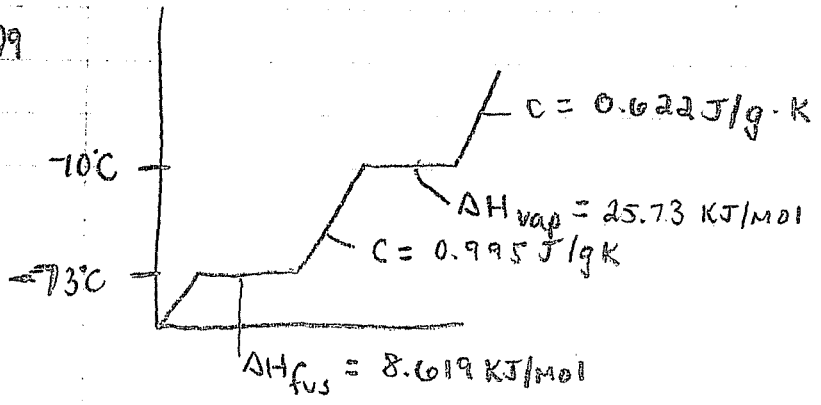
$q = 1.43(15.34)(78.5 - 300)$
$q = -4858.87\,J$

$q = 0.333(40.5)$
$q = -13.487\,kJ = -13486.5\,J$

$q = 2.45(15.34)(25 - 78.5)$
$q = -20106.9\,J$

$q_{tot} = \ominus 20,356.0\,J$
$\ominus 2.04 \times 10^4\,J$ lost

29



$2.50\ Kg \times \frac{1000\ g}{1\ Kg} \times \frac{1\ mol}{g}$

Convert 2.500 Kg at -73°C → 60°C SO_2

To melt

$q = 8.619(\quad)$

$q =$ KJ

To Heat to -10°C

$q = 0.995(2500)(-10-(-73))$

$q =$ J

To Boil

$q = 25.73(\quad)$

$q =$ KJ

To heat to 60°C

$q = 0.622(2500)(60-(-10))$

$q_{tot} = 1.606 \times 10^6\ J$

33 (a) dipole dipole
(b) dipole dipole
(c) ion dipole
(d) hydrogen bonding

dipole-dipole < H-bonding < ion dipole

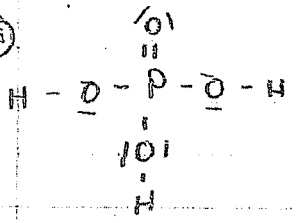
35 I_2 I-I ··· I-I

shorter than

distance between 2 I_2 molecules

intramolecular covalent bond stronger attraction than intermolecular dispersion force between two I_2 molecules

40 (a)



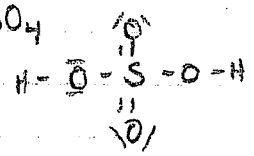
hydrogen bonding
polar tetrahedral

(b) SO_2 $\bar{O}-\bar{S}=O$ dipole-dipole

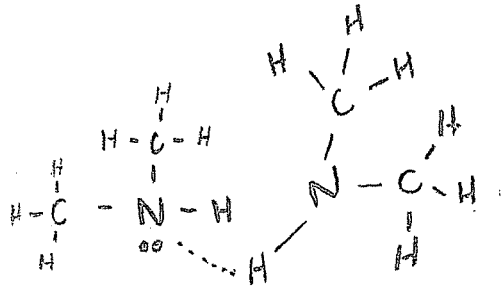
$6+12=18$

(c) $MgCl_2$ ionic bond ionic bonding/crystal lattice not an intramolecular force

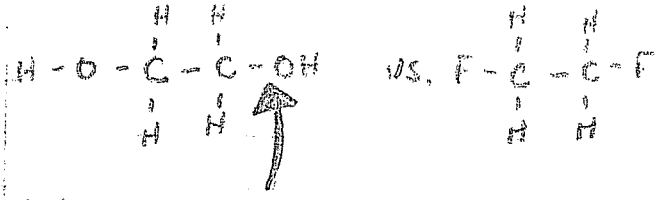
42 (a) Kr dispersion
(b) BrF dipole dipole
(c) H_2SO_4



hydrogen bonding

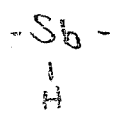
44(a) 

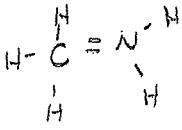
↑ ★ Hydrogen bonding

(b) 

★ hydrogen bonding

46(a) Br_2 dispersion forces

(b)  dipole dipole forces

(c)  hydrogen bonding

48 Greater polarizability = more electrons

(a) Ca^{2+} or $\boxed{Ca}$ 20 electrons vs. 18 e^- in Ca^{2+}

(b) CH_3CH_3 or $CH_3CH_2CH_3$ ★ larger molecule = larger dispersion

(c) CCl_4 or CF_4

★ bigger molecule = larger dispersion force

50 **lower v.p. = high IMF**

ⓐ $HOCH_2CH_2OH$ 2 H-bonding sites so ↑ IMF ↓ VP

ⓑ CH_3COOH H-bonding ↑ IMF ↓ VP

ⓒ HF H-bonding ↑ IMF ↓ VP

52 higher boiling point = stronger IMF

ⓐ CH_3CH_2OH has hydrogen bonding

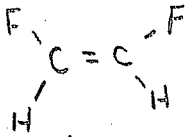
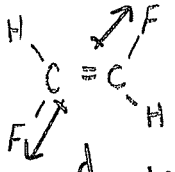
ⓑ NO vs. N_2 NO has dipole-dipole IMF

ⓒ H_2S vs. H_2Te H_2Te larger molecule = more dipole-dipole

54 higher boiling pt = stronger IMF

ⓐ CH_3OH vs. CH_3CH_3
↳ hydrogen bonding

ⓑ FNO ★ greater polarity vs. ClNO

ⓒ  vs. 

★ polar dipole-dipole

dipoles cancel

(56) motor oil - extremely long hydrocarbon chain so it has a large polarizable cloud, creating a strong dispersion force & raising the boiling pt.

(57) ethylene glycol 62.07g/mol b.p. 197.6°C $HOCH_2CH_2OH$

propanol 60.9g/mol b.p 97.4 $CH_3CH_2CH_2OH$

↓ 2 places to hydrogen bond so stronger forces = high b.p.

(60) ethanol has lower surface tension due to the occurance of less hydrogen bonding between molecules.

(64) order of decreasing surface, decreasing IMF

$CH_3OH > H_2C=O > CH_3CH_3$

(66) increasing viscosity viscosity ↓ temp ↑ smaller = low visc.

↓ flows slower, higher IMF

$CH_3CH_3 < H_2C=O < CH_3OH$

(69) $C_5H_{10}OH$ 88.15g/mol pentanol 12x more viscous because it has stronger IMF, holding molecules tightly together

C_6H_{14} 86.17g/mol hexane

(76) When water melts the hydrogen bond attractions between water molecules weaken, allow the water molecules to move around more, they become less fixed in position

(77) Crystalline solid - well defined shape, particles are arranged in orderly fashion
amorphous solids - poorly defined shape because they lack an orderly arrangement

(101) (a) Carbon (graphite) : Conductor
(b) sulfur : insulator
(c) platinum : Conductor

(105) tin added to Copper = bronze, becomes a much harder substance, Tin contributes extra valence electrons to the metallic bonding

(109) n-Type - add element w/ more valence electrons
p-Type - add element w/ less valence electrons

(118) (a) Ge doped w/ As : n-type
(b) Si doped w/ B : p-type

(144) (a) H-bonding : A & B
(b) high viscosity = strong forces : B (2 O-H bonding sites)