Tutorial 5 Solutions

10-30 (a) ionic (b) London (c) London (d) dipole-dipole
(e) H-bonding (f) dipole-dipole (g) London
(note: all of these have London dispersion forces, but they are generally not as strong as the dipole-diple or H-bonding forces in those molecules that have them)

10-62 8 corner * 1/8 = 1 Ni atom 2 internal As atoms * 1 = 2 total As atoms
4 edge * 1/4 = 1 Ni atom
total = 2 Ni atoms
Therefore, the formula for the compound is Ni_2As_2 (or empirical formula NiAs)

10-86 250. g = 3.33 mol
Step 1 cool gas from 100.ºC to 75ºC (boiling point):
$q = -msΔT$ = -(250.g)(1.0J/g·º)(100-75º) = -6250 J = -6.3 kJ
Step 2 condense gas at its boiling point:
q = (-20. kJ/mol)(3.33 mol) = -66.7 kJ
Step 3 cool liquid from boiling point to melting point:
$q = -msΔT$ = -(250.g)(2.5J/g·º)(75º-(-15)) = -56 250 J = -56 kJ
Step 4 solidify at the melting point:
q = (-5. kJ/mol)(3.33 mol) = -16.7 kJ
Step 5 cool from -15ºC to -50.º
q final = $-msΔT$ = -(250.g)(3.0 J/g·º)(-15º-(-50.)) = -26250 J = -26 kJ

Total heat released = sum of the above 5 steps = -172 kJ

10-92 (a) There are 3 triple points

(b) @ 1420 atm TP: *s* (monoclinic) + *s* (rhombic) + *l*
@ 5.1 x 10^{-6} atm TP: *s* (monoclinic) + *s* (rhombic) + *g*
@ 3.2x 10^{-5} atm: *s* (monoclinic) + *g* + *l*

(c) *s* (monoclinic)

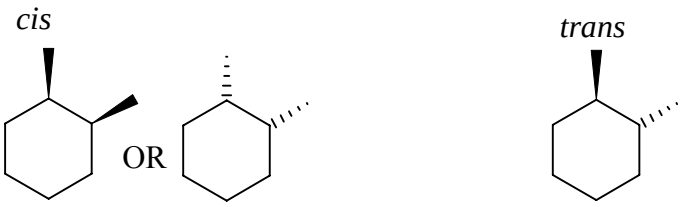
(d) for monoclinic, mpt = 115.21ºC
for rhombic, mpt = 95.39ºC

(e) densest is rhombic (it is always the top-left if all slopes are positive)

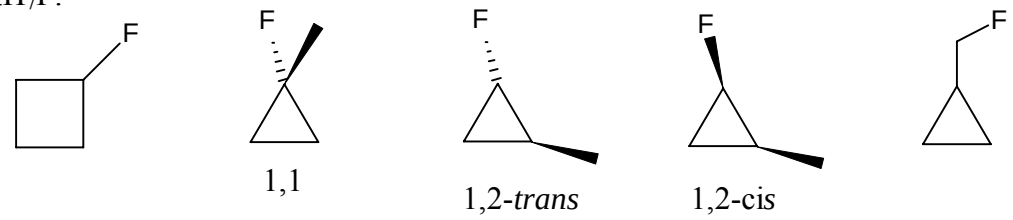
(f) no (can go rhombic → monoclinic → liquid → gas)

(g) gas → monoclinic → rhombic

22-42 *Cis-trans* isomerism in rings is related to the fact that rings have faces - an upper and a lower. Two substituents on the same face is *cis*, on opposite faces is *trans*. See Fig. 22.30.

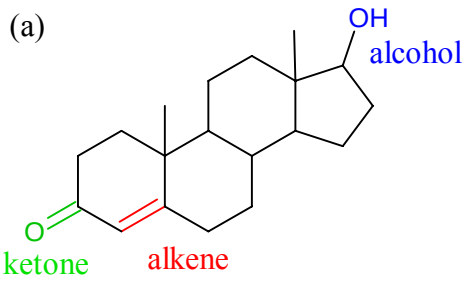


For C_4H_7F:

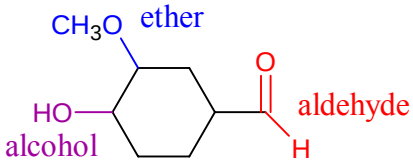


22-44 (a) *cis*-1-bromopropene (or *cis*-1-bromo-1-propene)
(b) *cis*-4-ethyl-3-methyl-3-heptene
(c) *trans*-1,4-diiodo-2-propyl-1-pentene

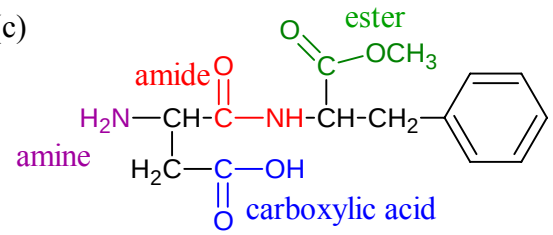
22-48 (a)



(b)



(c)



22-62 Major product in each case is,
(a) 2-butanol
(b) 2-bromobutane
(c) 2,2-dibromobutane
(d) 1-methylcyclopentanol (the OH and the CH_3 are one the same ring position)
(e) 3-chloro-3-methylpentane