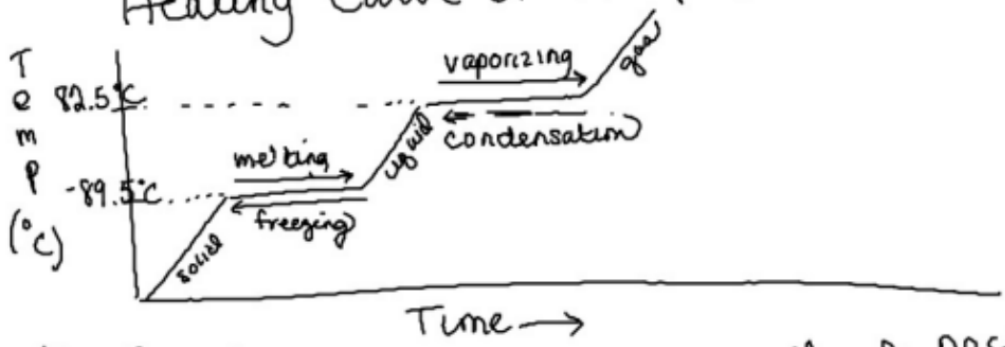
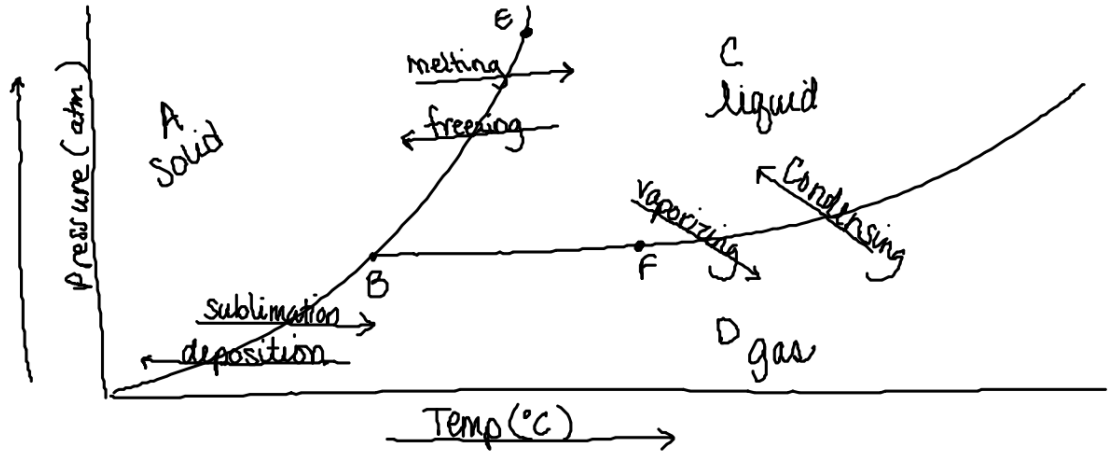
Hmwk:

1. a, c, d, g
2. H_2O can dissolve most things – because of its shape + polarity
3. The intermolecular forces cause adhesion + cohesion
4. H_2O requires a great deal of energy to change temp, and retains temps for a long time.

Heating Curve of Isopropanol



5. 82.5°C
6. -89.5°C
7. solid
8. no change in temp. time needed to gather energy



10.) B. = Triple point = all three phases exist at the same time

11.) E (melting)

12). F

14.) the point at which you can no longer liquify a gas.

15.) Steam @ 100°C Steam has greater energy.

Thermochemistry

measurement of the changes in energy for a system

energy is measured in calories, (calories, joules + kilojoules)
cal (Cal) J KJ

1 calorie is the energy required to heat 1 gram of H_2O by 1°C.

* 1 cal = 4.184 joules * memory work.

Temperature 0°C = 273K (°C + 273 = K)

-273°C = 0K (K - 273 = °C)

Energy = (mass)(ΔT)(C_p) ← when temp changes

Energy = (mass)(Heat of fusion or vaporization) ← no ΔT

} memory work

$\Delta T = T_{final} - T_{initial}$

C_p = Specific Heat Capacity (varies by phase)

* $C_{p_{H_2O\ liquid}} = 1\ ^{cal}/_{g°C} = 4.184\ ^{J}/_{g°C}$ * memory work

Heating Curve Practice:

H_2O	$H_f = 334\ J/g$	$H_v = 2260\ J/g$
	$C_{p_{steam}} = 1.996\ J/g°C$	$C_{p_{ice}} = 2.108\ J/g°C$

- $Energy = (mass)(\Delta T)(C_{p_{ice}}) = 632.4\ J$ (10g, 30°C, 2.108 J/g°C)
- $Energy = (mass)(H_{fusion})$ (10g)
- $Energy = (mass)(\Delta T)(C_{p_{water}})$ (10g)
- $Energy = (mass)(H_{vaporizing})$ (10g)
- $Energy = (mass)(\Delta T)(C_{p_{steam}})$ (10g)

How much energy is required to heat water (ice) @ -30.0°C to steam @ 120.°C? (10.0g of H_2O)

$(10g)(30°C)(2.108\ J/g°C) = 632.4\ J$

$(10g)(334\ J/g) = 3340\ J$

$(10g)(100°C)(4.184\ J/g°C) = 4184\ J$

$(10g)(2260\ J/g) = 22600\ J$

$(10g)(20°C)(1.996\ J/g°C) = 399.2\ J$

Total $31155\ J \rightarrow \boxed{31200\ J}$

$H_f = 321\ J/g$

How much energy is required to melt 0.73 mol of Al? (0.73 mol: given)

$$0.73\ \text{mol Al} \times \frac{26.98\ \text{g Al}}{1\ \text{mol Al}} \times \frac{321\ \text{J}}{1\ \text{g}} = 6300\ \text{J}$$

How much energy would be required to vaporize 50.0g of Al? $H_v = 307572\ J/mol$

$$50.0\ \text{g Al} \times \frac{1\ \text{mol Al}}{26.98\ \text{g Al}} \times \frac{307572\ \text{J}}{1\ \text{mol}} = 5.70 \times 10^5\ \text{J}$$

570000 J

$$H_2(g) + Br_2(g) \longrightarrow 2\ HBr \quad \Delta H_{rxn} = 72.80\ KJ$$

How much energy will be absorbed if 38.2g Br_2 react?

$$38.2\ \text{g } Br_2 \times \frac{1\ \text{mol } Br_2}{159.80\ \text{g } Br_2} \times \frac{72.80\ \text{KJ}}{1\ \text{mol } Br_2} = 17.4\ \text{KJ}$$

$$2\ P + 5\ Cl_2(g) \longrightarrow 2\ PCl_5 \quad \Delta H_{rxn} = -886\ KJ$$

exothermic

How much energy is lost when 1.48g Cl_2 react?

$$1.48\ \text{g } Cl_2 \times \frac{1\ \text{mol } Cl_2}{70.90\ \text{g } Cl_2} \times \frac{-886\ \text{KJ}}{5\ \text{mol } Cl_2} = -3.67\ \text{KJ}$$