① [C], I_2 is the largest molecule - Bigger = more intermolecular interactions

② [D] Gases are less dense than liquids $\frac{g}{L}$ vrs $\frac{g}{mL}$

③ NONE

④ 14.7 psi = 760 torr so $75 psi \times \frac{760 torr}{14.7 psi} = 3878 torr = 3900 torr$ [C]

⑤ none

⑥ [D] Cold + pressure brings atoms close together

1. intermolecular y'all

2. Nope

3. [C] hydrogen bonding - the Atlas of intermolecular forces

④ Nuh-uh

⑤ [C] Think about Ketchup (Catsup?) heat it, faster molasses in January?

⑥ huh?

⑦ Just like the quiz? RbCl highest - ionic (salt)
CH_3OH H-Bonding
CH_3Cl dipole dipole
$CH_3CH_2CH_2CH_2CH_2CH_3$ hexane dispersion (induced dipole)
CH_4 methane less induced dipole

(8) Just like the quiz?

Imagine water on your skin ($H_2O_{(l)}$) - add heat to become $H_2O_{(g)}$ so: 1.7×10^5 J of heat $\times \frac{1\text{ mol } H_2O}{40700\text{ J}} = 4.177\text{ mol}$

$4.177\text{ mol } H_2O \times \frac{18.02\text{ g } H_2O}{1\text{ mol } H_2O} = 75\text{ g}$ (2 sig figs)

1 mol H_2O absorbs 40700 J to go to a gas

(9) 25.0 g $NH_{3(l)}$ (1) → $NH_{3(l)}$ (2) → $NH_{3(g)}$ (3) → $NH_{3(g)}$

$-65.0°C$ -33.4 -33.4 $-12.0°C$

N = 14.01
3×H = 3.032
17.04 g/mol

(1) $q = 25.0\text{ g} \times 4.71\frac{\text{J}}{\text{g°C}}(-33.4-(-65.0)) = 3713\text{ J}$ 2 sig figs

(2) $q = \Delta H_{vap} \times \text{mol } NH_3 = 23500\frac{\text{J}}{\text{mol}} \times \frac{1\text{ mol } NH_3}{17.04\text{ g}} \times 25.0\text{ g } NH_3 = 34480\text{ J}$

(3) $q = 25.0\text{ g} \times 2.2\frac{\text{J}}{\text{g°C}}(-12.0°C-(-33.4°C)) = 1177\text{ J}$

3713 J
34480 J
+ 1177 J
39370 J

39400 J or 39.4 kJ

(10) $P_T = P_{H_2} + P_{H_2O}$ @ 45°C $P_{H_2O} = 71.9\text{ torr} \times \frac{1\text{ atm}}{760\text{ torr}} = 0.0946\text{ atm}$

$P_{H_2} = P_T - P_{H_2O} = 0.85\text{ atm} - 0.0946\text{ atm}$

$P_{H_2} = 0.76\text{ atm}$

Limiting

mol Mg = $\frac{0.0345\text{ g}}{24.31\text{ g/mol}} = 0.00142$ mol Mg

moles H_2

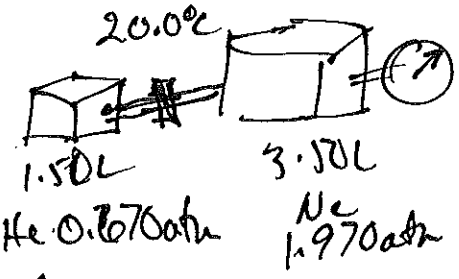
mol HCl = $.725\text{M} \times 0.275\text{ L}$
= 0.2 mol HCl

$PV = nRT$

$V = \frac{nRT}{P} = \frac{0.00142\text{ mol } H_2 \times 0.0820\frac{\text{L atm}}{\text{mol K}} \times 318.15}{0.76\text{ atm}} = 0.049\text{ L}$

$n = 0.00142\text{ mol Mg} \times \frac{1\text{ H}_2}{1\text{ Mg}} = 0.00142$ mol

(12)



Final pressure? moles of everything

$P = \frac{n RT}{V}$ ← 20.0°C = 293.15K

V ← 3.50 + 1.50 L

$\text{mol He} = \frac{0.670\text{atm} \times 1.5\text{L}}{0.08206 \times 293.15\text{K}} = 0.0418 \text{ mol He}$

$\text{mol Ne} = \frac{1.97\text{atm} \times 3.50\text{L}}{0.08206 \times 293.15\text{K}} = 0.2866 \text{ mol Ne}$

0.3284 mol gas

$P = \frac{0.3248\text{mol} \times 0.08206 \cdot 293.15\text{K}}{5.00\text{L}}$

$\boxed{P_T = 1.58\text{atm}}$

(13) mass of $X \cdot H_2O = 55.00\text{g}$ mass of H_2O = ?

$n = \frac{PV}{RT} = \frac{2.50\text{atm} \cdot 20.00\text{L}}{0.08206 \cdot 423.15\text{K}} = 1.4399 \text{ mol } H_2O \times \frac{18.02\text{g}}{1\text{mol}} =$

$25.95\text{g } H_2O$

$\%\text{ by mass} = \frac{25.95\text{g}}{55.00\text{g}} \times 100 = \boxed{47.2\%}$

(14) $\ln \frac{P_1}{P_2} = \frac{\Delta H_{vap}}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$

$P_1 = 0.0528\text{atm}$ $T_1 = 7.60°C = 280.75\text{K}$

$P_2 = ?$ $T_2 = 30.50°C = 303.65\text{K}$

$\ln \frac{0.0528\text{atm}}{P_2} = \frac{31000\text{J/mol}}{8.314\text{J/mol K}}\left(\frac{1}{303.65} - \frac{1}{280.75}\right)$

$3729\text{J}\left(-2.686 \times 10^{-4}\right)$

$e^{\left(\ln \frac{0.0528\text{atm}}{P_2}\right)} = e^{-1.002}$

$\frac{0.0528\text{atm}}{P_2} = 0.3673$

$\boxed{P_2 = 0.144\text{atm}}$

(15) 

find mass of $H_2O_{(g)}$ from n (moles of $H_2O_{(g)}$)

$$n = \frac{PV}{RT} = \frac{0.247\text{atm} \times 5.00\text{L}}{0.08206 \times 338.15\text{K}}$$

$$= 0.04451\text{ mol } H_2O \times \frac{18.02\text{g}}{\text{mol}}$$

$= 0.8020\text{ g } H_2O$

$H_2O_{(l)} = H_2O_T - H_2O_{(g)}$

$= 1.45\text{g} - 0.8020\text{g}$

$= 0.648 \equiv 0.65\text{g } H_2O$

(16) $\Delta T_f = K_f m$

$(5.50 - 4.30) = 5.12^\circ\text{C}\ m$

$\frac{1.2^\circ\text{C}}{5.12^\circ\text{C}} = m = 0.2344\ m \leftarrow \frac{\text{mol Sol}}{\text{Kg Solvent}}$

$\text{mol Solute} = \frac{0.2344\text{ mol Solute}}{1\text{ Kg Benzene}} \times 0.025\text{Kg}$

$= 0.005859\text{ mol Solute}$

$\text{Molar mass} = \frac{\text{g}}{\text{mol}}$ So $\frac{2.500\text{g}}{0.005859\text{mol}}$

$= 426.7\text{ g/mol}$

(17) molality $= \frac{\text{mol HCl}}{\text{Kg Solvent } (H_2O)}$

37.0% HCl by mass imagine 100g of sol 37g HCl → mol HCl $37.0\text{g HCl} \times \frac{1\text{mol}}{36.46\text{g}} = 1.015\text{mol}$

$63\text{g } H_2O = 0.063\text{Kg } H_2O$

$m = \frac{1.015\text{mol}}{0.0630\text{Kg}} = 16.1\text{ molal}$