KEY

5-28

1. 760 mmHg $\rightarrow$ $\boxed{1\,atm}$

$$\frac{800\,mmHg}{} \left| \frac{1\,atm}{760\,mmHg} \right| \frac{1.01325\times10^5\,Pa}{1\,atm} = \boxed{1.07\times10^5\ Pa}$$

2. same # moles - P, V, T same so n same
mass different, velocity different b/c mass different.

3. smallest mass = fastest = CH_4

4. PV same n = 1x (flask 1), 2x (flask 2)

$PV = nRT$

$\hookrightarrow T = \frac{PV}{nR}$

$T_1 = \frac{\cancel{PV}}{\cancel{R}(1T)} \times 2T \quad T_2 = \frac{\cancel{PV}}{\cancel{R}(2T)}$

$T_1 = \frac{1}{1T} \qquad T_2 = \frac{1}{2T}$

half as many moles

ratio = 2 : 1
flask #1 flask #2

5. $V_1 = 2L$ $\quad V_2 = ?$ $\quad \frac{n_1}{V_1} = \frac{n_2}{V_2}$
$n_1 = 5\,mol$ $\quad n_2 = 2.3\,mol$

$\frac{5\,mol}{2\,L} = \frac{2.3\,mol}{V_2}$ $\quad V_2 = 0.92\,L$

6. just asking you to write a practice problem for a $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ problem

7. T, P same → then V same IF n is same

8. $PV = nRT$

$(732 \text{ mmg})(3.5 L) = n(62.4 \frac{L \cdot mmHg}{K \text{ mol}})(20° + 273)$

$n = 0.14$ mol

$\frac{0.14 \text{ mol}}{} \bigg| \frac{6.02 \times 10^{23} \text{ molec.}}{1 \text{ mol}} = \boxed{8.44 \times 10^{22} \text{ molecules}}$

9. $V_1 = 28.8 L$ — $V_2 = ?$

$T_1 = 12°C + 273 = 285 K$ — $T_2 = 30°C + 273 = 303 K$

$P_1 = 843 mmHg$ — $P_2 = 720 mmHg$

$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$ $\quad \frac{(843)(28.8)}{(285)} = \frac{(720)(V_2)}{(303)}$

$\boxed{V_2 = 35.8 L}$

10. most ideal = ↓P, ↓n, ↑T

need them very far apart (↓P, ↓n) and going very fast (↑T) so they dont interact w/ each other

11 $\frac{220g\ H_2O \mid 1\ mol\ H_2O}{\mid 18g\ H_2O}$ = 12.22 mol

PV=nRT

(P)(0.25) = (12.22)(0.0821)(293)

P=?
V= 250mL → 0.25L
n= 12.22 mol
R= 0.0821 Latm/Kmol
T= 20° +273 = 293K

$\boxed{P = 1175.8\ atm}$

12 $M = \frac{mRT}{PV}$ $\frac{(3.67g)(62.4\ L\ mmHg/K\ mol)(24°+273)}{(792\ mmHg)(0.25L)}$

$\boxed{M = 343.5\ g/mol}$

13 $D = \frac{MP}{RT}$ C_2H_5OH = 46 g/mol

$D = \frac{(46)(800)}{(62.4)(25+273)}$ $\boxed{D = 1.98\ g/L}$

14 30°C → 90°C
+273 +273
303 K 363

KE varies directly w/ temp in KELVIN! not °C.

↳ ∴ Your temp does NOT triple, your KE does NOT triple, it just increases.

15 $P_{DRY} = P_{TOTAL} - P_{WET}$
↖ From chart

P_{DRY} = 1atm − P_{WET}
↳ 760 mmHg − 28.3 mmHg = $\boxed{731.7\ mmHg}$

(4)

(16) 28.3 mmHg → from chart

(17) see your reader!

(18) ↑ temp = ↑ velocity

(19) PV=nRT

$(795\,\text{mmHg})(0.5L) = (n)(62.4\,\frac{L\,\text{mmHg}}{K\,\text{mol}})(15° + 273)$

$\boxed{n = 0.022 \text{ mol}}$

(1) copper has a greater ΔT b/c its specific heat is lower → takes less energy to raise 1g by 1°C so it will happen faster

(2) $Q = (25g)(0.386\,\frac{J}{gK})(75° - 23°) = \boxed{501.8\,J}$

* its ok that C is in K and T's are in °C b/c ΔT is a change and one Δ degree °C is the same size as one Δ degree K

(3) $2350\,J = (25g)(0.126\,\frac{J}{gK})(T_f - 27°)$

$2350 = 3.15\,T_f - 85.05$

$\frac{2435.05}{3.15} = \frac{3.15\,T_f}{3.15}$ $T_f = 773°C$

(4) see your reader!

(5) $12300\,J = (m)(0.380\,\frac{J}{g^\circ C})(75^\circ - 25^\circ)$

$\boxed{m = 647.4g}$

(6) $Q = (50g)(4.18\,J/g^\circ C)(15^\circ - 75^\circ) = \boxed{-12540\,J}$

(7) $Q_3 = (25)(4.18)(100-25) = 7837.5\,J$

$Q_4 = (25)(2260) = 56500\,J$

$Q_T = Q_3 + Q_4 =$

$\boxed{64337.5\,J}$

(8) $Q_5 = (10)(1.87)(100-115) = -280.5\,J$

$Q_4 = (10)(-2260) = -22600\,J$

$Q_3 = (10)(4.18)(0-100) = 4180\,J$

$Q_2 = (10)(-334) = -3340\,J$

$Q_1 = (10)(2.09)(-15-0) = -313.5\,J$

$Q_T = \boxed{-30714\,J}$

(9) use $Q = mL$, no temp change so $Q = mc\Delta T$ doesn't work!

(10) silver

$Q =$

$m = ?$

$C = 0.233\,J/g^\circ C$

$\Delta T = 26^\circ C - 58.6^\circ C = -32.6^\circ C$

water

$Q =$

$m = 100g$

$c = 4.18\,J/g^\circ C$

$\Delta T = 26^\circ C - 24.8^\circ C = 1.2^\circ C$

$Q = -Q$

$mc\Delta T = -mc\Delta T$

$(m)(0.233)(-32.6) = -(100)(4.18)(1.2)$

$\boxed{m = 66.04g}$

6

11 metal

$Q = -$
$m = 5.74g$
$C = ?$
$\Delta T = 26.3$
$\underline{-72.1}$
$-45.8°$

water

$Q = -$
$m = 15.2g$
$C = 4.18\ J/g°C$
$\Delta T = 26.3$
$\underline{-24.7}$
$1.6°$

$Q = -Q$
$mC\Delta T = -mC\Delta T$

$(5.74)(C)(-45.8) = -(15.2)(4.18)(1.6)$

$\boxed{C = 0.387\ J/g°C = \text{copper}}$

12 metal

$Q = -$
$m = 25g$
$C = 0.128\ J/g°C$
$\Delta T = Tf$
-100

water

$Q = -$
$m = 10g$
$C = 4.18\ J/g°C$
$\Delta T = Tf$
-25

$Q = -Q$
$mC\Delta T = -mC\Delta T$

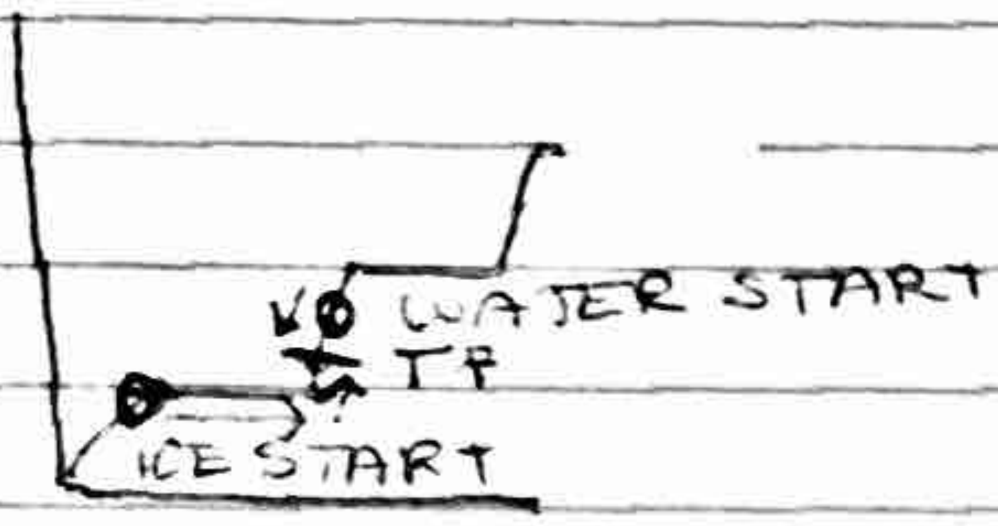
$(25)(0.128)(Tf - 100) = -(10)(4.18)(Tf - 25)$

$3.2Tf - 320 = -41.8Tf + 1045$
$+41.8Tf \quad +320 \quad + 41.8Tf \quad +320$

$\frac{45Tf}{45} = \frac{1365}{45}$ $\boxed{Tf = 30.3°}$

13 Closer to water's starting temp b/c the metal's low specific heat means that it cant hold a lot of energy, and water's high specific heat means it can hold onto a lot of energy so it wont change its temp as much

14



$$Q_{ice} = -Q_{water}$$

$$\rightarrow Q_{ice} + Q_{water} = \emptyset$$

$$Q_{ice} \begin{cases} Q_2 = mL \\ Q_3 = mc\Delta T \end{cases}$$

$$Q_{water} \{ \; Q_3 = mc\Delta T$$

ice

$Q_2 = (18)(334) = 6012 \text{ J}$

$Q_3 = (18)(4.18)(T_f - \emptyset°) = 75.24\,T_f$

water

$Q_3 = (275)(4.18)(T_f - 80°) = 1149.5\,T_f - 91960 \text{ J}$

$$(75.24\,T_f) + (1149.5\,T_f - 91960) = \emptyset$$

$$\frac{1224.74\,T_f}{1224.74} = \frac{91960}{1224.74} \qquad \boxed{T_f = 75°}$$