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Thermo Hmwk:

1. C
2. F
3. B
4. E
5. A/H
6. G
7. A/H
8. D
9. Δ delta (final - initial)
10. released
11. molar mass
12. 25°C is Room Temp.
13. Thermochemistry
14. Calorimeter
15. $1\ \text{cal/g°C} = 4.184\ \text{J/g°C}$

$3Fe + 2O_2 \rightarrow Fe_3O_4$

16. $11.8\text{g Fe} \times \frac{1\text{ mol Fe}}{55.85\text{g Fe}} \times \frac{-1120.48\text{ KJ}}{3\text{ mol Fe}} = \boxed{-78.9\text{ KJ}}$

17. $18.6\text{g } H_2 \times \frac{1\text{ mol } H_2}{2.02\text{g } H_2} \times \frac{-571.6\text{ KJ}}{2\text{ mol } H_2} = \boxed{-2630\text{ KJ}}$

18. $14.9\text{g } NH_3 \times \frac{1\text{ mol } NH_3}{17.04\text{g } NH_3} \times \frac{-1170\text{ KJ}}{4\text{ mol } NH_3} = \boxed{-256\text{ KJ}}$

19. $5.81\text{g C} \times \frac{1\text{ mol C}}{12.01\text{g C}} \times \frac{49.03\text{ KJ}}{6\text{ mol C}} = \boxed{3.95\text{ KJ}}$

24. H_2O $(65.0g)(15.4-28.1°C)(4.184\ J/g°C) = \boxed{-3454\ J}$

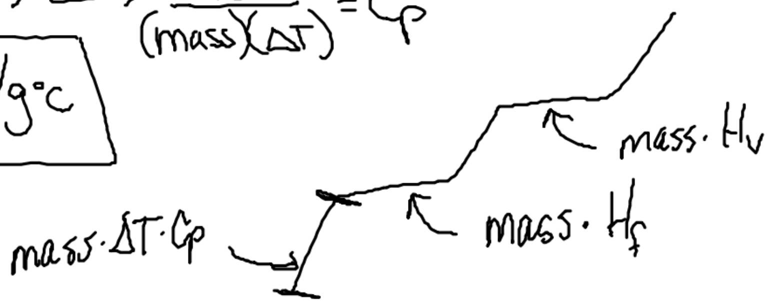
KCN $19.2g\ KCN \times \frac{1\ mol\ KCN}{65.12\ g\ KCN} \times \frac{-3454J}{1\ mol\ KCN} = \boxed{-1020J}\ \cancel{-1018}$

25. H_2O $(60.0g)(13.2°C - 27.2°C)(4.184\ J/g°C) = \boxed{-3515J}$

KI $28.7g\ KI \times \frac{1\ mol\ KI}{166.00g\ KI} \times \frac{-3515J}{1\ mol\ KI} = \boxed{-608J}$

26. $Heat = (mass)(\Delta T)(C_p) \longrightarrow \frac{Heat}{(mass)(\Delta T)} = C_p$

$\frac{91.6J}{(36.7g)(4.8°C)} = \boxed{0.52\ J/g°C}$



Gas Laws

STP = Standard temperature + pressure

Standard temperature: 0°C = 273K

(°C + 273)

all gas laws use Kelvin

pressure: 1ATM 101.3KPa 760mmHg

Boyle's Law

↑P ↓V ↓P ↑V

$$V_1P_1 = V_2P_2$$

Charles' Law

↑T ↑V ↓T ↓V

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

Combined Gas Law

$$\frac{V_1P_1}{T_1} = \frac{V_2P_2}{T_2}$$

ALL Temps in KELVIN

Boyle's Law Practice

#1 $V_1 = 100.0cm^3$

$P_1 = 10.50KPa$

$V_2 = ?$

$P_2 = 9.91kPa$

(3sf)

$$\frac{(100.0cm^3)(10.50\cancel{kPa})}{9.91\cancel{kPa}} = \frac{V_2(\cancel{9.91KPa})}{\cancel{9.91KPa}}$$

$$V_2 = \boxed{106\ cm^3}$$

Charles' Law Practice

3. $V_1 = 0.560L$

$T_1 = \cancel{120°C} \rightarrow 393K$

$V_2 = 0.400L$

$T_2 = ?$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$\div \frac{0.560L}{393K} = \frac{0.400L}{T_2}$$

$$T_2 = \boxed{281\,K}$$

Combined Gas Laws Practices

1. $V_1 = 500.0ml$

2sf $P_1 = 120\ kPa$

$T_1 = 293K$

$V_2 = ?$

$P_2 = 101.3\ kPa$

$T_2 = 273K$

$$\frac{(500.0ml)(120kPa)}{293k} = \frac{V_2(101.3kPa)}{273K}$$

$$V_2 = \boxed{550ml}$$

$$(500 \cdot 120 \cdot 273) \div (293 \cdot 101.3)$$

$$\underline{55}1.8 \rightarrow 550$$

STP 0°C 273K 1 ATM 101.3 kPa 760 mmHg

Boyle's Law	Charles Law	Combined Gas Laws
$V_1P_1 = V_2P_2$	$\frac{V_1}{T_1} = \frac{V_2}{T_2}$	$\frac{V_1P_1}{T_1} = \frac{V_2P_2}{T_2}$
(inverse)	(Direct)	

$$P V = \underset{\text{moles}}{\underset{\uparrow}{n}} R T$$

$$P V \underset{\text{molar mass}}{\underset{\uparrow}{m}} = \underset{\nwarrow \text{grams given}}{g} R T$$

R values (Ideal Law Gas Constant)

$$0.0821 \frac{L \cdot atm}{mol \cdot K} \quad 8.31 \frac{L \cdot kPa}{mol \cdot K} \quad 62.4 \frac{L \cdot mmHg}{mol \cdot K}$$

Calculating the density of a gas:

$D = \frac{m}{V}$ $D_{STP} = \frac{\text{molar mass}}{22.4L}$ (gas only)

CO_2 $?D_{STP} = \frac{44.01g}{22.4L} = \boxed{1.96 g/L}$

O_2 $?D_{STP} = \frac{32.00g}{22.4L} = \boxed{1.43 g/L}$

if NOT at STP use combined gas Law to find Volume.