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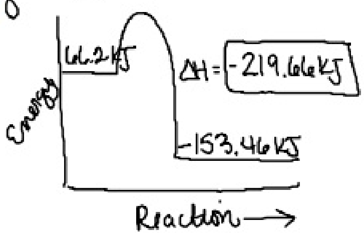
1 cal = 4.184 J $\frac{1\ cal}{4.184\ J}$ or $\frac{4.184\ J}{1\ cal}$

Thermo Hmwk:

C 1
G 2
B 3
E 4
H 5
A 6
E 7
D 8

1. 22.7 J
2. 3038 J
3. 14.5 cal
4. 281.5 cal
5. $4.14 \times 10^6$ cal
6. 1.92 cal
7. 0.00772 cal
8. $3.10 \times 10^6$ J
9. 0.0125 cal
10. 0.141 J
11. 320 K
12. 48°C
13. 1273 K
14. 253 K
15. −241°C
16. 2137°C
17. 176 K
18. 28°C
19. 277.9 K
20. 219.6 K

21. Exothermic



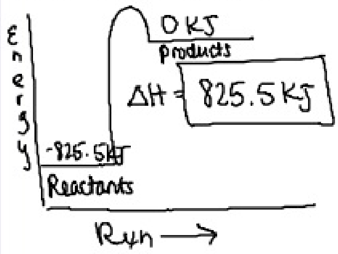

$\Delta H_{rxn} = \Delta H_{prod.} - \Delta H_{react.}$

$\Delta H_{rxn} = (2\,mol \cdot -76.73\,kJ/mol) - (0\,kJ/mol + 2\,mol \cdot 33.10\,kJ/mol)$

$= (-153.46\,kJ) - (66.2\,kJ)$

$= \boxed{-219.66\,kJ}$

22. Endothermic

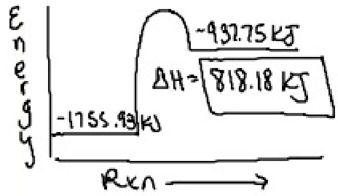



prod − react

$\Delta H_{rxn} = (4\,mol \cdot 0\,kJ/mol + 3\,mol \cdot 0\,kJ/mol) - (1\,mol \cdot -825.5\,kJ/mol) =$

$\Delta H_{rxn} = \boxed{+\ 825.5\,kJ}$

23. Endothermic




$\Delta H_{rxn} = ((2\,mol \cdot -331.64\,kJ/mol) + (1\,mol \cdot -274.47\,kJ/mol)) - ((2\,mol \cdot -417.98\,kJ/mol) + (1\,mol \cdot -919.97\,kJ/mol)) =$

$\Delta H_{rxn} = \boxed{818.18\,kJ}$

If given moles and need grams —

$$\# \text{ mol given} \times \frac{\text{molar mass}}{1 \text{ mol}} = \# g$$

If given grams and need moles —

$$\# \text{ grams given} \times \frac{1 \text{ mol}}{\text{molar mass}} = \# \text{ of mol.}$$

24.02 g C being melted. If the Heat of fusion for Carbon is 100 J/mol, how many joules are released?

mass · $H_{fusion}$ — mol · $H_{fus}$

$$24.02g \times \frac{1 \text{ mol}}{12.01 g} = 2 \text{ mol} \cdot 100 \text{ J/mol} = \boxed{200 J}$$

Chem. SOL June 1st

5 strands — (2 quizzes per strand)

1 - Scientific Investigation

2. Atomic Relationships

3. Nomenclature + Chemical Reactions

4. Molar Relationships

5. Phases of Matter + KMT

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# Gas Laws

STP = Standard temperature + pressure

$0^{\circ}C = 273K$    1 ATM    101.3 KPa    760 mmHg

($^{\circ}C + 273$)

all gas laws use Kelvin

## 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)

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

$V_2 = 106\ cm^3$

## Charles' Law Practice

3. $V_1 = 0.560L$
   $T_1 = \sout{120°C} \rightarrow 393K$
   $V_2 = 0.400L$
   $T_2 = ?$

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

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

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

## Combined Gas Laws Practices

1. $V_1 = 500.0ml$
   2sf $P_1 = 120 kPa$
   $T_1 = 293K$
   $V_2 = ?$
   $P_2 = 101.3kPa$
   $T_2 = 273K$

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

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

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

$$551.8 \rightarrow 550$$

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## Gas Laws

**STP** — Standard Temperature + pressure

$0°C = 273\ K$ — 1 ATM

$(°C + 273 = K)$ — 101.3 KPa

* This unit requires Kelvin — 760 mmHg

### Boyle's Law

↑P↓V ↓P↑V

inverse relationship

$$P_1V_1 = P_2V_2$$

### Charles Law

↑T↑V ↓T↓V

direct relationship

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

### Combined Gas Law

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

### Boyle's Law Practice

#1
initial: $V_1 = 100.0 cm^3$, $P_1 = 10.50 KPa$
new: $V_2 = ?$, $P_2 = 9.91 KPa$

(3sf)

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

1050 $cm^3 \cdot$ ~~kPa~~

**106 $cm^3$**

### Charles' Law Practice

#3
$V_1 = 0.560L$
$T_1 = $ ~~120°C~~ → 393 K
$V_2 = 0.400L$
$T_2 = ?$

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

$$\frac{\cancel{(393K)}}{\cancel{0.560L}}\ T_2\ \frac{\cancel{(0.560L)}}{\cancel{393K}} = \frac{0.400L(393K)}{0.560L}$$

$T_2 = $ **281 K**