KEY!

energy Lols

CheMistry: http://genest.weebly.com

Stop in for help every day at lunch and Tues. & Thurs. after school!

After-hours question? Email me at home: eogenest@madison.k12.wi.us

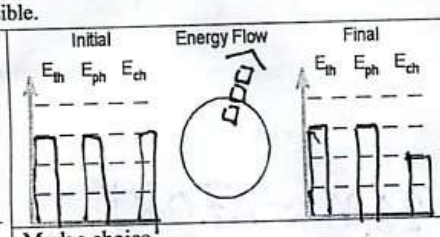
Name _____

Period _____

Word bank: Q, R, W These choices may be used more than once or not at all.	Word bank: E_{ph}, E_{ch}, E_{th} These choices may be used more than once or not at all.
1. W the symbol for when the system pushes on it's surroundings, 2. R the symbol for what a microwave sends through the air inside a microwave oven 3. Q what leaves your hand when it touches a cold steel chair 4. R the bright light from a burning piece of magnesium	5. E_{th} the energy of vibration is inside a system 6. E_{ph} the hidden energy connected with being gas, liquid, or solid 7. E_{th} the energy that increases in water when you heat a tea kettle 8. E_{ch} the energy that gasoline loses when your car burns it

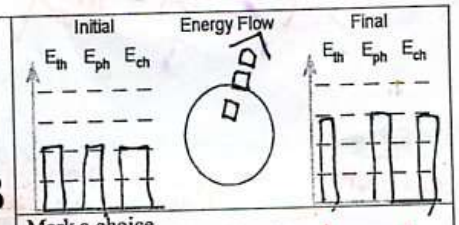
An energy diagram can't violate the Law of Conservation of Energy. Mark each of the following as possible or impossible.

A



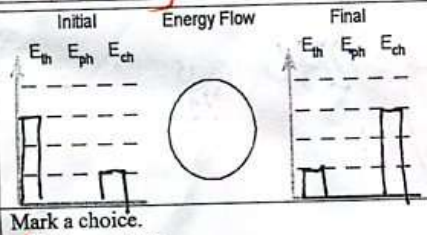
Mark a choice.
☐This is possible.
☒This is impossible because squares leaving is 3 but only 1 square is missing from the bar chart

B



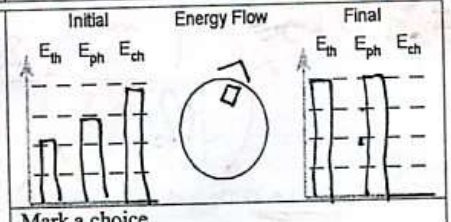
Mark a choice.
☒This is possible.
☐This is impossible because should have 3 units entering

C



Mark a choice.
☒This is possible.
☐This is impossible because _____

D



Mark a choice.
☒This is possible.
☐This is impossible because _____

1 2 4 (11)

9. For each reaction below decide whether the given conversion factors are true or false.

$2\ NH_{3(g)} \rightarrow N_{2(g)} + 3\ H_{2(g)} \quad \Delta H = 92.2\ kJ$			
$\frac{92.2\ kJ}{2\ N_2}$	$\frac{1\ N_2}{1\ H_2}$	$\frac{3\ H_2}{92.2\ kJ}$	$\frac{3\ H_2}{2\ NH_3}$
☐ True ☒ False	☐ True ☒ False	☒ True ☐ False	☒ True ☐ False
$\frac{22.4\ L\ H_2}{1\ mol\ H_2}$	$\frac{28.02\ grams\ N_2}{1\ mol\ N_2}$	$\frac{92.2\ kJ}{3\ moles\ H_2}$	$\frac{6.02 \times 10^{23}\ molecules\ H_2}{1\ molecule\ H_2}$
☒ True ☐ False	☒ True ☐ False	☒ True ☐ False	☐ True ☒ False

10. $3\ H_2 + N_2 \rightarrow 2\ NH_3 + 92kJ$

a) How many litres of hydrogen are required to produce 5.0 litres of NH_3 at the same temperature and pressure? Assume STP conditions.

$$5.0\ L\ NH_3 \times \frac{1\ mol\ NH_3}{22.4\ L\ NH_3} \times \frac{3\ mol\ H_2}{2\ mol\ NH_3} \times \frac{22.4\ L\ H_2}{1\ mol\ H_2} = 7.5\ L\ H_2$$

b) What amount of energy is released when 5.00 grams of NH_3 are produced?

$$5.00\ g\ NH_3 \times \frac{1\ mol\ NH_3}{17.04\ g\ NH_3} \times \frac{92\ kJ}{2\ moles\ NH_3} = 13.50\ kJ$$

c) Given the reaction above, what mass of nitrogen is needed to produce 889.0 kJ of energy?

$$889.0\ kJ \times \frac{1\ mol\ N_2}{92\ kJ} \times \frac{28.02\ g\ N_2}{1\ mol\ N_2} = 270\ grams\ N_2$$

11. $2\ C_{10}H_{22} + 31\ O_2 \rightarrow 20\ CO_2 + 22\ H_2O + 13483kJ$

a) What volume of CO_2 is produced when 17.4 litres of oxygen is used?

$$17.4\ L\ O_2 \times \frac{1\ mol\ O_2}{22.4\ L\ O_2} \times \frac{20\ mol\ CO_2}{31\ mol\ O_2} \times \frac{22.4\ L\ CO_2}{1\ mol\ CO_2} = 11.2\ L\ CO_2$$

b) What amount of energy is released when 1.00 gram of $C_{10}H_{22}$ is burned?

$$1.00\ g\ C_{10}H_{22} \times \left(\frac{1\ mol\ C_{10}H_{22}}{142.32\ g\ C_{10}H_{22}}\right)\left(\frac{13483\ kJ}{2\ mol\ C_{10}H_{22}}\right) = 47.4\ kJ$$

12. $4\ NH_3 + 5\ O_2 \longrightarrow 6\ H_2O + 4\ NO + 905kJ$

a) What mass of NO is produced when 2.0 moles of NH_3 react?

$$2.0\ moles\ NH_3 \times \left(\frac{4\ mol\ NO}{4\ mol\ NH_3}\right)\left(\frac{30.01\ grams\ NO}{1\ mol\ NO}\right) = 60.02\ grams\ NO$$

b) What volume of NH_3 is required to react with 3.00 litres of oxygen at STP?

$$3.0\ L\ O_2 \times \left(\frac{1\ mol\ O_2}{22.4\ L\ O_2}\right)\left(\frac{4\ mol\ NH_3}{5\ mol\ O_2}\right)\left(\frac{22.4\ L\ NH_3}{1\ mol\ NH_3}\right) = liters\ NH_3$$

answer: 2.4 liters NH_3

$4\ NH_3 + 5\ O_2 \longrightarrow 6\ H_2O + 4\ NO + 905kJ$

c) What volume of gaseous water, at STP, is produced along with 2.83 litres of NO gas at STP?

$$2.83\ L\ NO \times \left(\frac{1\ mol\ NO}{22.4\ L\ NO}\right)\left(\frac{6\ mol\ H_2O}{4\ mol\ NO}\right)\left(\frac{22.4\ L\ H_2O}{1\ mol\ H_2O}\right) = 4.25\ L\ H_2O\ gas$$

d) How much energy is produced when 2.70 grams of NH_3 are burned?

$$2.70\ g\ NH_3 \times \left(\frac{1\ mol\ NH_3}{17.04\ grams\ NH_3}\right)\left(\frac{905\ kJ}{4\ mol\ NH_3}\right) = 35.8\ kJ$$

1. How much energy should be transferred when 18.2 g of ammonia is formed during the reaction of hydrogen gas with nitrogen gas? Add the energy term to the correct side of the equation.

$N_2 + 3\,H_2 \rightarrow 2\,NH_3 + 92.2\,kJ$ $\quad \Delta H° = -92.2$ kJ

$18.2\,g\,NH_3 \left(\frac{2\,mol}{34.03\,g}\right)\left(\frac{92.2\,kJ}{2\,mol\,NH_3}\right) = 49.23\,kJ$

Solved by (signature): Tenzin

Worth 5 points Homework Credit.
No credit if not worked with your assigned partner.

Name Tenzin Chokyi

Name Rosee

2. What mass of Na_2CO_3 is needed to prepare 1.25 L of a 0.75M solution?

moles = 1.25L · 0.75 = .94 moles

$.94\,moles\,Na_2CO_3 \left(\frac{106.0\,g}{1\,mole}\right) = 100\,g\ of\ Na_2CO_3$

Solved by (signature): Rosee

3. Consider the following reaction: $P_4(s) + 6\,H_2(g) \rightarrow 4\,PH_3(g)$

What volume of hydrogen gas at 25°C and 0.981 atm is required to react completely with 2.51 g of P_4?

$2.51\,g\ of\ P_4 \left(\frac{1\,mole\,P_4}{123.88\,g}\right)\left(\frac{6\,mole\,H_2}{1\,mole\,P_4}\right) = .12\,mole\,H_2$

$.12\,mole\,H_2 \left(\frac{22.4}{1\,mole\,H_2}\right) = 2.68\,L\ of\ H_2$

Solved by (signature): Tenzin

1. How much energy should be transferred when 18.2 g of ammonia is formed during the reaction of hydrogen gas with nitrogen gas? Add the energy term to the correct side of the equation.

$N_2 + 3\,H_2 \rightarrow 2\,NH_3 + 92.2\ kJ \qquad \Delta H° = -92.2\ kJ$

$18.2\ g\ NH_3 \left(\frac{1\ mol}{17.04\ g}\right)\left(\frac{92.2\ kJ}{2\ mol\ NH_3}\right) = 49.24\ kJ$

Solved by (signature): _____

2. What mass of Na_2CO_3 is needed to prepare 1.25 L of a 0.75M solution?

$.75M \cdot 1.25L = .94\ mol\ Na_2CO_3$

$.94\ mol \left(\frac{106.06}{1\ mol}\right) \approx 100.\ g\ Na_2CO_3$

Solved by (signature): _____

Worth 5 points Homework Credit.
No credit if not worked with your assigned partner.

Name Lea

Name Alana

3. Consider the following reaction: $P_4(s) + 6\,H_2(g) \rightarrow 4\,PH_3(g)$

What volume of hydrogen gas at 25°C and 0.981 atm is required to react completely with 2.51 g of P_4?

STP

$2.51\ g\ P_4 \left(\frac{1\ mol}{30.97\ g}\right)\left(\frac{6\ mol\ H_2}{1\ mol\ P_4}\right)\left(\frac{22.4\ L}{1\ M\ H_2}\right) = 2.72\ L\ H_2$

Solved by (signature): Alana

a whole new ballgame