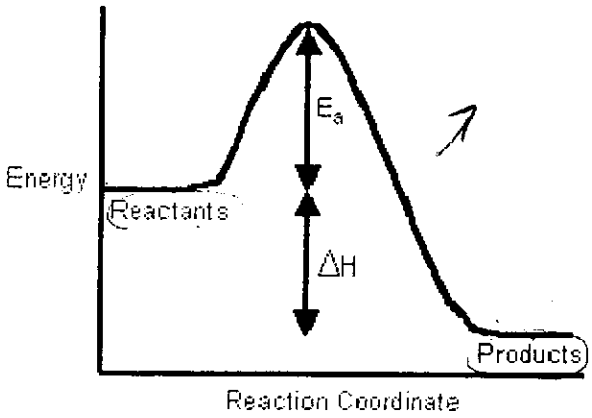
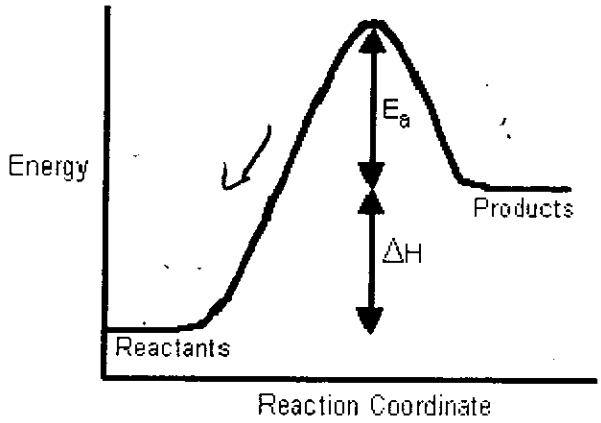
FITCH

Chemistry Unit 5
HW #3 – Enthalpy Diagrams and Reaction Rates

Questions 1-4 refer to the enthalpy diagrams shown. In each instance, choose the diagram which best fits the described process.



LEFT



RIGHT

1. The dilution of sulfuric acid by water is spontaneous, rapid reaction that is accompanied by the evolution of large amounts of heat.

LEFT

2. Ammonia, NH_3 may be made by the combination of nitrogen and hydrogen according to the following equation:

   $N_2 + 3H_2 \rightarrow 2NH_3 + 22$ kcal

   The use of catalysts, temperature of 500^0C and pressure of 250 atm are necessary to get a yield of about 30% ammonia.

RIGHT

3. Carbon (graphite) may be converted to carbon (diamond) under extremely high temperature and high pressure. $\Delta H = 37.5$ cal/g.

RIGHT

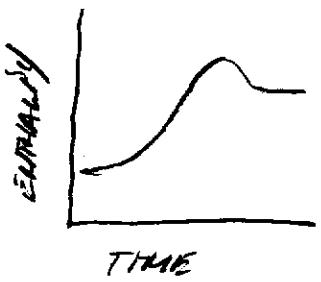
4. Ammonium chloride dissolves readily and spontaneously in water. When this process occurs, the reaction vessel becomes cold.

RIGHT

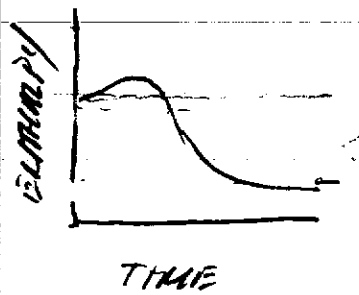
5. ACTIVATION ENERGY (A)
6. C
7. H
8. J
9. I
10. M
11. G
12. F
13. D

14. EXOTHERMIC = HEAT RELEASING
ENDOTHERMIC = HEAT ABSORBING

16.



17.



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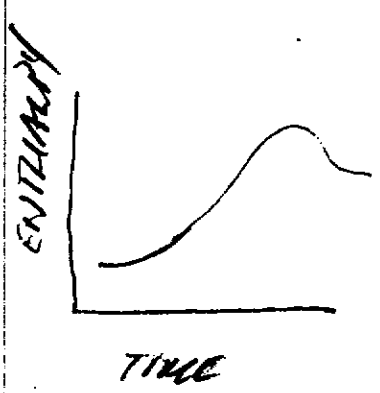

15. a. EXOTHERMIC
b. EXO
c. ENDOTHERMIC
d. EXOTHERMIC
e. EXO
f. EXO
g. EXO

(TRUE VALUE 686 KCAL = -2870 KJ)

19. $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + -2870\,KJ$

$(.05\text{-mol } C_6H_{12}O_6)\left(\frac{-2870\,KJ}{1\text{-mol}}\right) = -143.50\,KJ$

$= 143.50\,KJ$ (RELEASED)

20. $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O + -2200\,KJ$

$(44g\ C_3H_8)\left(\frac{1\text{-mol}}{44.1g}\right) = .998\text{-mol } C_3H_8$

$= -2195.6\,KJ$

$(.998\text{-mol } C_3H_8)\left(\frac{-2200\,KJ}{\text{mol}}\right) = 2195.6\,KJ$ (RELEASED)

21. $2H_2O_2 \rightarrow 2H_2O + O_2 \quad \Delta H = -98.2\,KJ/\text{mol}_{H_2O_2}$

$(51g\ H_2O_2)\left(\frac{1\text{-mol}}{34.02g}\right) = 1.499\text{-mol } H_2O_2$

$(1.499\text{-mol } H_2O_2)\left(\frac{-98.2\,KJ}{1\text{-mol}}\right) = -147.02\,KJ$

$-147.02\,KJ$ (RELEASED)