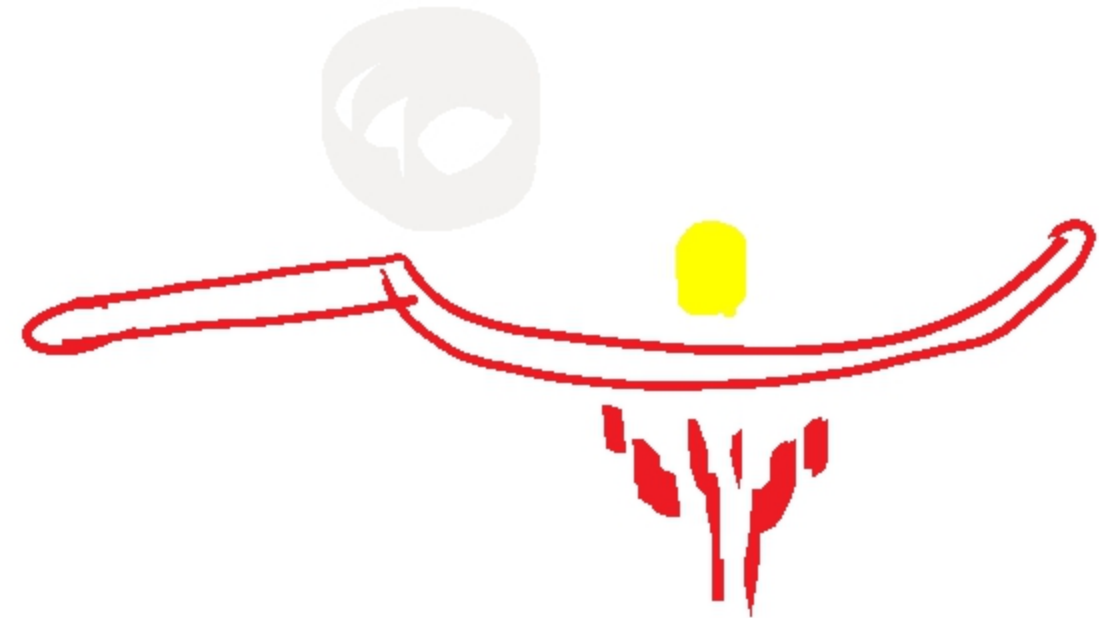
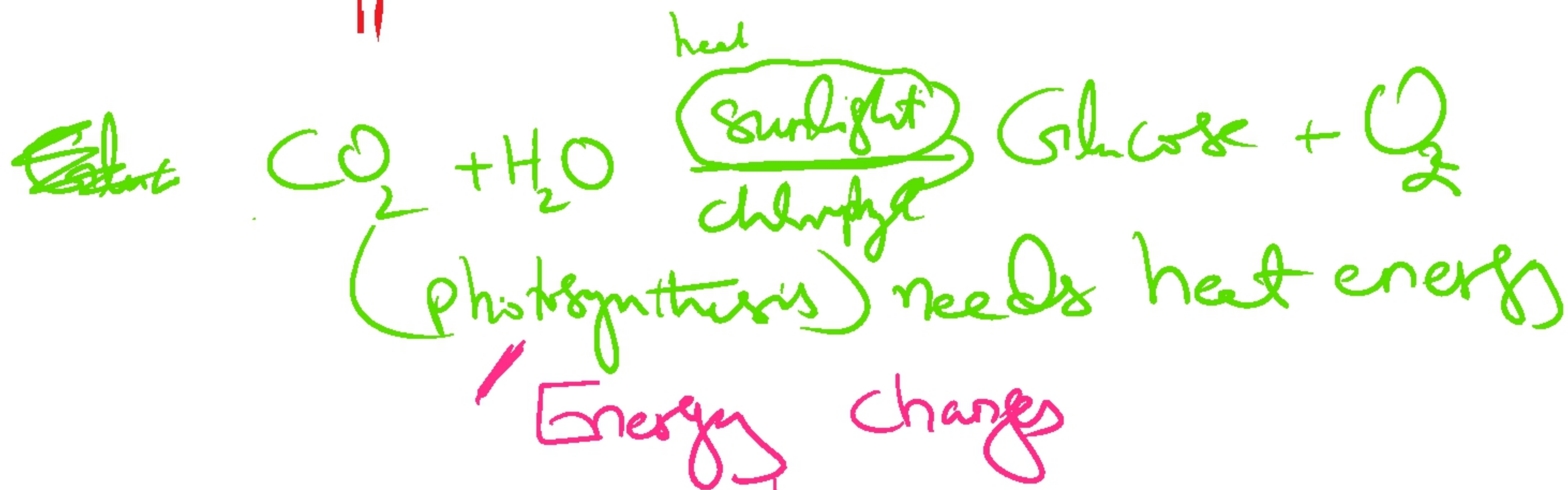


Chemical Energetics



Cooking an egg
needs heat energy

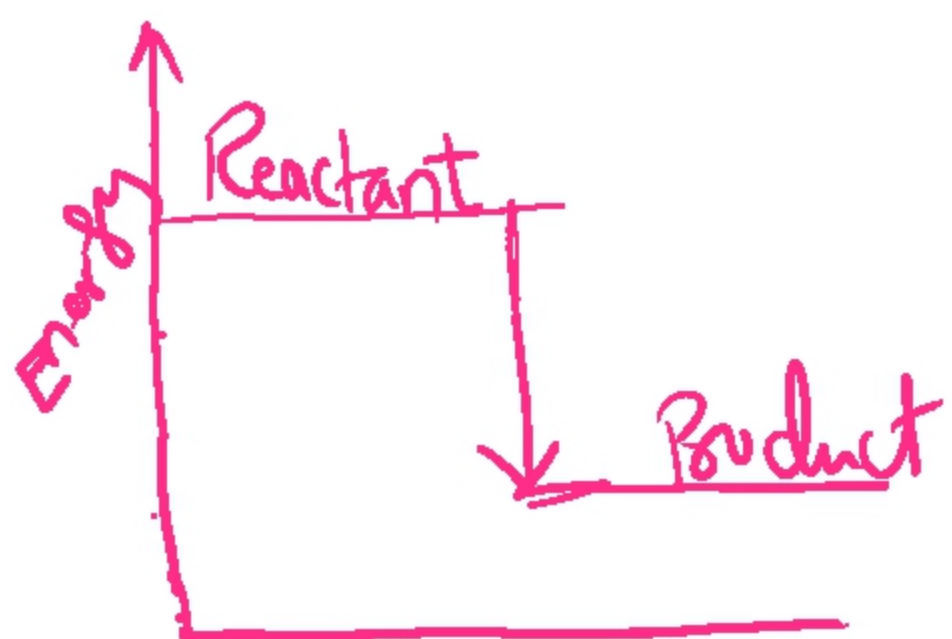


Exothermic Exit heat

These reactions gives out heat
into their surroundings



Energy level Diagram



Examples

(1) Combustion Reactions

Burning in the presence of O_2
Producing CO_2 & H_2O

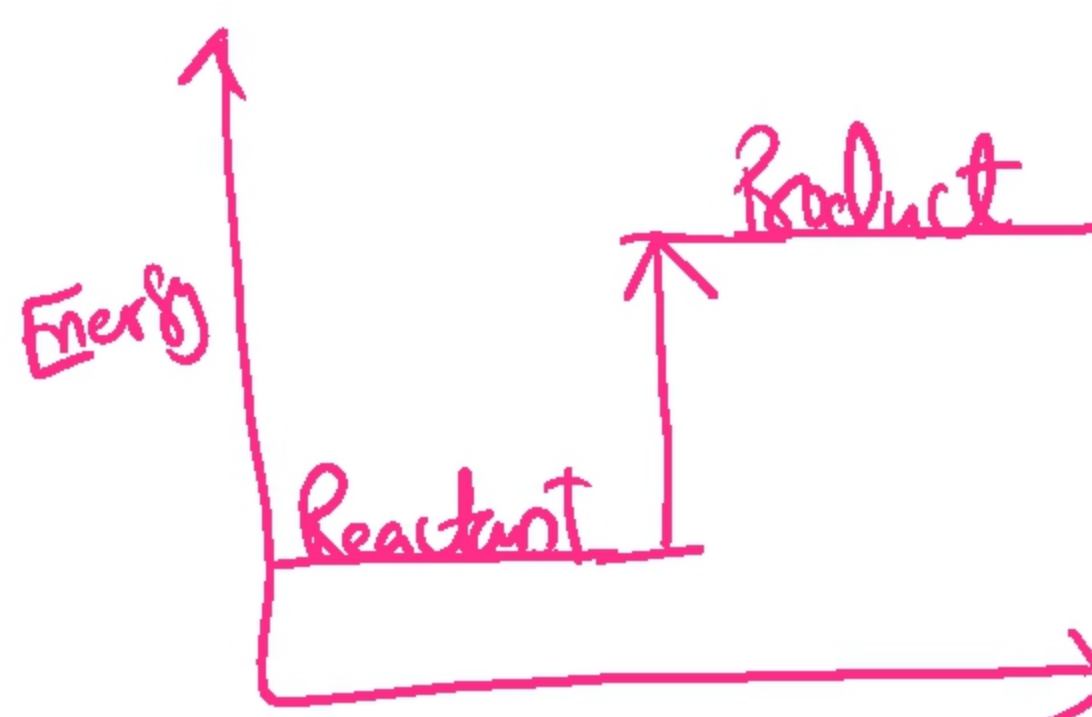
(2) Respiration



(3) Neutralisation Reaction

Endothermic Enter heat

These reactions needs heat
from the surrounding.



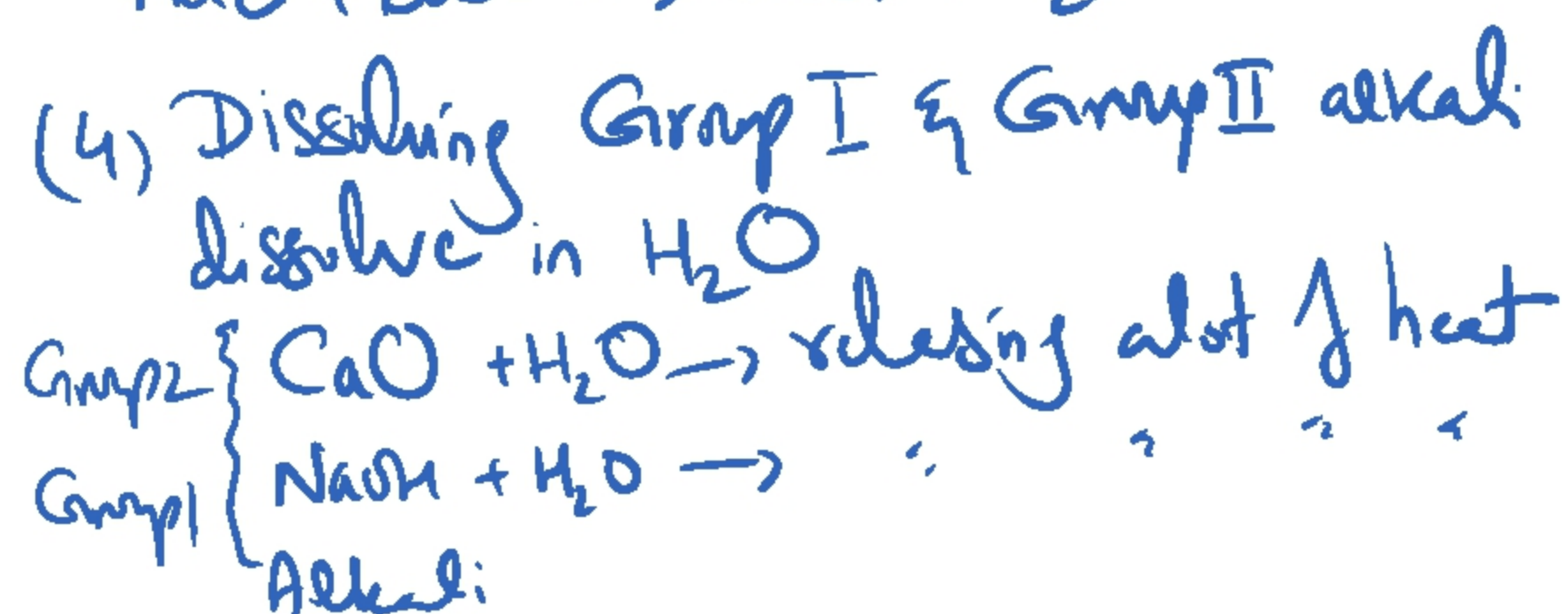
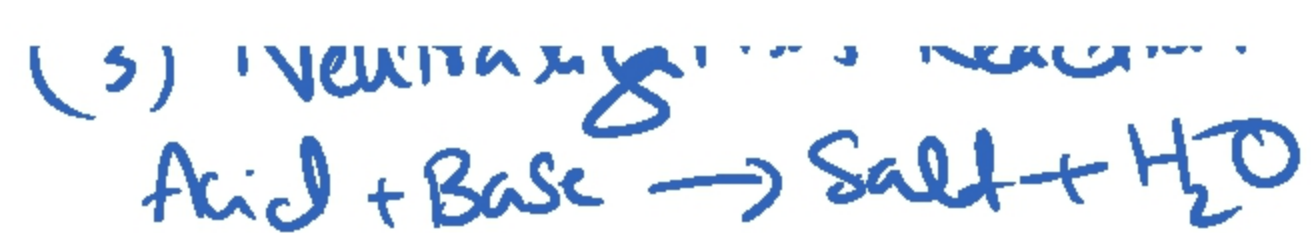
Examples

(1) Photosynthesis

(2) Thermal decomposition



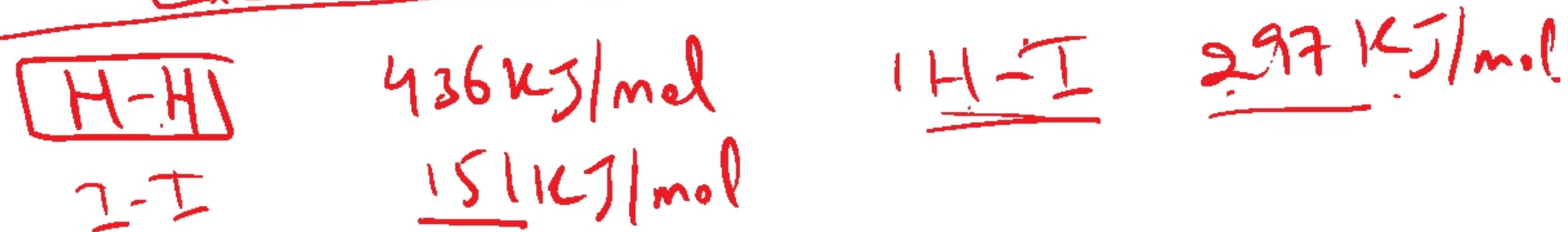
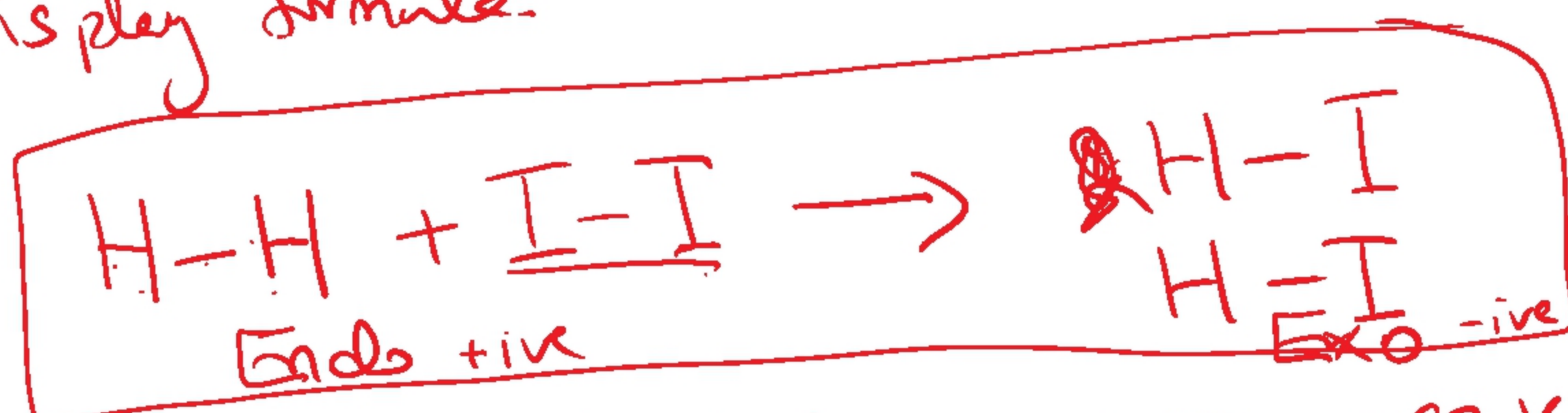
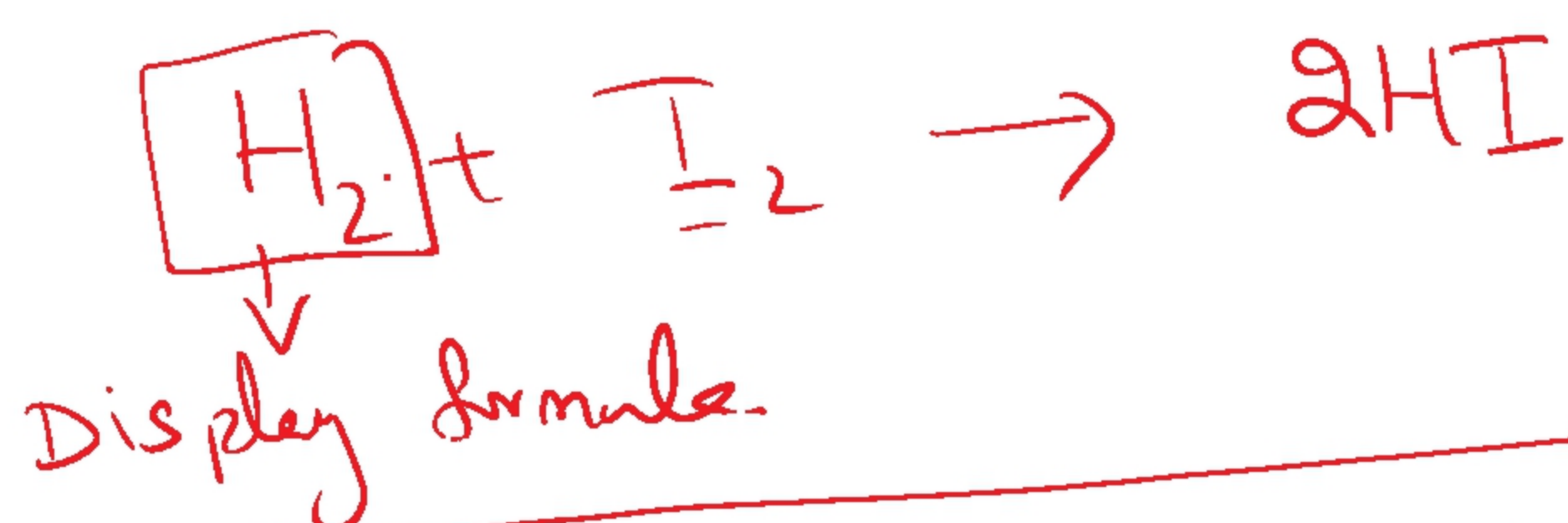
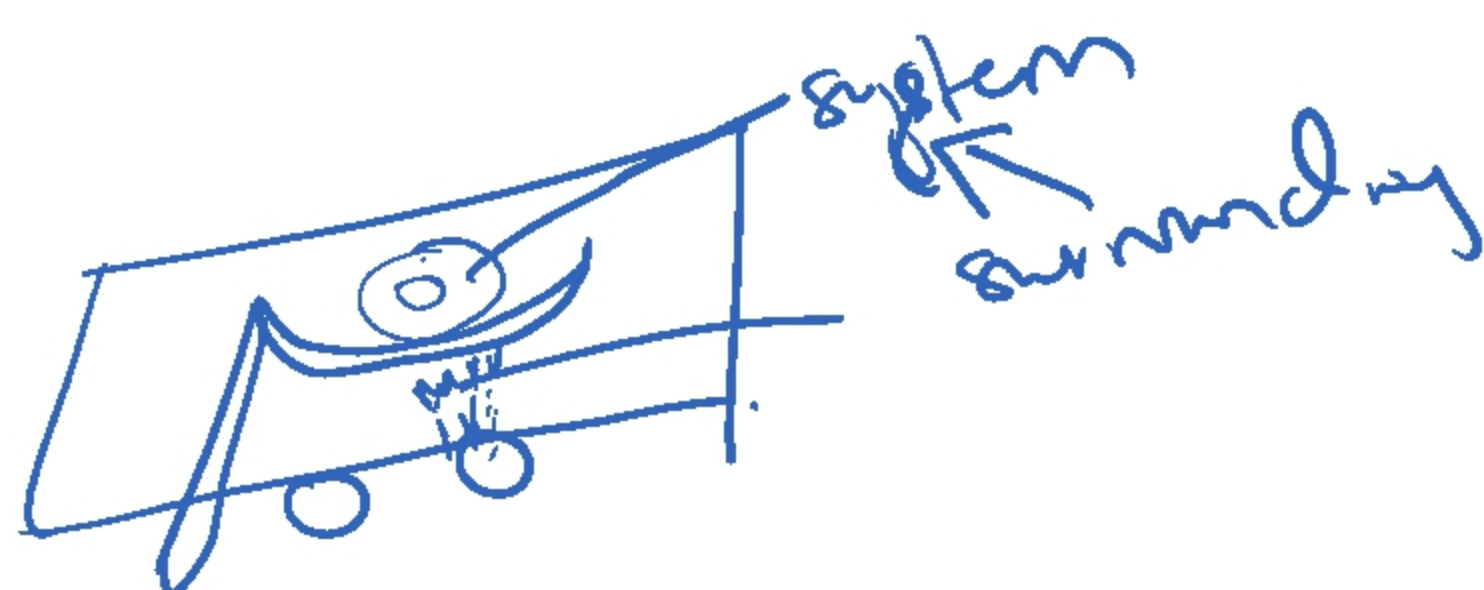
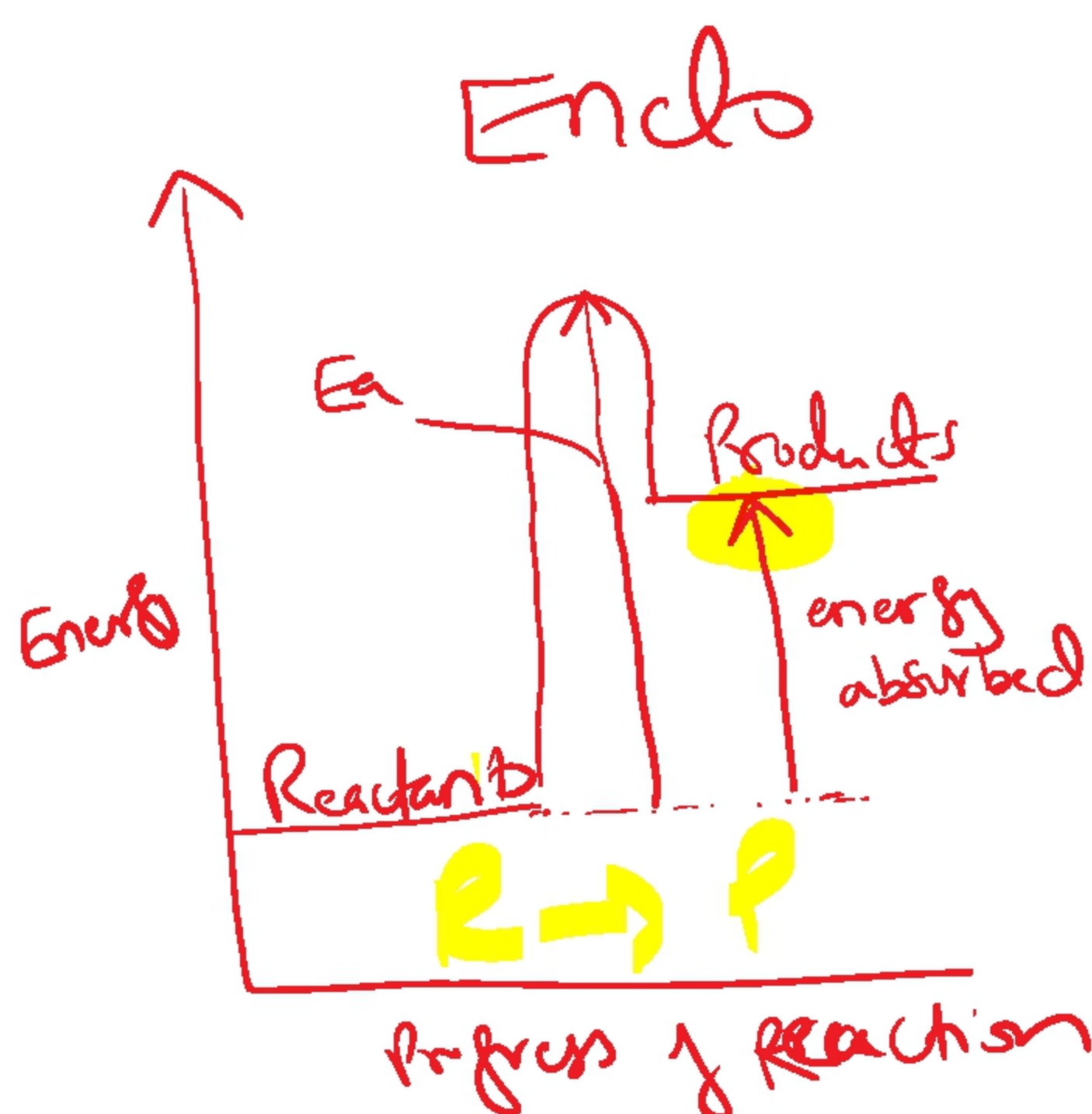
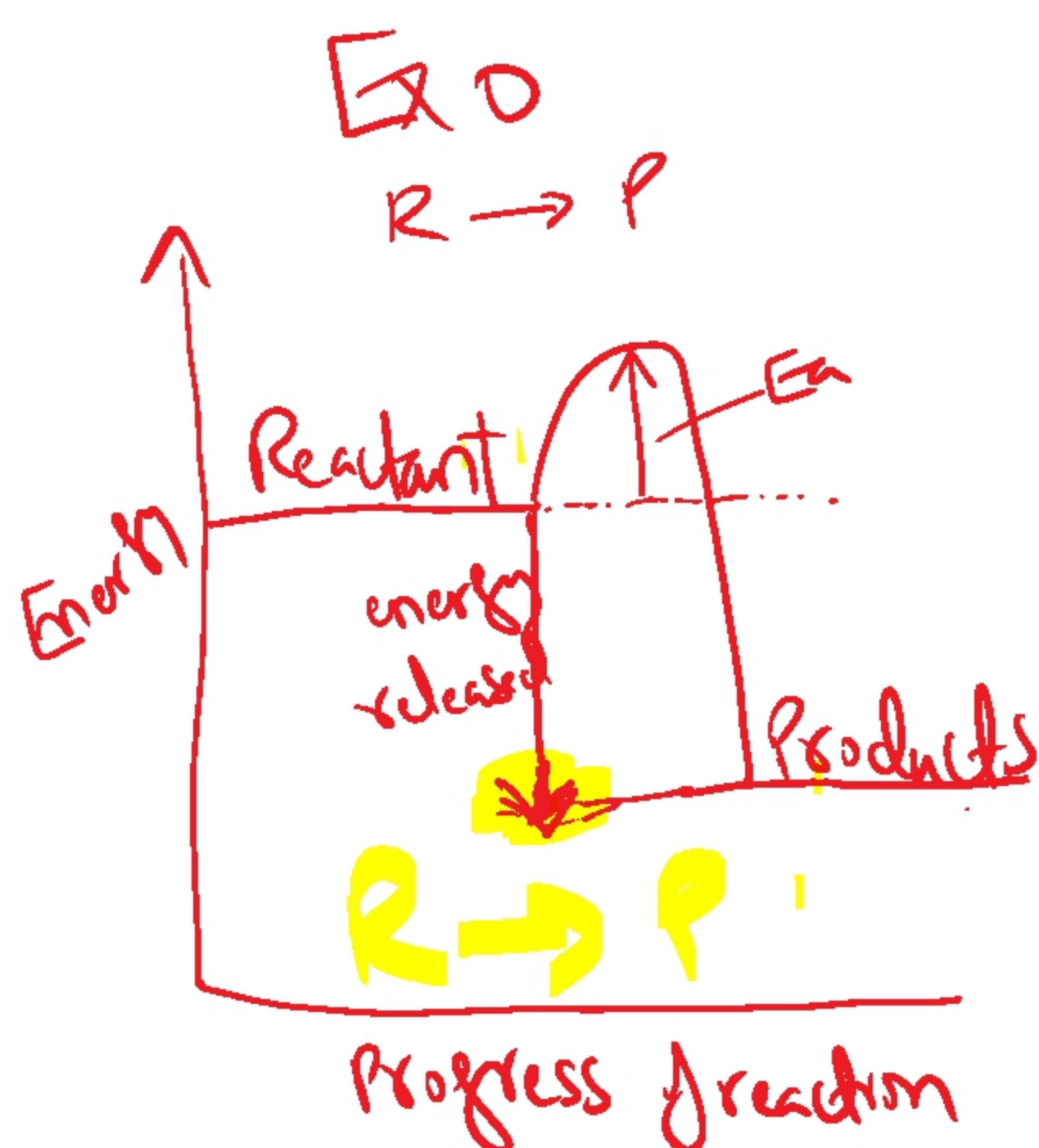
(3) Reaction between Citric acid and sodium hydrogen carbonate (NaHCO_3)



(4) Cold Packs



Redox Reactions are exothermic

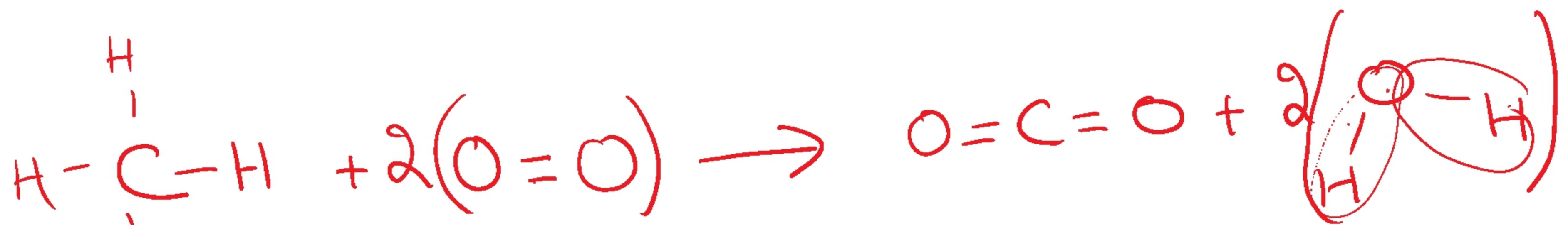


$\Delta H = \text{Bond Breaking} - \text{Bond Making}$
 $= 436 + 151 - 2 \times 297$
 $= \boxed{587} - 594$

$\Delta H = \boxed{-7 \text{ kJ/mol}}$



C-H	413 kJ/mol
O=O	498 kJ/mol
C=O	800 kJ/mol
O-H	464 kJ/mol



$\Delta H = \text{Bond Breaking} - \text{Bond Making}$

$$4(\text{C-H}) + 2(\text{O=O}) - \left[2 \times 800 + 4 \times 464 \right]$$

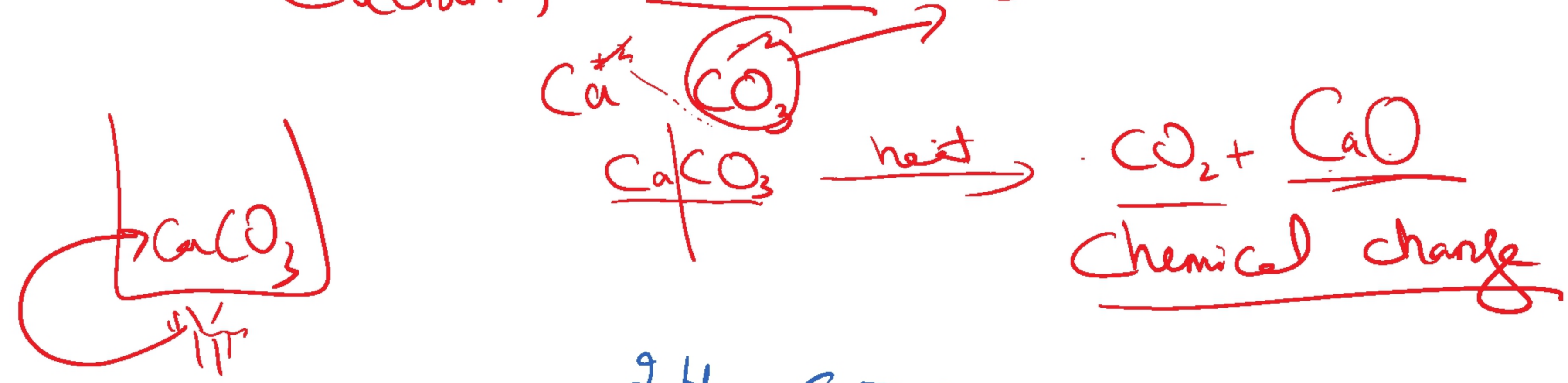
$$\frac{4 \times 413 + 2 \times 498}{1652 + 996} - \frac{1600 + 1856}{3456}$$

$\Delta H = +2648$

$\Delta H = -808 \text{ (kJ/mol)}$ $\text{Ca}^{2+} \text{O}^{2-}$

unit

Chapter 3
Calcium Carbonate CO_3



9 The equation for the complete combustion of ethyne, $\text{H}-\text{C}\equiv\text{C}-\text{H}$, is shown.
The bond energies are listed. (extended only)

bond	bond energy in kJ/mol
$\text{C}\equiv\text{C}$	837
C-H	415
O=O	498
C=O	805
O-H	464

$\Delta H = \text{Bond Breaking} - \text{Bond Making}$

$$= 5824 - 8296$$

$$= -2472 \text{ kJ/mol}$$

What is the enthalpy change of the reaction when 1 mol of ethyne is completely burned? (extended only)

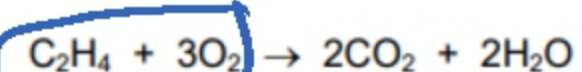
- A -2472 kJ/mol
- B -1236 kJ/mol
- C +1236 kJ/mol

D +2472 kJ/mol

3/25/2025 8:39 PM - Screen Clipping

- 11 Ethene gas, C_2H_4 , is completely burned in excess oxygen to form carbon dioxide and water.

The equation for this exothermic reaction is shown.

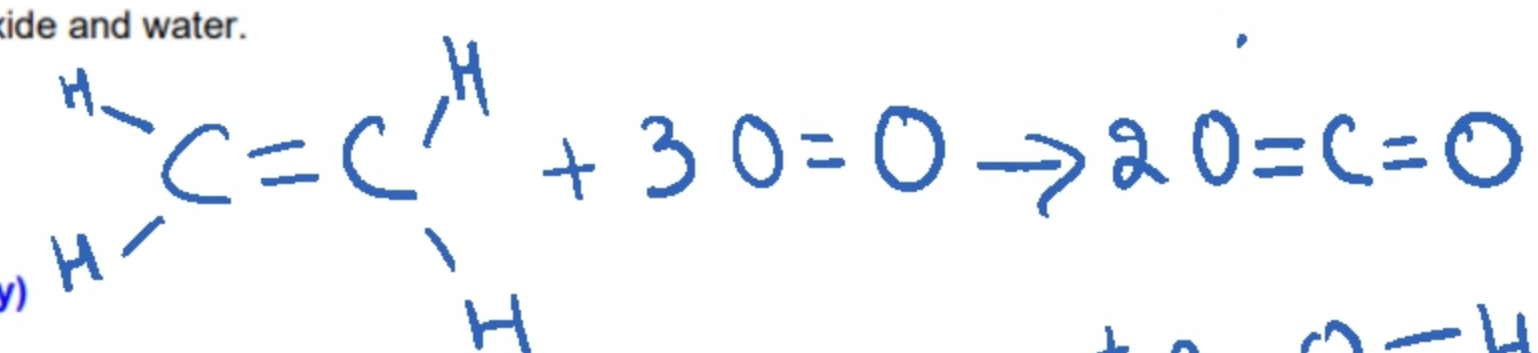


The table shows the bond energies involved in the reaction. (extended only)

bond	bond energy in kJ/mol
C=C	614 $\times 1$
C-H	413 $\times 4$
O=O	495 $\times 3$
C=O	799 $\times 4$
O-H	467 $\times 4$

What is the total energy change in this reaction? (extended only)

- A -954 kJ/mol
B -1010 kJ/mol
C -1313 kJ/mol
D -1369 kJ/mol



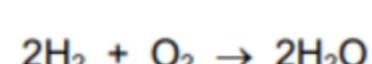
Bond breaking = 3751 kJ/mol
Bond Making = 5063

$$\Delta H = \text{Bond Breaking} - \text{Bond Making}$$

$$3751 - 5063 = -1313$$

- 13 Hydrogen burns in oxygen.

The equation for the reaction is shown.



The table shows the bond energies involved. (extended only)

bond	bond energy in kJ/mol
H-H	436
O=O	498
O-H	464

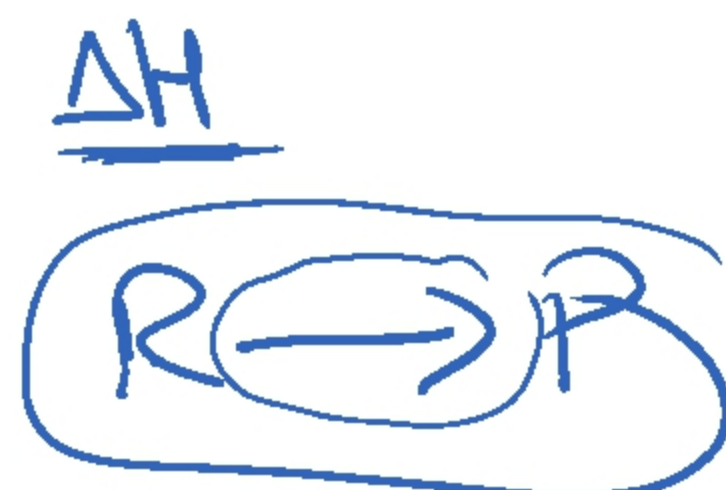
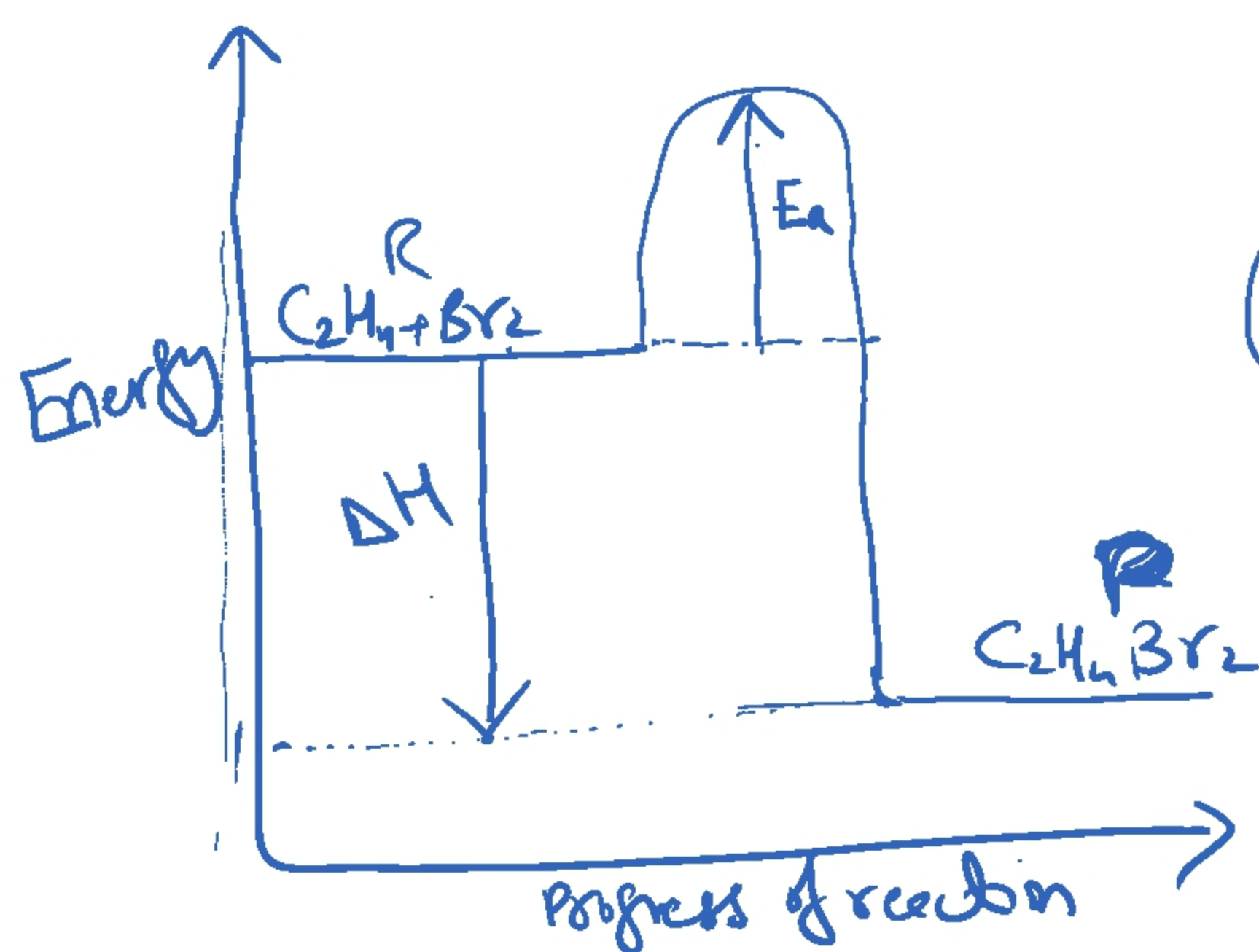
What is the energy given out during the reaction? (extended only)

- A -3226 kJ/mol
B -884 kJ/mol
C -486 kJ/mol
D -442 kJ/mol



Bond breaking 4 H-H

delta
 ΔH
Change enthalpy



exothermic