

## Energetics

a) Atomic Structure and Mixtures

b) Periodic Table

c) Structure and Bonding

d) Quantitative Chemistry

e) Chemical Changes

f) Energy Changes

Exothermic Reactions

Endothermic Reactions

Reaction Profile Diagrams

Bond Energy Calculations

Fuel Cells

Batteries

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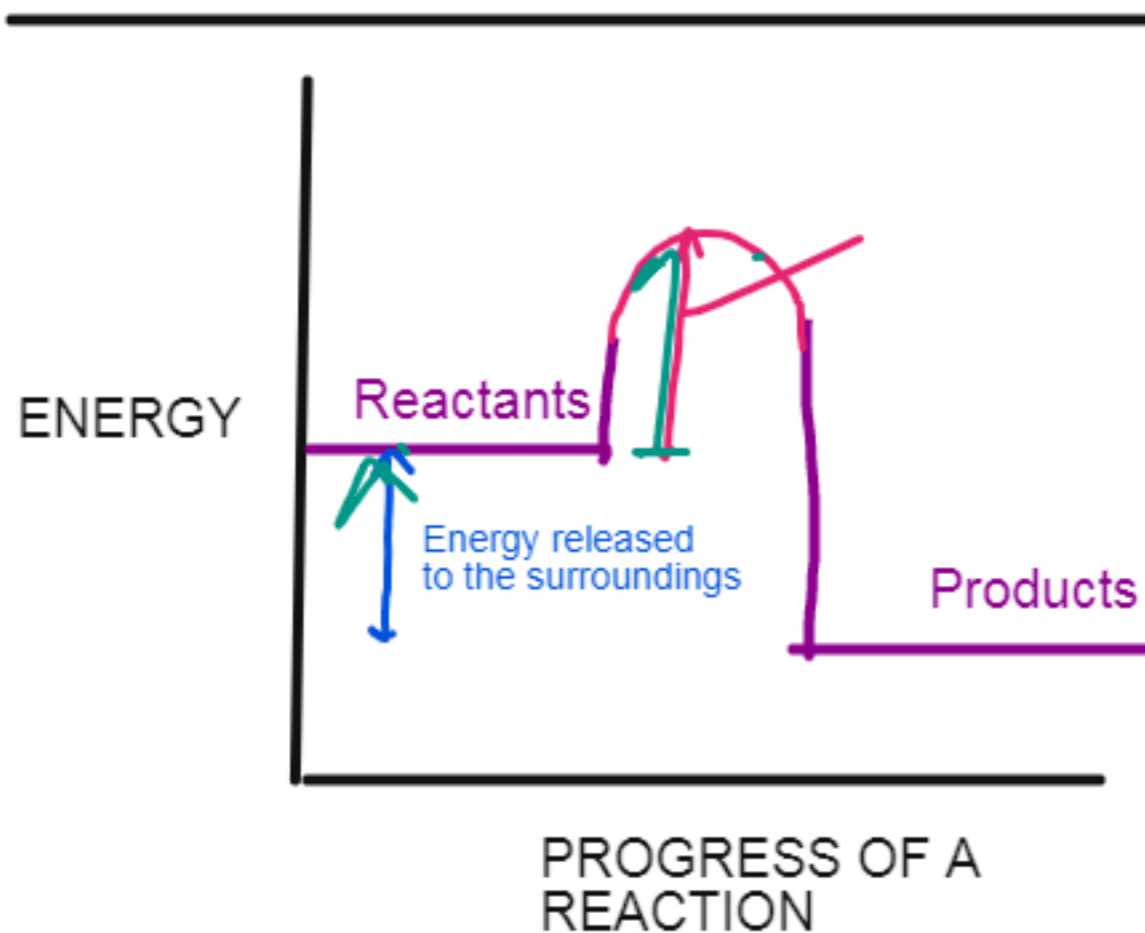
Law of conservation of energy states that energy is neither created nor destroyed. It just converts from one form to another.

EXOTHERMIC REACTIONS	ENDOTHERMIC REACTIONS
Reactions that releases heat to the surroundings.	Reactions that takes in heat from the surroundings
The reaction is accompanied by increase in temperature of the surroundings as the heat is released.	The reaction is accompanied by decrease in temperature of the surroundings as the heat is absorbed.
The product have the lower energy than the reactants.	The products have higher energy than the reactants.
Example: Combustion reaction and Respiration	Example: Thermal decomposition and Photosynthesis
In terms of bond breaking the energy released in making the product is more than energy used up in breaking the reactants.	In terms of bond breaking the energy used in breaking the bonds of reactants is more than the energy released in making up of the products.
Used in self heating cans and hand warmers	Used in Ice packs made for sports injuries

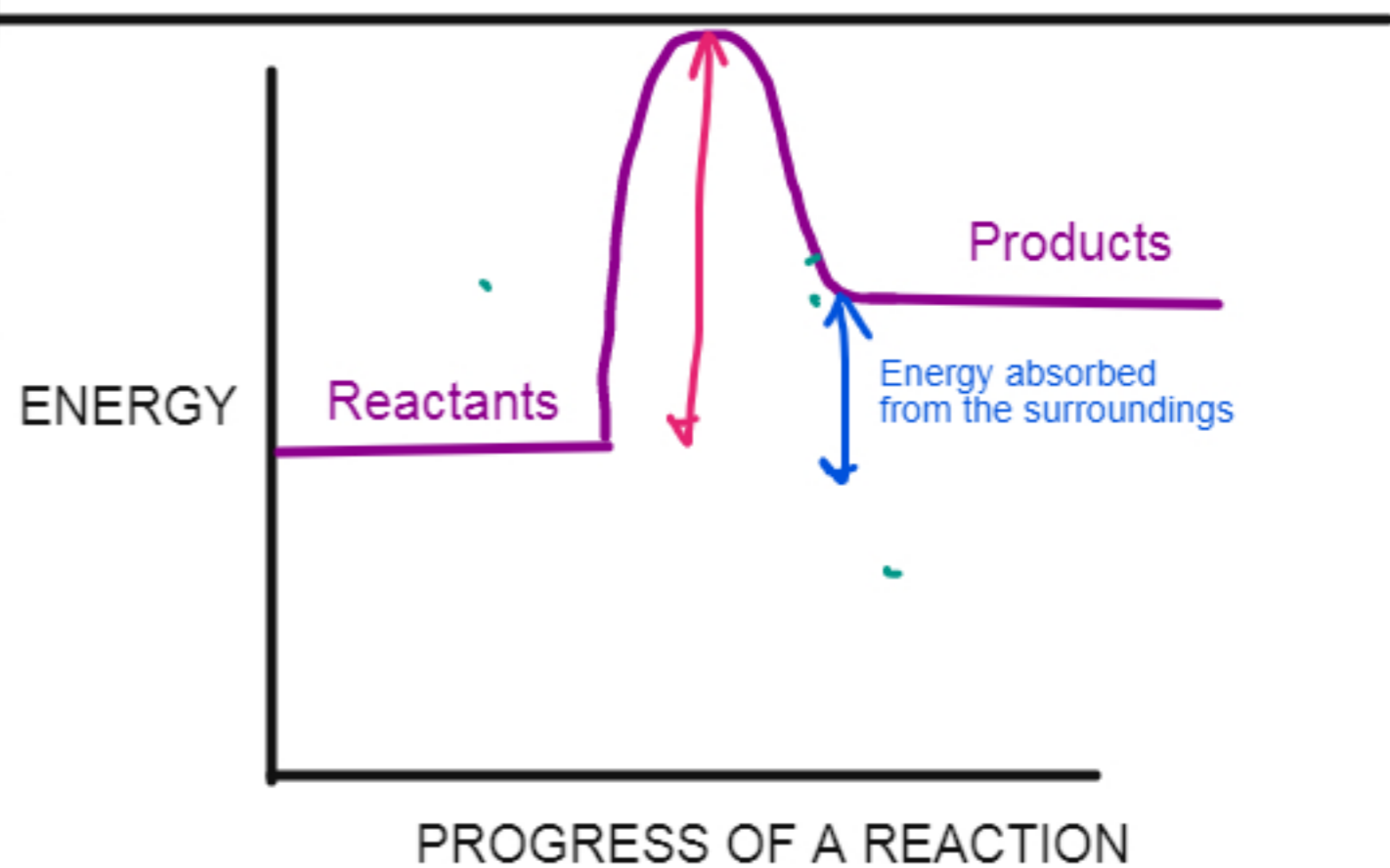


EXOTHERMIC

ENDOTHERMIC



It is the minimum energy required to start a reaction.



DEFINING EXOTHERMIC AND ENDOTHERMIC IN TERMS OF  
BOND MAKING AND BREAKING

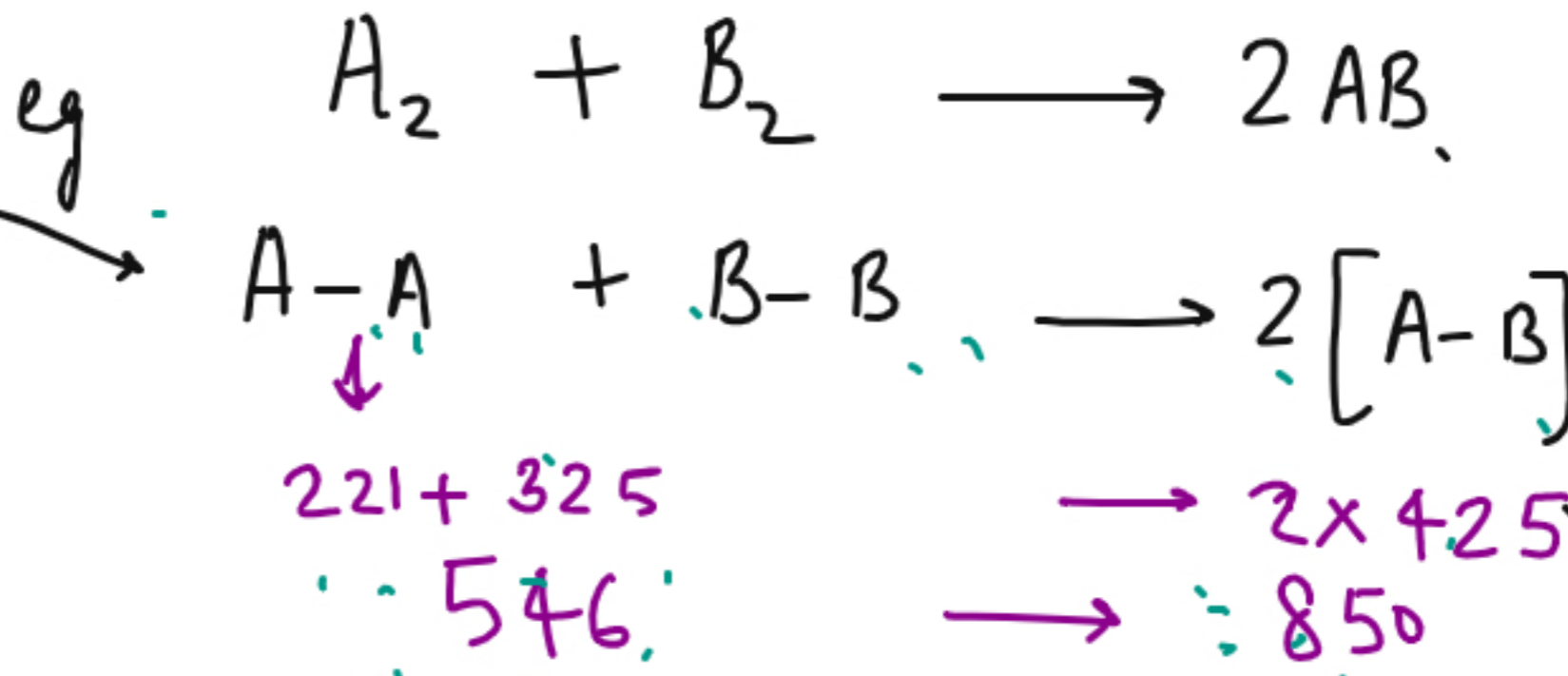
	Reactants		Products
	Bonds are always broken in a reaction		Bonds are always made in a reaction.
ENDOTHERMIC	Breaking of bonds of the reaction takes in heat	>	Making of bonds of the products releases heat.
EXOTHERMIC	Breaking of bonds of the reaction takes in heat	<	Making of bonds of the products releases heat.

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a) Display the bonds of the reaction and the products

b) Add the bond energies of the reactants and the products separately

c) Take the difference of the two to calculate the heat energy associated with the reaction



Bond	Energy (kJ/mol)
A-A	221
B-B	325
A-B	425

Energy used in breaking the bonds — 546 kJ/mol  
 Energy released in making the bonds — 850 kJ/mol  
 energy associated in overall reaction  $\rightarrow 546 - 850$   
 $\rightarrow -304 \text{ kJ/mol}$

Is it Exothermic or Endothermic  
 Exothermic as energy is released in making the products is greater.



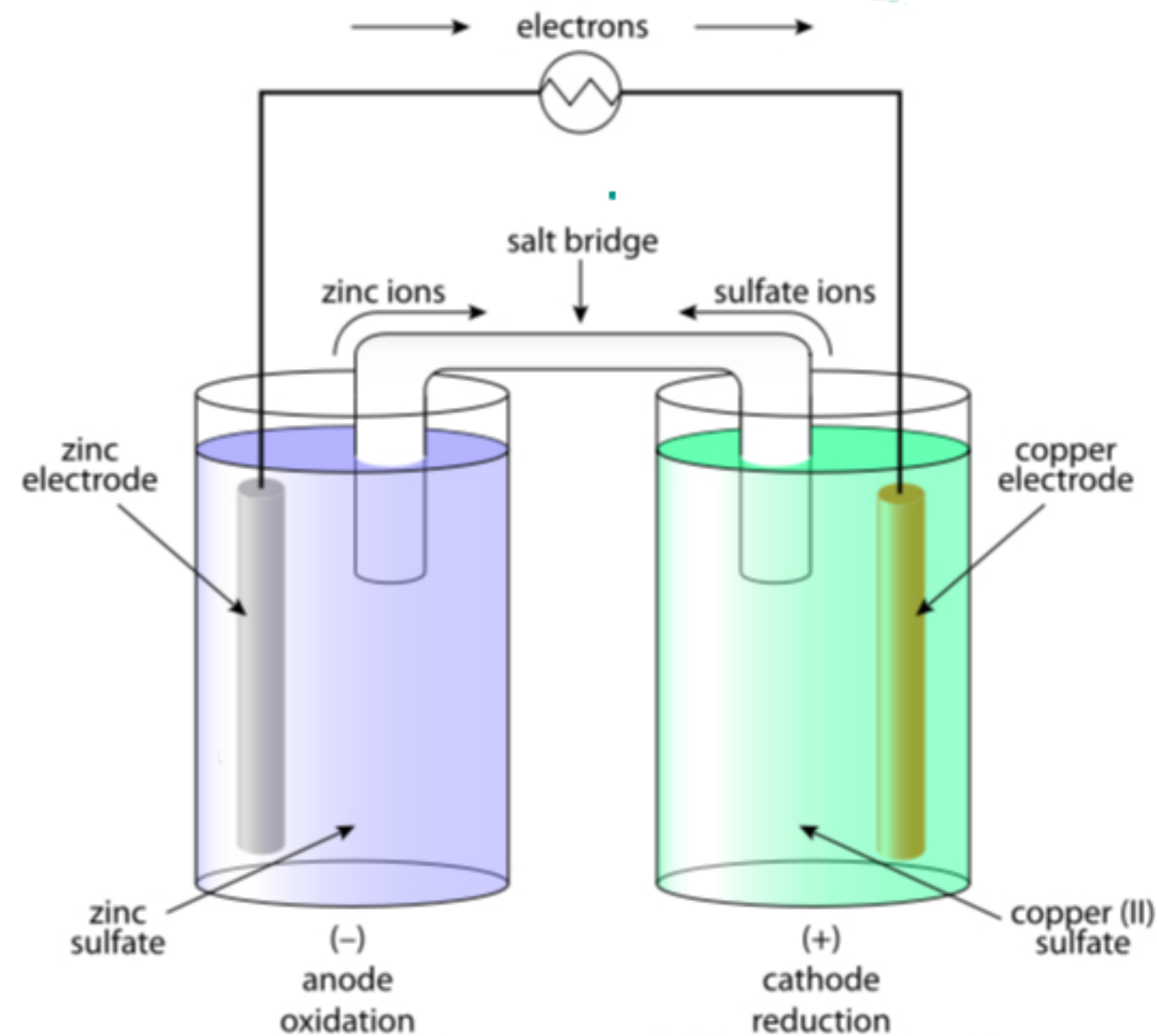
Cell is a device that converts a chemical energy into an electrical energy .

A simple cells contains two metal electrode dipped in an electrolytes.

Difference in the reactivity of the two metals greater is the voltage produced .

The more reactive metal donates electrons to the less reactive metal.

The electrons flow from one side to another constituting current and electricity.



## ADVANTAGES

No harmful gases or waste product is produced

Waste product is only water so no problem to the environment or disposing off the waste product.

Do not needs recharging

## DISADVANTAGES

Hydrogen is a flammable Gas

Production of hydrogen depends on non renewable resources.

Hydrogen being a gas is difficult to store and transport

Storing and transport of hydrogen involves energy which comes from fossils fuel thereby it contribute indirectly to global warming.

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**Exothermic Reaction** → The reaction which gives out heat to the surroundings. Example: Respiration or Combustion

**Endothermic Reaction** → The reactions which taken in heat from the surrounding. Example: Photosynthesis or Thermal decomposition

**Reaction Profile** → Diagrammatic representation showing the relative energies of reactants and products in a reaction.

**Activation Energy** → Minimum energy required to start a reaction.

**Bond Energy** → Heat energy contained in a bond between two atoms.

**Chemical Cells** → A device that converts chemical energy into electrical energy.

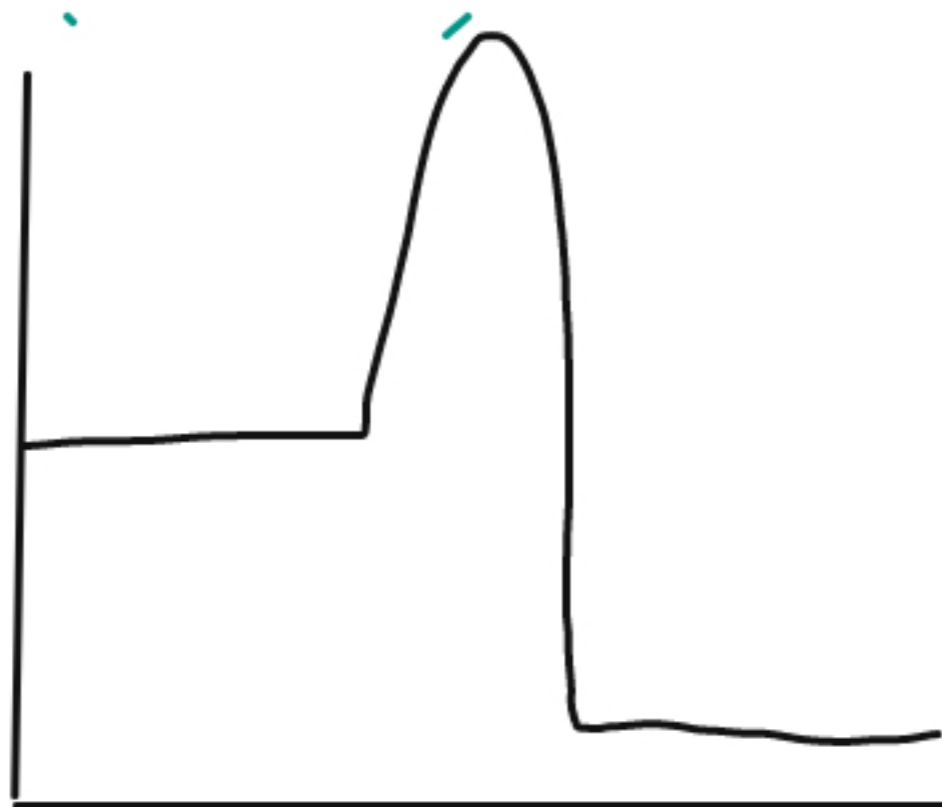
**Fuel Cells** → A chemical cells that uses a reaction between hydrogen and oxygen to form water and energy.

**Batteries** → Collection of cells .





Label the reaction profile and classify it as Exothermic or Endothermic



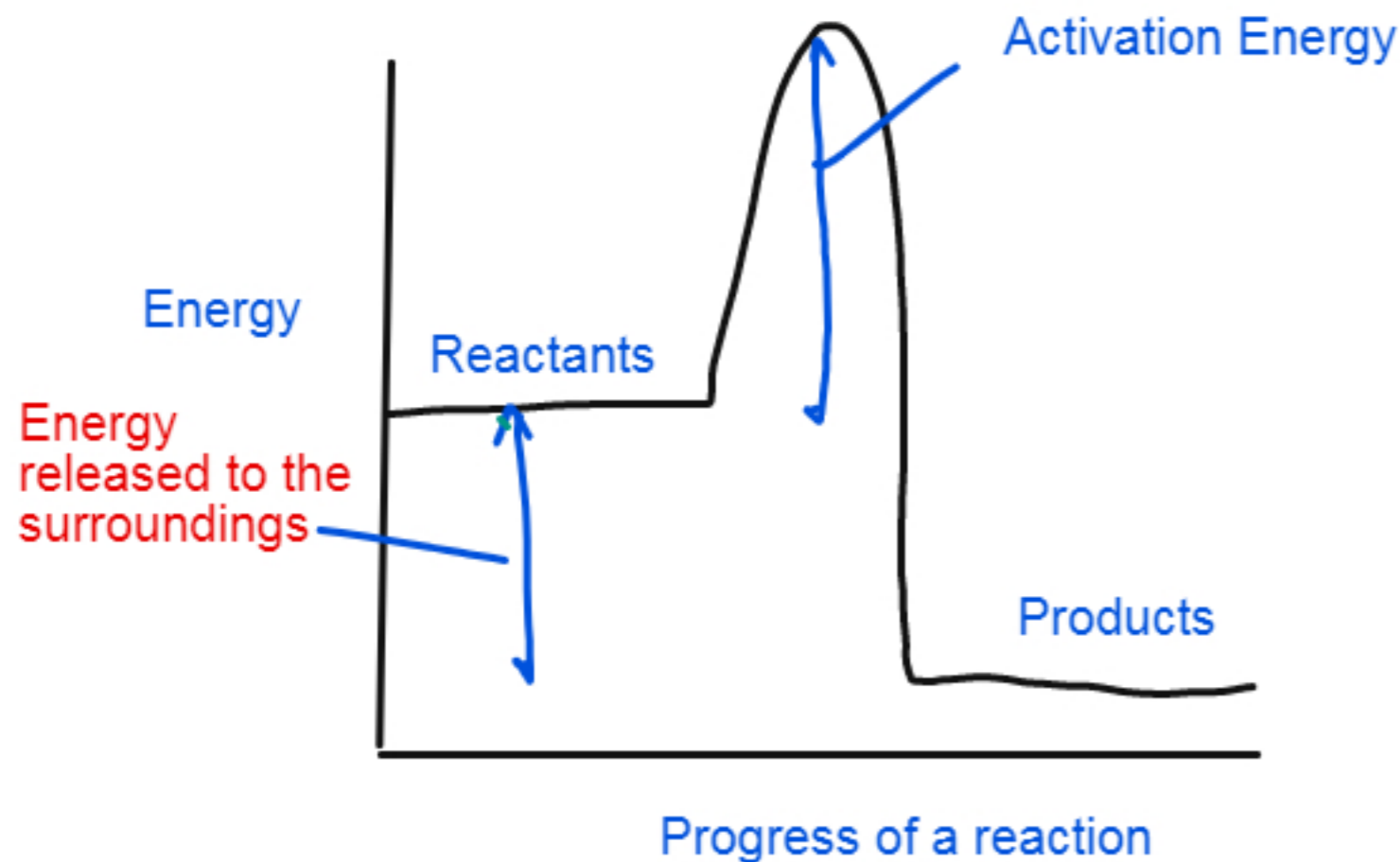
Draw Energy profile diagram of endothermic reaction

Give two application of exothermic and endothermic reactions

State the advantages and disadvantages of fuel cell.

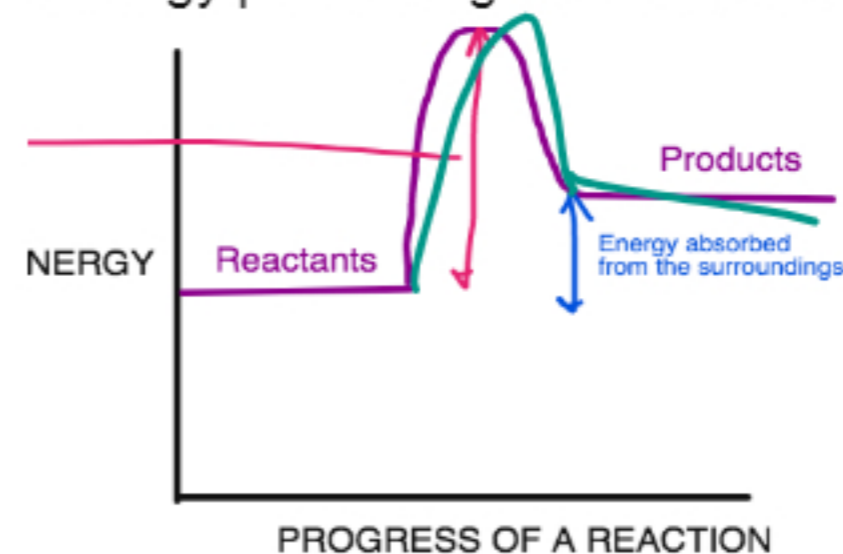


Label the reaction profile and classify it as Exothermic or Endothermic



As products have lower energy than the reactants therefore it is an exothermic process.

Draw Energy profile diagram of endothermic reaction



Give two application of exothermic and endothermic reaction

Exothermic : Self heating cans and hand warmers  
Endothermic: Ice packs, self cooling cans

State the advantages and disadvantages of fuel cell.

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CHECK THE SPECIFICATION



DO EXAM QUESTIONS ON THIS TOPIC

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