



**Centurion**  
**UNIVERSITY**

*Shaping Lives...  
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**PRESENTATION ON**

# ***KINETICS OF EXPLOSION, ACTIVATION ENERGY AND RATE OF REACTION***

**CUFS 2416 EXPLOSIVE AND POST BLAST INVESTIGATION**

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B.SC. FORENSIC SCIENCE (SEM 6)  
SCHOOL OF FORENSIC SCIENCES  
BHUBANESHWAR CAMPUS

# CONTENT

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KINETICS OF EXPLOSION

HOW DOES KINETICS RELATE TO AN EXPLOSIVE REACTION.

ACTIVATION ENERGY

RATE OF REACTION

# KINETICS OF EXPLOSION

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- Kinetics is the study of the rate of change of chemical reaction those reaction can be very fast I.e instantaneous reaction such as detonation those requiring few minutes desolving sugar into water and those requiring several waves rotating of iron.
- In explosive reaction the rate is very fast & is dependent an the temperature & pressure of the reaction and on the concentrate of the reaction.

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- An explosive reaction is a highly exothermic process that once initiated, goes to completion very rapidly and cannot be stopped..
  - The destructive force of an explosion arises from the rapid expansion of the gaseous products as they absorb the heat of the reaction.

# HOW DOES KINETICS RELATE TO AN EXPLOSIVE REACTION?

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- The kinetics constants for the decomposition reaction of an explosive can be used to calculate the lowest temperature (critical temperature,  $T_m$ ) at which any specific size and shape of explosive can self heat to explosion; however, the accuracy of the calculation is in doubt without an independent experimental determination of a critical temperature for a known size and shape of the explosive.
- A method is presented for the experimental determination of critical temperatures on a routine basis, and it is shown that agreement between calculated and experimental values is excellent for most common explosives.

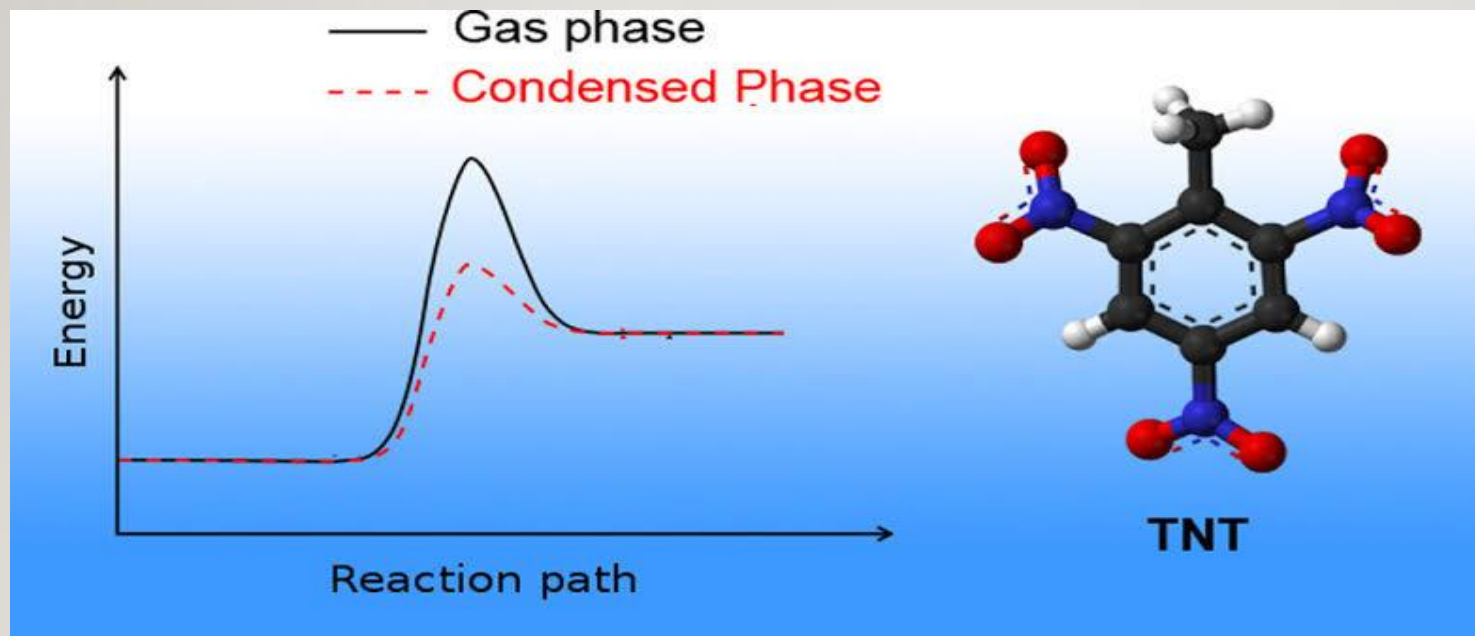
# ACTIVATION ENERGY

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- During an endothermic reaction energy is supplied from initiator to rise the temperature of the explosives so that the ignition takes place with the formation of hot spot.
- If the energy generated by the hot spot than the activation energy than no reaction will be take place.
- If the energy generated by the hotspot is greater than the activation energy the reaction will proceed further with the formation of explosives product with the release of energy.
- The activation energy represent an amount of energy which is required to take a starting material (an explosive material) and convert it into a reactive high energy excited state.

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- In the excited state the reaction occurs to form the product with the liberation of considerable amount of energy which is greater than the energy of reaction.
  - The value for the activation energy can be used to measure the ease with which an explosive composition will initiate where the large activation energy the more difficult it would be to initiate the explosive composition.
  - Activation energy for the decomposition of explosives is a crucial parameter of performance.
  - The dramatic suppression of activation energy in condensed phase decomposition of nitroaromatic explosives has been an unresolved issue for over a decade.

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- The thermal decomposition of a model nitroaromatic explosive, 2,4,6-trinitrotoluene (TNT), is presented as a prime example.





# RATE OF REACTION

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- The rate of reaction determine by the magnitude of activation energy and the temperature at which reaction takes places.
- Has the temperature of system is raised and exponentially greater number of molecule posses necessary energy of activation the rate of reaction will increase accordingly exponential Fashion as the temperature raises.
- All reaction rates are consistent with known activation parameters and reaction conditions, and there is no indication of unique chemical processes connected with the subnanosecond rise time of the shock front.

# Reaction Rates

**reaction rate:** a measure of how fast reactions happen  
– based on collisions of atoms and molecules

ex. explosive and biological reactions are  
very fast and iron rusting is very slow.

Reaction rate is measured by the rate of decrease in  
concentration of reactants or as the rate of increase in  
concentration of the products



**THANK YOU.**

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