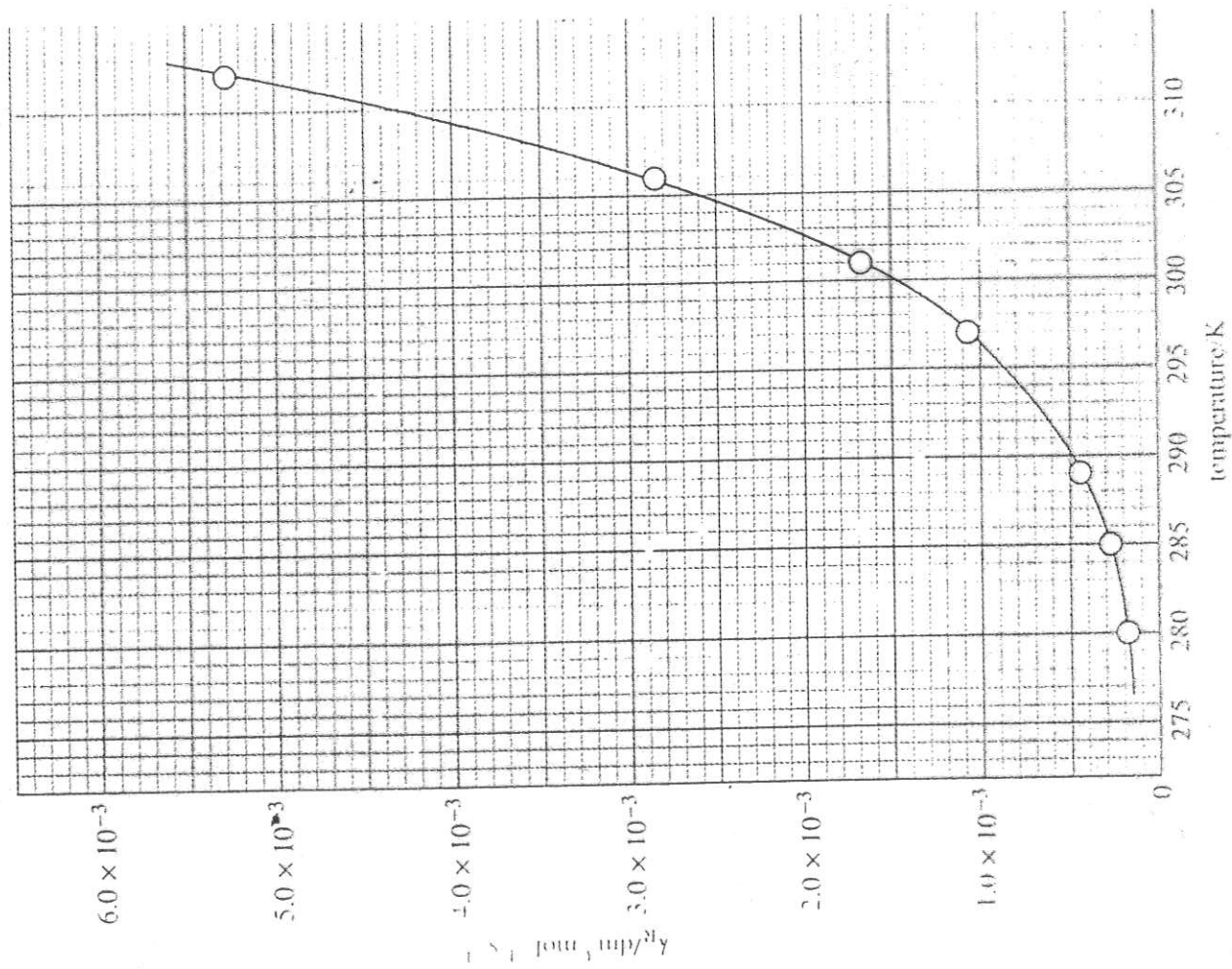
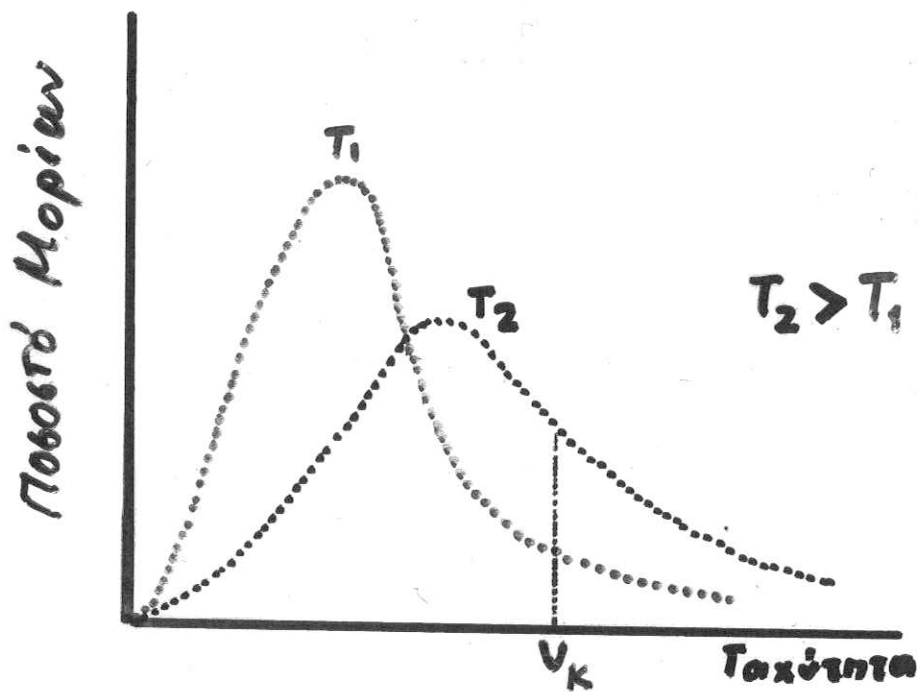
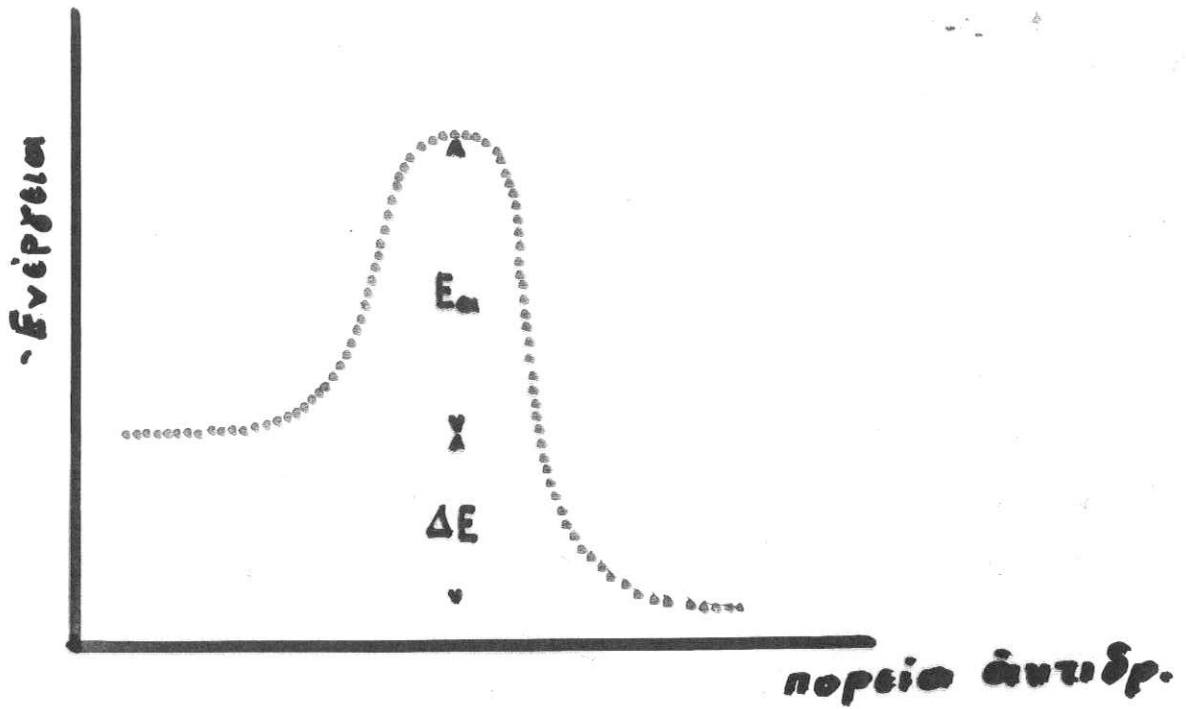


Reaction between iodomethane ( $\text{CH}_3\text{I}$ ) and ethoxide ion ( $\text{C}_2\text{H}_5\text{O}^-$ ) in a solution of ethanol



The variation of the rate constant for Reaction 6.1 with temperature. A smooth curve has been drawn through the experimental data points.



$$k = A \cdot e^{-\frac{E_{\alpha}}{RT}}$$

Σχέση Arrhenius

επαύξει  
ταχύτητα

παραγοντας συχνότητας

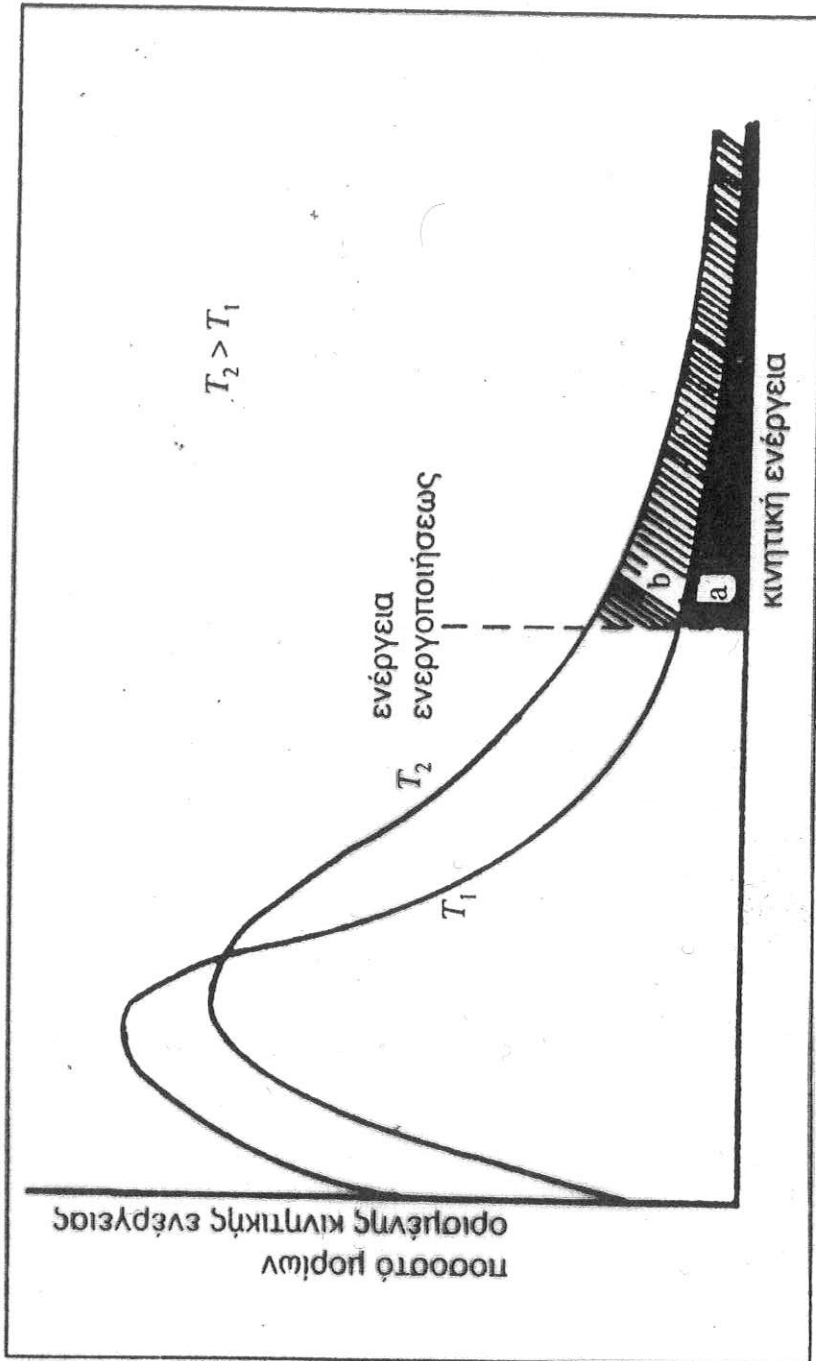
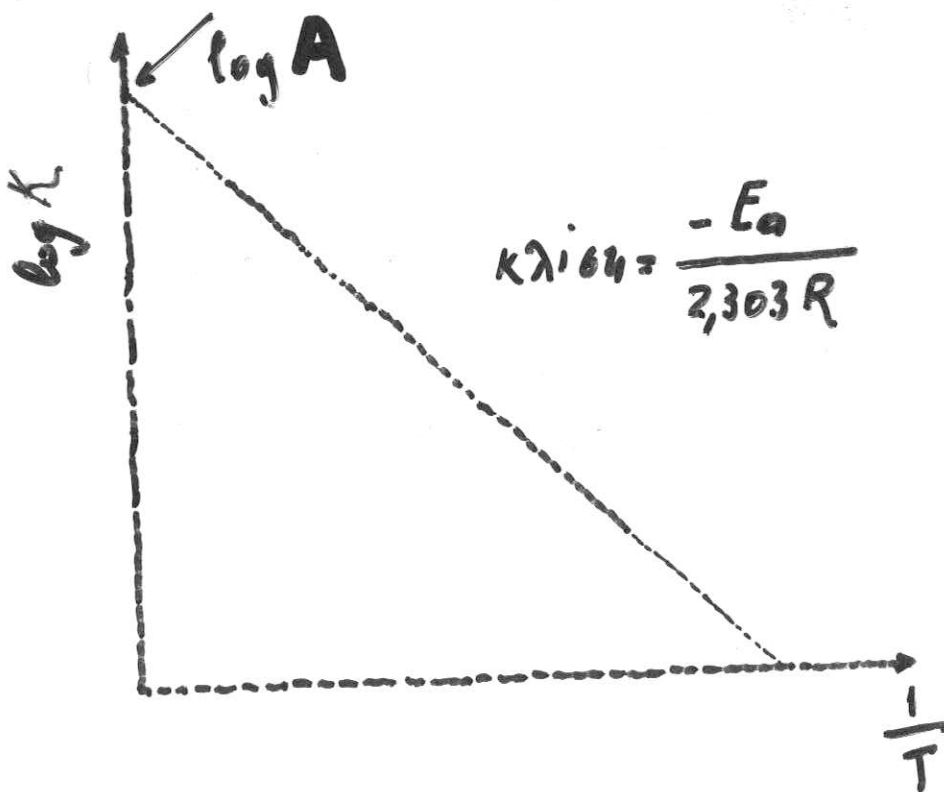


Fig. 9.6 Κατανομή μοριακών ενεργειών σε θερμοκρασίες  $T_1$  και  $T_2$ .

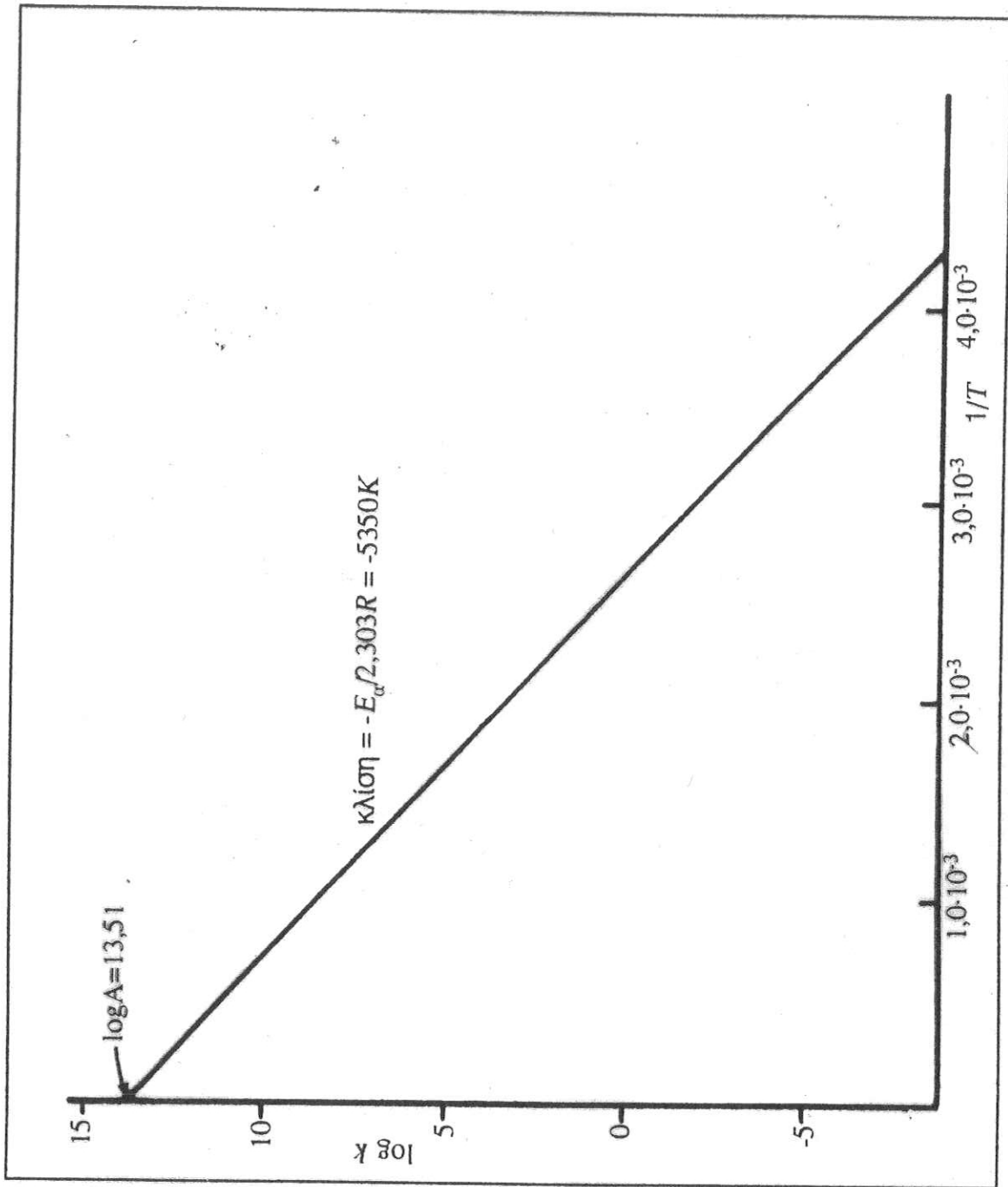
$$k = A \cdot e^{-\frac{E_a}{RT}}$$

ἔξις ἰσῶν ARRENIUS

$$\log k = \log A + \left(\frac{1}{T}\right) \left(\frac{-E_a}{2,303 R}\right)$$



$$E_a = 2,303 R \left(\frac{T_1 T_2}{T_2 - T_1}\right) \log\left(\frac{k_2}{k_1}\right)$$



Γραφική παράσταση του  $\log k$  έναντι του  $1/T$  για την αντίδραση  
 $2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$

## ΠΑΡΑΓΟΝΤΕΣ ΠΟΥ ΚΑΘΟΡΙΖΟΥΝ ΤΗΝ ΕΝΕΡΓΟΠΟΙΗΣΗΣ.

- ① Αύξηση ή ελάττωση τοχού δριμύτων χημικῶν δρομῶν
- ② Ἄπωση μεταξὺ δριμύτων φορτίων  
ἔξω μεταξὺ ἑτερόνυμων φορτίων
- ③ Ἐπιπιῆ ἢ ἀπωστικῆ δύναμη μεταξὺ  
υδρογονικῶν κερῶν κατὰ τὴ πρόβηξιν  
τῶν βερματιδίων.
- ④ Ἐπὶν ἄκριο φάση, ἂν ἡ εὐμερομένη δὲν εἶται  
μετωπιῆ ἰπάρχη φράγμα, λοξῶ φυλομεντικῶν  
δυνάμεων ποὺ ἀναπτύσσονται, ποὺ παρεμπο-  
δίζουν τὴ παραπέρα πρόβηξιν.
- ⑤ Σὲ ἀντιδράσει βέ διαλύμα, ὅπω ἐνέργεια  
ἐνεργοποιῶσαι πειχαμβάνεται καὶ ἡ  
ἐνέργεια διακύβεται τῶν βερματιδίων, μέχρη  
ὅταν πηκιάβου μεταξὺ τῶν.-

## Svante Arrhenius (1859–1927)

Svante Arrhenius was born near Uppsala in Sweden. He became Professor of Physics at Stockholm in 1895 and a director of the Nobel Institute of Physical Chemistry (Stockholm) in 1905.

The equation named after him is one of the best known in chemical kinetics. However, apart from the 1889 paper, referred to earlier, he published little else in this area. His award of the third **Nobel Prize for Chemistry in 1903** was in recognition of the extraordinary services he had rendered to the advancement of chemistry by his electrolytic theory of dissociation. He developed very wide research interests encompassing immunological chemistry, cosmology, the causes of the ice ages, and the origin of life.



Figure 6.2  
Svante Arrhenius (1859–1927).

## Ahmed H. Zewail (1946–)

Ahmed H. Zewail was born in 1946 near Alexandria in Egypt and undertook undergraduate studies at the University of Alexandria. His Ph.D. was obtained from the University of Pennsylvania. Currently, he is the Linus Pauling Professor of Chemistry and Professor of Physics, and the Director of the National Science Foundation Laboratory for Molecular Sciences, at the California Institute of Technology (Caltech) in Pasadena. He has been awarded many honours including the **1999 Nobel prize in Chemistry**. From Egypt he received the Grand Collar of the Nile, the highest state honour, and postage stamps were issued to celebrate his contributions to both science and humanity.



Ahmed H. Zewail (1946–).

$$\ln \frac{k_2}{k_1} = - \frac{\Delta H^\circ}{R} \left( \frac{T_1 - T_2}{T_1 T_2} \right)$$

Εξώθερμη αντίδραση  $\Delta H < 0$

αύξηση θερμοκρασίας  $T_2 > T_1$

$$\ln \frac{k_2}{k_1} < 0$$

$$\ln k_2 - \ln k_1 < 0$$

$$\ln k_2 < \ln k_1$$

$$k_2 < k_1$$

Στις εξώθερμες αντιδράσεις: αύξηση θερμοκρασίας  
 $\Rightarrow$  ελάττωση  $k$

Ενδόθερμη αντίδραση  $\Delta H > 0$

αύξηση θερμοκρασίας  $T_2 > T_1$

$$\ln \frac{k_2}{k_1} > 0$$

$$\ln k_2 - \ln k_1 > 0$$

$$\ln k_2 > \ln k_1$$

$$k_2 > k_1$$

Στις ενδόθερμες αντιδράσεις: αύξηση θερμοκρασίας  
 $\Rightarrow$  αύξηση  $k$





$$K_{160p} = \frac{[(\text{NO})_2]}{[\text{NO}]^2}$$



$$\frac{d(\text{NO}_2)}{dt} = k' [(\text{NO})_2] [\text{O}_2] = k' K_{160p} [\text{NO}]^2 [\text{O}_2]$$

• Η (1) είναι ΕΞΟΘΕΡΜΟΣ προς το δεξιά  $\Rightarrow$

$K_{160p}$  ΜΕΙΟΥΤΑΙ με την αύξηση της θερμοκρασίας

$\Rightarrow$  "Επιδετήωση" της αύξησης  $k'$   $\Rightarrow$

Αύξηση θερμοκρασίας  $\Rightarrow$  Μείωση της ταχύτητας της αντίδρασης.-

## ΚΑΤΑΛΥΤΕΣ

Ουσία που ΑΥΞΑΝΟΥΝ Τὴν ταχύτητα μιᾶς χημικῆς ἀντίδρασης ἄνευ νὰ καταναλωθῶνται κατὰ τὴν ἀντίδραση.

