ELIMINATION REACTION

It involves the loss of 2 atoms or group of atoms from the same or adjacent atom of a substance leading to the formation of multiple bond [DEPTH OF BIOLOGY]

OR

This reaction involves elimination of atoms or group of atom [DEPTH OF BIOLOGY]

- Always increases the degree of unsaturation
- Generally this reaction occurs in alkaline medium
- Depending upon the reaction kinetics the reaction can be classified as [DEPTH OF BIOLOGY]

1. E1 elimination
2. E2 elimination

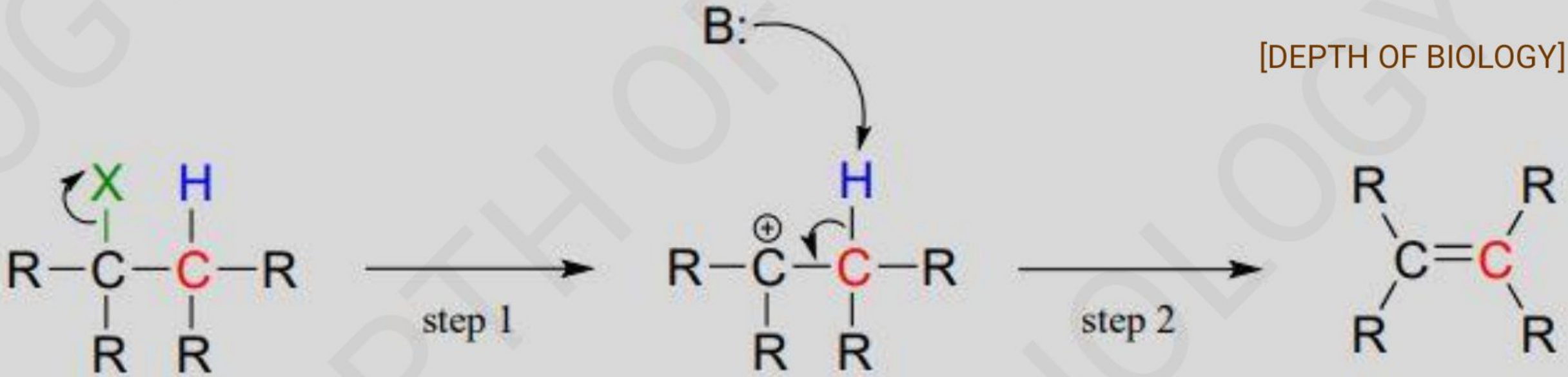
- **E1 reaction-**

a. Also known as unimolecular elimination reaction

b. These are two step reaction.

i. Ionization: the carbon-halogen bond breaks to give a carbocation intermediate.

ii. Deprotonation of the carbocation.



- Follow I order kinetics i.e. Rate of reaction depends only on concentration of substrate [DEPTH OF BIOLOGY]
  - RATE= K [RX]
- Reactivity of alkyl halide in E1 reaction= relative stability of carbocation
- Compound should be in weak alkaline medium & provide heat
- Reactivity order – 3>2>1 [DEPTH OF BIOLOGY]

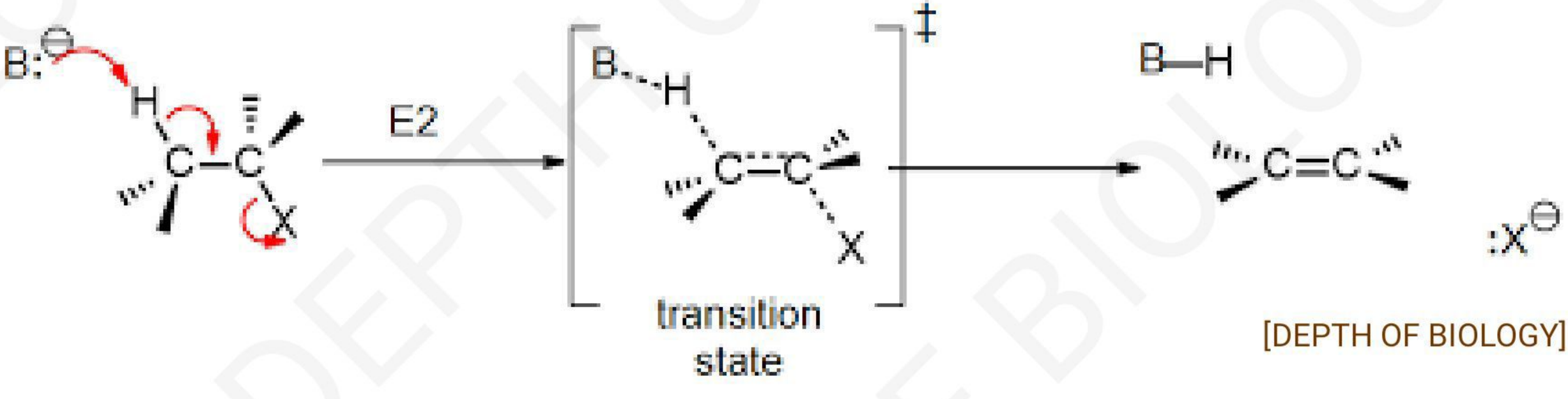
- **E2 reaction –**

a) Refers to bimolecular elimination. It is basically a single step mechanism [DEPTH OF BIOLOGY]

b) Here the carbon-hydrogen and carbon- halogen bond mostly break off to form a new double bond [DEPTH OF BIOLOGY]

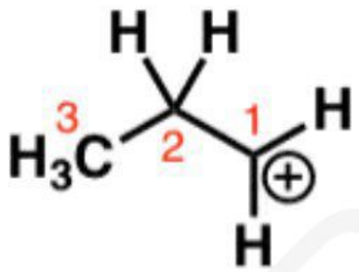
c) Compound should be in strong alkaline medium.

- ***MECHANISM-***

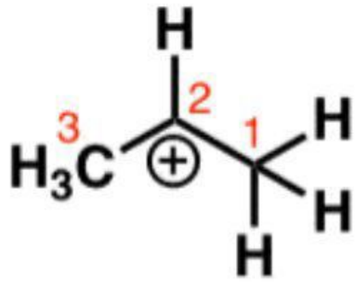


E1	E2
• Unimolecular elimination reaction i.e. Follows I st order kinetics. • 2 step reaction • Molecularity = 1 • Weak base + heat • Formation of carbocation takes place • Rearrangement possible • No steriochemical reactions are involved • Order of reactivity ∝ related to stability of carbocation	• Bimolecular elimination reaction i.e. Follows 2nd order kinetics • Single step reaction • Molecularity = 2 • Strong base – alc. KOH, NaNh2, $C_2H_5O^-$ • No rearrangement possible • No reactive intermediate is formed • Steriochemical reactions are involved since anti elimination occur. Elimination of HX occur only when (H,X) anti each other in configuration • Order of reactivity ∝ stability of alkene

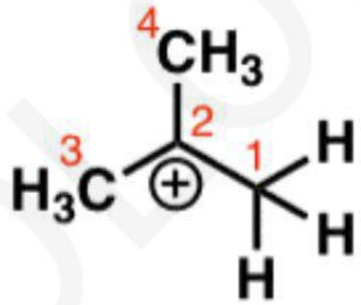
- Rearrangement possible in E1 reaction [DEPTH OF BIOLOGY]



Primary carbocation
(least stable)



Secondary carbocation
[DEPTH OF BIOLOGY]



Tertiary carbocation
(most stable)

Factors affecting E1 & E2

1. Effect of substrate structure :

Electron withdrawing group increases the rate of E2 reaction

Electron donating group : will direct the molecule to E1 ;by stabilizing the carbocation

2. Effect of attacking base :

In E1 the solvent itself acts as a base means externally adding a base not required,

If added base is present (H_2O, OH) then reaction will follow E2 reaction

3. Effect of leaving group:

Nature of leaving group will decide the mechanism a reaction follows

A strong leaving group will direct the reaction towards E1 mechanism

4. Effect of solvent :

- As the solvent polarity increases the R.OR follows E1 mechanism will also increase [DEPTH OF BIOLOGY]
- Neutral leaving group shift the reaction towards E1

ELIMINATION KINETICS

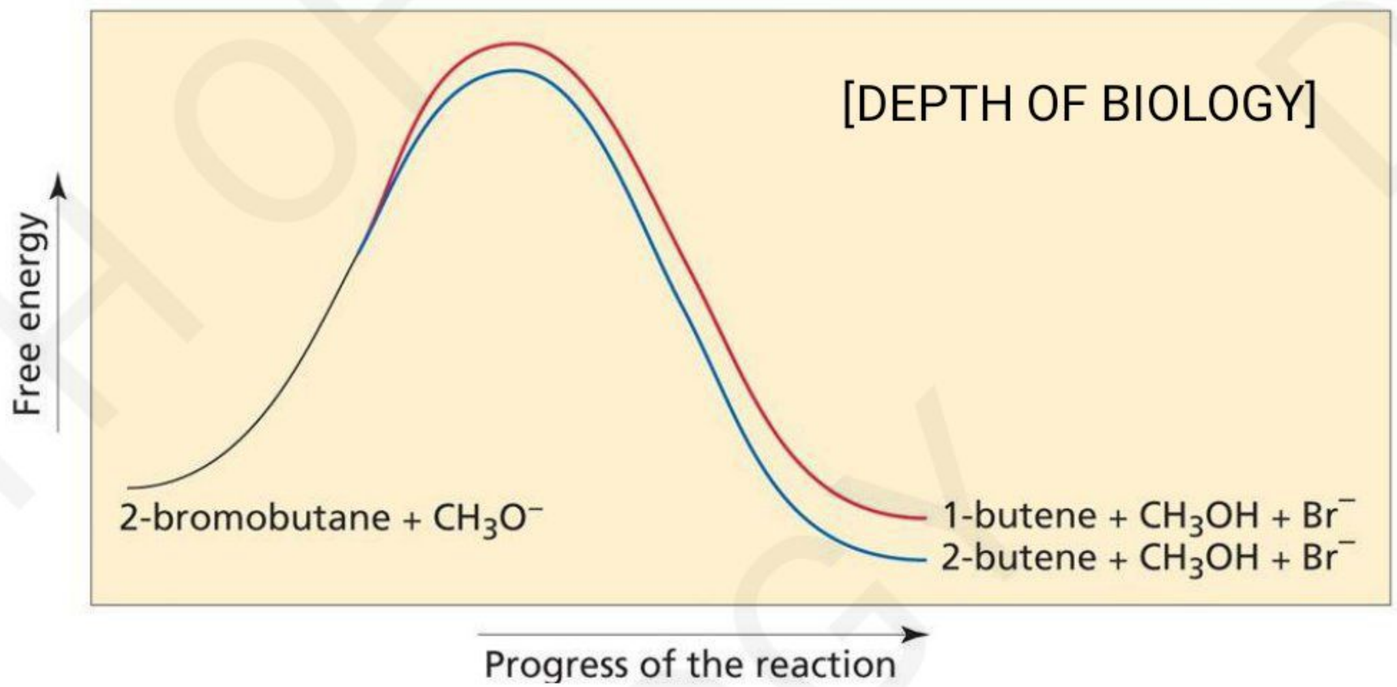
[DEPTH OF BIOLOGY]

2 alkene form more

Substituted alkene ; form

Minor product

Reaction coordinate diagram for the E2 reaction of 2-bromobutane and methoxide ion



- This reaction is only applicable for E2 reaction