



CONDENSATION REACTION

MONOMER ADDED
TO POLYMER

CONDENSATION REACTION



CONDENSATION REACTION

MONOMER ADDED
TO POLYMER

COVALENT BOND FORMED

CONDENSATION REACTION

CONDENSATION REACTION

MONOMER ADDED

TO POLYMER

COVALENT BOND FORMED

DERIVING WATER

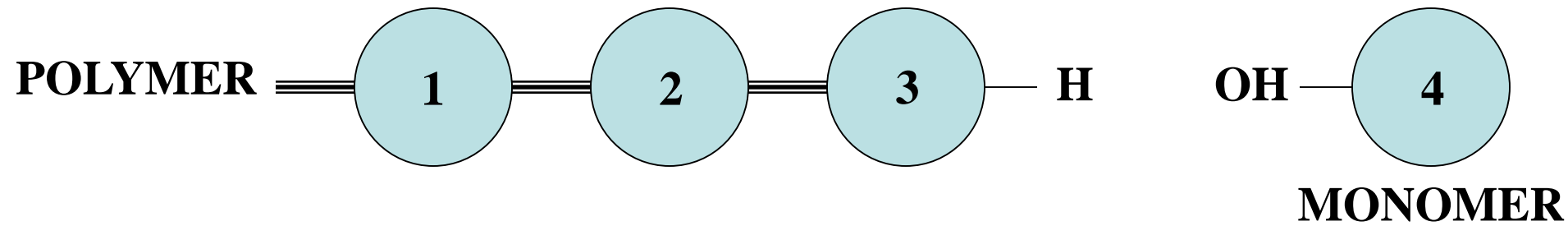
CONDENSATION REACTION



**CONDENSATION
REACTION
APPLIED**

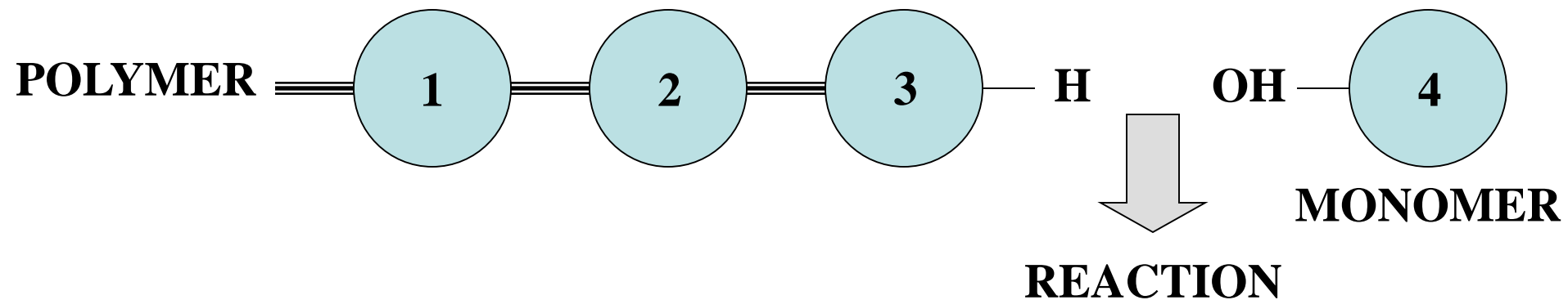


MACROMOLECULE CONDENSATION REACTION

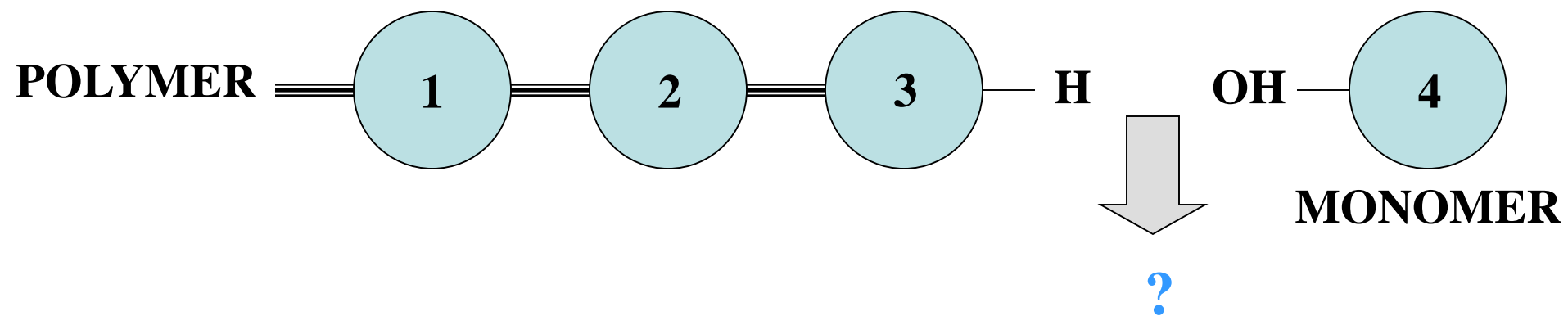




MACROMOLECULE CONDENSATION REACTION

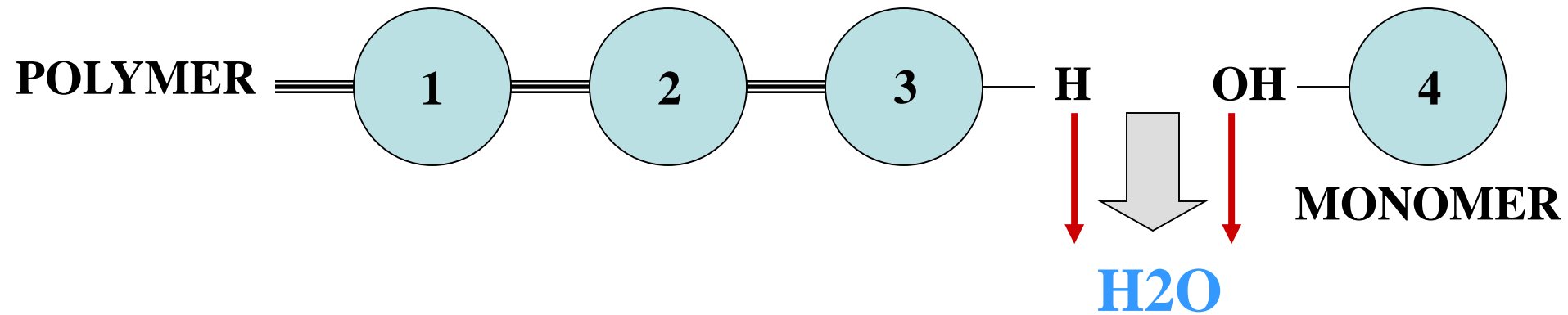


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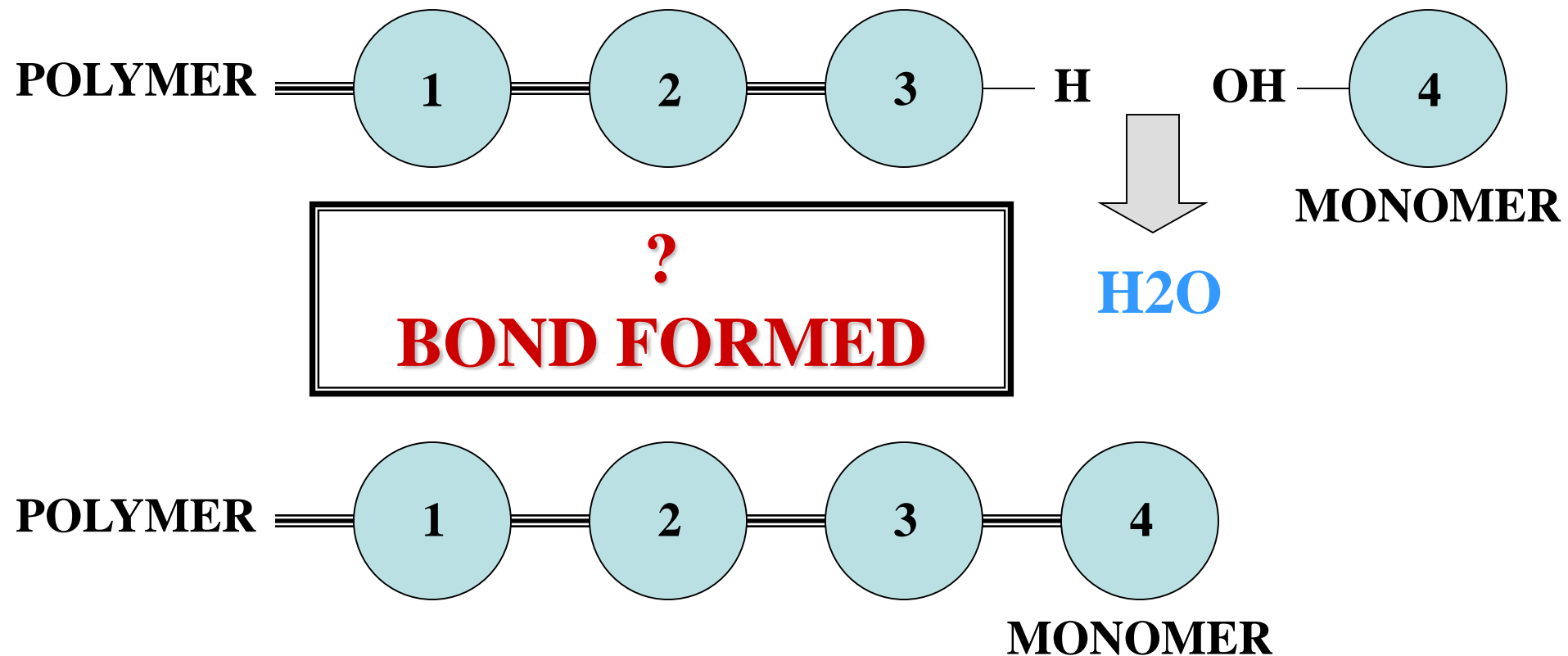




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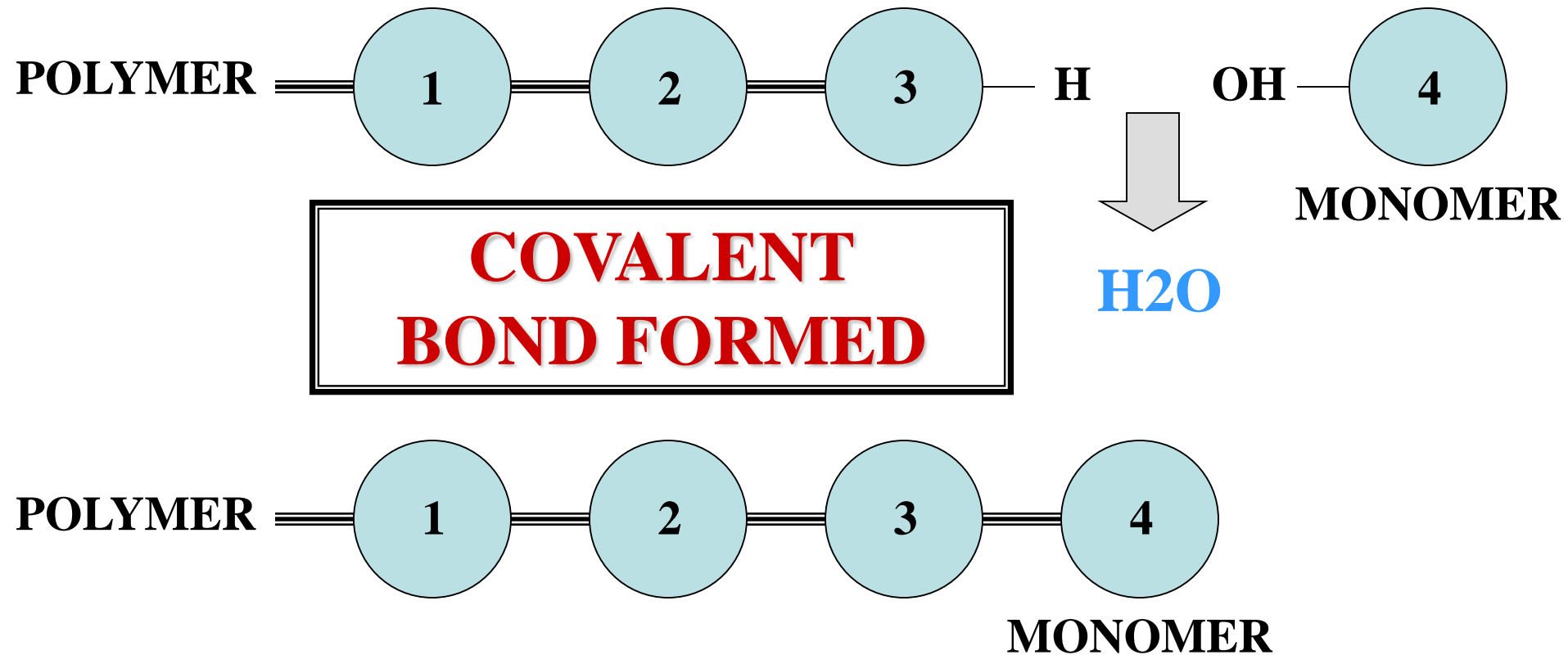


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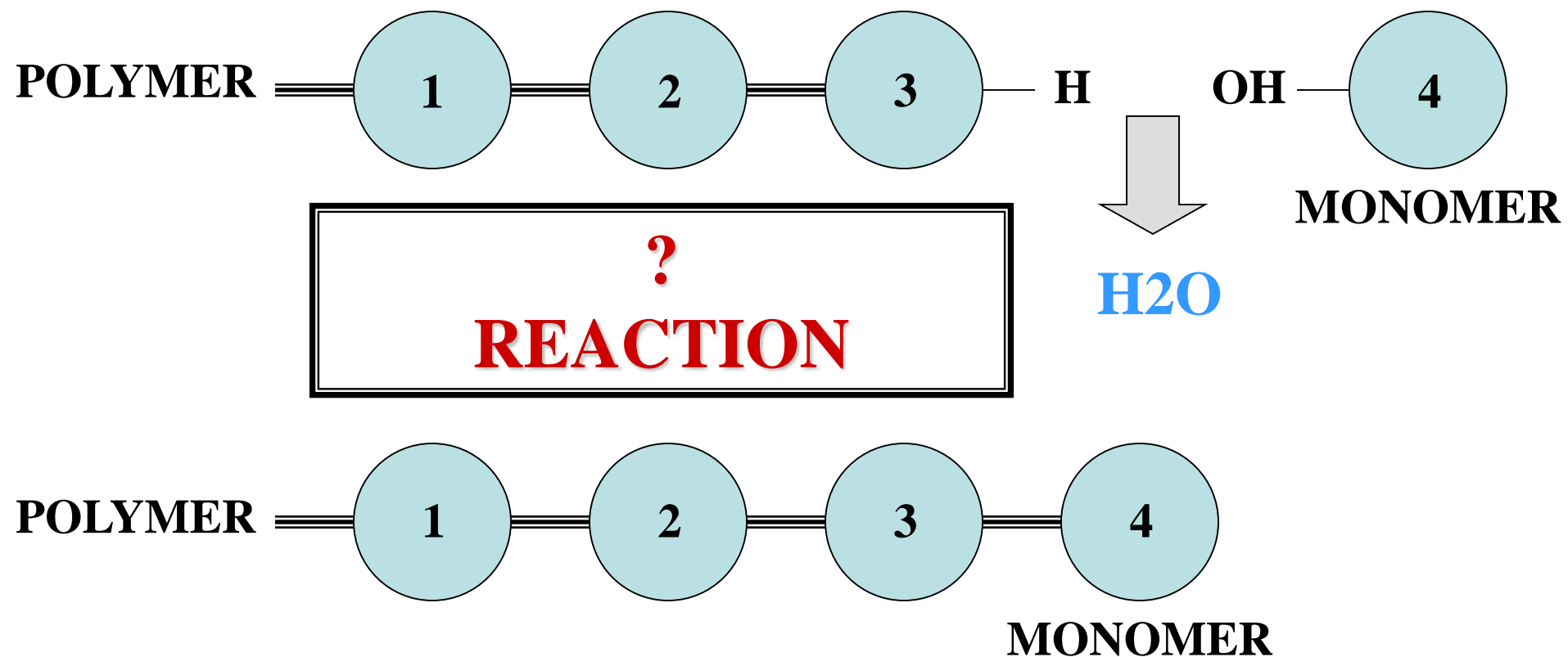




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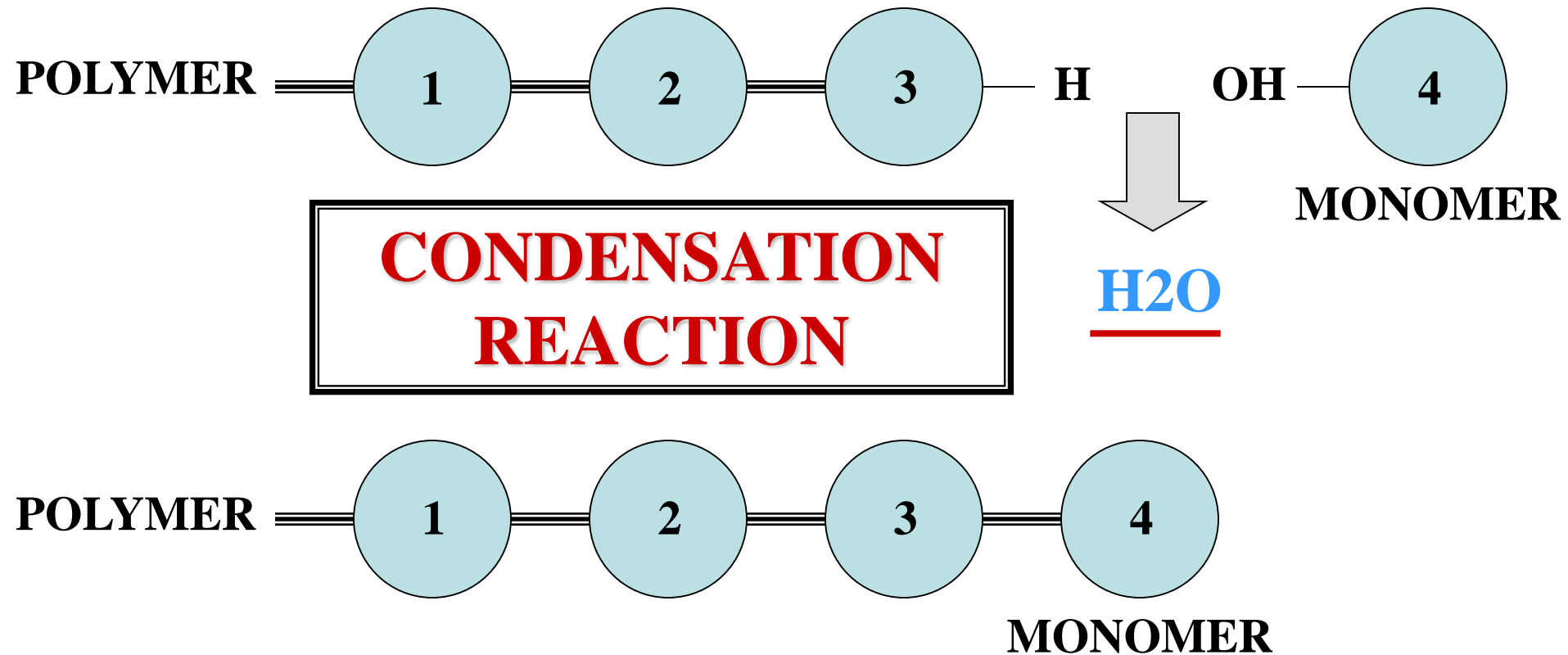


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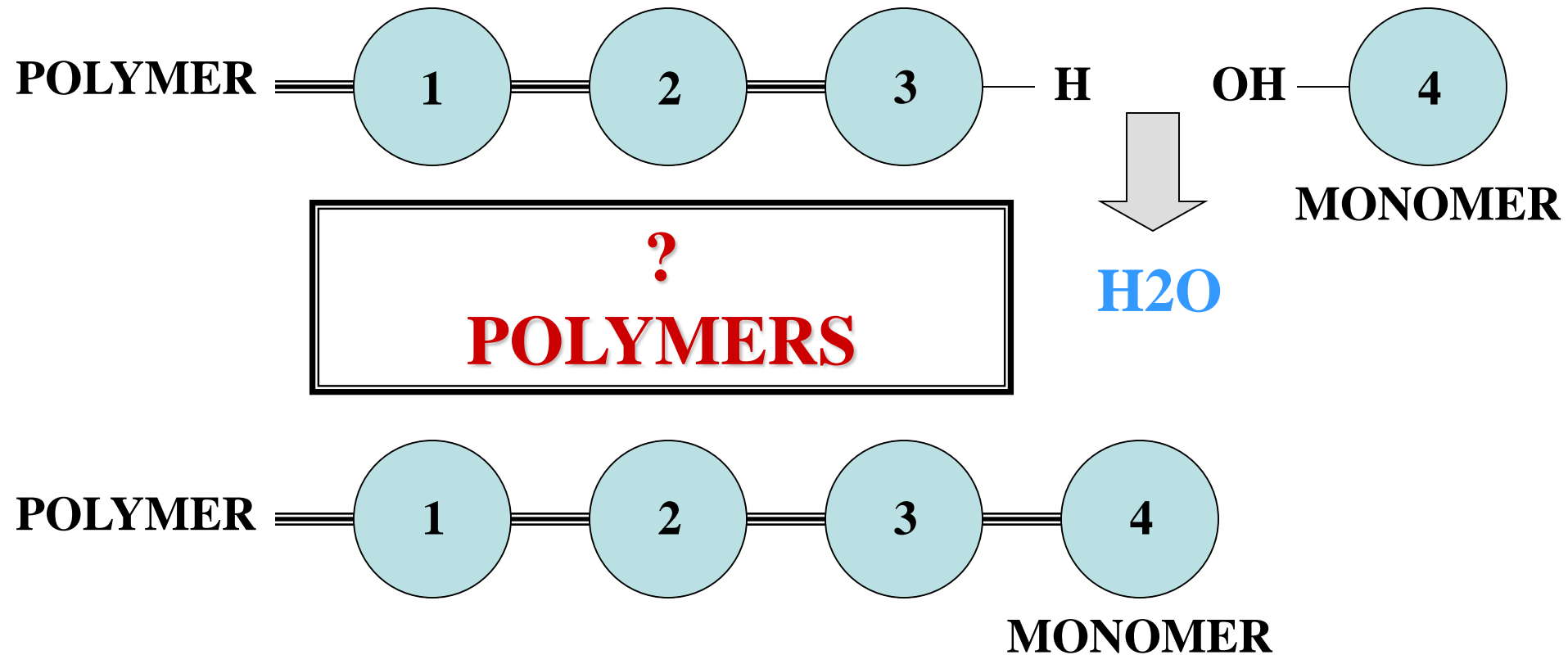


MACROMOLECULE CONDENSATION REACTION



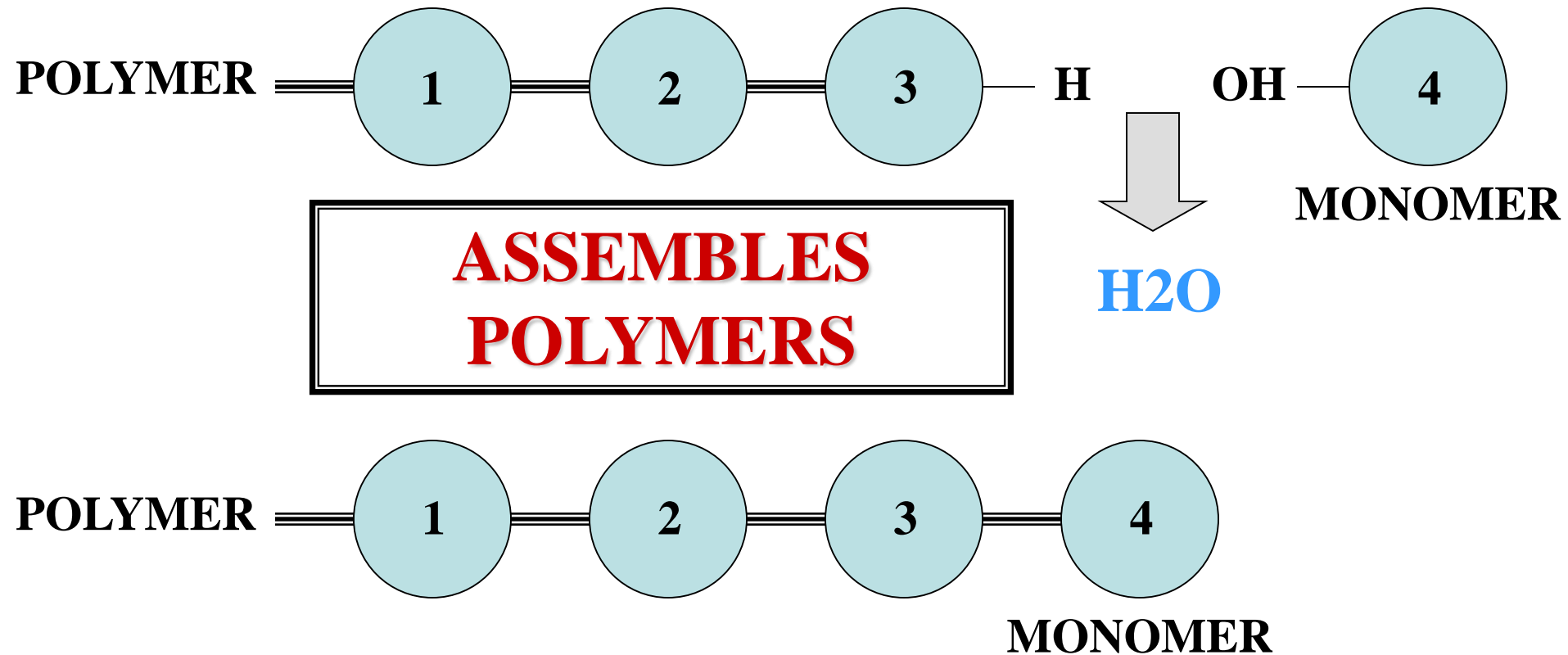


MACROMOLECULE CONDENSATION REACTION





MACROMOLECULE CONDENSATION REACTION



HYDROLYSIS REACTION

HYDROLYSIS REACTION



HYDROLYSIS REACTION

MONOMER REMOVED
FROM POLYMER

HYDROLYSIS REACTION



HYDROLYSIS REACTION

MONOMER REMOVED
FROM POLYMER

COVALENT BOND BROKEN

HYDROLYSIS REACTION

HYDROLYSIS REACTION

MONOMER REMOVED
FROM POLYMER

COVALENT BOND BROKEN

CONSUMING WATER

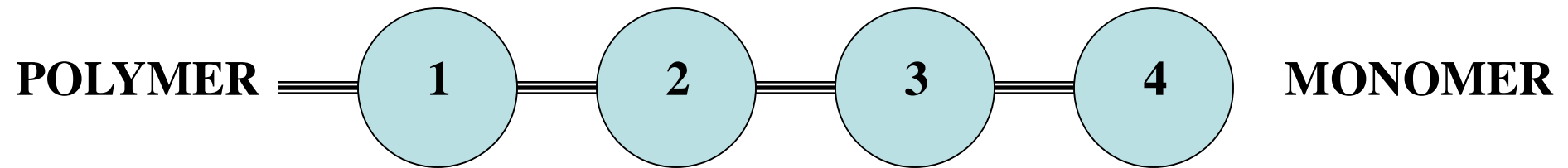
HYDROLYSIS REACTION



**HYDROLYSIS
REACTION
APPLIED**

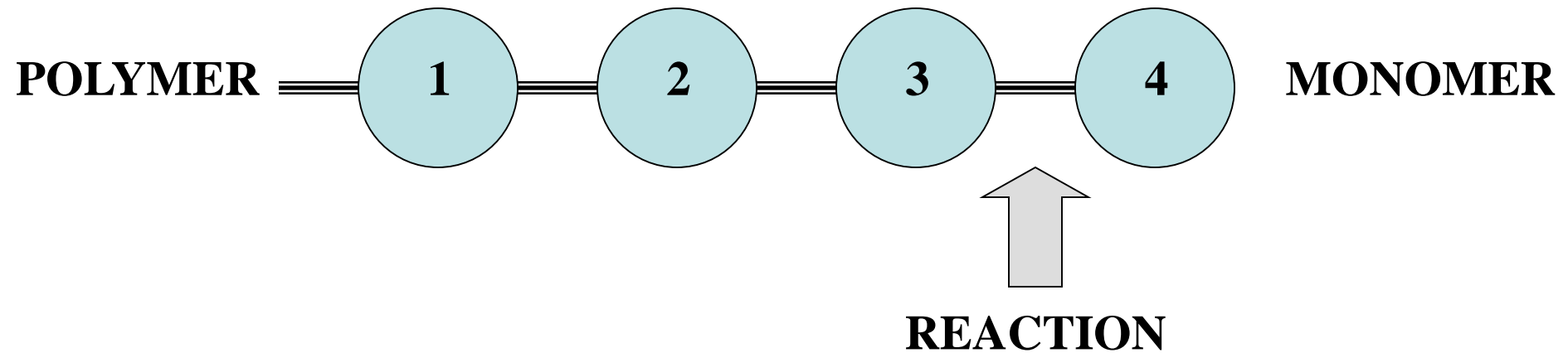


MACROMOLECULE HYDROLYSIS REACTION

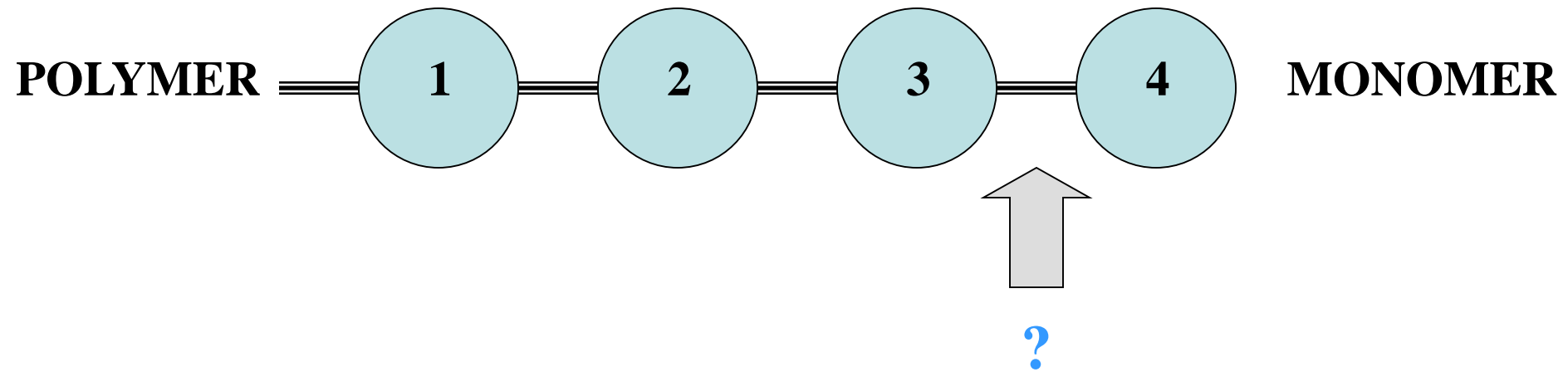




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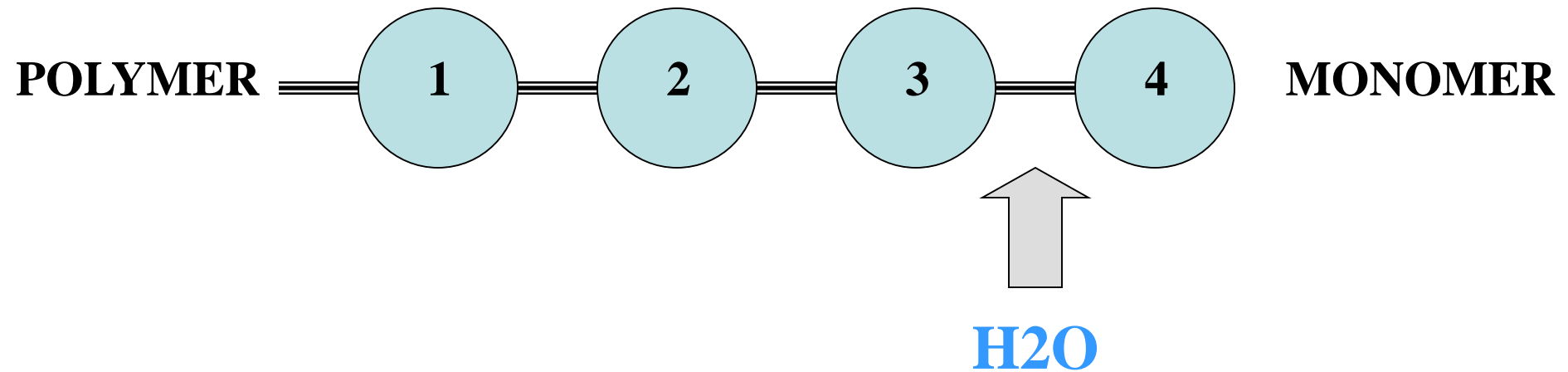


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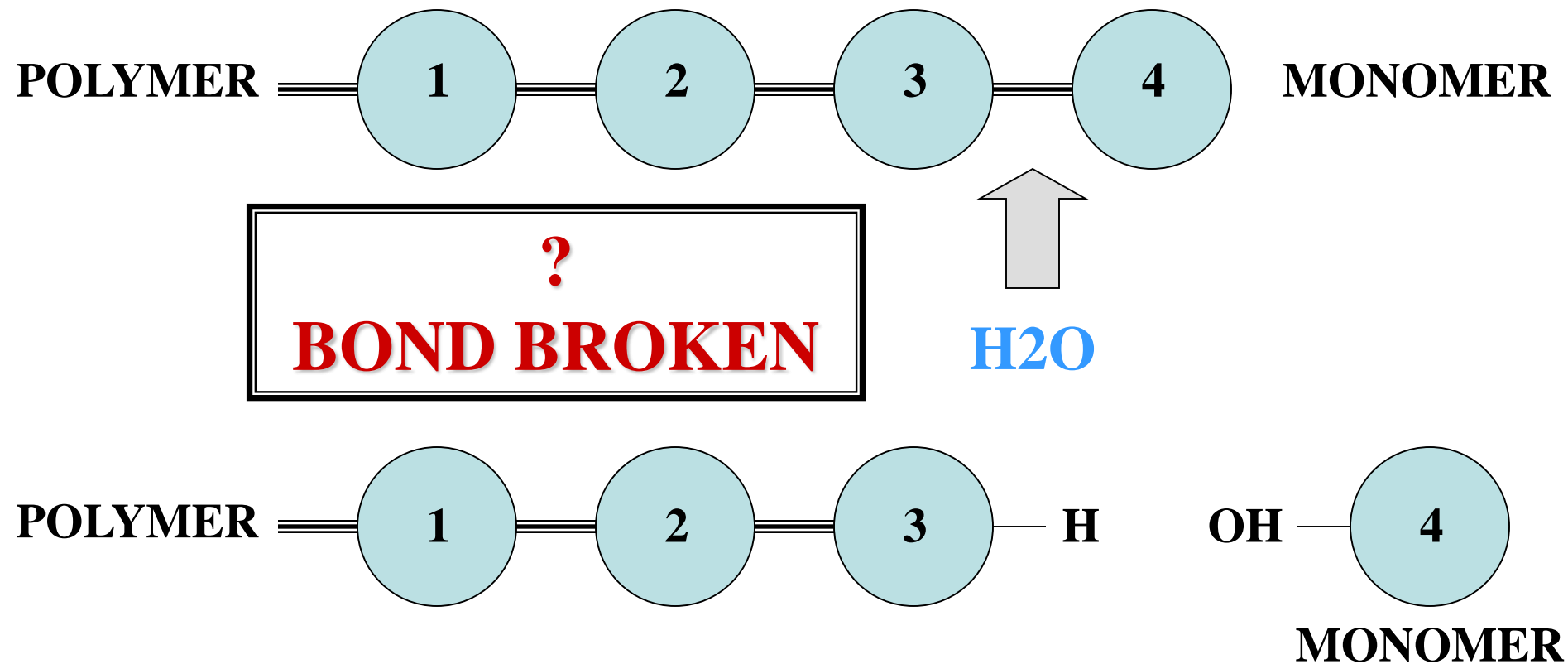




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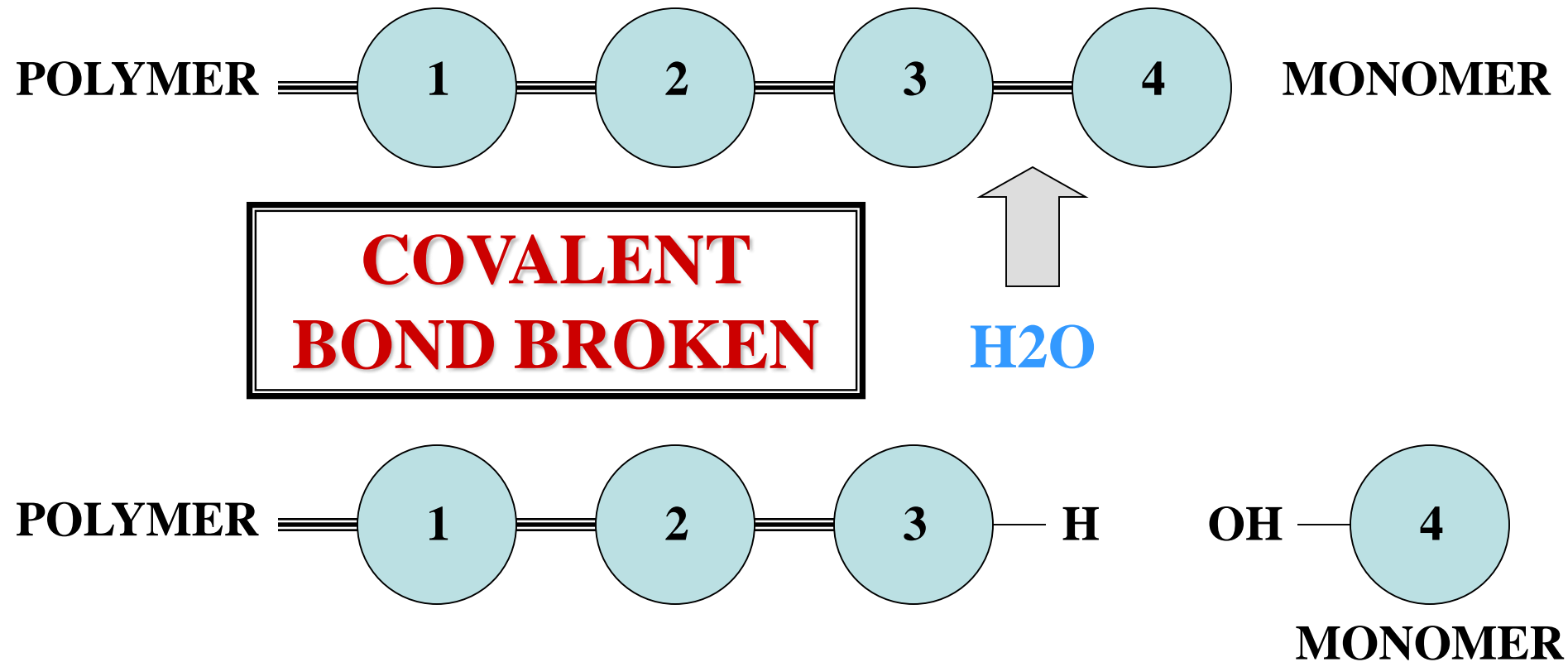


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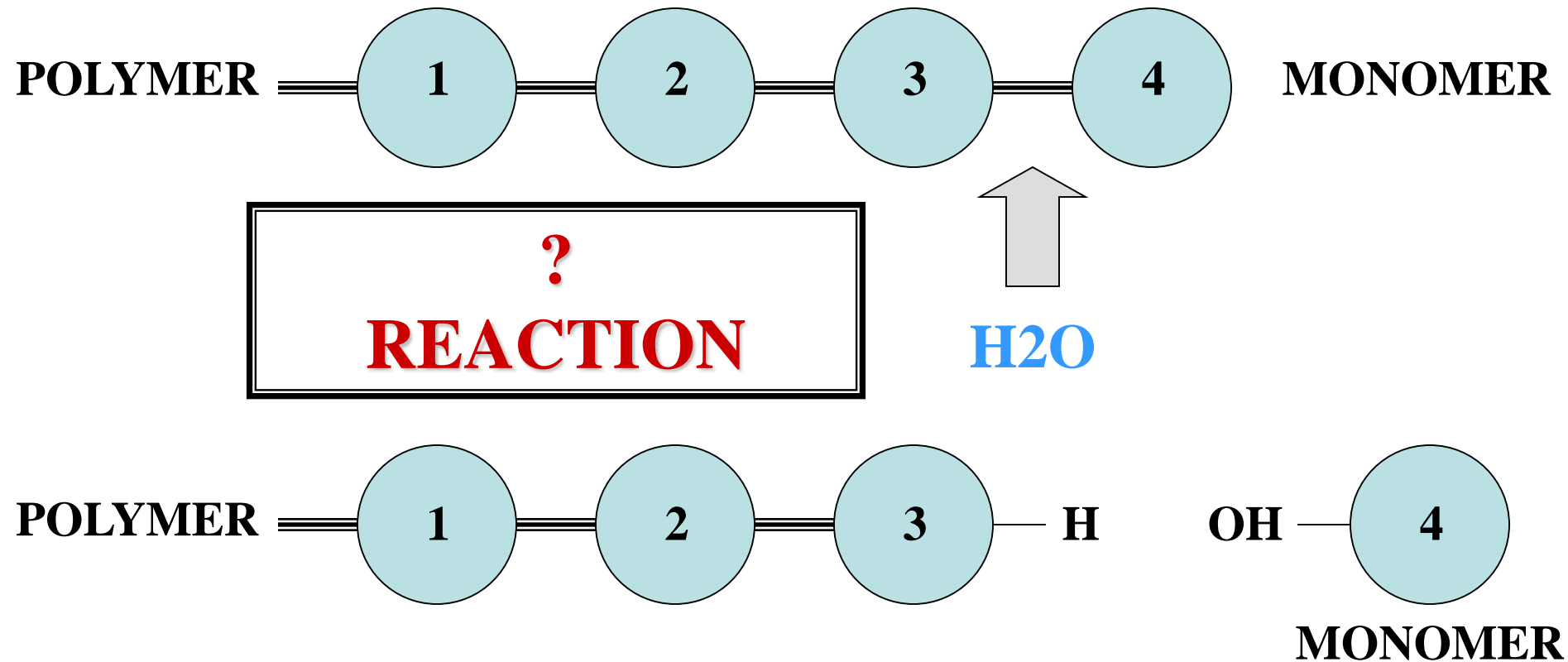




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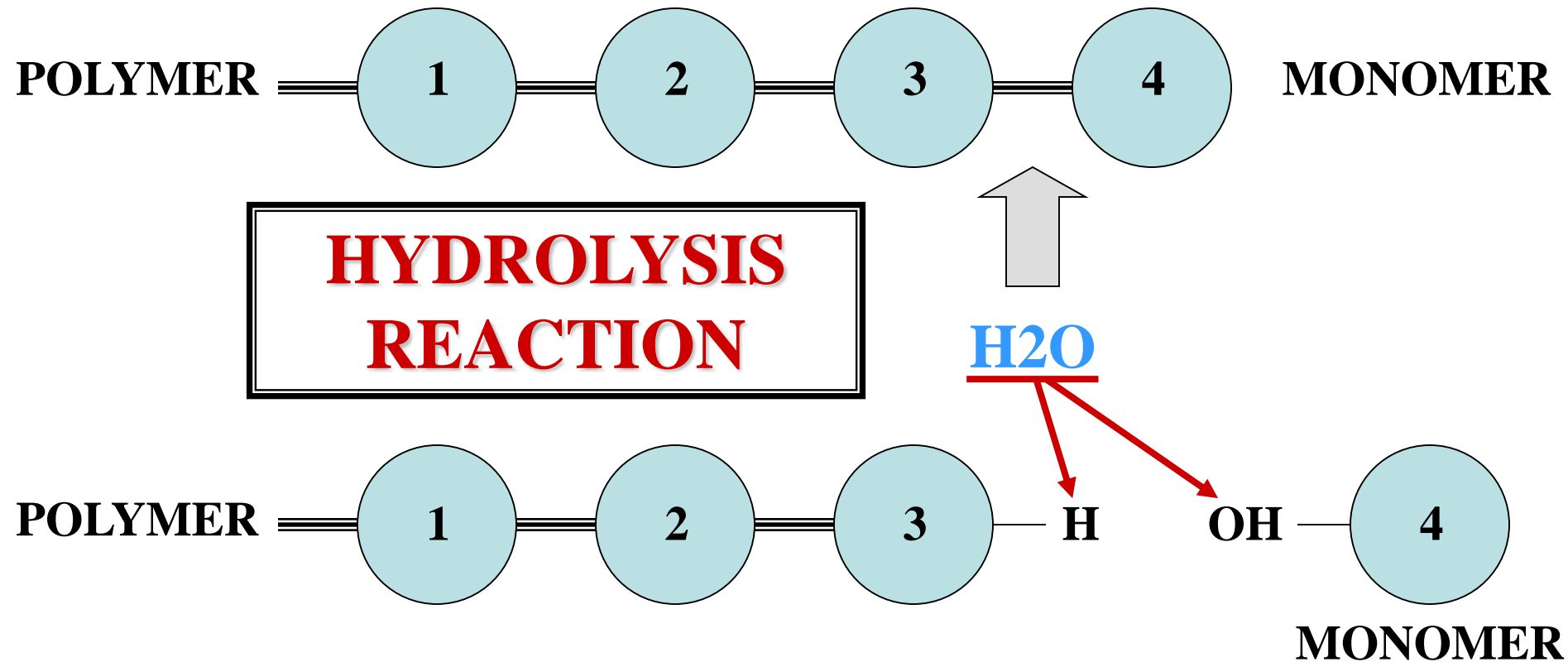


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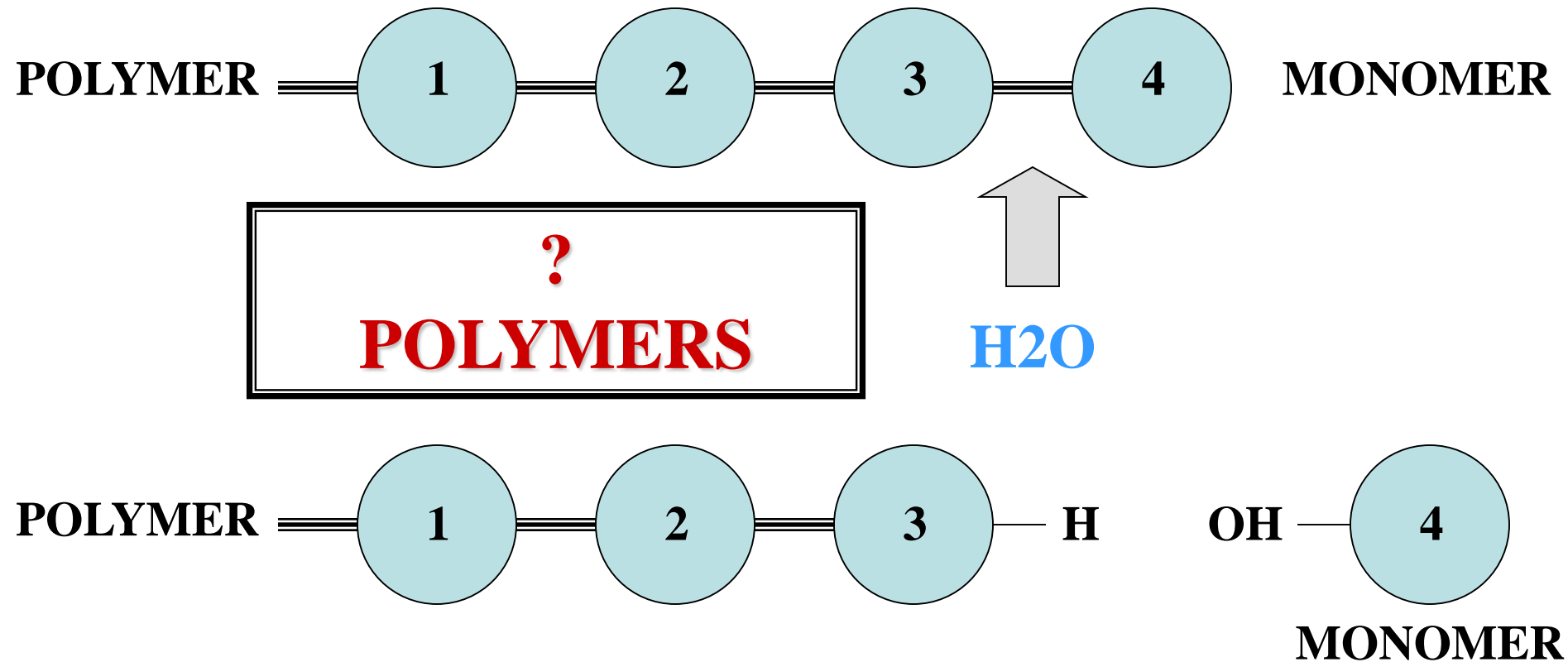


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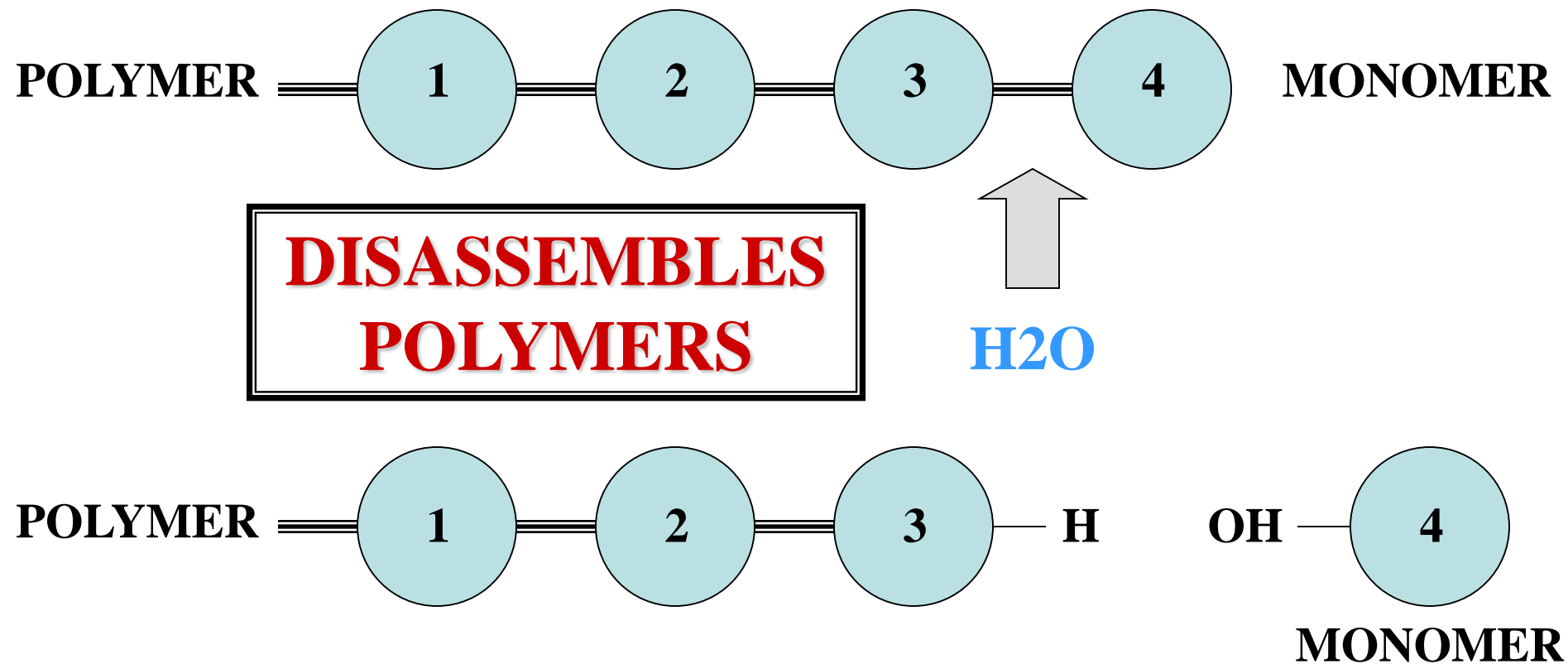




MACROMOLECULE HYDROLYSIS REACTION



MACROMOLECULE HYDROLYSIS REACTION



CONDENSATION

REACTION

HYDROLYSIS

REACTION

SUMMARY



CONDENSATION

I

REACTION

VS

HYDROLYSIS

REACTION

?

CONDENSATION

REACTION

VS

HYDROLYSIS

REACTION

!!!INVERSE RXTS!!!



CONDENSATION

ASSEMBLES

VS

HYDROLYSIS

DISASSEMBLES

!!!*INVERSE RXTS*!!!



**CATABOLIC
METABOLISM
VS
ANABOLIC
METABOLISM**

CATABOLIC METABOLISM

CATABOLIC METABOLISM



CATABOLIC METABOLISM

BREAK-DOWN METABOLISM

CATABOLIC METABOLISM



CATABOLIC METABOLISM

BREAK-DOWN METABOLISM

DEGRADATIVE

CATABOLIC METABOLISM



CATABOLIC METABOLISM

BREAK-DOWN METABOLISM

DEGRADATIVE

RELEASES ENERGY

CATABOLIC METABOLISM



CATABOLIC METABOLISM

SUMMARY



***CATABOLIC
METABOLISM***





***CATABOLIC
METABOLISM
BREAK-DOWN
METABOLISM***



***CATABOLIC
METABOLISM
DEGRADATIVE
METABOLISM***

***CATABOLIC
METABOLISM
RELEASES
ENERGY***

ANABOLIC METABOLISM

ANABOLIC METABOLISM



ANABOLIC METABOLISM

BUILD-UP METABOLISM

ANABOLIC METABOLISM



ANABOLIC METABOLISM

BUILD-UP METABOLISM

BIOSYNTHESIS

ANABOLIC METABOLISM

ANABOLIC METABOLISM



BUILD-UP METABOLISM

BIOSYNTHESIS

CONSUMES ENERGY

ANABOLIC METABOLISM

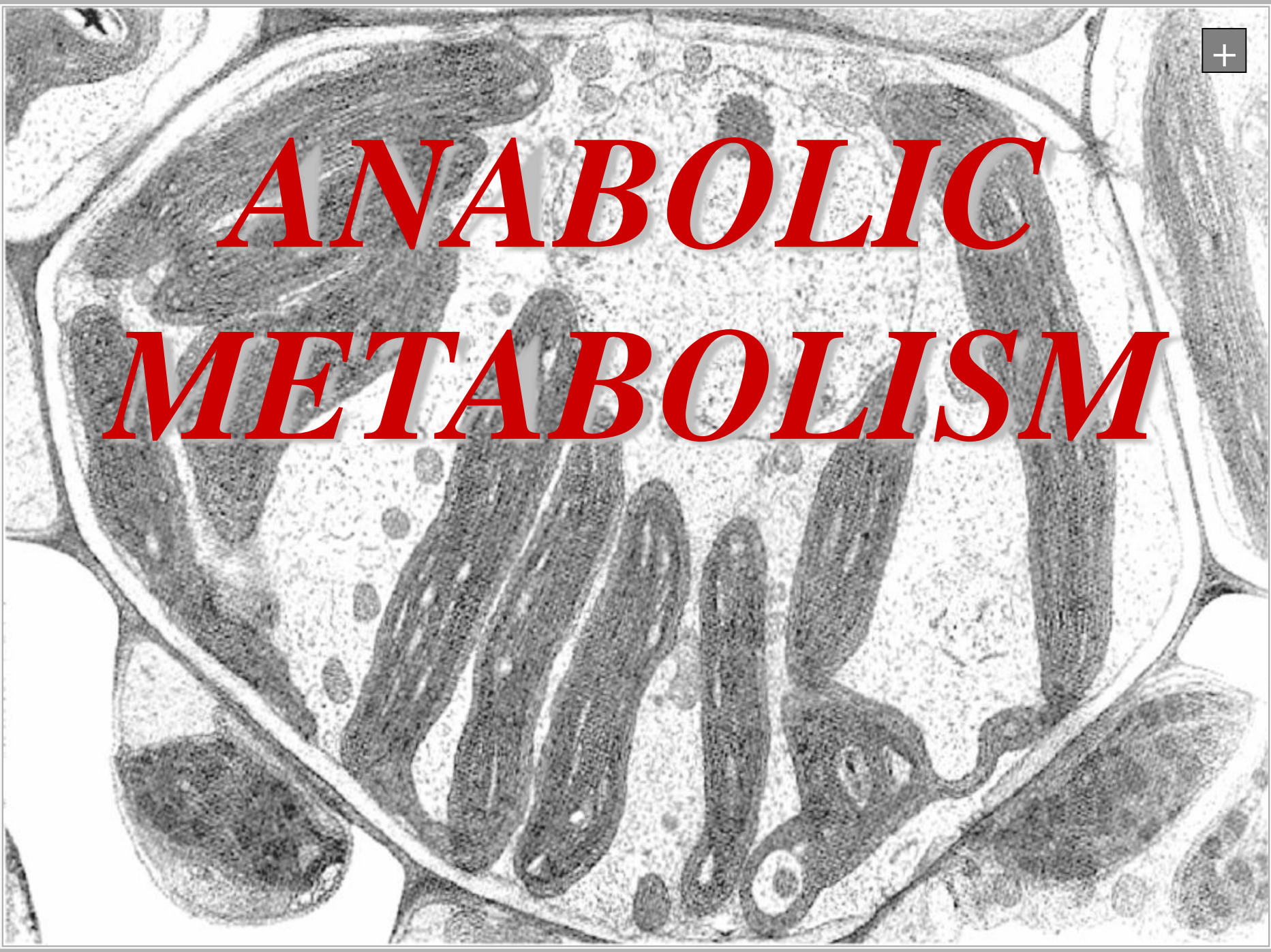


ANABOLIC METABOLISM

SUMMARY



***ANABOLIC
METABOLISM***





***ANABOLIC
METABOLISM
BUILD-UP
METABOLISM***



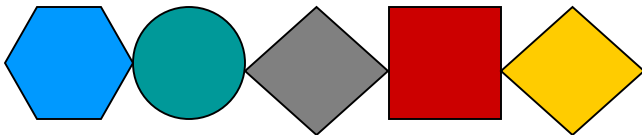
***ANABOLIC
METABOLISM
BIOSYNTHESIS
METABOLISM***

***ANABOLIC
METABOLISM
CONSUMES
ENERGY***

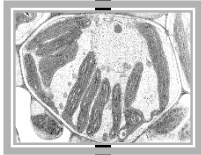
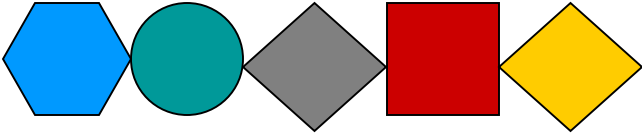
**CATABOLIC
METABOLISM
&
ANABOLIC
METABOLISM
APPLIED**



POLYMER

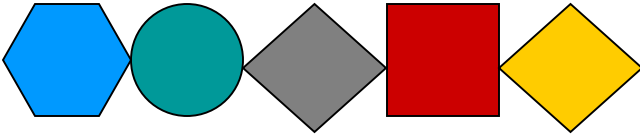


POLYMER



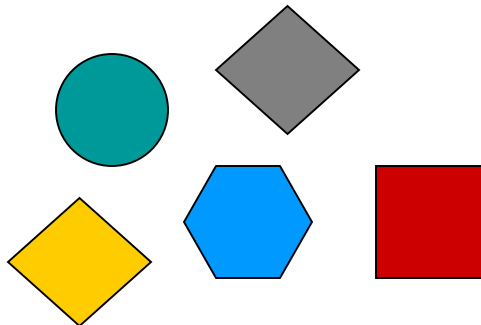
METABOLISM

POLYMER



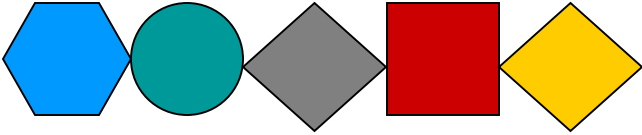
**POLYMER
DISASSEMBLED**

METABOLISM



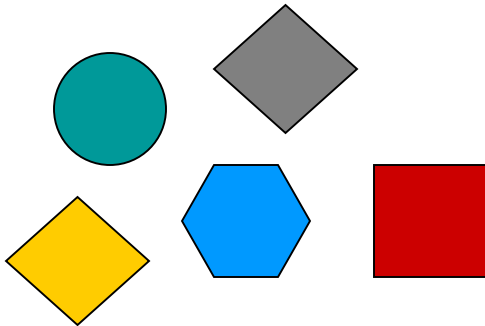
“BUILDING BLOCKS”

POLYMER

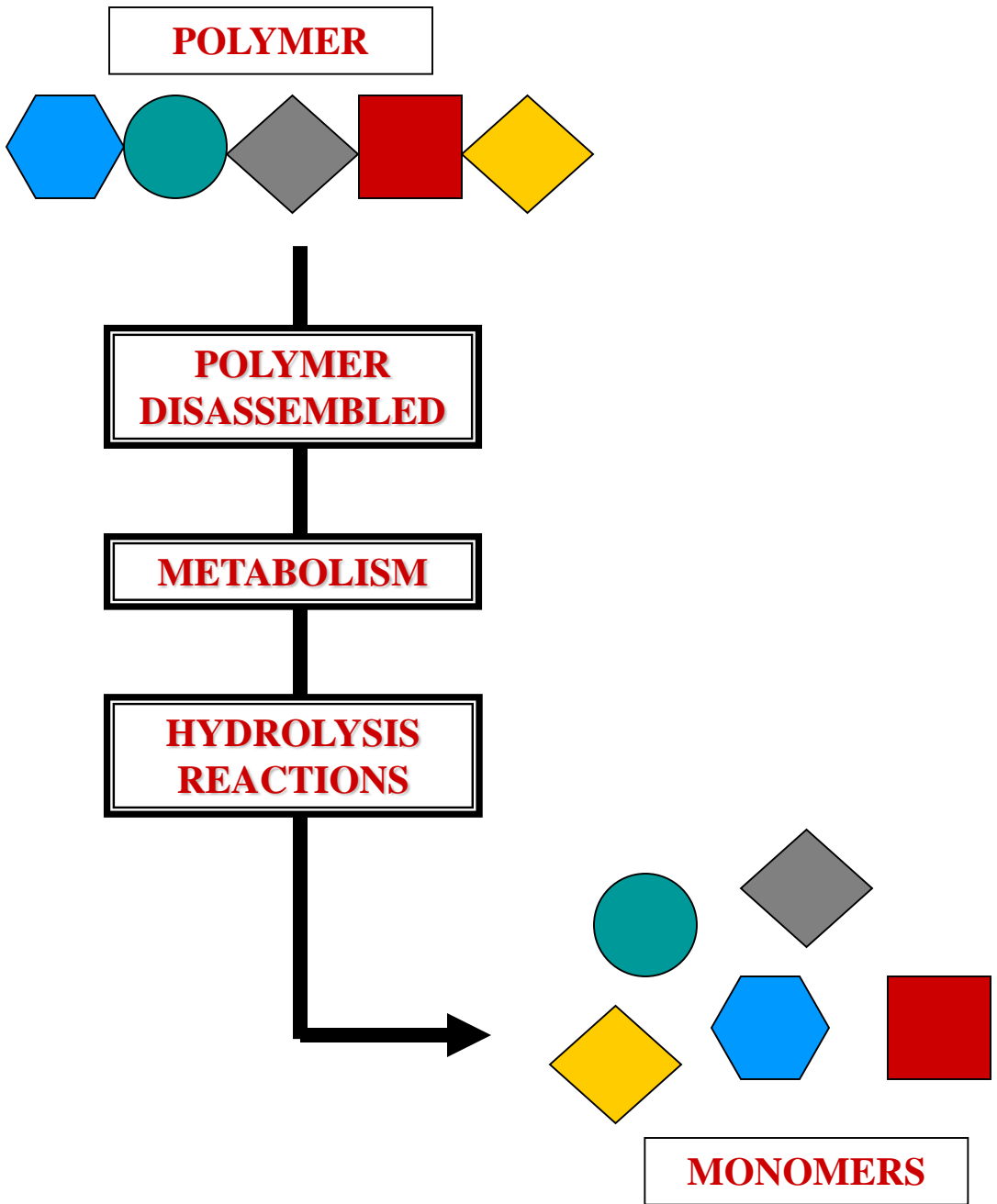


**POLYMER
DISASSEMBLED**

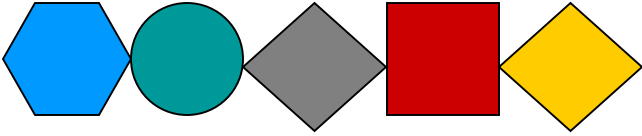
METABOLISM



MONOMERS



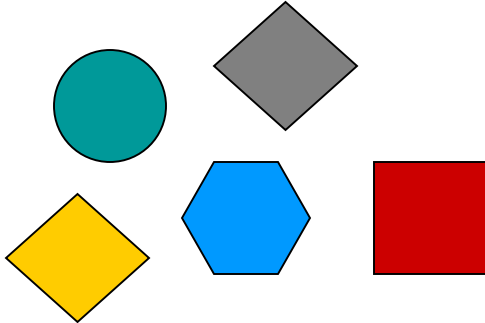
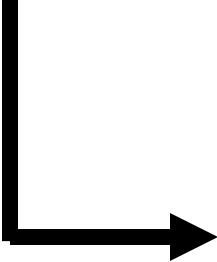
POLYMER



**POLYMER
DISASSEMBLED**

**BREAK-DOWN
METABOLISM**

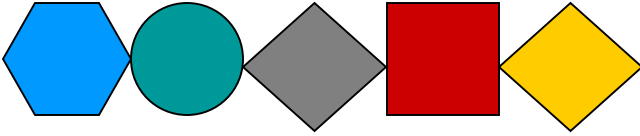
**HYDROLYSIS
REACTIONS**



MONOMERS



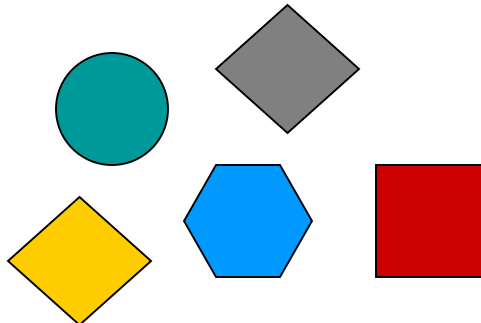
POLYMER



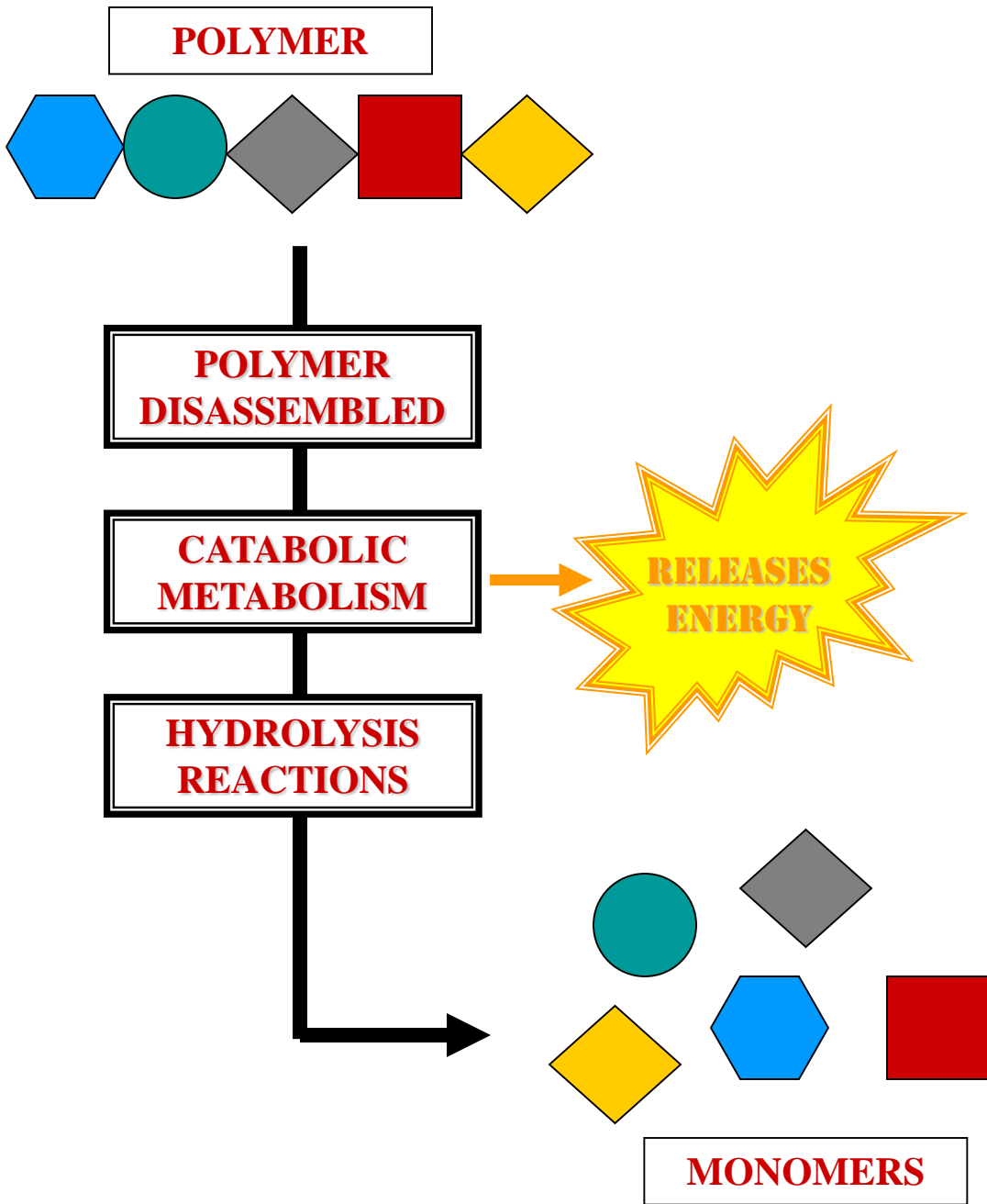
**POLYMER
DISASSEMBLED**

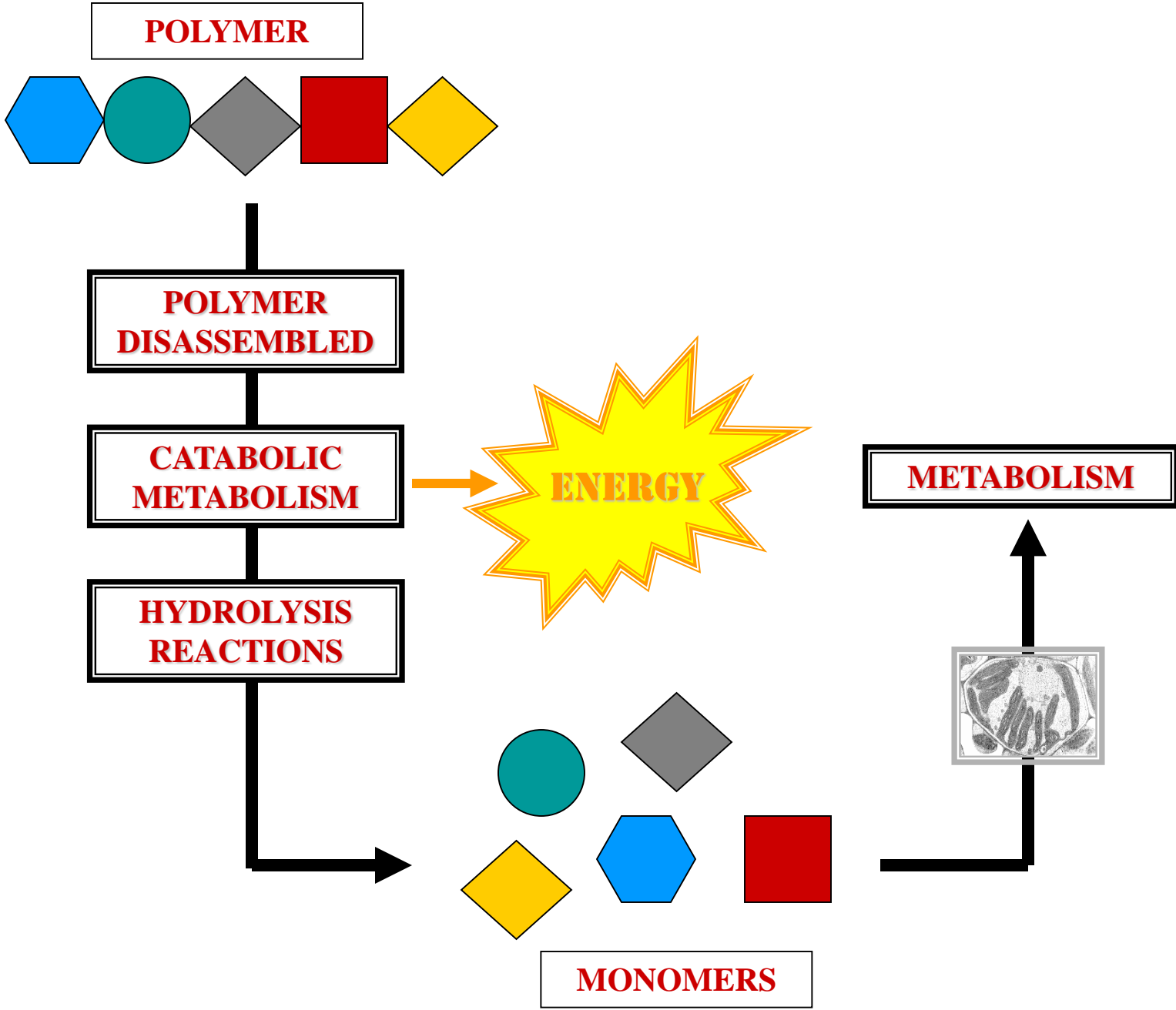
**CATABOLIC
METABOLISM**

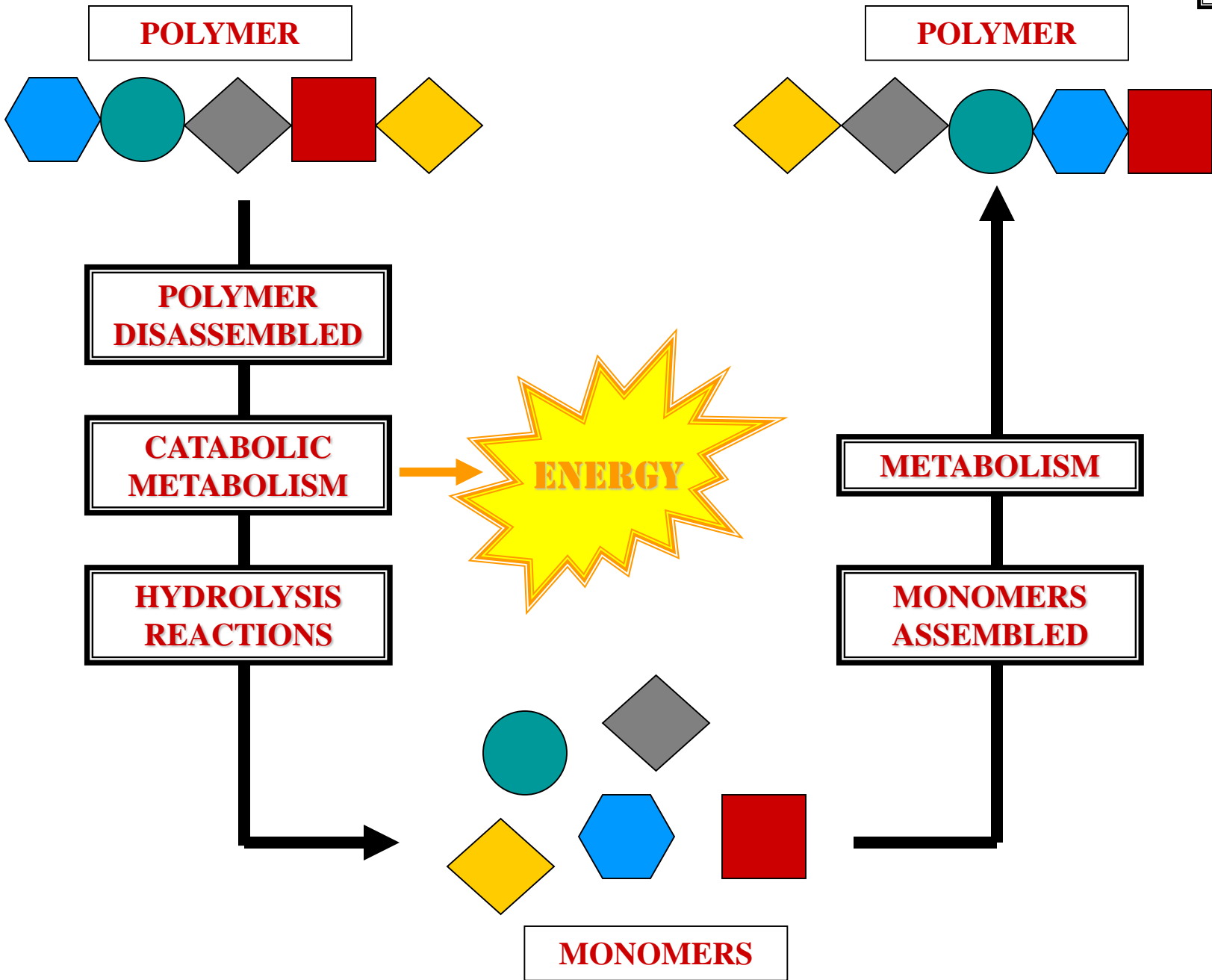
**HYDROLYSIS
REACTIONS**

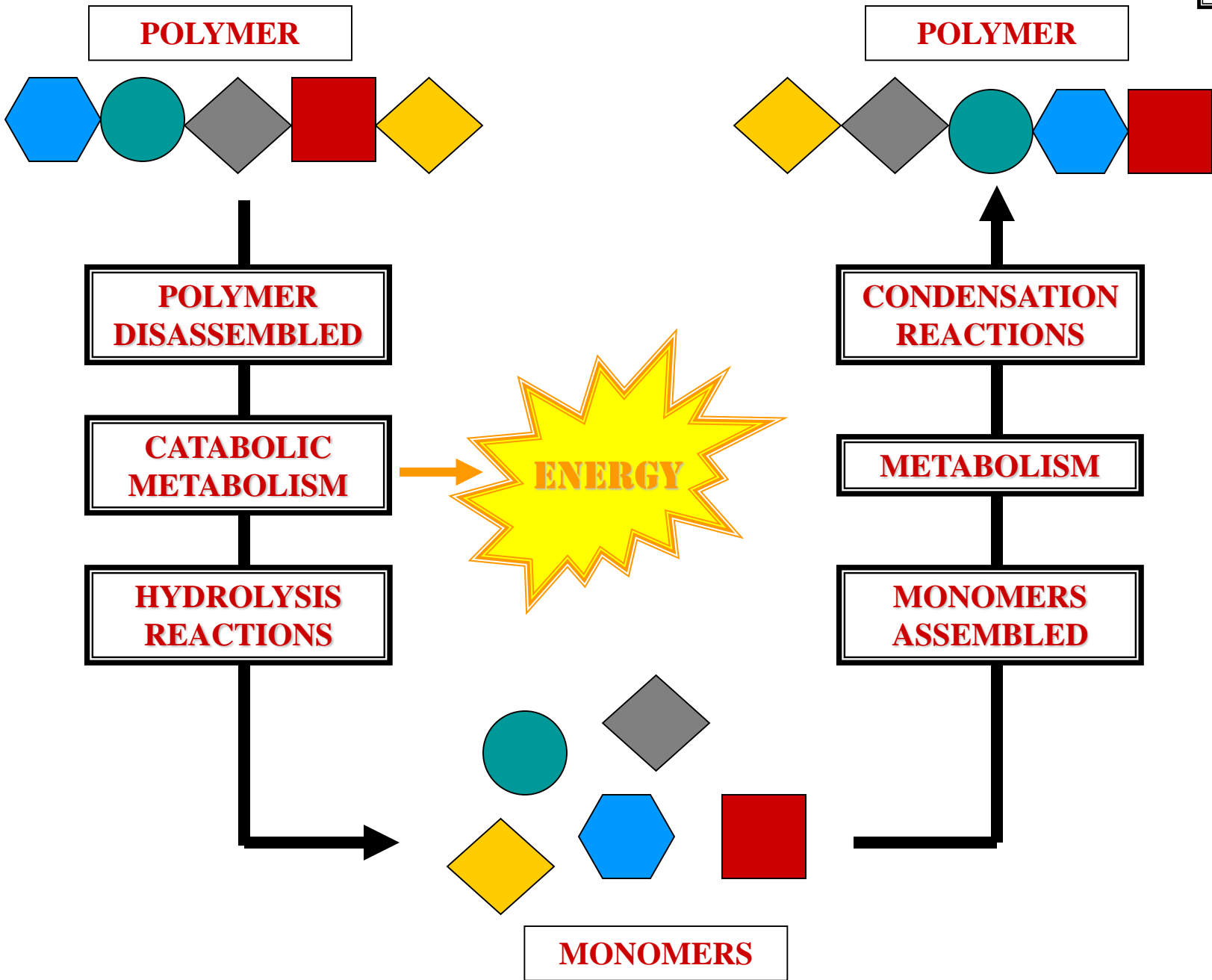


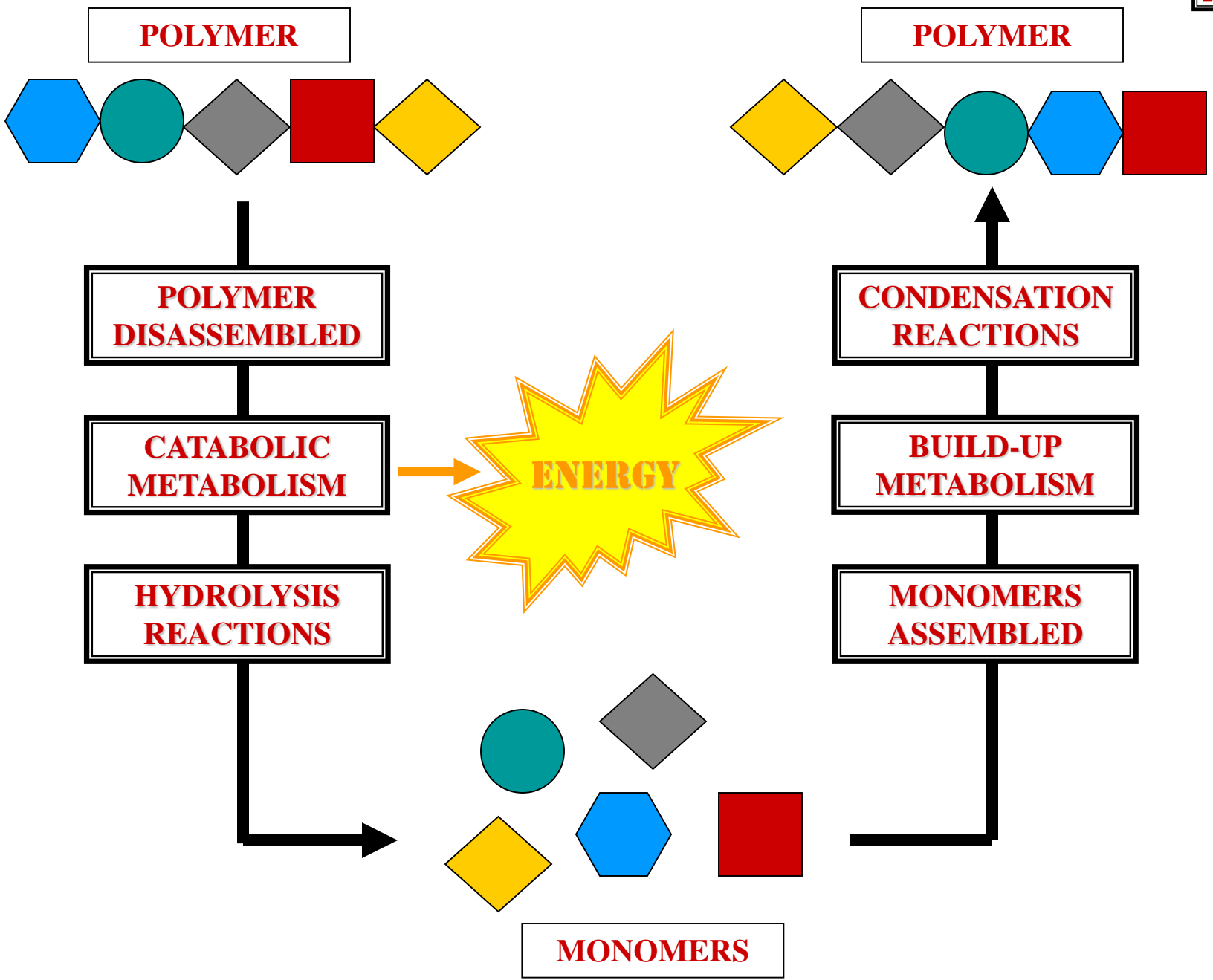
MONOMERS

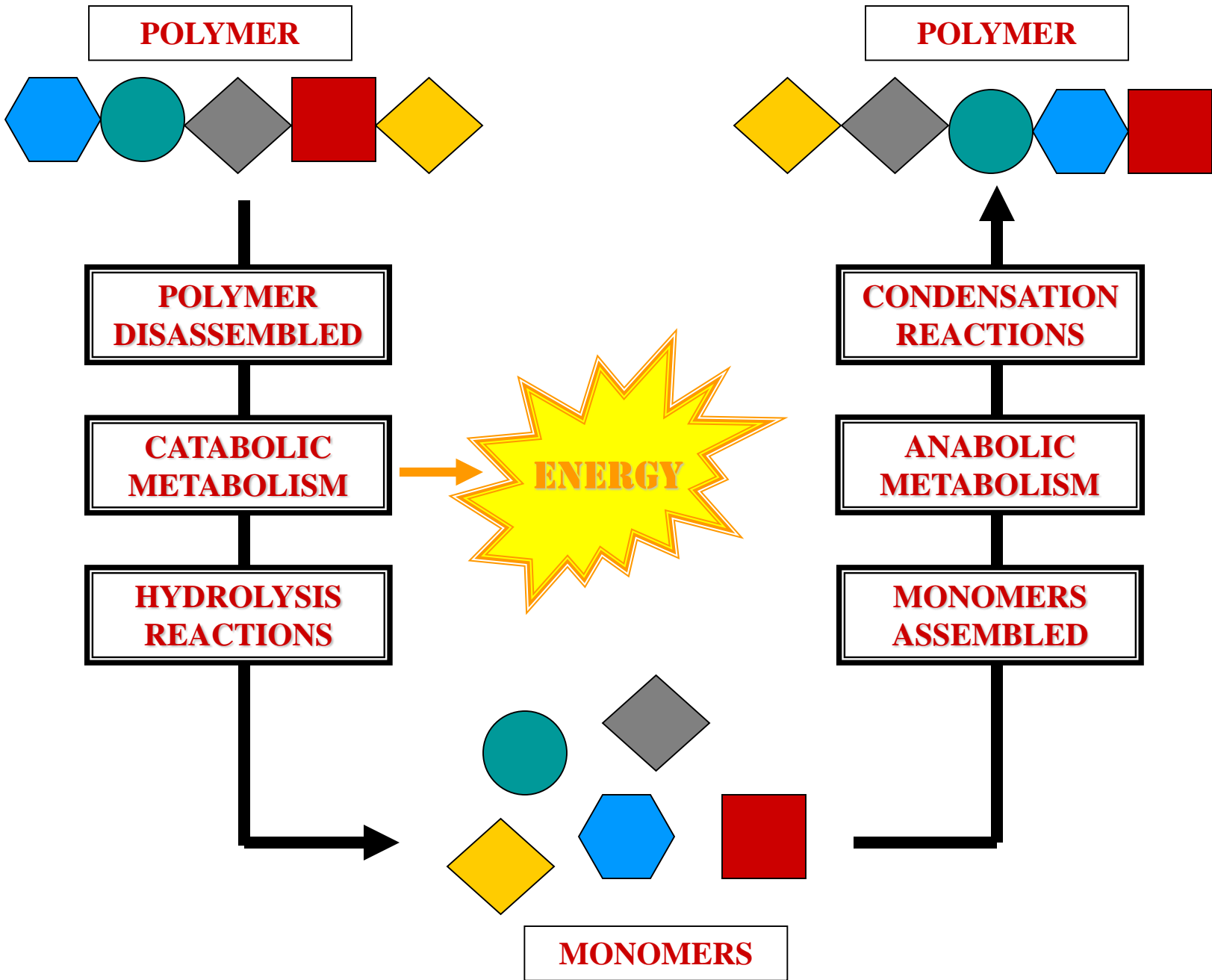












POLYMER

POLYMER

**POLYMER
DISASSEMBLED**

**CONDENSATION
REACTIONS**

**CATABOLIC
METABOLISM**

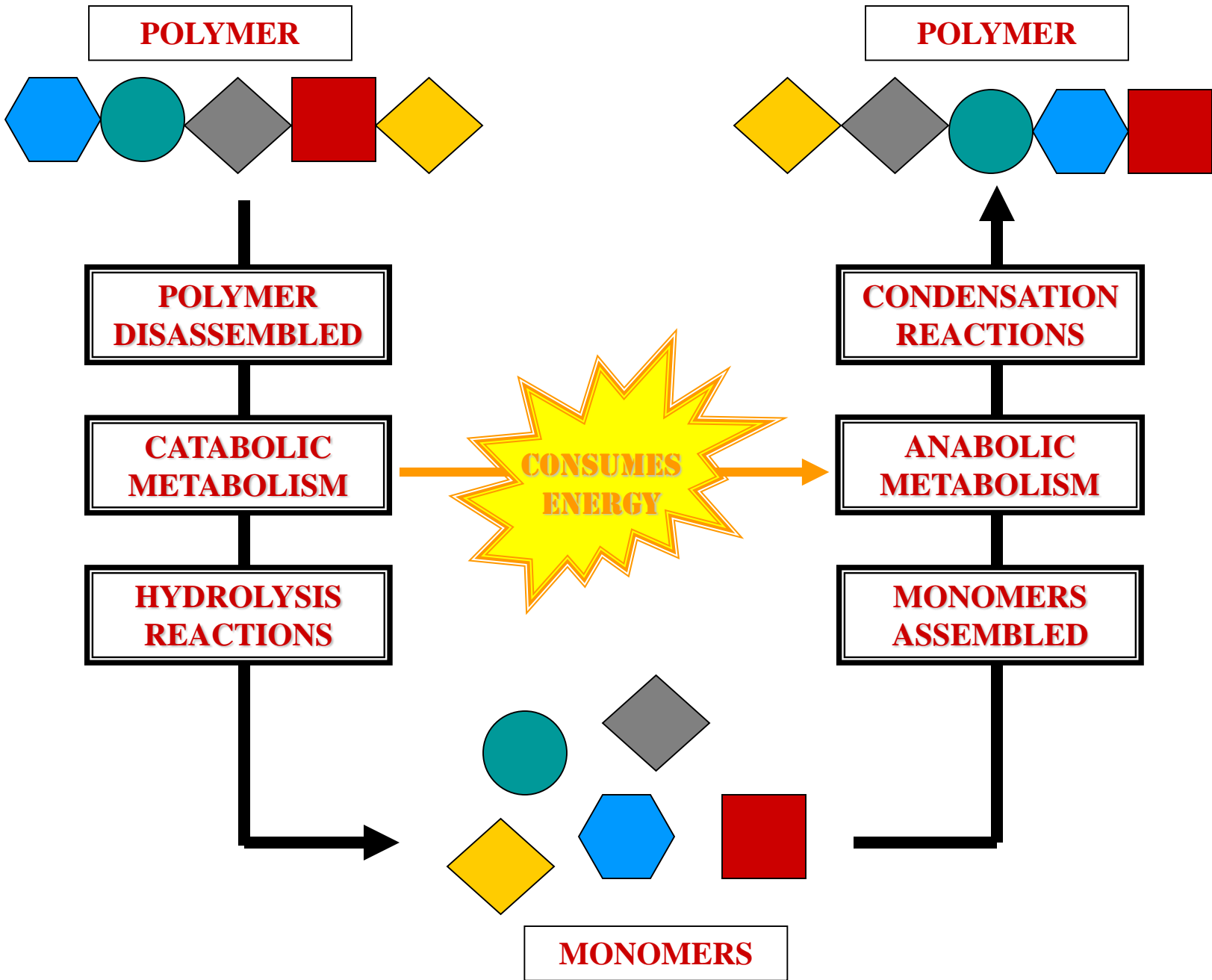
**ANABOLIC
METABOLISM**

**HYDROLYSIS
REACTIONS**

**MONOMERS
ASSEMBLED**

ENERGY

MONOMERS



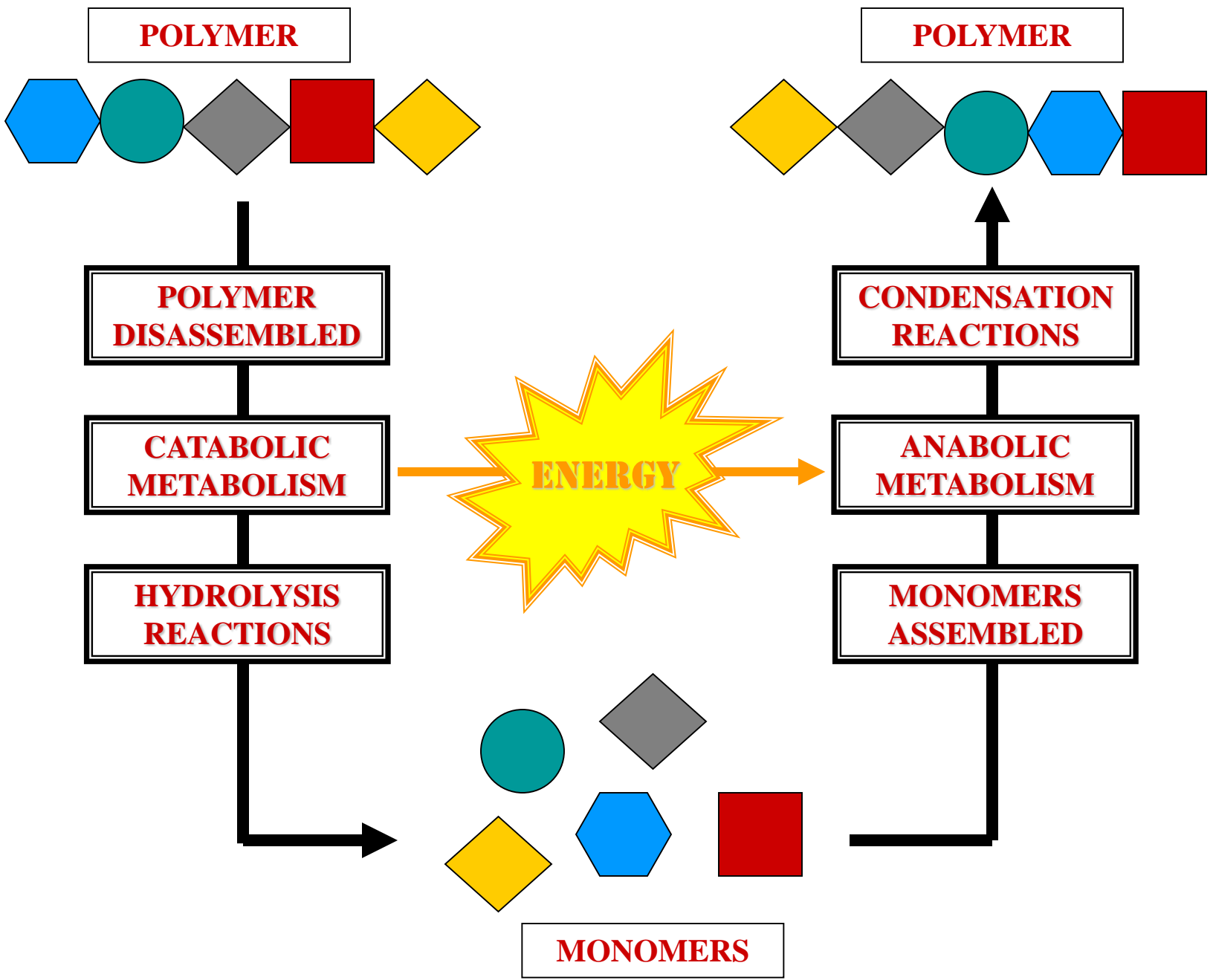
**CATABOLIC
METABOLISM
&
ANABOLIC
METABOLISM
?**

**CATABOLIC
METABOLISM
&
ANABOLIC
METABOLISM
*!!!INVERSE!!!***

**CATABOLIC
BREAK-DOWN
&
ANABOLIC
BUILD-UP**

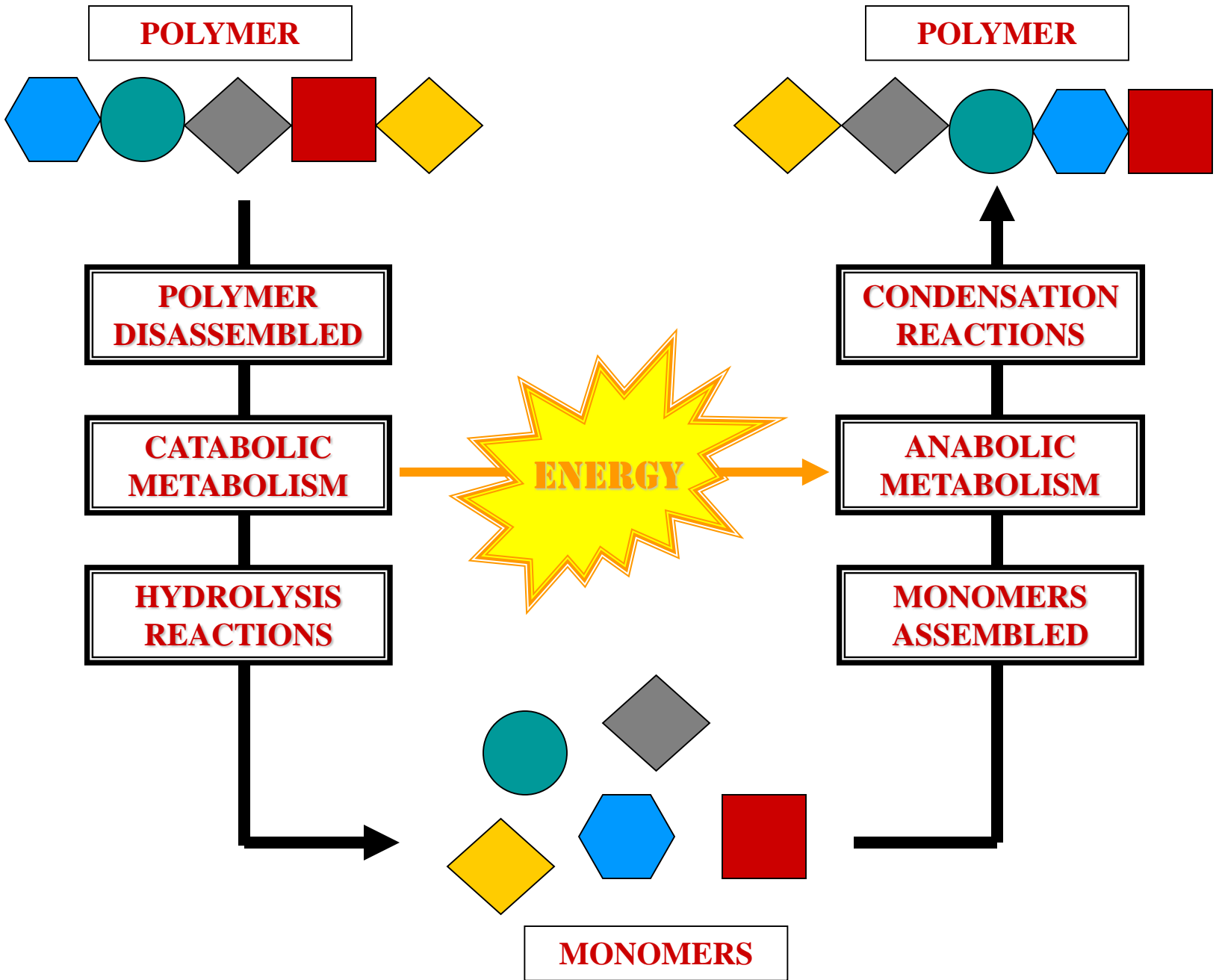
!!!*INVERSE*!!!





**CATABOLIC
METABOLISM
&
ANABOLIC
METABOLISM
*!!!COUPLED!!!***







ENERGY



ENERGY



QUESTION

**WHAT IS THE
INITIAL BIO-ENERGY
SOURCE?**

QUESTION

LIVING ORGANISMS



LIVING ORGANISMS

LIVING ORGANISMS

EARTH



ANSWER

SUN / STAR

ANSWER

A large, detailed image of the sun, showing its fiery surface with various shades of orange, red, and yellow, set against a dark background. The sun is the central focus of the image.

LIGHT ENERGY

SUN / STAR

ENERGY: DEFINED

ENERGY



ENERGY

**ABSTRACT
DIFFICULT TO DEFINE**

ENERGY



ENERGY

ABSTRACT

ABILITY TO DO WORK

ENERGY

ENERGY

ABSTRACT

ABILITY TO DO WORK

ABILITY TO DRIVE

BIO-CHEMICAL REACTIONS

ENERGY



ENERGY: DEFINED

SUMMARY



ENERGY

ABSTRACT

DIFFICULT TO DEFINE



ENERGY

ABILITY TO DO WORK



ENERGY

**ABILITY TO DRIVE
BIO-CHEM RXTS**

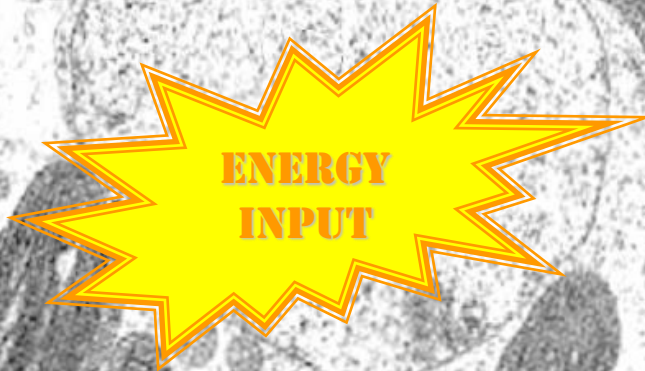


BIOCHEMICAL REACTION



BIOCHEMICAL REACTION

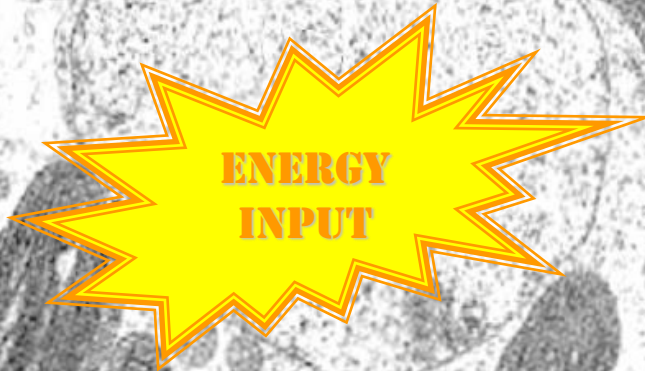
ENERGY INPUT



BIOCHEMICAL REACTION



ENERGY INPUT



**ENERGY INPUT
DRIVES**

BIOCHEMICAL REACTIONS



ENERGY INPUT
ESSENTIAL
CELL
METABOLISM



QUESTION

WHAT
ENERGY FORM IS
ESSENTIAL TO
CELL METABOLISM?

QUESTION

ENERGY FORMS

ENERGY FORMS

LIGHT ENERGY

ENERGY FROMS

ENERGY FORMS

LIGHT ENERGY

HEAT ENERGY

ENERGY FORMS

ENERGY FORMS



LIGHT ENERGY

HEAT ENERGY

CHEMICAL ENERGY

ENERGY FORMS