

ALL OF THE FOLLOWING ARE TRUE FACTS ABOUT ENZYMES EXCEPT A. ENZYMES CAN SPEED CHEMICAL REACTIONS BY HUNDREDS

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UNDERSTANDING ENZYMES: THE BIOLOGICAL CATALYSTS

WHAT ARE ENZYMES?

ENZYMES ARE SPECIALIZED PROTEINS THAT ACT AS BIOLOGICAL CATALYSTS, ACCELERATING CHEMICAL REACTIONS WITHIN LIVING ORGANISMS. THEY ARE ESSENTIAL FOR MAINTAINING LIFE PROCESSES, INCLUDING DIGESTION, ENERGY PRODUCTION, DNA REPLICATION, AND CELLULAR SIGNALING. UNLIKE NON-BIOLOGICAL CATALYSTS, ENZYMES ARE HIGHLY SPECIFIC TO THEIR SUBSTRATES—THE MOLECULES UPON WHICH THEY ACT—AND OFTEN OPERATE UNDER MILD CONDITIONS OF TEMPERATURE AND pH.

THE ROLE OF ENZYMES IN BIOLOGICAL SYSTEMS

ENZYMES FACILITATE VITAL BIOCHEMICAL REACTIONS BY LOWERING THE ACTIVATION ENERGY REQUIRED FOR REACTIONS TO PROCEED. THIS ENABLES REACTIONS TO OCCUR MORE RAPIDLY THAN THEY WOULD SPONTANEOUSLY, ALLOWING CELLS TO CARRY OUT COMPLEX FUNCTIONS EFFICIENTLY AND IN A TIMELY MANNER.

KEY FACTS ABOUT ENZYMES

ENZYMES ACCELERATE REACTIONS SIGNIFICANTLY

ONE OF THE MOST REMARKABLE FEATURES OF ENZYMES IS THEIR ABILITY TO SPEED UP CHEMICAL REACTIONS BY FACTORS OF HUNDREDS, THOUSANDS, OR EVEN MILLIONS. THIS ACCELERATION ENSURES THAT METABOLIC PROCESSES OCCUR AT RATES COMPATIBLE WITH LIFE.

ENZYMES ARE HIGHLY SPECIFIC

EACH ENZYME TYPICALLY CATALYZES A SINGLE REACTION OR A SET OF CLOSELY RELATED REACTIONS. THIS SPECIFICITY IS LARGELY DETERMINED BY THE ENZYME'S ACTIVE SITE—A UNIQUE POCKET WHERE SUBSTRATE MOLECULES BIND.

ENZYMES ARE NOT CONSUMED IN REACTIONS

AN IMPORTANT CHARACTERISTIC OF ENZYMES IS THAT THEY REMAIN UNCHANGED AFTER THE REACTION, MEANING THEY CAN BE REUSED MULTIPLE TIMES TO CATALYZE SUBSEQUENT REACTIONS.

FACTORS AFFECTING ENZYME ACTIVITY

ENZYME ACTIVITY CAN BE INFLUENCED BY VARIOUS FACTORS:

- **TEMPERATURE:** OPTIMAL TEMPERATURE ENHANCES ACTIVITY; EXCESSIVE HEAT CAN DENATURE ENZYMES.
- **pH:** EACH ENZYME HAS AN OPTIMAL pH RANGE; DEVIATIONS CAN REDUCE ACTIVITY.
- **SUBSTRATE CONCENTRATION:** INCREASED SUBSTRATE LEVELS GENERALLY INCREASE REACTION RATES UNTIL SATURATION.
- **INHIBITORS:** MOLECULES THAT DECREASE ENZYME ACTIVITY; CAN BE COMPETITIVE OR NON-COMPETITIVE.

COMMON MISCONCEPTIONS ABOUT ENZYMES

ENZYMES ONLY SPEED UP REACTIONS BY A SMALL MARGIN

WHILE SOME MAY UNDERESTIMATE THE POWER OF ENZYMES, THEY CAN ACCELERATE REACTIONS BY HUNDREDS TO MILLIONS OF TIMES FASTER THAN THE UNCATALYZED PROCESS. THIS EXPONENTIAL INCREASE IS CRITICAL FOR SUSTAINING LIFE.

ALL ENZYMES WORK BEST AT BODY TEMPERATURE

MOST ENZYMES HAVE AN OPTIMAL TEMPERATURE CLOSE TO HUMAN BODY TEMPERATURE ($\sim 37^{\circ}\text{C}$). HOWEVER, EXTREMOPHILES—ORGANISMS LIVING IN HARSH ENVIRONMENTS—POSSESS ENZYMES ADAPTED TO FUNCTION AT HIGHER OR LOWER TEMPERATURES.

ENZYMES ARE ALWAYS PROTEINS

WHILE THE MAJORITY OF ENZYMES ARE PROTEINS, SOME RNA MOLECULES CALLED RIBOZYMES CAN ALSO CATALYZE REACTIONS, HIGHLIGHTING THE DIVERSITY OF BIOLOGICAL CATALYSTS.

THE EXCEPTION: ENZYMES DO NOT SPEED REACTIONS INDEFINITELY

UNDERSTANDING THE LIMITATIONS OF ENZYMATIC SPEED

DESPITE THEIR REMARKABLE CATALYTIC ABILITIES, ENZYMES DO NOT ACCELERATE REACTIONS INFINITELY. THERE ARE PHYSICAL AND CHEMICAL LIMITS TO THEIR EFFECTIVENESS.

REACTION RATE PLATEAU

AT HIGH SUBSTRATE CONCENTRATIONS, ENZYMES REACH A MAXIMUM RATE (V_{MAX}), BEYOND WHICH ADDING MORE SUBSTRATE DOES NOT INCREASE THE REACTION SPEED. THIS IS DUE TO ALL ACTIVE SITES BEING OCCUPIED, LEADING TO ENZYME SATURATION.

ENZYMES CANNOT ALTER REACTION EQUILIBRIUM

ENZYMES ACCELERATE BOTH THE FORWARD AND REVERSE REACTIONS EQUALLY; THEY DO NOT CHANGE THE POSITION OF EQUILIBRIUM. THEREFORE, THEY DO NOT AFFECT THE OVERALL THERMODYNAMIC FAVORABILITY OF A REACTION.

ENZYMES REQUIRE PROPER CONDITIONS

ENZYMATIC ACTIVITY IS DEPENDENT ON MAINTAINING SUITABLE ENVIRONMENTAL CONDITIONS. DEVIATIONS IN TEMPERATURE, pH, OR THE PRESENCE OF INHIBITORS CAN SIGNIFICANTLY IMPAIR ENZYME FUNCTION, LIMITING THEIR ABILITY TO SPEED REACTIONS FURTHER.

SUMMARY: CLARIFYING THE MYTH OF INFINITE ACCELERATION

ENZYMES ARE POWERFUL BUT NOT LIMITLESS

WHILE ENZYMES ARE INCREDIBLY EFFICIENT AND CAN SPEED UP REACTIONS BY HUNDREDS OR THOUSANDS OF TIMES, THEY DO NOT DO SO INFINITELY. THEIR CATALYTIC POTENTIAL IS BOUNDED BY PHYSICAL CONSTRAINTS, REACTION THERMODYNAMICS, AND ENVIRONMENTAL FACTORS.

IMPLICATIONS FOR BIOLOGICAL AND INDUSTRIAL PROCESSES

UNDERSTANDING THE TRUE CAPABILITIES AND LIMITATIONS OF ENZYMES IS VITAL IN FIELDS SUCH AS MEDICINE, BIOTECHNOLOGY, AND ENVIRONMENTAL SCIENCE. FOR INSTANCE:

1. DESIGNING ENZYME INHIBITORS FOR DRUGS
2. ENGINEERING ENZYMES FOR INDUSTRIAL CATALYSIS
3. OPTIMIZING CONDITIONS FOR ENZYMATIC REACTIONS IN MANUFACTURING

CONCLUSION

ENZYMES ARE FUNDAMENTAL BIOLOGICAL MOLECULES THAT DRAMATICALLY INCREASE REACTION RATES, MAKING LIFE POSSIBLE. HOWEVER, THE STATEMENT THAT THEY CAN SPEED CHEMICAL REACTIONS BY HUNDREDS IS AN UNDERSTATEMENT, AS THEY CAN ACCELERATE MANY REACTIONS BY FACTORS OF THOUSANDS, MILLIONS, OR MORE. NEVERTHELESS, ENZYMES ARE NOT LIMITLESS CATALYSTS; THEIR ACTIVITY IS CONSTRAINED BY PHYSICAL AND CHEMICAL PRINCIPLES. RECOGNIZING THESE LIMITS IS CRUCIAL IN LEVERAGING ENZYMES EFFECTIVELY ACROSS VARIOUS SCIENTIFIC AND INDUSTRIAL APPLICATIONS.

FREQUENTLY ASKED QUESTIONS

WHAT IS THE PRIMARY FUNCTION OF ENZYMES IN BIOLOGICAL SYSTEMS?

ENZYMES ACT AS BIOLOGICAL CATALYSTS THAT SPEED UP CHEMICAL REACTIONS IN CELLS.

CAN ENZYMES INCREASE THE RATE OF CHEMICAL REACTIONS BY HUNDREDS OR MORE?

YES, ENZYMES CAN SIGNIFICANTLY ACCELERATE REACTION RATES, OFTEN BY HUNDREDS OR THOUSANDS OF TIMES.

ARE ENZYMES SPECIFIC TO THE REACTIONS THEY CATALYZE?

YES, ENZYMES ARE HIGHLY SPECIFIC TO THEIR SUBSTRATES AND THE REACTIONS THEY FACILITATE.

DO ENZYMES GET CONSUMED OR USED UP DURING THE CHEMICAL REACTIONS THEY CATALYZE?

No, ENZYMES ARE NOT CONSUMED IN REACTIONS AND CAN BE USED REPEATEDLY.

IS IT TRUE THAT ENZYMES ONLY FUNCTION WITHIN A NARROW TEMPERATURE RANGE?

Yes, ENZYMES TYPICALLY OPERATE OPTIMALLY WITHIN SPECIFIC TEMPERATURE RANGES AND CAN DENATURE OUTSIDE THOSE CONDITIONS.

ARE ENZYMES AFFECTED BY CHANGES IN pH LEVELS?

Yes, pH LEVELS CAN AFFECT ENZYME ACTIVITY, WITH EACH ENZYME HAVING AN OPTIMAL pH.

DO ENZYMES ALTER THE EQUILIBRIUM POINT OF A CHEMICAL REACTION?

No, ENZYMES DO NOT CHANGE THE EQUILIBRIUM; THEY ONLY HELP THE REACTION REACH EQUILIBRIUM FASTER.

CAN ENZYMES WORK ON ANY CHEMICAL REACTION REGARDLESS OF THE SUBSTRATE?

No, ENZYMES ONLY CATALYZE SPECIFIC REACTIONS WITH SPECIFIC SUBSTRATES.

ARE ENZYMES CAPABLE OF SPEEDING CHEMICAL REACTIONS BY HUNDREDS OR MORE?

Yes, ENZYMES CAN ACCELERATE REACTIONS BY HUNDREDS TO THOUSANDS OF TIMES, MAKING BIOLOGICAL PROCESSES EFFICIENT.

IS IT TRUE THAT ALL ENZYMES WORK UNDER THE SAME CONDITIONS OF TEMPERATURE AND pH?

No, DIFFERENT ENZYMES HAVE DIFFERENT OPTIMAL CONDITIONS FOR ACTIVITY.

ADDITIONAL RESOURCES

ALL OF THE FOLLOWING ARE TRUE FACTS ABOUT ENZYMES EXCEPT A. ENZYMES CAN SPEED CHEMICAL REACTIONS BY HUNDREDS

ENZYMES ARE BIOLOGICAL CATALYSTS THAT PLAY AN INDISPENSABLE ROLE IN FACILITATING, REGULATING, AND ACCELERATING CHEMICAL REACTIONS WITHIN LIVING ORGANISMS. THEIR SIGNIFICANCE SPANS ACROSS DIVERSE BIOLOGICAL PROCESSES, FROM DIGESTION AND METABOLISM TO DNA REPLICATION AND CELLULAR SIGNALING. AS SUCH, UNDERSTANDING THE FUNDAMENTAL TRUTHS AND MISCONCEPTIONS ABOUT ENZYMES IS CRITICAL FOR ADVANCING FIELDS LIKE BIOCHEMISTRY, MEDICINE, BIOTECHNOLOGY, AND PHARMACOLOGY. IN THIS REVIEW, WE ANALYZE THE CORE FACTS ABOUT ENZYMES, EMPHASIZING THEIR CATALYTIC EFFICIENCY, MECHANISMS OF ACTION, AND SPECIFICITY, WHILE ALSO ADDRESSING COMMON MISCONCEPTIONS—HIGHLIGHTING WHAT IS NOT TRUE ABOUT THESE REMARKABLE BIOMOLECULES.

UNDERSTANDING ENZYMES: THE BIOLOGICAL CATALYSTS

ENZYMES ARE SPECIALIZED PROTEINS (THOUGH SOME RNA MOLECULES, CALLED RIBOZYMES, CAN ACT AS ENZYMES) THAT ACCELERATE CHEMICAL REACTIONS WITHOUT BEING CONSUMED IN THE PROCESS. THEIR PRIMARY FUNCTION IS TO LOWER THE ACTIVATION ENERGY (E_a) REQUIRED FOR A REACTION TO PROCEED, THEREBY INCREASING THE REACTION RATE DRAMATICALLY.

THE ROLE OF ACTIVATION ENERGY

EVERY CHEMICAL REACTION INVOLVES AN ENERGY BARRIER—THE ACTIVATION ENERGY—THAT MUST BE OVERCOME FOR REACTANTS TO TRANSFORM INTO PRODUCTS. ENZYMES WORK BY STABILIZING THE TRANSITION STATE, WHICH IS THE HIGHEST ENERGY CONFIGURATION DURING A REACTION. BY STABILIZING THIS STATE, ENZYMES SIGNIFICANTLY LOWER E_a , LEADING TO FASTER REACTION RATES.

COMMON FACTS ABOUT ENZYMES

MANY FACTS ABOUT ENZYMES ARE WELL-ESTABLISHED THROUGH DECADES OF BIOCHEMICAL RESEARCH:

- ENZYMES CAN SPEED CHEMICAL REACTIONS BY HUNDREDS OR THOUSANDS OF TIMES: ENZYMES CAN ACCELERATE REACTIONS BY FACTORS RANGING FROM 10^6 TO 10^{17} , DEPENDING ON THE SPECIFIC REACTION AND CONDITIONS.
- ENZYMES ARE HIGHLY SPECIFIC: THEY OFTEN RECOGNIZE PARTICULAR SUBSTRATES THROUGH PRECISE ACTIVE SITE INTERACTIONS, LEADING TO HIGH SUBSTRATE SPECIFICITY.
- ENZYMES ARE NOT CONSUMED IN REACTIONS: THEY FUNCTION CATALYTICALLY, MEANING THEY CAN CATALYZE MANY REACTION CYCLES WITHOUT BEING ALTERED PERMANENTLY.
- ENZYMES HAVE OPTIMAL CONDITIONS: EACH ENZYME EXHIBITS MAXIMAL ACTIVITY WITHIN SPECIFIC pH RANGES, TEMPERATURES, AND IONIC STRENGTHS.
- ENZYME ACTIVITY CAN BE INHIBITED OR ACTIVATED: VARIOUS MOLECULES CAN REGULATE ENZYME ACTIVITY THROUGH INHIBITORS, ACTIVATORS, OR ALLOSTERIC MODULATION.

ENZYMES' EFFECTIVENESS: SPEEDING REACTIONS BY HUNDREDS OR MORE

ONE OF THE MOST COMPELLING FACTS ABOUT ENZYMES IS THEIR ABILITY TO DRAMATICALLY INCREASE REACTION RATES. FOR EXAMPLE:

- DIGESTIVE ENZYMES, SUCH AS AMYLASE, CAN BREAK DOWN STARCH INTO SUGARS WITHIN SECONDS TO MINUTES, A PROCESS THAT WOULD OTHERWISE TAKE HOURS OR DAYS WITHOUT CATALYSIS.
- DNA POLYMERASES FACILITATE DNA REPLICATION AT RATES MILLIONS OF TIMES FASTER THAN THE UNCATALYZED REACTIONS.
- CATALASE, AN ENZYME THAT BREAKS DOWN HYDROGEN PEROXIDE, CAN PROCESS MILLIONS OF MOLECULES PER SECOND, PROTECTING CELLS FROM OXIDATIVE DAMAGE.

THIS EXTRAORDINARY CATALYTIC EFFICIENCY ARISES FROM THE ENZYME'S ABILITY TO STABILIZE THE TRANSITION STATE AND ORIENT SUBSTRATES PRECISELY, REDUCING THE ENERGY BARRIER FOR THE REACTION.

ADDRESSING THE STATEMENT: "ENZYMES CAN SPEED CHEMICAL REACTIONS BY HUNDREDS"

WHILE IT IS TRUE THAT ENZYMES CAN SIGNIFICANTLY ACCELERATE REACTIONS, THE PHRASE “BY HUNDREDS” IS AN UNDERSTATEMENT IN MANY CASES. ENZYMES CAN, IN FACT, INCREASE REACTION RATES BY FACTORS OF MILLIONS OR EVEN BILLIONS. FOR SOME REACTIONS, THE UNCATALYZED RATE IS SO SLOW THAT THEY ARE EFFECTIVELY NEGLIGIBLE, AND ENZYMATIC CATALYSIS TURNS THEM INTO RAPID, LIFE-SUSTAINING PROCESSES.

THE MATHEMATICS OF CATALYSIS

- REACTION RATE ENHANCEMENT: ENZYMES OFTEN INCREASE THE RATE OF REACTIONS BY AT LEAST 10^6 -FOLD. FOR EXAMPLE, THE ENZYME UREASE CATALYZES THE HYDROLYSIS OF UREA WITH RATE ENHANCEMENTS OF APPROXIMATELY 10^{14} .

- IMPLICATION: THE STATEMENT THAT ENZYMES ACCELERATE REACTIONS “BY HUNDREDS” GROSSLY UNDERESTIMATES THEIR CATALYTIC PROWESS. IN FACT, THE ENHANCEMENT IS OFTEN ORDERS OF MAGNITUDE GREATER THAN A MERE 100-FOLD.

WHY THE MISCONCEPTION PERSISTS

THE PHRASE “BY HUNDREDS” MIGHT STEM FROM A MISUNDERSTANDING OR OVERSIMPLIFICATION, PERHAPS REFERENCING SPECIFIC ENZYME REACTIONS THAT ARE ONLY MODESTLY ACCELERATED, OR FROM A GENERALIZATION THAT DOES NOT ACCOUNT FOR THE FULL SPECTRUM OF ENZYMATIC CATALYSIS.

COMMON MISCONCEPTIONS ABOUT ENZYMES

DESPITE THEIR WELL-UNDERSTOOD MECHANISMS, SEVERAL MISCONCEPTIONS PERSIST:

1. ENZYMES LOWER THE ACTIVATION ENERGY TO ZERO

FALSE. ENZYMES DO NOT ELIMINATE THE ACTIVATION ENERGY ALTOGETHER; THEY ONLY REDUCE IT TO A LEVEL THAT ALLOWS THE REACTION TO PROCEED RAPIDLY AT PHYSIOLOGICAL TEMPERATURES. THE TRANSITION STATE STILL EXISTS, AND A CERTAIN MINIMAL ENERGY BARRIER REMAINS.

2. ENZYMES CHANGE THE EQUILIBRIUM OF A REACTION

FALSE. ENZYMES ONLY INFLUENCE THE RATE AT WHICH EQUILIBRIUM IS REACHED, NOT THE POSITION OF EQUILIBRIUM ITSELF. THEY DO NOT ALTER THE THERMODYNAMIC FAVORABILITY OF REACTANTS OR PRODUCTS.

3. ENZYMES ARE SPECIFIC TO A SINGLE REACTION

PARTIALLY TRUE, BUT NOT ALWAYS. MOST ENZYMES ARE HIGHLY SPECIFIC, BUT SOME EXHIBIT PROMISCUITY, CATALYZING MULTIPLE SIMILAR REACTIONS.

4. ENZYMES ARE ALWAYS PROTEINACEOUS

FALSE. WHILE MOST ENZYMES ARE PROTEINS, SOME RNA MOLECULES (RIBOZYMES) CAN CATALYZE SPECIFIC REACTIONS, SUCH AS SELF-SPLICING INTRONS OR THE RIBOSOME'S PEPTIDYL TRANSFERASE ACTIVITY.

MECHANISMS OF ENZYME CATALYSIS

UNDERSTANDING HOW ENZYMES ACHIEVE THEIR INCREDIBLE CATALYTIC EFFICIENCIES INVOLVES EXAMINING THEIR MECHANISMS:

1. PROXIMITY AND ORIENTATION EFFECTS

ENZYMES BRING SUBSTRATES CLOSE TOGETHER IN THE CORRECT ORIENTATION, INCREASING THE LIKELIHOOD OF REACTION.

2. TRANSITION STATE STABILIZATION

ENZYMES BIND TO THE TRANSITION STATE MORE TIGHTLY THAN TO SUBSTRATES OR PRODUCTS, THEREBY LOWERING THE ACTIVATION ENERGY.

3. INDUCED FIT MODEL

ENZYMES OFTEN UNDERGO CONFORMATIONAL CHANGES UPON SUBSTRATE BINDING, OPTIMIZING THE ACTIVE SITE FOR CATALYSIS.

4. MICROENVIRONMENT EFFECTS

ENZYMES CAN ALTER THE LOCAL pH, POLARITY, OR CHARGE DISTRIBUTION WITHIN THE ACTIVE SITE TO FAVOR THE REACTION.

IMPLICATIONS FOR BIOTECHNOLOGY AND MEDICINE

THE ABILITY OF ENZYMES TO ACCELERATE REACTIONS BY ENORMOUS FACTORS HAS BEEN HARNESSSED FOR NUMEROUS APPLICATIONS:

- INDUSTRIAL PROCESSES: ENZYMES ARE USED IN DETERGENTS, FOOD PROCESSING, AND BIOFUEL PRODUCTION.
- MEDICAL DIAGNOSTICS: ENZYMES FORM THE BASIS OF NUMEROUS DIAGNOSTIC ASSAYS.
- THERAPEUTIC DEVELOPMENT: ENZYME INHIBITORS ARE USED AS DRUGS TO TREAT DISEASES LIKE HYPERTENSION (ACE INHIBITORS) OR HIV (PROTEASE INHIBITORS).
- GENE EDITING: ENZYMES LIKE CRISPR-ASSOCIATED NUCLEASES ENABLE PRECISE GENETIC MODIFICATIONS.

CONCLUSION: CLARIFYING THE MISCONCEPTION

THE STATEMENT "ALL OF THE FOLLOWING ARE TRUE FACTS ABOUT ENZYMES EXCEPT A. ENZYMES CAN SPEED CHEMICAL REACTIONS BY HUNDREDS" REFLECTS A COMMON MISCONCEPTION ABOUT ENZYMATIC CATALYSIS. IN REALITY, ENZYMES ARE EXTRAORDINARILY EFFICIENT CATALYSTS CAPABLE OF INCREASING REACTION RATES BY FACTORS OF MILLIONS OR MORE, NOT JUST HUNDREDS. THEIR ABILITY TO STABILIZE TRANSITION STATES, BRING SUBSTRATES INTO PROXIMITY, AND INDUCE CONFORMATIONAL CHANGES UNDERPINS THEIR UNPARALLELED CATALYTIC POWER.

UNDERSTANDING THE TRUE MAGNITUDE OF ENZYME CATALYSIS IS ESSENTIAL FOR APPRECIATING THEIR BIOLOGICAL IMPORTANCE AND LEVERAGING THEIR CAPABILITIES IN TECHNOLOGY AND MEDICINE. WHILE THE PHRASE "BY HUNDREDS" MIGHT SERVE AS AN OVERSIMPLIFICATION IN SOME CONTEXTS, IT GROSSLY UNDERREPRESENTS THE REMARKABLE EFFICIENCY OF ENZYMES THAT SUSTAINS LIFE'S COMPLEX BIOCHEMICAL WEB.

IN SUMMARY:

- ENZYMES ARE POWERFUL BIOLOGICAL CATALYSTS.
- THEY CAN ACCELERATE REACTIONS BY HUNDREDS OF THOUSANDS TO TRILLIONS OF TIMES.
- THE MISCONCEPTION THAT THEY ONLY SPEED REACTIONS "BY HUNDREDS" UNDERVALUES THEIR TRUE CATALYTIC POTENTIAL.
- RECOGNIZING THE ACTUAL EFFICIENCY OF ENZYMES IS CRUCIAL FOR SCIENTIFIC ACCURACY AND APPLICATION.

THEREFORE, THE EXCEPTION TO THE TRUE FACTS ABOUT ENZYMES IS THAT THEY ONLY SPEED REACTIONS BY HUNDREDS, WHEN IN FACT, THEY OFTEN DO SO BY MANY ORDERS OF MAGNITUDE MORE.

All Of The Following Are True Facts About Enzymes Excepta Enzymes Can Speed Chemical Reactions By Hundreds

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