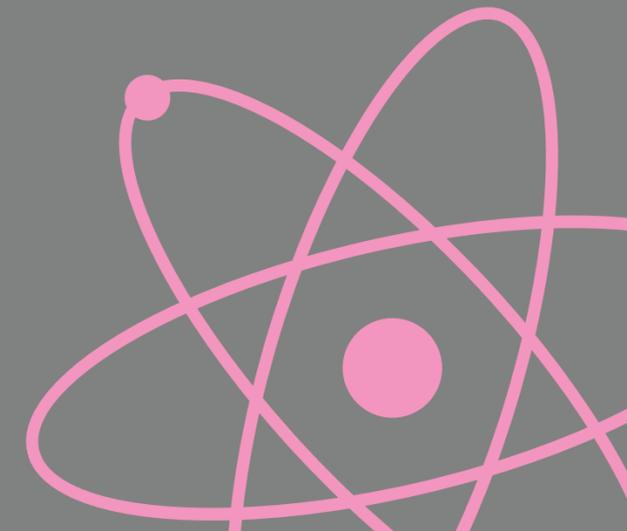
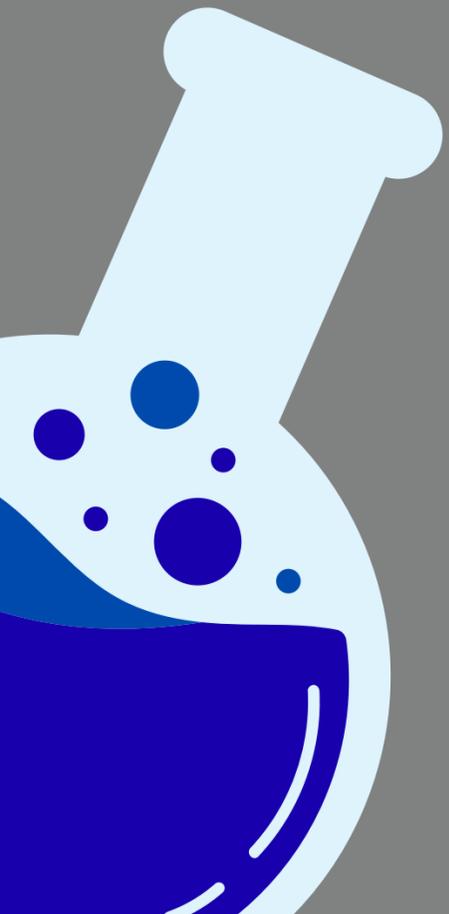
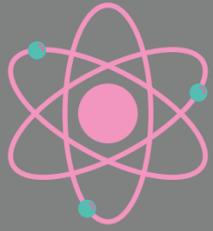


ENZYMES DEFINITION TERMINOLOGY AND CLASSIFICATION SECOND STAGE

DR.RASHAD AL - TUUAMAH
MEDICAL BIOCHEMISTRY

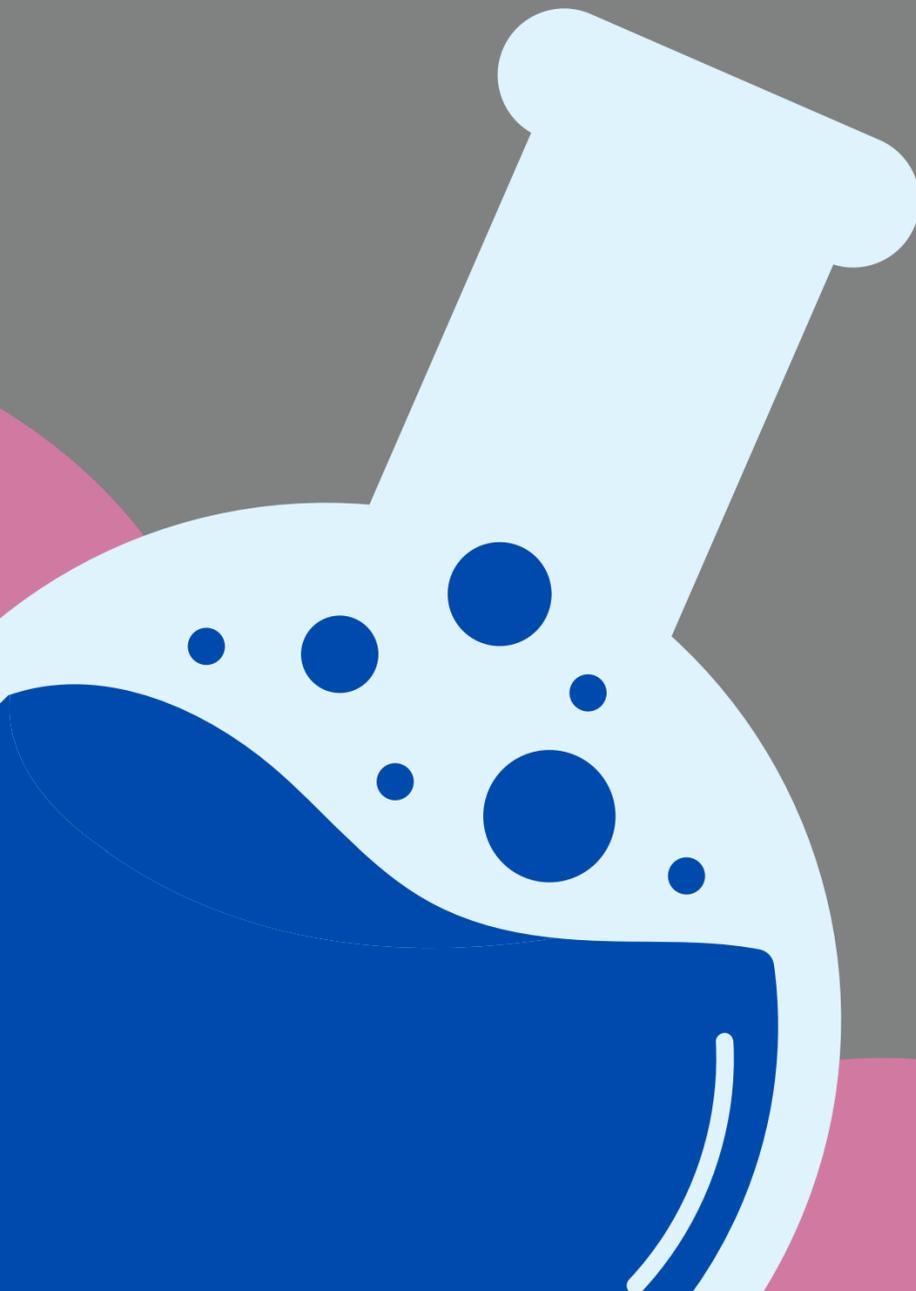


ENZYMES: DEFINITION



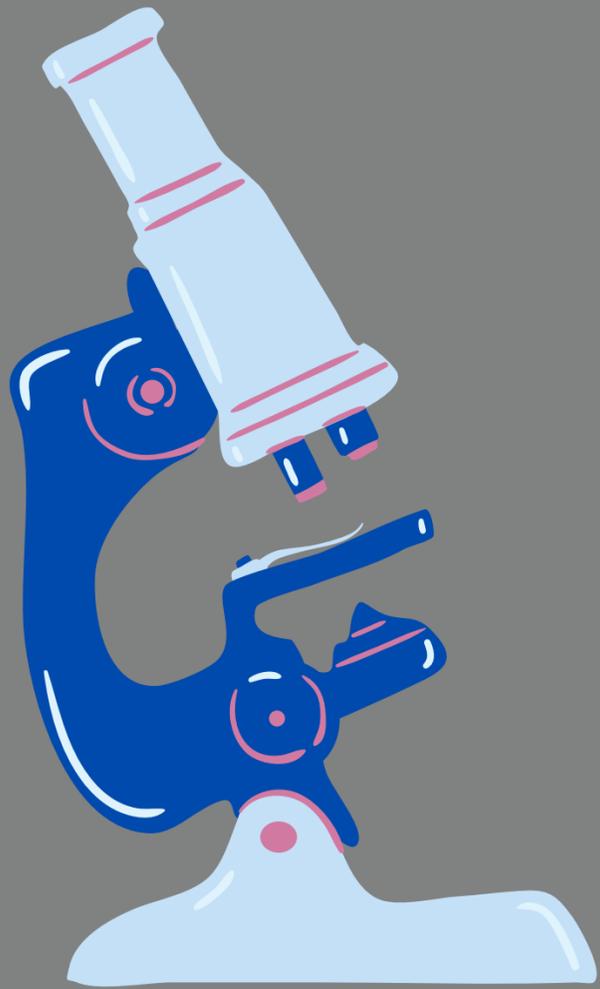
ENZYMES, AS PROTEIN CATALYSTS, FACILITATE METABOLIC REACTIONS WITHIN CELLS BY INCREASING REACTION RATES WITHOUT UNDERGOING PERMANENT CHANGE

THEY SELECTIVELY DIRECT SUBSTRATES INTO BENEFICIAL PATHWAYS, THEREBY ORCHESTRATING VARIOUS BIOLOGICAL PROCESSES.

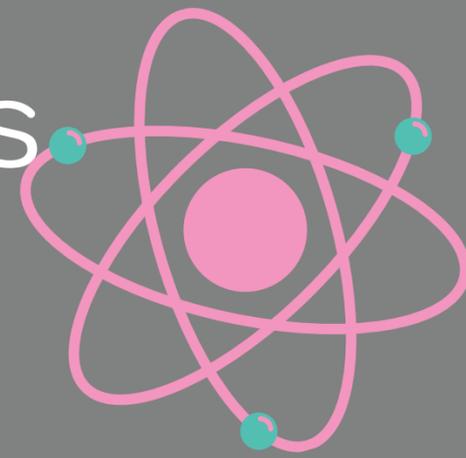




ENZYMES: TERMINOLOGY
NOMENCLATURE
NOMENCLATURE EACH ENZYME IS
DESIGNATED A SHORT,
RECOMMENDED NAME FOR
EVERYDAY REFERENCE,
ALONGSIDE A MORE
COMPREHENSIVE SYSTEMATIC
NAME THAT ENSURES PRECISE
IDENTIFICATION WITHOUT
AMBIGUITY.

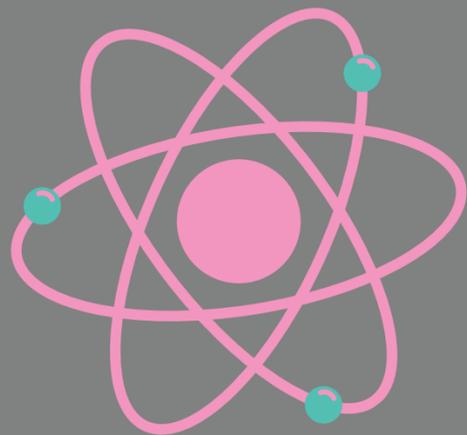


A. RECOMMENDED NAME MOST ENZYME NAMES
TYPICALLY END WITH THE SUFFIX "-ASE"
REFLECTING THE SUBSTRATE THEY ACT UPON
SUCH AS GLUCOSIDASE AND UREASE



SOME NAMES DESCRIBE THE ENZYME'S
FUNCTION LIKES LACTATE DEHYDROGENASE
AND ADENYLYL

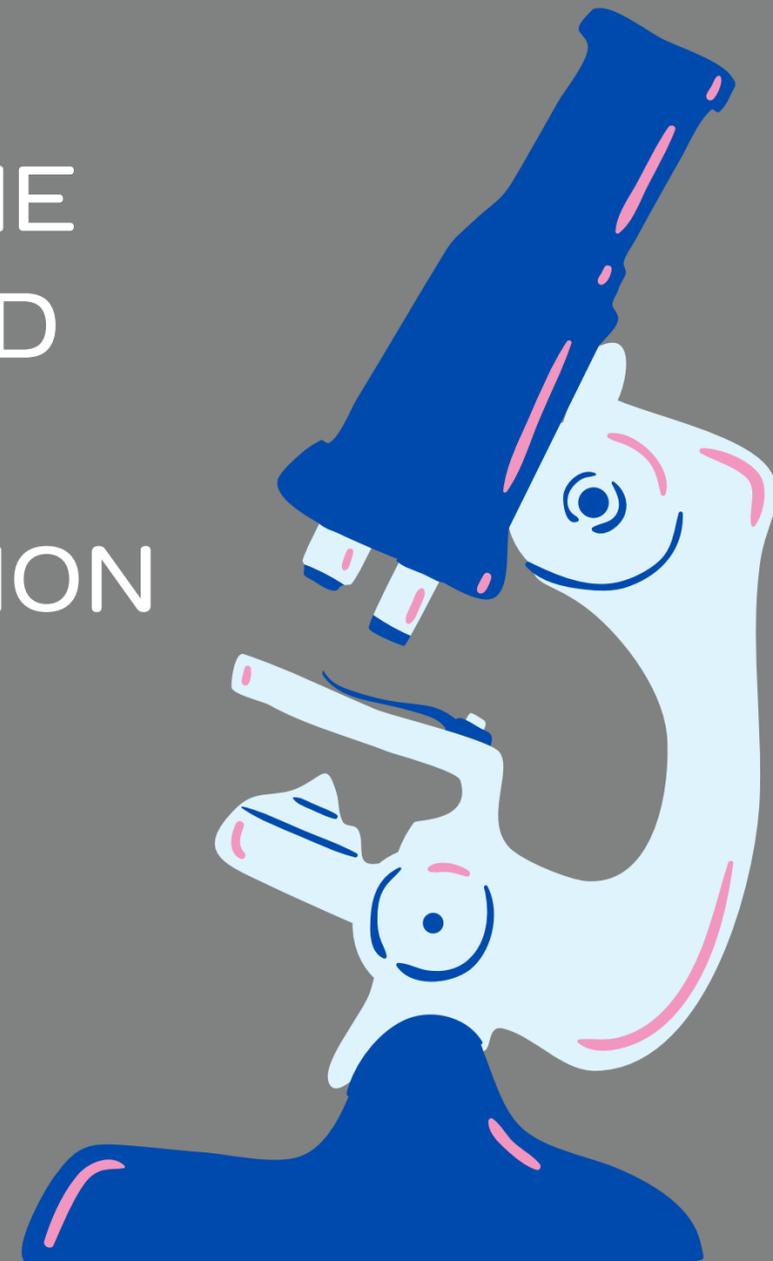
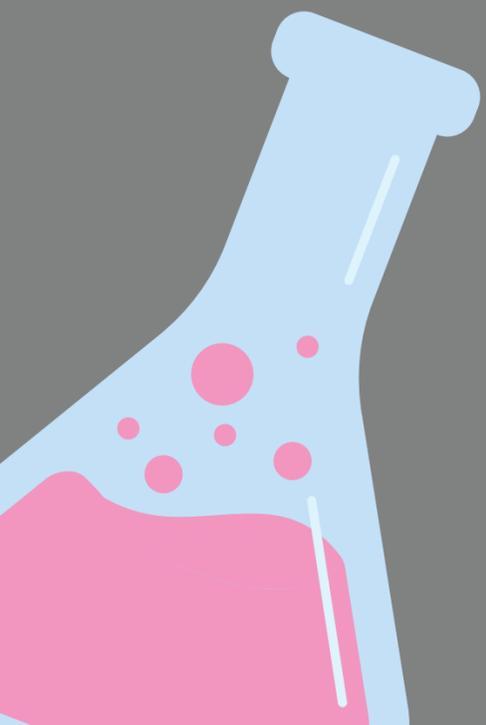
CYCLASE, WHILE OTHERS RETAIN THEIR TRIVIAL
NAMES SUCH AS TRYPSIN AND PEPSIN WHICH
DO NOT INDICATE THEIR SPECIFIC REACTIONS.



B. SYSTEMATIC NAME IN THE SYSTEMATIC NAMING SYSTEM ENZYMES ARE CATEGORIZED INTO SIX MAJOR CLASSES EACH

CONTAINING VARIOUS SUBGROUPS. THE SUFFIX "-ASE" IS ADDED TO A DETAILED

DESCRIPTION OF THE CHEMICAL REACTION ENCOMPASSING THE NAMES OF ALL SUBSTRATES INVOLVED.



CONFUSING ENZYME NOMENCLATURE

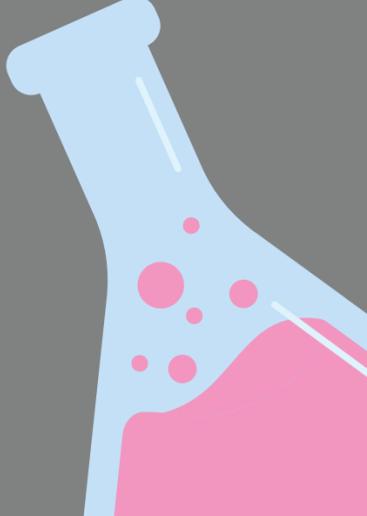
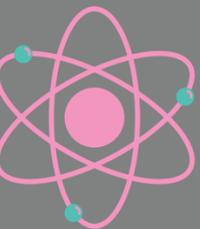
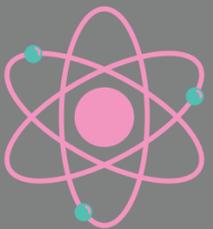
ENZYME NOMENCLATURE CAN BE MISLEADING AS SIMILAR NAMES MAY REPRESENT DIFFERENT FUNCTIONS OR MECHANISMS FOR INSTANCE SYNTHETASES REQUIRE ATP WHILE SYNTHASES

DO NOT PHOSPHATASES USE

WATER TO REMOVE PHOSPHATE GROUPS WHEREAS PHOSPHORYLASES UTILIZE INORGANIC PHOSPHATE TO GENERATE

PHOSPHORYLATED PRODUCTS

DEHYDROGENASES ACCEPT ELECTRONS IN REDOX REACTIONS WHILE OXIDASES USE OXYGEN AS AN ACCEPTOR WITHOUT INCORPORATING IT INTO THE SUBSTRATE, UNLIKE OXYGENASES WHICH DO INCORPORATE OXYGEN ATOMS INTO THEIR SUBSTRATES.



ENZYMES: TERMINOLOGY: PROPERTIES

ENZYMES ARE EFFICIENT AND SPECIFIC PROTEIN CATALYSTS THAT BIND TO SUBSTRATES AT THEIR ACTIVE SITES, FACILITATING THE CONVERSION TO PRODUCTS THEY SIGNIFICANTLY ACCELERATE BIOCHEMICAL

REACTIONS MAKING THEM CRUCIAL FOR PHYSIOLOGICAL PROCESSES IN THE HUMAN BODY IMPORTANTLY, ENZYMES ARE NOT CONSUMED DURING THESE REACTIONS ADDITIONALLY SOME RIBONUCLEIC ACIDS, KNOWN AS

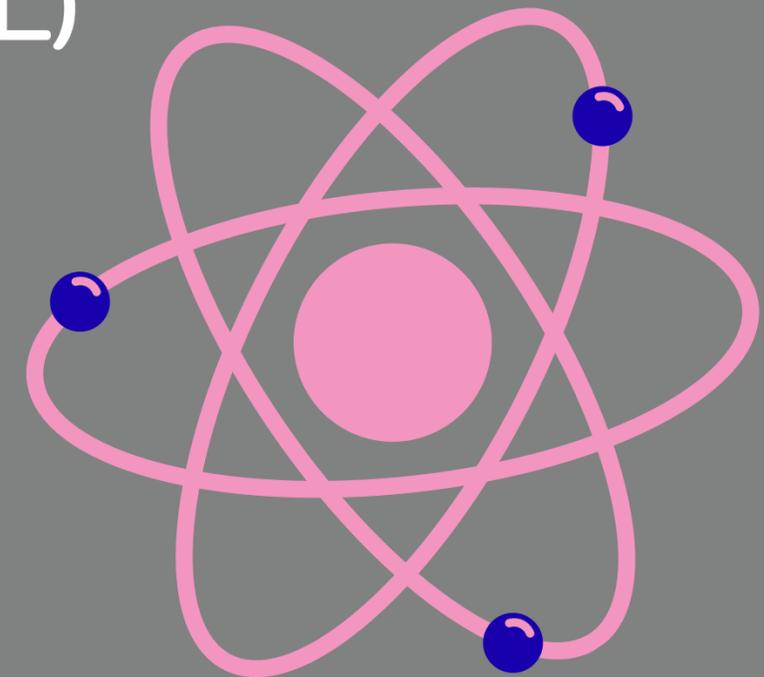
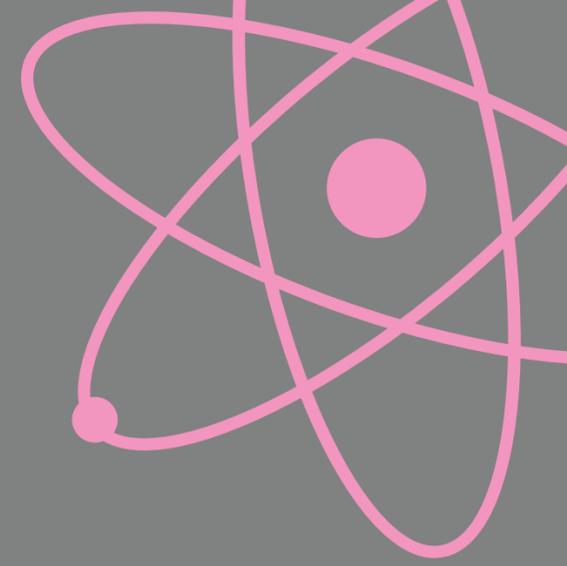
RIBOZYMES, CAN ALSO CATALYZE REACTIONS THOUGH THEY ARE MUCH LESS COMMON THAN PROTEIN CATALYSTS.

ACTIVE SITE

ENZYME MOLECULES FEATURE AN ACTIVE SITE, A SPECIALIZED POCKET FORMED BY PROTEIN FOLDING WHICH CONTAINS AMINO ACID RESIDUES CRUCIAL

FOR SUBSTRATE BINDING AND CATALYSIS THE SUBSTRATE BINDS TO THE ENZYME FORMING AN ENZYME-SUBSTRATE (ES) COMPLEX WHICH INDUCES A CONFORMATIONAL CHANGE (INDUCED FIT MODEL)

THAT FACILITATES THE RAPID CONVERSION TO AN ENZYME-PRODUCT (EP) COMPLEX ULTIMATELY DISSOCIATING INTO FREE ENZYME AND PRODUCT.

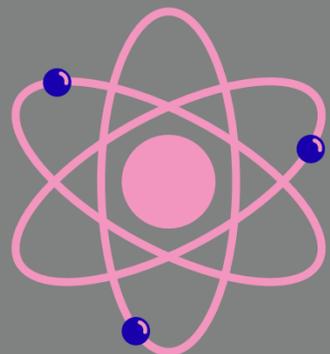
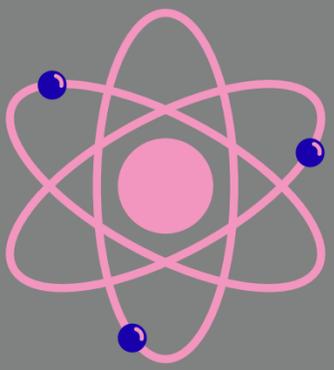


EFFICIENCY

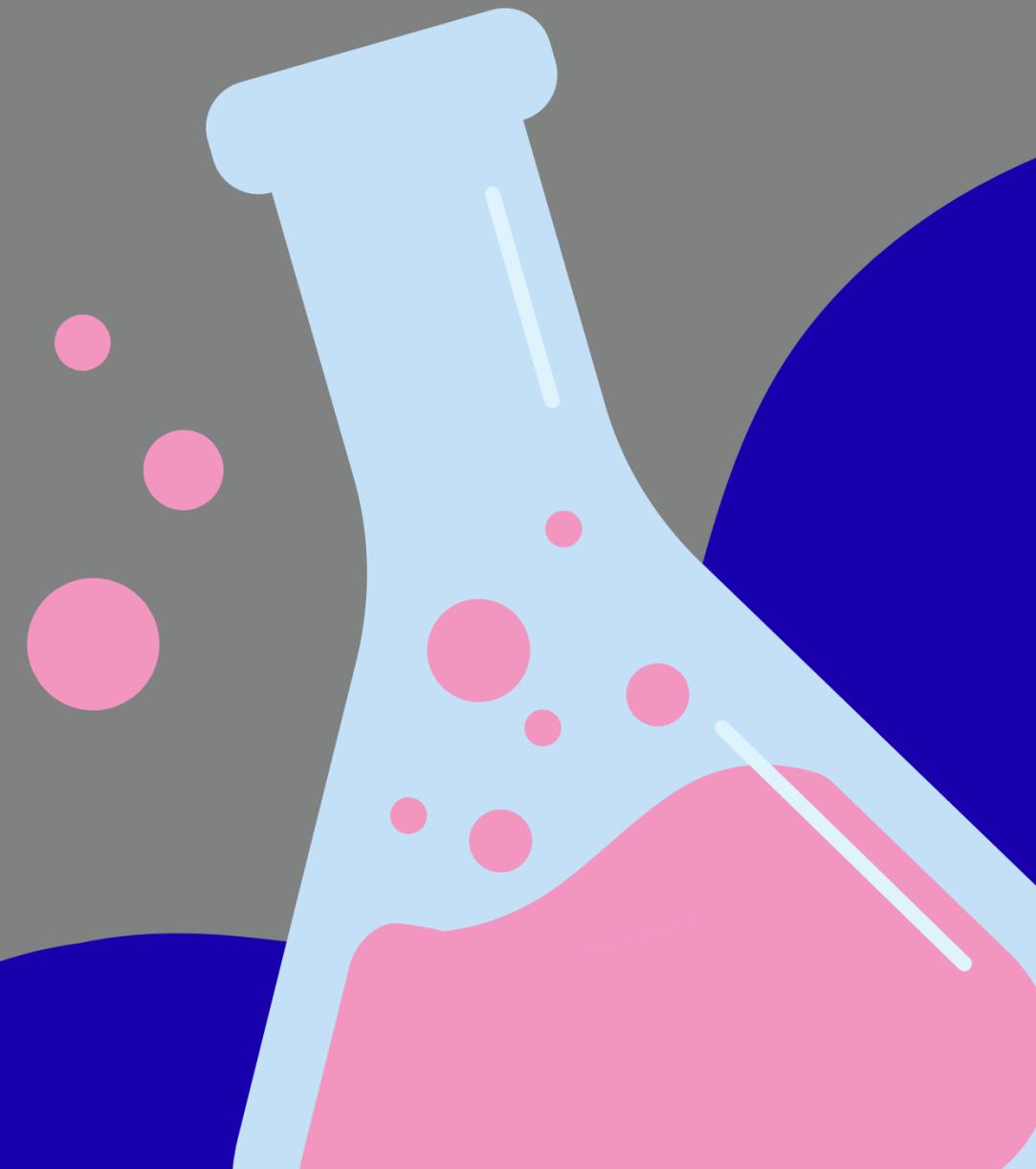
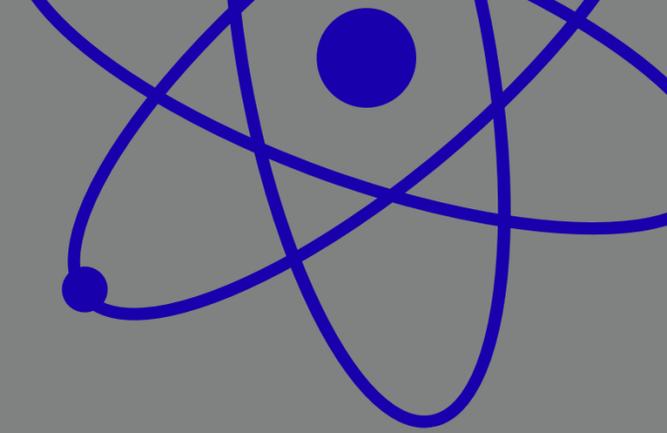
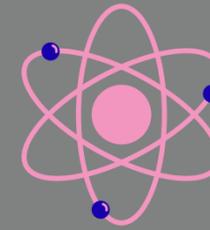
ENZYME-CATALYZED REACTIONS ARE
REMARKABLY EFFICIENT OCCURRING 10^3
TO 10^8 TIMES FASTER THAN
UNCATALYZED REACTIONS

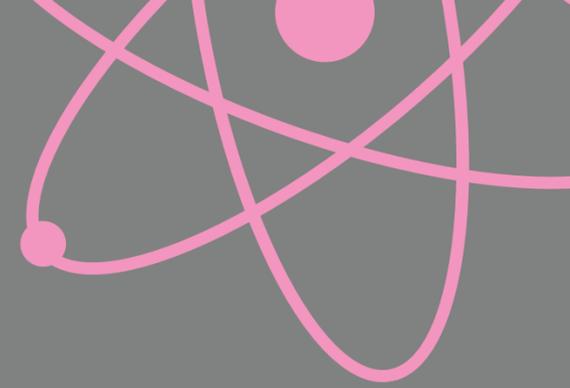
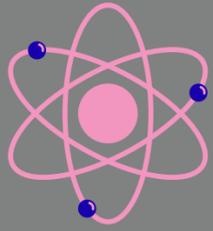
THE TURNOVER NUMBER OR k_{cat}
REPRESENTS THE NUMBER OF
SUBSTRATE MOLECULES CONVERTED TO

PRODUCT PER ENZYME MOLECULE PER
SECOND TYPICALLY RANGING FROM 10^2
TO 10^4 s^{-1} .



SPECIFICITY
ENZYMES ARE HIGHLY SPECIFIC
AND ARE CAPABLE OF
INTERACTING WITH ONE
OR A VERY FEW SUBSTRATES AND
CAN CATALYZE ONLY ONE TYPE
OF CHEMICAL REACTION
THE SET OF ENZYMES
SYNTHESIZED WITHIN A CELL
DETERMINES WHICH REACTIONS
OCCUR IN THAT CELL.





HOLOENZYMES APOENZYMES COFACTORS AND COENZYMES:

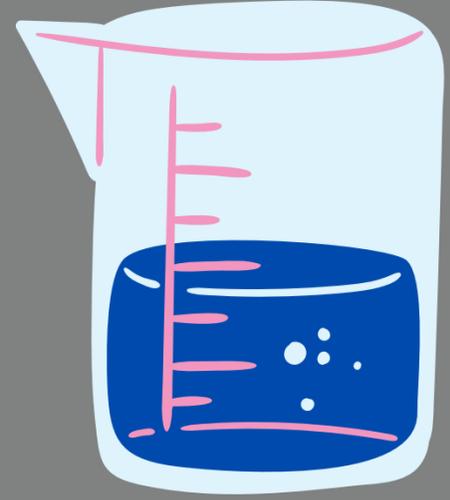
SOME ENZYMES REQUIRE NONPROTEIN COMPONENTS FOR ACTIVITY THE COMPLETE ENZYME WITH THESE

COMPONENTS IS CALLED A HOLOENZYME, WHILE THE INACTIVE ENZYME WITHOUT THEM IS KNOWN AS AN APOENZYME

NONPROTEIN COMPONENTS CAN BE METAL IONS, TERMED COFACTORS, OR SMALL ORGANIC MOLECULES, CALLED COENZYMES.

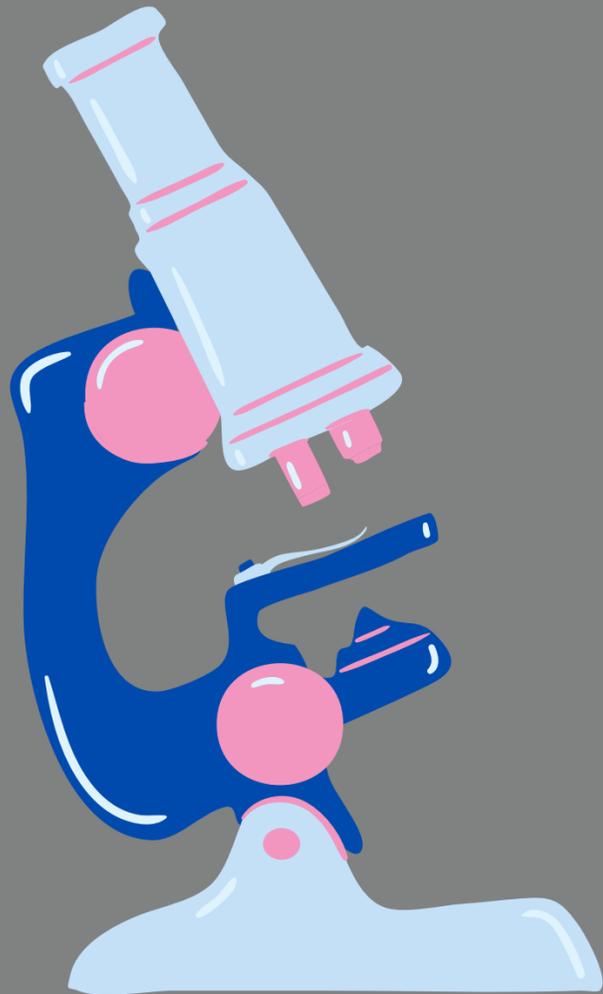


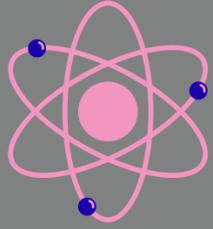
**COENZYMES TRANSIENTLY:
ASSOCIATE WITH THE ENZYME
WHILE PROSTHETIC GROUPS**



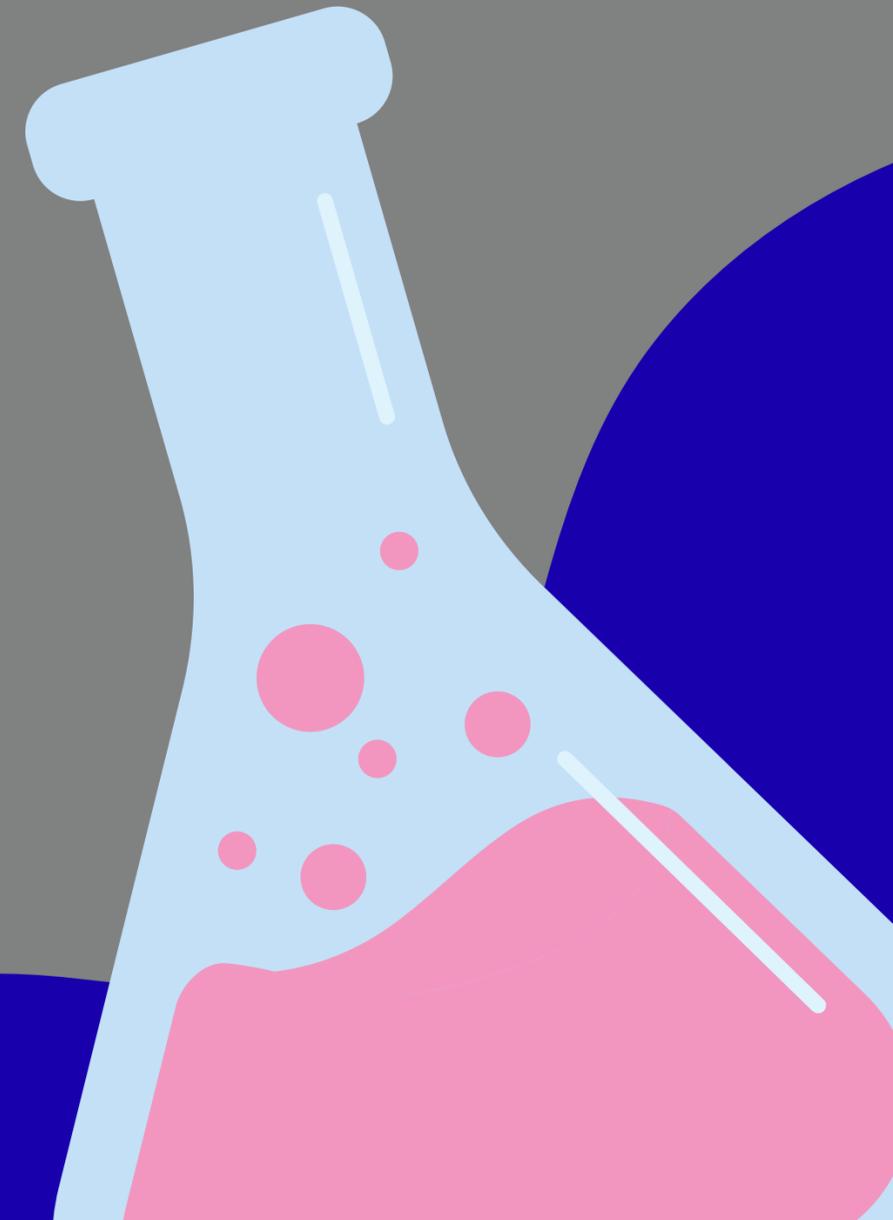
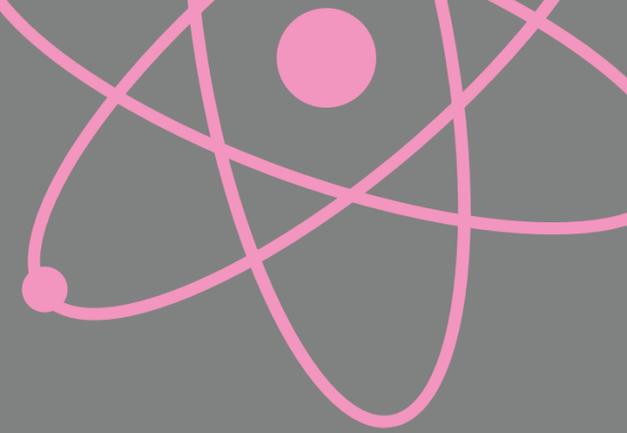
**WHICH ARE PERMANENTLY
ATTACHED AND RETURN TO THEIR
ORIGINAL FORM ARE ALSO A TYPE**

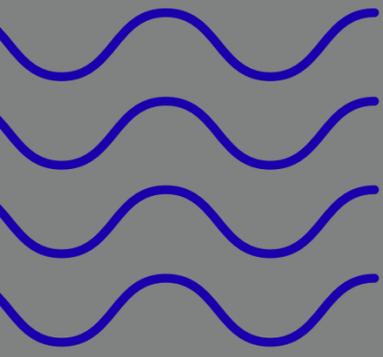
**OF COENZYME. COMMONLY
COENZYMES ARE DERIVED FROM
VITAMINS SUCH AS NAD⁺ FROM
NIACIN AND FAD FROM
RIBOFLAVIN.**





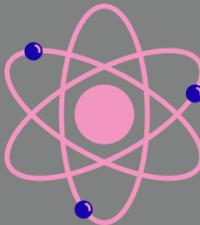
REGULATION
ENZYME ACTIVITY CAN
OFTEN BE INCREASED
OR DECREASED, SO
THAT THE RATE OF
PRODUCT FORMATION
RESPONDS TO THE
PRESENT CELLULAR
NEEDS.



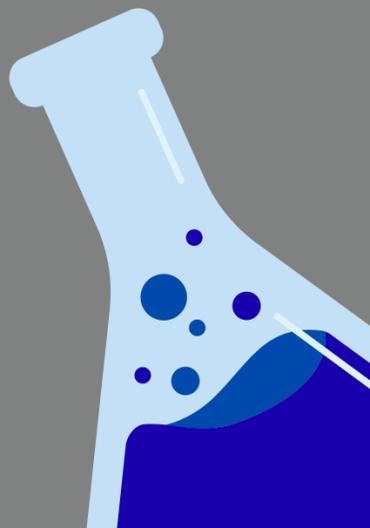
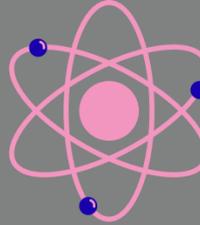


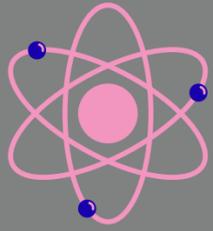
LOCATION WITHIN THE CELL:
MOST ENZYMES OPERATE WITHIN CELLS,
OFTEN LOCALIZED IN

SPECIFIC ORGANELLES WHICH
COMPARTMENTALIZES REACTIONS TO
ISOLATE SUBSTRATES AND PRODUCTS
FROM COMPETING PROCESSES



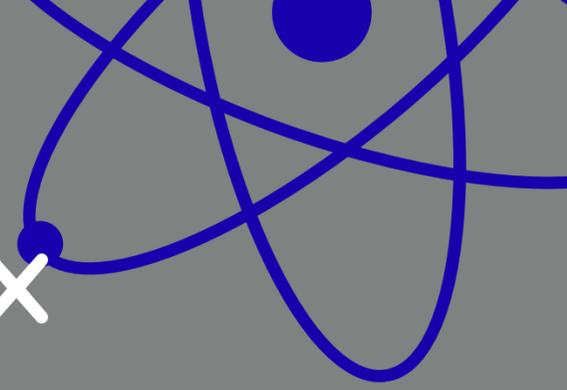
THIS ORGANIZATION CREATES A
FAVORABLE ENVIRONMENT FOR
REACTIONS AND ARRANGES THE
NUMEROUS ENZYMES INTO PURPOSEFUL
METABOLIC PATHWAYS.





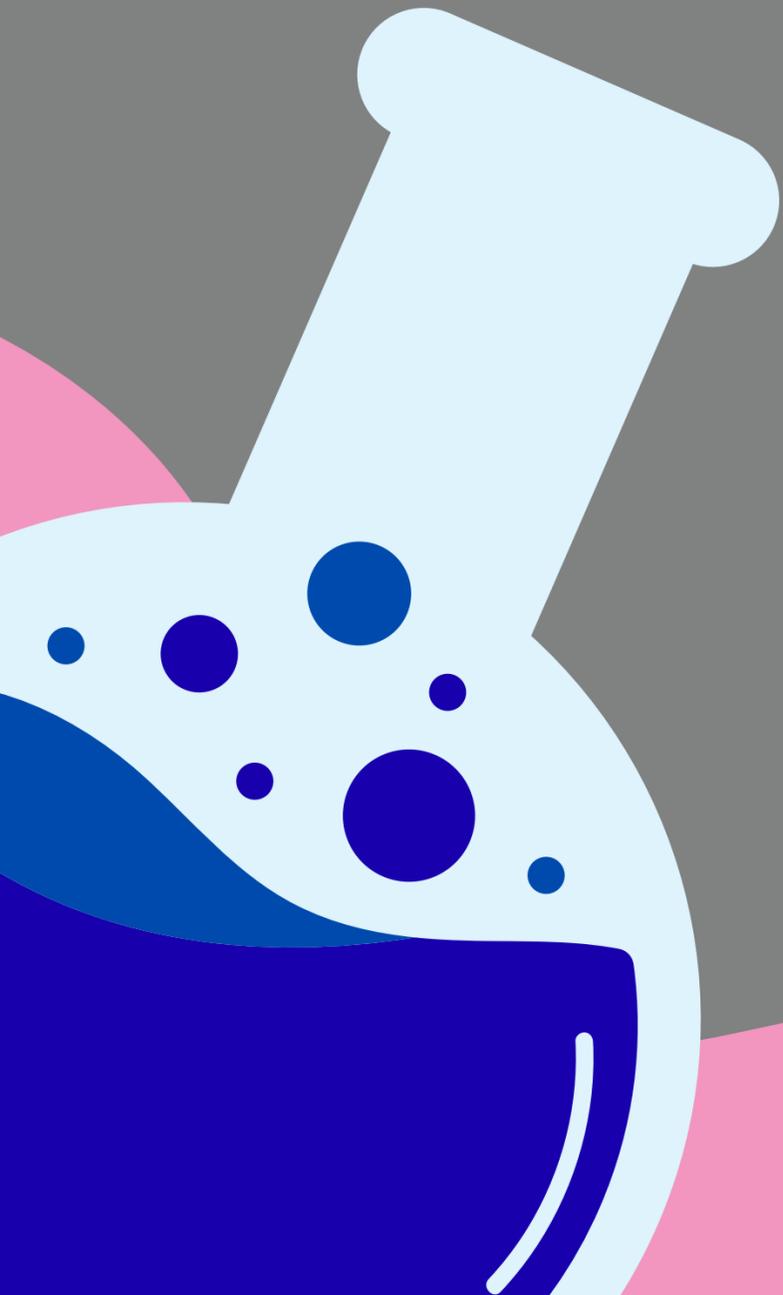
ENZYMES: CLASSIFICATION

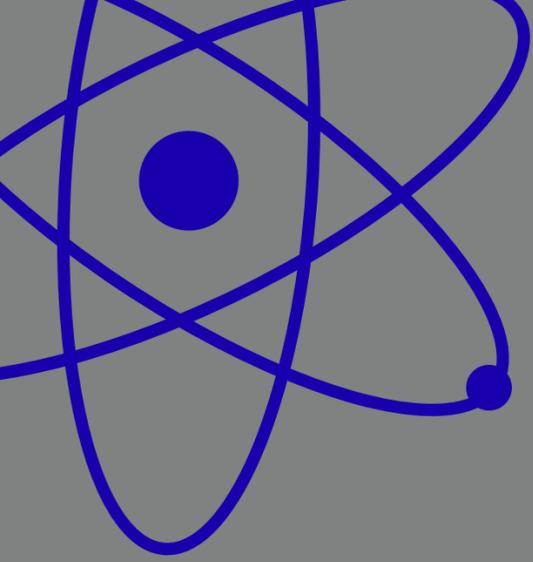
ENZYMES ARE CATEGORIZED INTO SIX MAJOR CLASSES



EACH DEFINED BY THE TYPE OF REACTION THEY CATALYZE, SUCH AS LACTATE:

NICOTINAMIDE ADENINE DINUCLEOTIDE (NAD⁺) OXIDOREDUCTASE, WHICH HIGHLIGHTS THE SUBSTRATE INVOLVED.





THANK YOU

FOR YOUR

ATTENTION !!

