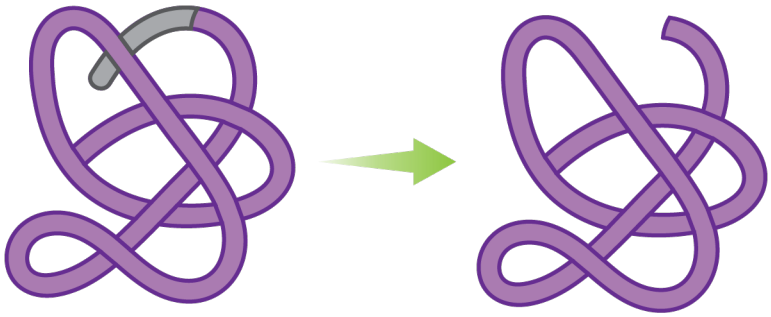
CONCEPT: ENZYME REGULATION: COVALENT MODIFICATION

- Enzyme activity can be regulated by _____ or _____ of groups on the enzyme polypeptide chain.
    - □ Two types: 1) Zymogens (_____) and 2) Phosphorylation/dephosphorylation

Zymogens

- Zymogens are enzymes produced in _____ form with an extra polypeptide segment.
    - □ Activated by _____ of the extra polypeptide segment by hydrolysis.



_____ Enzyme _____ Enzyme

EXAMPLE: Which of the following statements is not relevant to zymogens?

a) Zymogens are inactive because the excess polypeptide chain alters their overall structure.

b) Enzyme activation by loss of some part of peptide chain is a type of covalent modification.

c) Trypsinogen is converted into active trypsin by the hydrolysis of a hexapeptide segment from its backbone.

d) Citrate can attach to a non-active site of the phosphofructokinase enzyme and decrease its activity.

PRACTICE: Match the terms (a) allosteric control, (b) feedback control, and (c) zymogen activation with each of the following:

_____ Pepsinogen is converted into its active form (pepsin) by losing 44 amino acids from its primary structure.

_____ A small molecule attaches to the enzyme and makes an active site available to a substrate.

_____ The end-product of a metabolic pathway decreases the activity of the enzyme in the first step.

_____ Alanine binds to pyruvate kinase and reduces active site availability for the enzyme's substrate.

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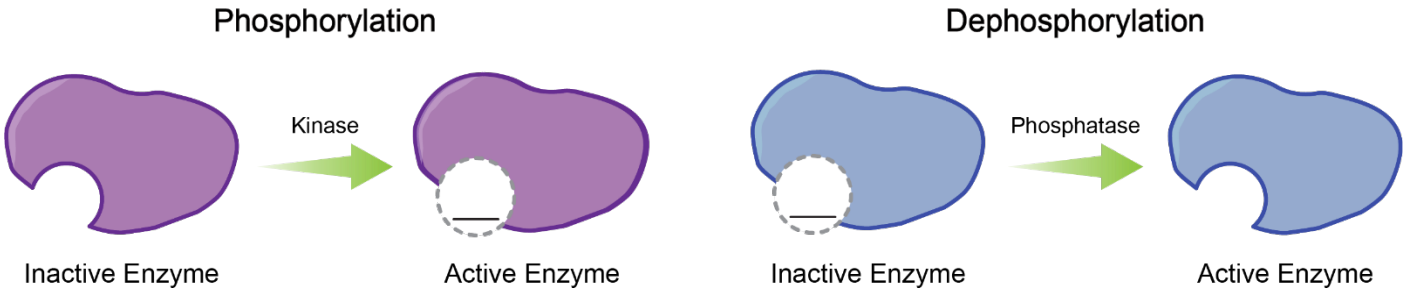
Phosphorylation/Dephosphorylation

● Addition or removal of _____ groups to the enzyme polypeptide chain alters enzyme activity.



EXAMPLE: Which of the following is true about covalent modification?

a) A zymogen loses its activity when a peptide segment is removed from its primary structure.

b) Addition or removal of a phosphate group has no effect on enzyme activity.

c) A zymogen is activated by removal of hydroxy groups from its polypeptide backbone.

d) Phosphatase removes a phosphate group from an enzyme by breaking a covalent bond.

PRACTICE: Match the terms (a) allosteric control, (b) feedback control, (c) zymogen activation, and (d) phosphorylation/dephosphorylation with each of the following:

_____ Proline inhibits glutamate 5-kinase, the enzyme in the first step of the biosynthesis of proline from glutamate.

_____ Glycogen synthase loses its catalytic activity when it is phosphorylated.

_____ Proelastase is converted to its active form elastase when it loses some part of its polypeptide backbone.

_____ Adenosine monophosphate binds to phosphofructokinase-1 and increases its activity.