CONCEPT: SIGNAL AMPLIFICATION

●Once a signaling molecule binds its receptor, the signal is _____ inside the cell to MAXIMIZE its effect.

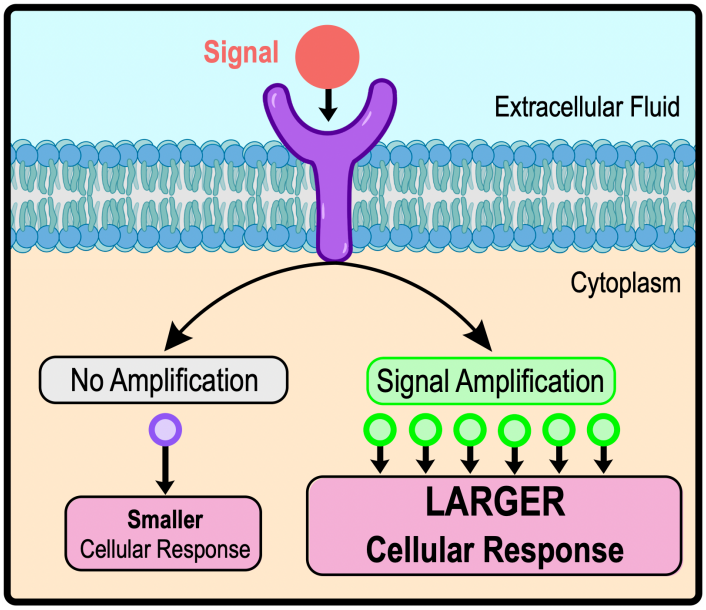
□ _____ types of enzymes are commonly used to amplify the signal inside the cell:

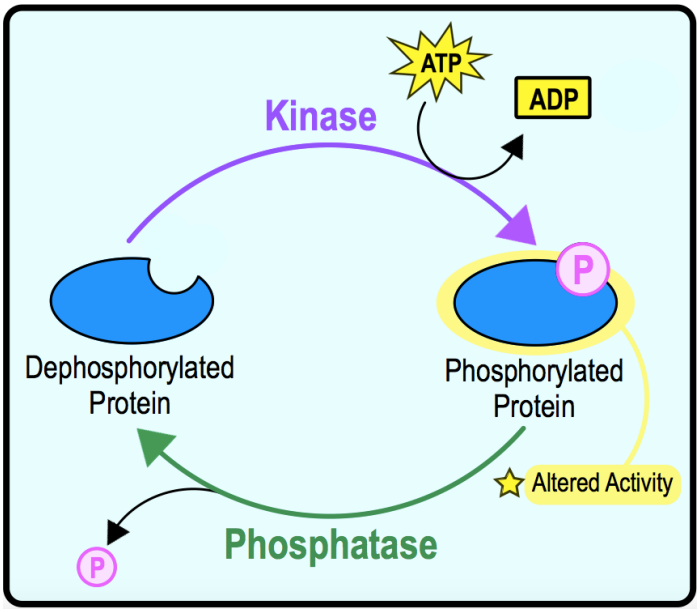
1) **Protein Kinases**: _____ a phosphate group to a substrate.

2) **Protein Phosphatases**: _____ a phosphate group from a substrate.

□ Phosphorylation _____ a protein's activity by turning it either "on" or "off".

EXAMPLE: Signal Amplification by Phosphorylation.





PRACTICE: Kinases and phosphatases are essential to the cell because they:

a) Are enzymes that synthesize proteins.

b) Are enzymes that degrade proteins.

c) Are enzymes that can turn proteins "on" and/or "off" through changes in phosphorylation.

d) Are enzymes that can turn proteins "on" and/or "off" through changes in proton concentrations.

e) None of the above.

PRACTICE: What role do phosphatases play in signal transduction pathways?

a) They phosphorylate proteins involved in signal transduction or cellular response.

b) They activate protein kinases by phosphorylation.

c) They amplify the signal molecule.

d) They regulate the function of proteins involved in signal transduction pathways or cellular response.

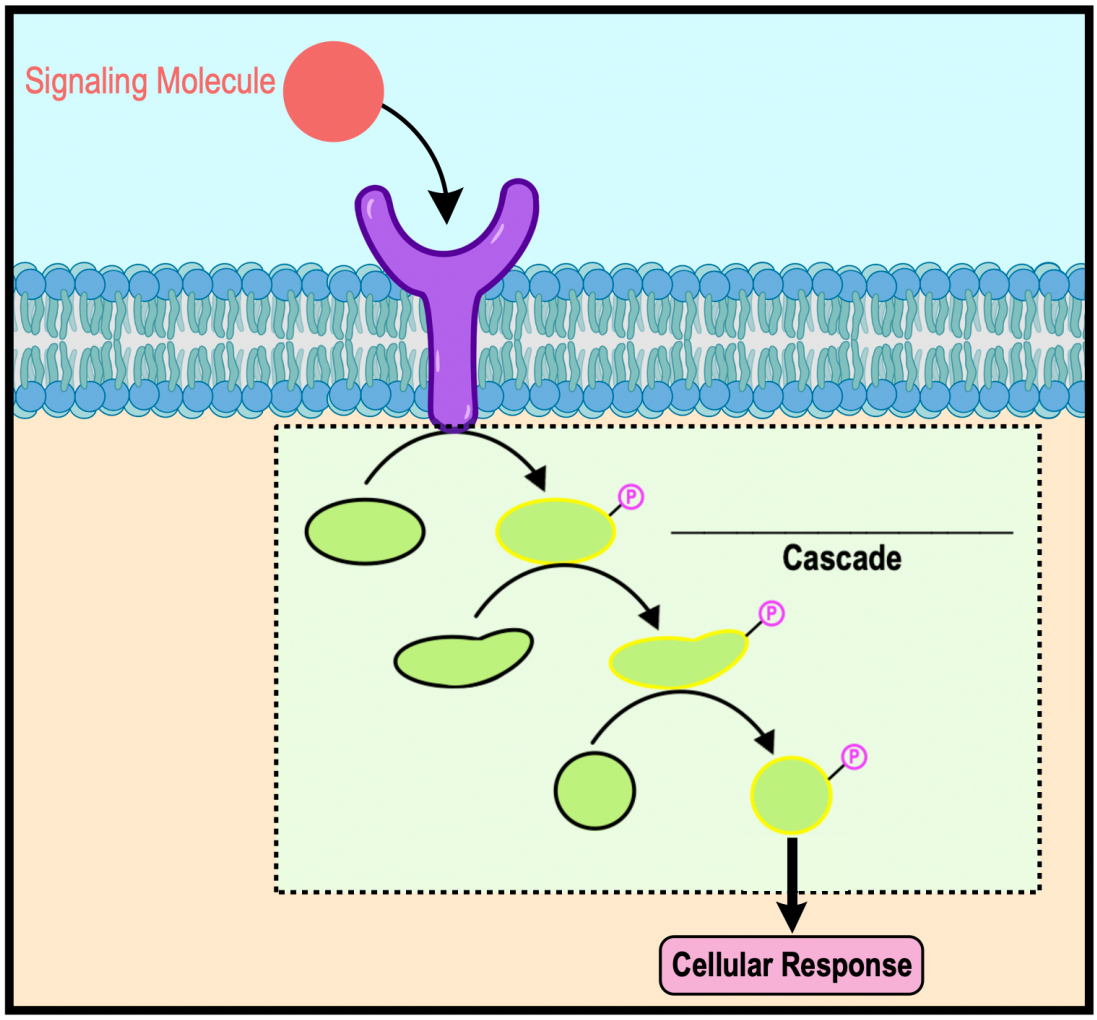
CONCEPT: SIGNAL AMPLIFICATION

Phosphorylation Cascades

●A series of protein kinases that _____ a signal by successive phosphorylation events of different *kinases*.

□ In other words, kinases can phosphorylate & activate other kinases.

EXAMPLE: Phosphorylation Signaling Cascade.



PRACTICE: Phosphorylation cascades are useful signal transduction pathways because they _____.

a) Allow proteins to be easily activated by adding or removing a phosphate group.

b) Allow proteins to be easily deactivated by adding or removing a phosphate group.

c) Amplify the original signal many times.

d) All of the above.