Online Resource 4

Pop-up questions with test questions that test the overall understanding of the video clip for study 3 (translated from Dutch)

Chapter 9.1 Cell Signaling 1

ITEM 1 – LEARNING GOAL 71

Pop-up question

We just discussed endocrine, paracrine and synaptic signaling. Which of these three systems has the most specific interaction between receptor and ligand?

A. **Endocrine**
B. Paracrine
C. Synaptic signaling

Feedback: Paracrine signaling does not need to be specific since receptors of these signal molecules are located on adjacent cells. Synaptic signaling does not need to be specific since signals are only transferred across the synaptic cleft and receptors are located on postsynaptic cells.

ITEM 2 – LEARNING GOAL 74

Pop-up question

A hydrophobic signal molecule binds to an intracellular receptor after which the ligand-receptor complex is transported towards the nucleus. Why are unbound receptors not transported towards the nucleus?

A nuclear localization signal from the signal molecule is needed for recognition and transport towards the nucleus.

No Feedback provided

ITEM 3 – LEARNING GOAL 73

Pop-up question

How do proteins bind to an activated receptor?

A. Through covalent binding with the phosphate group
B. Through hydrolysis wherein phosphate is released
C. **Through weak ion bonds between positively charged amino acids of the protein and negatively charged phosphate groups.**

Feedback: Covalent binding does not occur; proteins can easily dissociate from the activated receptor. Water is not used within this reaction.

ITEM 4 – LEARNING GOAL 76

Pop-up question
Describe shortly how signal transduction routes can be activated through the G-protein coupled receptor.

The G-protein coupled receptor (GPCR) gets activated and changes shape through binding of a signaling molecule. The cytoplasmic side of the GPCR can then bind to an inactive G protein, causing a GTP to displace the GDP. This activates the G protein. The activated G protein can then dissociate from the receptor and diffuse along the membrane to bind an enzyme and alter its shape and activity. This enzyme activation can then lead to further signal transduction.

No Feedback provided

Chapter 9.2 Cell Signaling 2

ITEM 5 – LEARNING GOALS 84 AND 86

Pop-up question
Which of the following expressions is a correct association?
A. Adenylyl cyclase activity and the conversion of cAMP to AMP
B. Phosphorylase activity and the catabolism of glucose
C. **Phosphodiesterase activity and the conversion of cAMP to AMP**
D. Kinase activity and the addition of tyrosine

Feedback: Adenylyl cyclase converts ATP to AMP. A kinase can phosphorylate a certain substrate. Phosphodiesterase converts cAMP to AMP.

ITEM 6 - LEARNING GOAL 86

Pop-up question
Adenylyl cyclase has the opposite effect of…
A. Protein phosphatase
B. Kinase
C. **Phosphodiesterase**
D. Phosphorylation

No feedback provided

ITEM 7 – LEARNING GOAL 4

Pop-up question
One protein is activated through binding with another protein. How are these two proteins bound together?

A. Through covalent binding
B. **Through non-covalent binding**

No feedback provided

ITEM 8 – LEARNING GOAL 84

Pop-up question
We just saw how kinases phosphorylate a certain substrate. What else needs to be bound to the active center of kinase?

A. Water
B. **ATP**
C. ADP
D. cAMP

Feedback: Where do the phosphate groups come from?