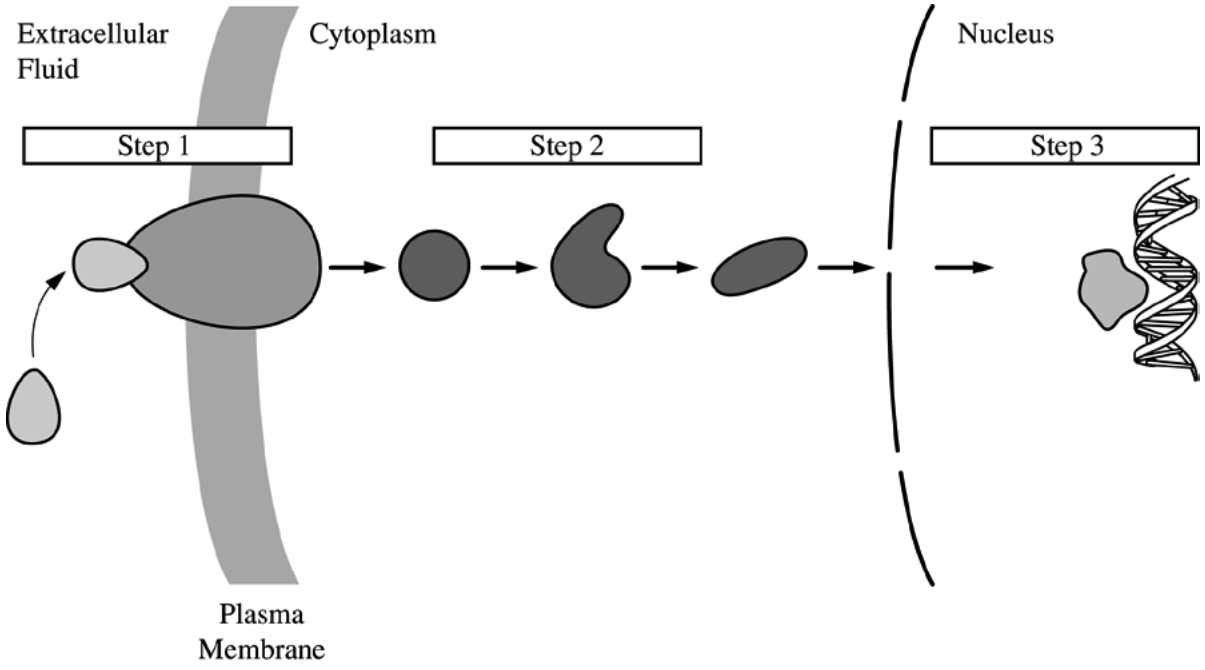
AP® BIOLOGY
2013 SCORING GUIDELINES

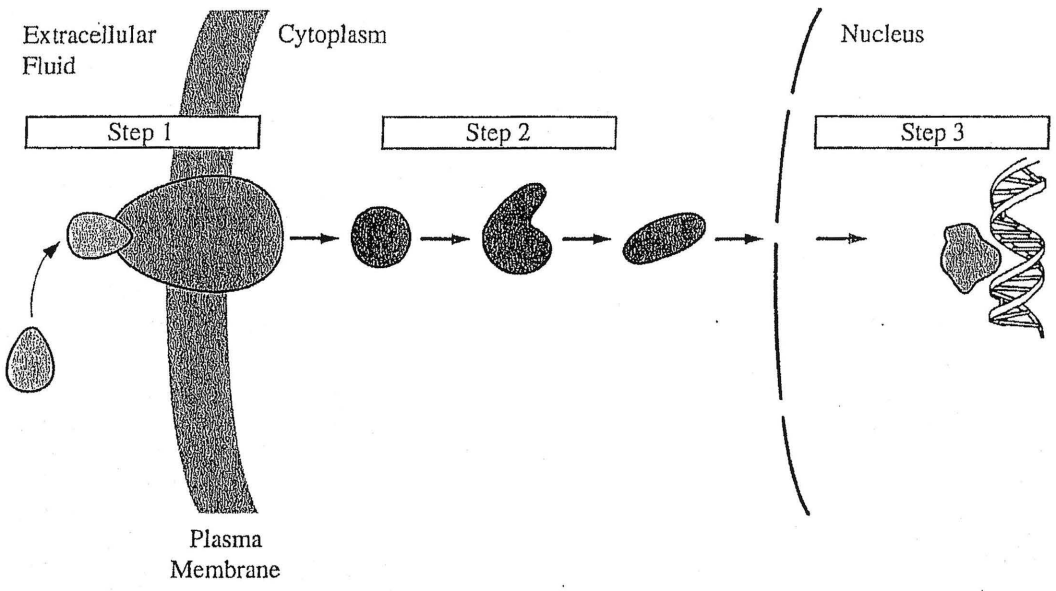
Question 8



The figure above represents a generalized hormone-signaling pathway. Briefly **explain** the role of each numbered step in regulating target gene expression. (**3 points maximum**)

- Step 1 = hormone/ligand binding to receptor to initiate/trigger/induce signaling OR signal reception
- Step 2 = an intracellular cascade that transduces/amplifies/transfers the signal from plasma membrane to nucleus (or other cellular effectors)
- Step 3 = transcription/expression of target genes is stimulated/repressed

8A1



8. The figure above represents a generalized hormone-signaling pathway. Briefly **explain** the role of each numbered step in regulating target gene expression.

ANSWER PAGE FOR QUESTION 8

Step 1: Ligand binds to membrane bound receptor (which goes through cell membrane. Receptor will alter its shape, inducing a signal response. If there are fewer ligands, the response will decrease. If the receptor is not functioning, the cellular response will not occur (ex. diabetes mellitus).

Step 2: The transduction pathway goes through a few messangers until one nonprotein messanger passes through nuclear envelope. This pathway amplifies the signal, controls the signal, and functions as a way to induce many cellular responses (if the pathway can continue in divergent directions)

Step 3: The messanger will either act as a inducer, allower RNA polymerase to transcribe the gene, or as a inhibitor, to stop the transcription. This is critical in negative feedback, where signals control the on/off times of the mRNA production.

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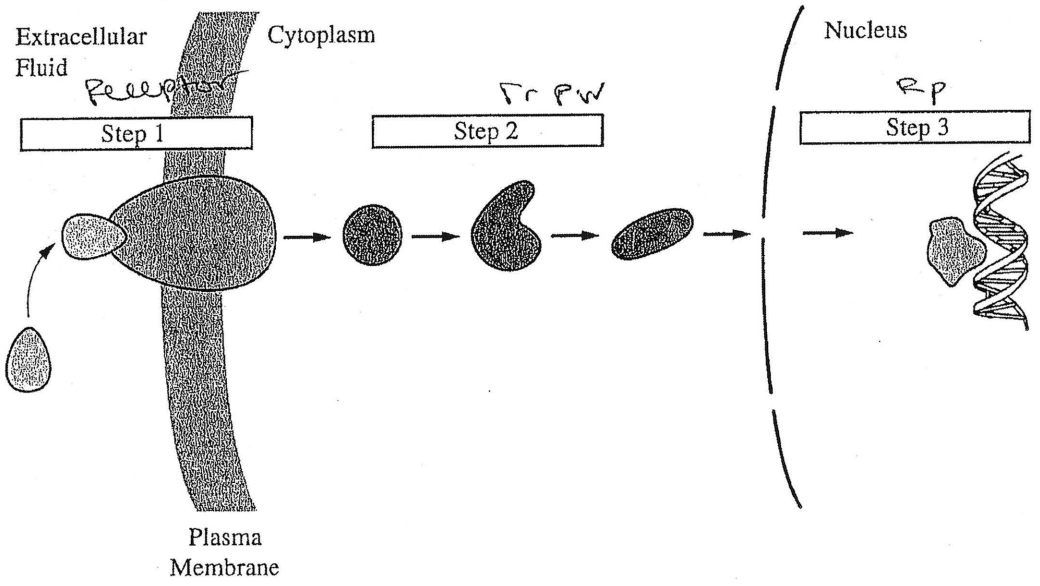

8B1

8. The figure above represents a generalized hormone-signaling pathway. Briefly **explain** the role of each numbered step in regulating target gene expression.

ANSWER PAGE FOR QUESTION 8

Step 1: the signal is relieved in the reciptor step 2: Which activates the cascade of several other intermediate steps within the transduction pathway the Sep 3: is the response is given and recied by the DNA.

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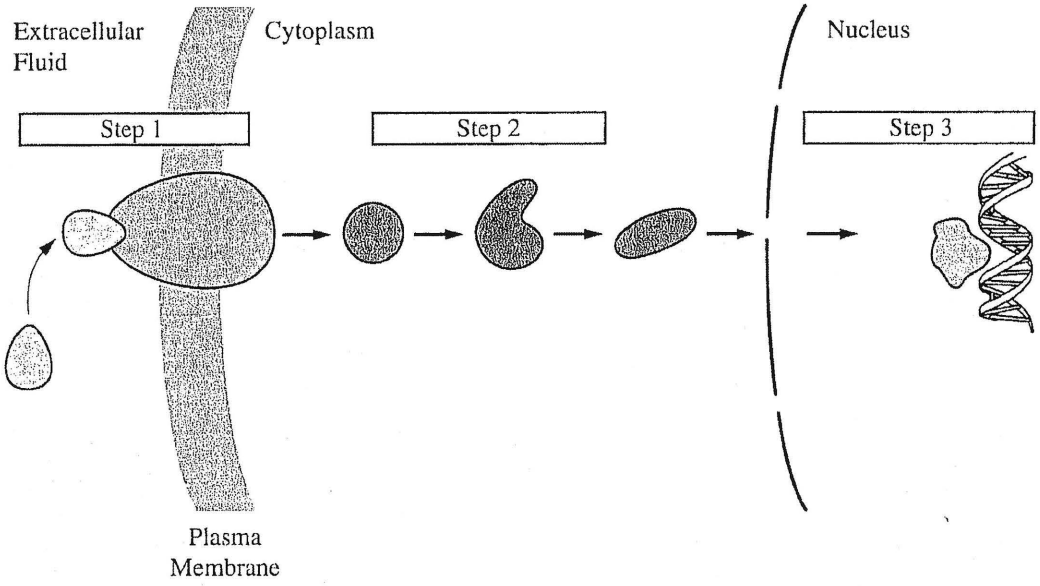
8C,



8. The figure above represents a generalized hormone-signaling pathway. Briefly **explain** the role of each numbered step in regulating target gene expression.

ANSWER PAGE FOR QUESTION 8

The hormone ~~[illegible]~~ binds to a receptor on the cell membrane. This causes a responce and the receptor releases a chemical that travels inside the cell to the nucleus. This chemical will form into a shape to be able to bind to a receptor in the ~~[illegible]~~ DNA which will signal for something to occur.

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AP® BIOLOGY
2013 SCORING COMMENTARY

Question 8

Question 8 was written to the following Learning Objectives in the AP Biology Curriculum Framework: 3.22 and 3.23.

Overview

Question 8 asks students to use a model of a hormone-signaling pathway to explain how extracellular signals are converted to specific cellular responses. Students were presented with a visual representation of a generalized hormone-signaling pathway and asked to use the representation to explain the role of specific steps in the pathway, beginning with reception of a hormone signal and ending with changes in target gene expression.

Sample: 8A
Score: 3

The response earned 1 point for explaining that Step 1 induces a signal response when a ligand binds to a membrane bound receptor, resulting in the receptor altering its shape.

The response earned 1 point for explaining that Step 2 amplifies the signal by going through a transduction pathway involving a few messengers.

The response earned 1 point for explaining that in Step 3 a messenger in the pathway acts by inducing RNA polymerase to transcribe a gene or by inhibiting RNA polymerase from transcribing a gene.

Sample: 8B
Score: 2

The response earned 1 point for explaining that Step 1 represents the reception of the signal in the receptor.

The response earned 1 point for explaining that Step 2 represents activation of a cascade of several intermediates in the transduction pathway.

Sample: 8C
Score: 1

The response earned 1 point for explaining that Step 1 represents a hormone binding to a receptor on the cell membrane, causing a response.