

**TYPE\_A1 QUESTION**

**MULTIPLE-CHOICE TEST**

**Directions:**

Indicate the best answer AND give a brief explanation of the reason(s) why each of the three options that you discarded BE NOT the appropriate statement for the given stem text.

**Evaluation criteria:**

Best choice: half point (0.5)

Explanation about the three discarded alternatives: up to half point (0-0.5)

MAX SCORE/item: 1 pt.

Estrogen and testosterone are steroid hormones, and are most likely to bind to:

- A. membrane ion channel
- B. enzyme linked membrane receptor
- C. G-protein linked membrane receptor
- D. cytoplasmic receptors

Explanation: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

TYPE\_A2 QUESTION

GRAPHICAL PROBLEM

**Directions:**

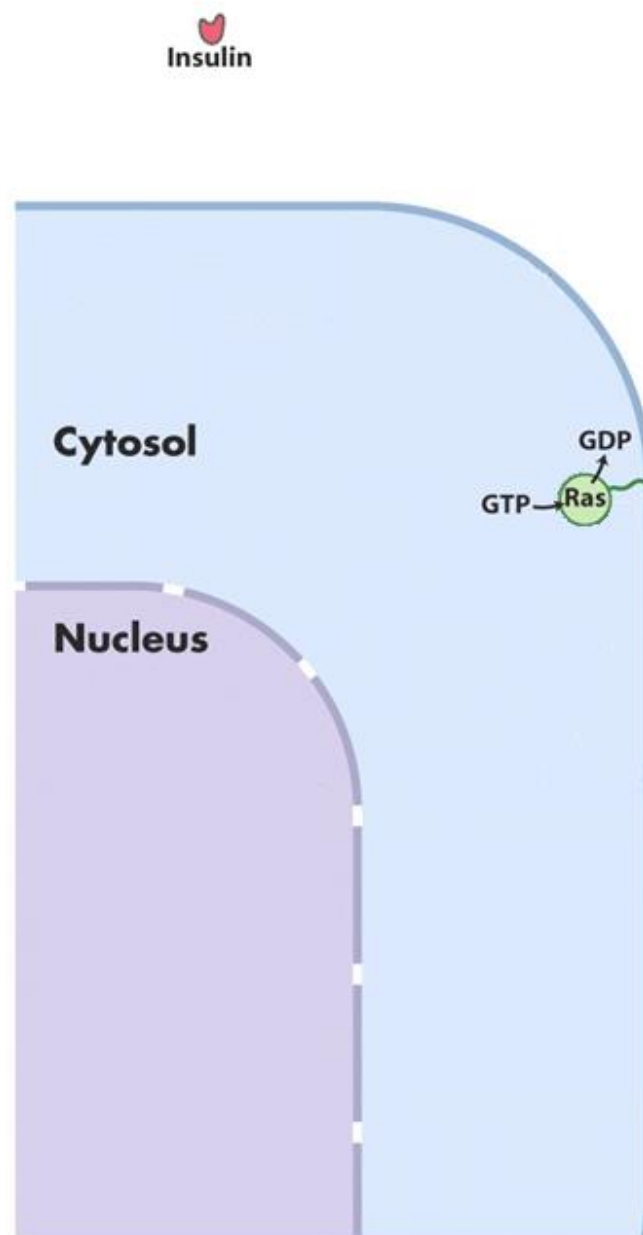
Add labels and missing metabolic intermediates in order to illustrate in a schematic diagram the complexity of the given signal transduction pathway, THEN discuss the assigned problem.

**Evaluation criteria:**

Diagram: up to 1.5 points (0-1.5)

Problem discussion: up to half point (0-0.5)

MAX SCORE: 2 pts.



The insulin signal transduction through the MAPK pathway.

What would happen if the GTPase activity of Ras was decreased/inhibited?

Problem discussion: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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\_\_\_\_\_

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\_\_\_\_\_

\_\_\_\_\_

## TYPE\_A3 QUESTION

### FILL IN THE BLANKS

#### **Directions:**

Read through the text below, complete the blank spaces with appropriate words (in capital letters) AND draw a scheme of the signalling pathway(s) described in the text.

#### **Evaluation criteria:**

Matching words: 0.1 pt./each

Diagram: up to 1 point (0-1)

MAX SCORE: 2 pts.

The human insulin molecule, as a non-glycosylated heterodimer of 51 \_\_\_\_\_, is the result of numerous years of evolution. In order to perform its many biological activities (blood glucose \_\_\_\_\_ is only one of these), this protein has not only a defined primary structure, but also a well-defined secondary and tertiary structure. Each and every change/modification of its structure may have a serious/relevant impact on the effects of insulin. For many decades, the major source of animal insulin was the \_\_\_\_\_ from pigs and cows. After the discovery of the primary structure of the insulin molecule, total chemical synthesis appeared to be the next logical step for insulin production. Insulin is synthesized as inactive single-chain precursor. The molecule is linked by three \_\_\_\_\_ bridges. Before secretion, proinsulin is converted to active insulin, a \_\_\_\_\_ protein containing \_\_\_\_\_ polipeptide chains, by \_\_\_\_\_ that remove the C-peptide. Although the hormone functions in the bloodstream as a  $Zn^{2+}$ -free monomer, insulin assembles as a  $Zn^{2+}$ -coordinated \_\_\_\_\_ in the human  $\beta$ -cell. When blood glucose rises, active metabolism of glucose in the  $\beta$  cell raises intracellular concentration of \_\_\_\_\_, causing the \_\_\_\_\_ of ATP-gated  $K^+$  channels in the \_\_\_\_\_ membrane.

FIGURE:

