**Data Analysis Problem**

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to accompany

*The Cell: A Molecular Approach,* Eighth Edition

Geoffrey M. Cooper

**17.1 The Effect of Cholera Toxin on the Transcription**

**Factor CREB**

This Data Analysis Problem is also found on page 600 of the textbook.

**Source:** Li, Y., W. Kin, X. Wong, W. Zhu, Y. Huang, G. Yan. 2007. Cholera toxin induces malignant glioma cell differentiation via the PKA/CREB pathway. *Proc. Nat. Acad. Sci. USA* 104: 13438–13443.

**Level of difficulty:** Medium

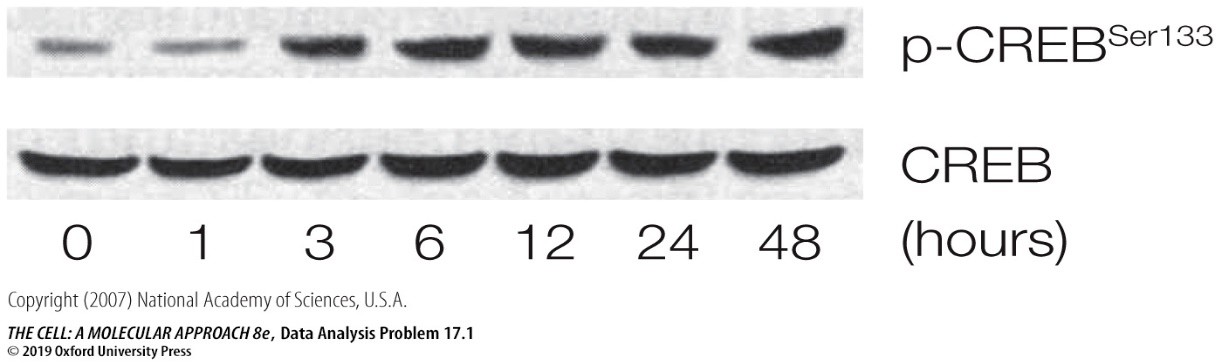
**Corresponding chapter(s) in the textbook:** Chapter 17

**Review the following terms before working on the problem:** cell culture, glioma, heterotrimer G proteins, cholera toxin, nuclear protein extracts, Western blotting, cAMP response element binding protein (CREB)

**Experiment**

Cultures of rat glioma cells were treated with cholera toxin for the time periods indicated in the figure. (*Note:* Cholera toxin inhibits the GTPase activity of the Gs protein.) Nuclear protein extracts were prepared and subjected to Western blot analysis using anti-CREB and anti-phospho-CREB antibodies. The anti-CREB antibody recognizes all CREB proteins, no matter whether posttranslationally modified or not; the anti-phospho-CREB antibody used in this study binds to CREB molecules only if they are phosphorylated on Ser133.

**Figure**

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**Questions**

1. How does cholera toxin affect CREB expression and CREB phosphorylation?

2. Describe the chain of signaling events that lead to this effect of cholera toxin.

3. Does phosphorylation affect the nuclear localization of CREB?