**Data Analysis Problem**

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to accompany

*The Cell: A Molecular Approach,* Eighth Edition

Geoffrey M. Cooper

**11.1 Nuclear Import of a Protein**

This Data Analysis Problem is also found on pages 380–381 of the textbook.

**Source:** Görlich, D., S. Prehn, R. A. Laskey, E. Hartmann. 1994. Isolation of a protein that is essential for the first step of nuclear protein import. *Cell* 79: 767–778.

**Level of difficulty:** Medium

**Corresponding chapter(s) in the textbook:** Chapter 11

**Review the following terms before working on the problem:** Ran protein, importin, cell membrane, nuclear membrane, fluorescent labeling, nuclear localization signal, fluorescence microscopy, cytosol, ATP

**Experiment**

This experiment studied the role of two proteins, Ran and importin, in nuclear protein transport. Permeabilized tissue culture cells were used: Their plasma membrane is permeable to proteins, but their nuclear membrane retains the ability for selective protein transport. The cells were incubated with fluorescently labeled protein molecules, containing a nuclear localization signal. Cytosol, Ran, importin, and ATP were present or absent, as indicated in the figure. Cells exposed to these different conditions were then analyzed by fluorescence microscopy.

**Figure**



**Questions**

1. What actions does Ran perform by itself?

2. What actions does importin perform by itself?

3. How do Ran and importin perform together in the nuclear import of protein?

4. Why is ATP required?

5. What conclusion can be drawn regarding the cytosol sample?