

2. Probabilities of sequences.

Assume that the four bases A, C, T, and G occur with equal likelihood in a DNA sequence of nine monomers.

- (a) What is the probability of finding the sequence AAATCGAGT through random chance?
- (b) What is the probability of finding the sequence AAAAAAAAAA through random chance?
- (c) What is the probability of finding any sequence that has four A's, two T's, two G's, and one C, such as that in (a)?

- (a) Each base occurs with probability $1/4$. The probability of an *A* in position 1 is $1/4$, of *A* in position 2 is $1/4$, of *A* in position 3 is $1/4$, of *T* in position 4 is $1/4$, and so on. There are 9 bases. The probability of this specific sequence is $(1/4)^9 = 3.8 \times 10^{-6}$.
- (b) Same answer as (a) above.
- (c) Each specific sequence has the probability given above, but in this case there are many possible sequences which satisfy the requirement that we have 4 *A*'s, 2 *T*'s, 2 *G*'s, and 1 *C*. How many are there? We start as we have done before, by assuming all nine objects are distinguishable. There are $9!$ arrangements of nine distinguishable objects in a linear sequence. (The first one can be in any of nine places, the second in any of the remaining eight places, and so on.) But we can't distinguish the four *A*'s, so we have overcounted by a factor of $4!$, and must divide this out. We can't distinguish the two *T*'s, so we have overcounted by $2!$, and must also divide this out. And so on. So the probability of having this composition is

$$\left[\frac{9!}{4!2!2!1!} \right] \left(\frac{1}{4} \right)^9 = 0.014.$$

Molecular Driving Forces Full Solution Manual

**Thirumalaisamy P.
Velavancorresponding**



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Instructor's Solutions Manual to Accompany Atkins' Physical Chemistry, Ninth Edition C. A. Trapp, M. P. Cady, Carmen Giunta, 2010 The Instructor's solutions manual to accompany Atkins Physical Chemistry provides detailed solutions to the exercises and the even numbered discussion questions and problems that feature in the ninth edition of Atkins Physical Chemistry. The manual is intended for instructors and consists of material that is not available to undergraduates. The manual is free to all adopters of the main text.

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Instructor's Resource Manual Silberberg,1999-07 *Shriver and Atkins' Inorganic Chemistry* Peter Atkins,2010

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characterizes air pollutant emission sources and the technology available to control them It provides industry and government with the guidelines to comply with air pollution standards and equipment used for gases and particulates

Cehmistry Textbook for College and University USA Ibrahim Sikder,2023-06-04 Cehmistry Textbook USA

Chemical Engineering Reference Manual Randall N. Robinson,1987 The chemical PE exam is an eight hour open book test consisting of 80 multiple choice problems It is administered every April and October The Chemical Engineering Reference Manual is the primary text examinees need both to prepare for and to use during the exam It reviews current exam topics and uses practice problems to emphasize key concepts The Chemical Engineering Reference Manual provides a detailed review for engineers studying for the chemical PE exam preparing them for what they will find on test day It includes more than 160 solved example problems 164 practice problems and test taking strategy *Basiswissen*

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