

# POGIL: Protein Synthesis

## *The Central Dogma of Biology*

Use the diagrams and text provided to answer the following questions.

### Module 1: Pre-thinking questions

1. DNA provides the instructions for building which type of biological molecule?

Proteins

2. Where is DNA located in a eukaryotic cell? Where is it located in a prokaryotic cell?

The nucleus, in the cytoplasm

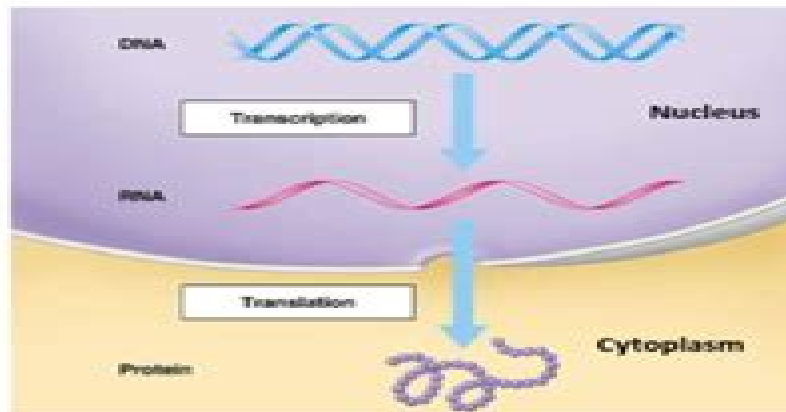
3. Which cellular structures are the "machines" that build proteins? Where are they located?

tRNA, the ribosomes and cytoplasm

4. If DNA can't leave the nucleus, how do you think the DNA instructions get to the ribosomes in the cytoplasm?

Transcription to RNA and RNA brings it in the cytoplasm.

### Module 2: The flow of information in EUKARYOTIC cells



**Figure 1:** This figure shows the flow of information from DNA to a molecule called RNA (in the nucleus) and then to the creation of proteins (in the cytoplasm). We now know that RNA, which is similar but not identical to DNA, moves from the nucleus to the cytoplasm. RNA is a nucleic acid polymer composed of nucleotides like DNA. However, RNA has the sugar ribose and the nitrogen base uracil, instead of DNA's deoxyribose and thymine. Also RNA is a much smaller molecule than DNA.

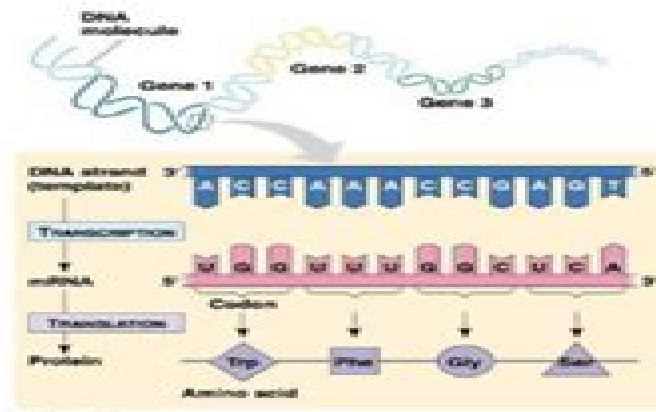
5. Fill in the blank: DNA → RNA → Protein

6. List at least 3 differences between DNA and RNA.

1-DNA = double strand  
RNA = single strand

2-DNA = thymine  
RNA = uracil

3-DNA = Deoxyribose  
RNA = ribose



**Figure 2:** This figure shows the flow of genetic information in a little more detail. Examine this figure carefully, paying attention to the different labels.

7. What is the name of the process that uses DNA as a template to make mRNA? ("hint" it starts with a T)

transcription

8. Look at how the DNA and RNA complement each other. Which DNA base does the U in RNA pair with? How is this different from the base-pairing rules for DNA?

U pairs with A, in DNA T pairs with A

9. What is the name of the process that uses mRNA to make a protein? ("hint" it also starts with a T)

Translation

# Pogil Protein Synthesis Model 1

**Alan E. Smith, Alan Smith**



## **Pogil Protein Synthesis Model 1:**

*Broadening Participation in STEM* Zayika Wilson-Kennedy, Goldie S. Byrd, Eugene Kennedy, Henry T. Frierson, 2019-02-28  
This book reports on high impact educational practices and programs that have been demonstrated to be effective at broadening the participation of underrepresented groups in the STEM disciplines **Doklady Akademii nauk**, 1996

Protein Biosynthesis Alan E. Smith, Alan Smith, 1976-05-13 46 3 2 mRNA metabolism 47 3 3 Initiation complex formation 3 3 1 Binding of initiator tRNA 47 3 3 2 Binding of messenger RNA 50 3 4 Elongation 56 3 5 Termination of protein biosynthesis and post translational modification 59 RNA phage protein synthesis 61 3 6 References 63 Index 64 1  
Introduction possible control processes operating to adjust 1 1 The problem protein synthesis to the needs of the cells and The discovery that the genetic material of organism It will be assumed that the reader has living organisms is DNA and the later de some knowledge of molecular biology in gen monstration that the DNA molecule is a eral and protein biosynthesis in particular but double helix were both great milestones in twentieth century science and formed the by way of introduction each of the major molecules and stages of the process will be foundation of the new discipline of molecular described in simple terms and in subsequent biology But even after these momentous dis chapters each will be discussed again in coveries the detailed mechanism by which such genetic material could be expressed as the struc greater depth tural and catalytic proteins which play so im portant a role in the functioning of all living 1 2 Overall steps in protein biosynthesis The information encoded in the two comple cells was still not obvious **Protein Synthesis** Yoshito Kaziro, 1971 **Protein Synthesis, A Series of Advances** Edwin H. McConkey, 1971 Mechanisms of Protein Synthesis E. Bermek, 2012-12-06  
This volume contains the papers presented at the international symposium on Molecular Mechanisms in Protein Synthesis held on September 26 27 1983 at the Beyaz Ko k in Emirgan Bosphorus Istanbul The symposium aimed to create a medium for information exchange and discussions regarding the current developments in the area of protein syn thesis To ensure an informal yet scientifically stimulating and productive atmosphere providing opportunity for relaxed and speculative discussions the number of presentations was limited to twenty and that of attendants to about sixty The emphasis in the symposium was laid on structure function relations in the prokaryotic protein synthesizing systems and on the control mechanisms of eukaryotic protein synthesis in particular during chain initia tion Other issues like evolutionary aspects of protein synthesis translational components genes and proofreading were covered as well The manuscripts represent the extended accounts of the oral presenta tions and it has been aimed with the concluding remarks at the end of the volume to give a summarizing view of the presentations and the discussions **Protein Synthesis** Robin Martin, 1998-08-04 The synthesis of proteins from 20 or so constituent amino acids according to a strictly defined code with an accuracy of better than 1 in 10 000 at most loca tions is arguably the most complex task performed by cells Protein Synthesis collects together methods and protocols covering a range of different approaches towards understanding how the cellular machinery

accomplishes this task and how these functions might be harnessed by the biotechnology industry to generate novel and useful proteins. The era in which the components of the translational machinery were being catalogued is over. This volume gathers together protocols that focus on preserving and describing the dynamic function as closely as possible. The need to understand exactly how ribosomes are positioned on messages or where tRNA molecules, translation factors or control proteins are bound has been appreciated by many of the authors. Several chapters that explore the fidelity and processivity of translation reflect this belief. Moreover, the fundamental importance of rRNA at the heart of the ribosome is a strong theme in a number of the protocols. These articles include in vitro and in vivo systems from bacterial, fungal, plant and animal systems. Overall, Protein Synthesis might be characterized by the novelty of the approaches employed to illuminate the inner workings of the protein synthetic machinery as well as by the inventiveness of the attempts to harness these reactions for

**biotechnological applications**      **Protein Synthesis** Abraham K. Abraham, Thor S. Eikhom, Ian F. Pryme, 2012-12-06 During the past decade we have witnessed several major discoveries in the area of protein synthesis and post translational modification of protein molecules. In this volume many of the latest research developments in these fields are reported by the distinguished international group of scientists who presented their state of the art results at the 13th Linderström Lang Conference held at Gøteborg, Norway, June 14-18, 1983. We feel that the presentation here of so wide a variety of articles on both the molecular and the cellular aspects of protein synthesis will be of considerable value to many scientists working in the area who were unable to attend as well as to many who are active in related areas. In addition to the research papers, the contents of the six scientific sessions held during the conference have been summarized by the respective session chairmen. These individual summaries provide insightful syntheses of all the recent progress in each field, identify which current problems remain of special interest and suggest what the future may hold in the several areas of protein synthesis research covered. Though this volume obviously cannot provide a complete survey of all important ongoing research on the molecular and cellular biology of translational and post translational events, we are confident that it will facilitate a much better understanding of many important contemporary problems in research on protein synthesis including cell differentiation, translational accuracy, protein modification, intracellular transport and membrane turnover.      **Cell-free Protein Synthesis**

Alexander S. Spirin, James R. Swartz, 2007-12-03 With its detailed description of membrane protein expression, high throughput and genomic scale expression studies both on the analytical and the preparative scale, this book covers the latest advances in the field. The step by step protocols and practical examples given for each method constitute practical advice for beginners and experts alike.      *Mechanisms of Protein Synthesis* Engin Bermeke, 1985 This volume contains the papers presented at the international symposium on Molecular Mechanisms in Protein Synthesis held on September 26-27, 1983 at the Beyaz Kök in Emirgan, Bosphorus, Istanbul. The symposium aimed to create a medium for information exchange and discussions regarding the current developments in the area of protein synthesis. To ensure an informal yet scientifically

stimulating and productive atmosphere providing opportunity for relaxed and speculative discussions the number of presentations was limited to twenty and that of attendants to about sixty The emphasis in the symposium was laid on structure function relations in the prokaryotic protein synthesizing systems and on the control mechanisms of eukaryotic protein synthesis in particular during chain initiation Other issues like evolutionary aspects of protein synthesis translational components genes and proofreading were covered as well The manuscripts represent the extended accounts of the oral presentations and it has been aimed with the concluding remarks at the end of the volume to give a summarizing view of the presentations and the discussions

**Elements of Protein Synthesis** Thomas Peter Bennett,1968      Elements of Protein Synthesis Thomas Peter Bennett,1969      **Protein Biosynthesis** Robert John Cecil Harris,1961      **Total Chemical**

**Synthesis of Proteins** Ashraf Brik,Philip Dawson,Lei Liu,2021-03-16 How to synthesize native and modified proteins in the test tube With contributions from a panel of experts representing a range of disciplines Total Chemical Synthesis of Proteins presents a carefully curated collection of synthetic approaches and strategies for the total synthesis of native and modified proteins Comprehensive in scope this important reference explores the three main chemoselective ligation methods for assembling unprotected peptide segments including native chemical ligation NCL It includes information on synthetic strategies for the complex polypeptides that constitute glycoproteins sulfoproteins and membrane proteins as well as their characterization In addition important areas of application for total protein synthesis are detailed such as protein crystallography protein engineering and biomedical research The authors also discuss the synthetic challenges that remain to be addressed This unmatched resource Contains valuable insights from the pioneers in the field of chemical protein synthesis Presents proven synthetic approaches for a range of protein families Explores key applications of precisely controlled protein synthesis including novel diagnostics and therapeutics Written for organic chemists biochemists biotechnologists and molecular biologists Total Chemical Synthesis of Proteins provides key knowledge for everyone venturing into the burgeoning field of protein design and synthetic biology      **Regulation of Protein Synthesis by**

**Elongation Factor 1** Patricia Williams Plant,1977      Protein Synthesis (majalah) Edwin H. McConkey,1976

*Carbohydrate and Protein Synthesis* ,1978      *Chemical Protein Synthesis* Xuechen Li,2023-07-13 This volume provides updated protocols for chemical protein synthesis Chapters guide readers through development methods strategies and applications of protein chemical synthesis Written in the format of the highly successful Methods in Molecular Biology series each chapter includes an introduction to the topic lists necessary materials and reagents includes tips on troubleshooting and known pitfalls and step by step readily reproducible protocols Authoritative and cutting edge Chemical Protein Synthesis aims to be a useful and practical guide to new researchers and experts looking to expand their knowledge      Protein

Synthesis Barbara L. Rosenberg,TVOntario,1985      **Molecular Biology and Protein Synthesis** Robert A. Niederman,1976-03-01

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### **Table of Contents Pogil Protein Synthesis Model 1**

1. Understanding the eBook Pogil Protein Synthesis Model 1
  - The Rise of Digital Reading Pogil Protein Synthesis Model 1
  - Advantages of eBooks Over Traditional Books
2. Identifying Pogil Protein Synthesis Model 1
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Pogil Protein Synthesis Model 1
  - User-Friendly Interface
4. Exploring eBook Recommendations from Pogil Protein Synthesis Model 1
  - Personalized Recommendations
  - Pogil Protein Synthesis Model 1 User Reviews and Ratings
  - Pogil Protein Synthesis Model 1 and Bestseller Lists

5. Accessing Pogil Protein Synthesis Model 1 Free and Paid eBooks
  - Pogil Protein Synthesis Model 1 Public Domain eBooks
  - Pogil Protein Synthesis Model 1 eBook Subscription Services
  - Pogil Protein Synthesis Model 1 Budget-Friendly Options
6. Navigating Pogil Protein Synthesis Model 1 eBook Formats
  - ePub, PDF, MOBI, and More
  - Pogil Protein Synthesis Model 1 Compatibility with Devices
  - Pogil Protein Synthesis Model 1 Enhanced eBook Features
7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Pogil Protein Synthesis Model 1
  - Highlighting and Note-Taking Pogil Protein Synthesis Model 1
  - Interactive Elements Pogil Protein Synthesis Model 1
8. Staying Engaged with Pogil Protein Synthesis Model 1
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Pogil Protein Synthesis Model 1
9. Balancing eBooks and Physical Books Pogil Protein Synthesis Model 1
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Pogil Protein Synthesis Model 1
10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
11. Cultivating a Reading Routine Pogil Protein Synthesis Model 1
  - Setting Reading Goals Pogil Protein Synthesis Model 1
  - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Pogil Protein Synthesis Model 1
  - Fact-Checking eBook Content of Pogil Protein Synthesis Model 1
  - Distinguishing Credible Sources
13. Promoting Lifelong Learning

- Utilizing eBooks for Skill Development
- Exploring Educational eBooks

14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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