



## Population Dynamics

hhmi BioInteractive

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Student Worksheet

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### INTRODUCTION

In the [Population Dynamics](#) Click & Learn, you'll explore a powerful tool for learning about populations: mathematical models. As you'll see by doing the Click & Learn and this activity, you can use models to answer questions, solve problems, and make predictions about all kinds of populations — from bacteria in your body, to wildlife across the world, to our own human populations.

#### PART 1: Introduction to Population Dynamics

Open the [Population Dynamics](#) Click & Learn and read through the introduction on the first page.

1. Describe a specific question or problem related to population dynamics that interests you.

I would be curious about the growth and sustainability of the human population in the long term.

2. Do you think the question or problem you described could be investigated using a mathematical population model? Why or why not?

We could likely use the demographic transition model as it measures birth and death rates along with carrying capacity.

#### PART 2: Exploring the Exponential Growth Model

Open the "Exponential growth model" tab and read the "Introduction" section.

3. The end of the "Introduction" describes how you could use a continuous-time, exponential growth model to simulate an *E. coli* population growing in a lab. Describe another specific population and situation that you could simulate with this type of model.

Other bacteria, populations in recovery from a disaster, or populations in ideal conditions for reproduction.

4. Complete the following table to explain the *biological* meanings of the symbols in the exponential growth model. For each explanation, give a specific example using the population you described above.

| Symbol  | Biological Meaning                                                 | Specific Example                                                    |
|---------|--------------------------------------------------------------------|---------------------------------------------------------------------|
| $N$     | The number in the population                                       | how many bacteria are in the population                             |
| $t$     | Time we are using as a measure                                     | 1 day                                                               |
| $dN/dt$ | The change in population size over the change in reproduction time | In one day, there was an increase from $x$ bacteria to $y$ bacteria |
| $r$     | Rate of reproduction                                               | 1.1 bacteria per minute.                                            |
| $N_0$   | Initial population                                                 | There were initially $z$ bacteria                                   |

5. Both  $dN/dt$  and  $r$  are types of growth rates. What are the differences between them?

While the first represents population growth rates as a whole,  $r$  is based more in birth/death rates per

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**D Kirk**



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## **Table of Contents Population Dynamics Packet Answer Key**

1. Understanding the eBook Population Dynamics Packet Answer Key
  - The Rise of Digital Reading Population Dynamics Packet Answer Key
  - Advantages of eBooks Over Traditional Books
2. Identifying Population Dynamics Packet Answer Key
  - 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 Population Dynamics Packet Answer Key
  - User-Friendly Interface
4. Exploring eBook Recommendations from Population Dynamics Packet Answer Key
  - Personalized Recommendations
  - Population Dynamics Packet Answer Key User Reviews and Ratings
  - Population Dynamics Packet Answer Key and Bestseller Lists

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