

NAME _____

Deletion, Insertion & Substitution



There are several types of mutation:

- > **DELETION** (a base is lost/deleted)
- > **INSERTION** (an extra base is added/inserted)
 - Deletion & insertion may cause what's called a **FRAMESHIFT** mutation, meaning the **reading "frame"** changes, thus changing the amino acid sequence from this point forward
- > **SUBSTITUTION** (one base is substituted for another)
 - If a substitution **changes** the amino acid, it's called a **MISSENSE** mutation
 - If a substitution **does not change** the amino acid, it's called a **SILENT** mutation
 - If a substitution **changes the amino acid to a "stop,"** it's called a **NONSENSE** mutation



Complete the boxes below. Classify each as Deletion, Insertion or Substitution **AND** as either frameshift, missense, silent or nonsense (*Hint: Deletion & Insertion will always be frameshift*).

Original DNA Sequence: T A C A C C T T G G C G A C G A C T ...
mRNA Sequence: A U G U G G A A C C G C U G C U G A
Amino Acid Sequence: MET - TRP - ASN - ARG - CYS - STOP

Mutated DNA Sequence #1 T A C A T C T T G G C G A C G A C T ...
What's the mRNA sequence? A U G U A G A A C C G C U G C U G A (Circle the change)
amino acid sequence? MET - STOP
Will there likely be effects? YES What type of mutation is this? point mutation - nonsense

Mutated DNA Sequence #2 T A C G A C C T T G G C G A C G A C T ...
What's the mRNA sequence? A U G C U G G A A C C G C U G C U G A (Circle the change)
amino acid sequence? MET - LEU - GLU - PRO - LEU - LEU
Will there likely be effects? YES What type of mutation is this? insertion - frameshift

Mutated DNA Sequence #3 T A C A C C T T A G C G A C G A C T ...
What's the mRNA sequence? A U G U G G A A C G C U G C U G A (Circle the change)
amino acid sequence? MET-TRP-ASN- ARG- CYS - STOP
Will there likely be effects? NO What type of mutation is this? point mutation - silent

Mutated DNA Sequence #4 T A C A C C T T G G C G A C T A C T ...
What's the mRNA sequence? A U G U G G A A C C G C U C A U G A (Circle the change)
amino acid sequence? MET - TRP - ASN - ARG - STOP
Will there likely be effects? YES What type of mutation is this? point mutation - nonsense

Worksheet Mutations Practice Answers

Dominic Wilkinson, Julian Savulescu



Worksheet Mutations Practice Answers

The Making of the Fittest: DNA and the Ultimate Forensic Record of Evolution Sean B. Carroll, 2007-08-28 A geneticist discusses the role of DNA in the evolution of life on Earth explaining how an analysis of DNA reveals a complete record of the events that have shaped each species and how it provides evidence of the validity of the theory of evolution

Biology for AP ® Courses Julianne Zedalis, John Eggebrecht, 2017-10-16 Biology for AP courses covers the scope and sequence requirements of a typical two semester Advanced Placement biology course The text provides comprehensive coverage of foundational research and core biology concepts through an evolutionary lens Biology for AP Courses was designed to meet and exceed the requirements of the College Board's AP Biology framework while allowing significant flexibility for instructors Each section of the book includes an introduction based on the AP curriculum and includes rich features that engage students in scientific practice and AP test preparation it also highlights careers and research opportunities in biological sciences

Strengthening Forensic Science in the United States National Research Council, Division on Engineering and Physical Sciences, Committee on Applied and Theoretical Statistics, Policy and Global Affairs, Committee on Science, Technology, and Law, Committee on Identifying the Needs of the Forensic Sciences Community, 2009-07-29 Scores of talented and dedicated people serve the forensic science community performing vitally important work However they are often constrained by lack of adequate resources sound policies and national support It is clear that change and advancements both systematic and scientific are needed in a number of forensic science disciplines to ensure the reliability of work establish enforceable standards and promote best practices with consistent application Strengthening Forensic Science in the United States A Path Forward provides a detailed plan for addressing these needs and suggests the creation of a new government entity the National Institute of Forensic Science to establish and enforce standards within the forensic science community The benefits of improving and regulating the forensic science disciplines are clear assisting law enforcement officials enhancing homeland security and reducing the risk of wrongful conviction and exoneration Strengthening Forensic Science in the United States gives a full account of what is needed to advance the forensic science disciplines including upgrading of systems and organizational structures better training widespread adoption of uniform and enforceable best practices and mandatory certification and accreditation programs While this book provides an essential call to action for congress and policy makers it also serves as a vital tool for law enforcement agencies criminal prosecutors and attorneys and forensic science educators

Ethics, Conflict and Medical Treatment for Children E-Book Dominic Wilkinson, Julian Savulescu, 2018-08-05 What should happen when doctors and parents disagree about what would be best for a child When should courts become involved Should life support be stopped against parents wishes The case of Charlie Gard reached global attention in 2017 It led to widespread debate about the ethics of disagreements between doctors and parents about the place of the law in such disputes and about the variation in approach between different parts of the world In this book medical ethicists Dominic Wilkinson and Julian Savulescu critically examine the ethical questions at the heart of disputes about medical treatment for children They use the Gard case as a springboard to a wider discussion about the rights of parents the harms of treatment and the vital issue of limited resources They discuss other prominent UK and international cases of disagreement and conflict From opposite sides of the debate Wilkinson and Savulescu provocatively outline the strongest arguments in favour of and against treatment They analyse some of the distinctive and challenging features of treatment disputes in the 21st century and argue that disagreement about controversial ethical questions is both inevitable and desirable They outline a series of lessons from the Gard case and propose a radical new dissensus framework for future cases of disagreement This new book critically examines the core ethical questions at the heart of disputes about medical treatment for children The contents review prominent cases of disagreement from the UK and internationally and analyse some of the distinctive and challenging features around treatment disputes in the 21st century The book proposes a radical new framework for future cases of disagreement around the care of gravely ill people

Mutation and Evolution Ronny C. Woodruff, James N. Thompson, 2012-12-06 Although debated since the time of Darwin the evolutionary role of mutation is still controversial In over 40 chapters from leading authorities in mutation and evolutionary biology this book takes a new look at both the theoretical and experimental measurement and significance of new mutation Deleterious nearly neutral beneficial and polygenic mutations are considered in their effects on fitness life history traits and the composition of the gene pool Mutation is a phenomenon that draws attention from many different disciplines Thus the extensive reviews of the literature will be valuable both to established researchers and to those just beginning to study this field Through up to date reviews the authors provide an insightful overview of each topic and then share their newest ideas and explore controversial aspects of mutation and the evolutionary process From topics like gonadal mosaicism and mutation clusters to adaptive mutagenesis mutation in cell organelles and the level and distribution of DNA molecular changes the foundation is set for continuing the debate about the role of mutation fitness and adaptability It is a debate that will have profound consequences for our understanding of evolution

Pearson Biology Queensland 12 Skills and Assessment Book Yvonne Sanders, 2018-09-04 Introducing the Pearson Biology 12 Queensland Skills and Assessment Book Fully aligned to the new QCE 2019 Syllabus Write in Skills and Assessment Book written to support teaching and learning across all requirements of the new Syllabus providing practice application and consolidation of learning Opportunities to apply and practice performing calculations and using algorithms are integrated throughout worksheets practical activities and question sets All activities are mapped from the Student Book at the recommend point of engagement in the teaching program making integration of practice and rich learning activities a seamless inclusion Developed by highly experienced and expert author teams with lead Queensland specialists who have a working understand what teachers are looking for to support working with a new syllabus

Everything You Need to Ace Biology in One Big Fat Notebook Workman Publishing, Matthew Brown, 2021-04-27 Biology No Problem This Big Fat Notebook covers everything you need to know during a year of high school BIOLOGY class breaking down one big bad subject into accessible units Including biological classification cell theory photosynthesis bacteria viruses mold fungi the human body plant and animal reproduction DNA RNA evolution genetic engineering the ecosystem and more Study better with mnemonic devices definitions diagrams educational doodles and quizzes to recap it all Millions and millions of BIG FAT NOTEBOOKS sold

Microbiology Nina Parker, OpenStax, Mark Schneegurt, Anh Hue Thi Tu, Brian M. Forster, Philip Lister, 2016-05-30 Microbiology covers the scope and sequence requirements for a single semester microbiology course for non majors The book presents the core concepts of microbiology with a focus on applications for careers in allied health The pedagogical features of the text make the material interesting and accessible while maintaining the career application focus and scientific rigor inherent in the subject matter Microbiology s art program enhances students understanding of concepts through clear and effective illustrations diagrams and photographs Microbiology is produced through a collaborative publishing agreement between OpenStax and the American Society for Microbiology Press The book aligns with the curriculum guidelines of the American Society for Microbiology BC Campus website

Potential Risks and Benefits of Gain-of-Function Research National Research Council, Institute of Medicine, Board on Health Sciences Policy, Policy and Global Affairs, Committee on Science, Technology, and Law, Division on Earth and Life Studies, Board on Life Sciences, 2015-04-13 On October 17 2014 spurred by incidents at U S government laboratories that raised serious biosafety concerns the United States government launched a one year deliberative process to address the continuing controversy surrounding so called gain of function GOF research on respiratory pathogens with pandemic potential The gain of function controversy began in late 2011 with the question of whether to publish the results of two experiments involving H5N1 avian influenza and continued to focus on certain research with highly pathogenic avian influenza over the next three years The heart of the U S process is an evaluation of the potential risks and benefits of certain types of GOF experiments with influenza SARS and MERS viruses that would inform the development and adoption of a new U S Government policy governing the funding and conduct of GOF research Potential Risks and Benefits of Gain of Function Research is the summary of a two day public symposia on GOF research Convened in December 2014 by the Institute of Medicine and the National Research Council the main focus of this event was to discuss principles important for and key considerations in the design of risk and benefit assessments of GOF research Participants examined the underlying scientific and technical questions that are the source of current discussion and debate over GOF research involving pathogens with pandemic potential This report is a record of the presentations and discussion of the meeting

Design and Analysis of DNA Microarray Investigations Richard M. Simon, Edward L. Korn, Lisa M. McShane, Michael D. Radmacher, George W. Wright, Yingdong Zhao, 2006-05-09 The analysis of gene expression profile data from DNA micorarray studies are discussed in this book It provides a review of available methods and presents it in a manner that is intelligible to biologists It offers an understanding of the design and analysis of experiments utilizing microarrays to benefit scientists It includes an Appendix tutorial on the use of BRB ArrayTools and step by step analyses of several major datasets using this software which is available from the National Cancer Institute

Mayo Clinic Internal Medicine Board Review Questions and Answers Robert D. Ficalora, 2013-08-15 Companion volume to Mayo Clinic internal medicine board review 10th ed c2013

Sophie's World Jostein Gaarder,2007-03-20 A page turning novel that is also an exploration of the great philosophical concepts of Western thought Jostein Gaarder s Sophie s World has fired the imagination of readers all over the world with more than twenty million copies in print One day fourteen year old Sophie Amundsen comes home from school to find in her mailbox two notes with one question on each Who are you and Where does the world come from From that irresistible beginning Sophie becomes obsessed with questions that take her far beyond what she knows of her Norwegian village Through those letters she enrolls in a kind of correspondence course covering Socrates to Sartre with a mysterious philosopher while receiving letters addressed to another girl Who is Hilde And why does her mail keep turning up To unravel this riddle Sophie must use the philosophy she is learning but the truth turns out to be far more complicated than she could have imagined

Pearson Biology 12 New South Wales Skills and Assessment Book Yvonne Sanders,2018-10-17 The write in Skills and Assessment Activity Books focus on working scientifically skills and assessment They are designed to consolidate concepts learnt in class Students are also provided with regular opportunities for reflection and self evaluation throughout the book

The Double Helix James D. Watson,1969-02 Since its publication in 1968 The Double Helix has given countless readers a rare and exciting look at one highly significant piece of scientific research Watson and Crick s race to discover the molecular structure of DNA

Concepts of Biology Samantha Fowler,Rebecca Roush,James Wise,2018-01-07 Concepts of Biology is designed for the single semester introduction to biology course for non science majors which for many students is their only college level science course As such this course represents an important opportunity for students to develop the necessary knowledge tools and skills to make informed decisions as they continue with their lives Rather than being mired down with facts and vocabulary the typical non science major student needs information presented in a way that is easy to read and understand Even more importantly the content should be meaningful Students do much better when they understand why biology is relevant to their everyday lives For these reasons Concepts of Biology is grounded on an evolutionary basis and includes exciting features that highlight careers in the biological sciences and everyday applications of the concepts at hand We also strive to show the interconnectedness of topics within this extremely broad discipline In order to meet the needs of today s instructors and students we maintain the overall organization and coverage found in most syllabi for this course A strength of Concepts of Biology is that instructors can customize the book adapting it to the approach that works best in their classroom Concepts of Biology also includes an innovative art program that incorporates critical thinking and clicker questions to help students understand and apply key concepts

Probability Rick Durrett,2010-08-30 This classic introduction to probability theory for beginning graduate students covers laws of large numbers central limit theorems random walks martingales Markov chains ergodic theorems and Brownian motion It is a comprehensive treatment concentrating on the results that are the most useful for applications Its philosophy is that the best way to learn probability is to see it in action so there are 200 examples and 450 problems The fourth edition begins with a short chapter on measure theory to orient readers new to the subject

Principles of Biology Lisa Bartee,Walter Shiner,Catherine Creech,2017 The Principles of Biology sequence BI 211 212 and 213 introduces biology as a scientific discipline for students planning to major in biology and other science disciplines Laboratories and classroom activities introduce techniques used to study biological processes and provide opportunities for students to develop their ability to conduct research

Your Genes, Your Choices Catherine Baker,1996 Program discusses the Human Genome Project the science behind it and the ethical legal and social issues raised by the project

IB Biology Student Workbook Tracey Greenwood,Lissa Bainbridge-Smith,Kent Pryor,Richard Allan,2014-10-02

Basic Concepts in Biochemistry: A Student's Survival Guide Hiram F. Gilbert,2000 Basic Concepts in Biochemistry has just one goal to review the toughest concepts in biochemistry in an accessible format so your understanding is through and complete BOOK JACKET

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