INTRODUCTION OF MOLECULAR BIOLOGY pdf

1: Molecular biology | www.enganchecubano.com

The term Molecular biology was first used by Warren Weaver in Molecular biology is the study of molecular underpinnings of the processes of replication, transcription, translation, and cellular function.

It was discovered by Robert Hooke and is the functional unit of all known living organisms. It is the smallest unit of life that is classified as a living thing, and is often called the building block of life. Some organisms, such as most bacteria, are unicellular consist of a single cell. Other organisms, such as humans and birds, are multicellular. The largest known cells are unfertilised ostrich egg cells which weigh 3. The cell theory, first developed in by Matthias Jakob Schleiden and Theodor Schwann, states that all organisms are composed of one or more cells, that all cells come from preexisting cells, that vital functions of an organism occur within cells, and that all cells contain the hereditary information necessary for regulating cell functions and for transmitting information to the next generation of cells. The word cell comes from the Latin cellula, meaning, a small room. The descriptive term for the smallest living biological structure was coined by Robert Hooke in a book he published in when he compared the cork cells he saw through his microscope to the small rooms monks lived in. There are two types of cells: Prokaryotic cells are usually independent, while eukaryotic cells are often found in multicellular organisms. There is abundant evidence of major volcanic eruptions 4 billion years ago, which would have released carbon dioxide, nitrogen, hydrogen sulfide H2S , and sulfur dioxide SO2 into the atmosphere. Experiments using these gases in addition to the ones in the original Millerâ€"Urey experiment have produced more diverse molecules. The experiment created a mixture that was racemic containing both L and D enantiomers and experiments since have shown that "in the lab the two versions are equally likely to appear. However, it is likely that most of the atmospheric carbon was CO2 with perhaps some CO and the nitrogen mostly N2. The hydrogen atoms come mostly from water vapor. In fact, in order to generate aromatic amino acids under primitive earth conditions it is necessary to use less hydrogen-rich gaseous mixtures. Most of the natural amino acids, hydroxyacids, purines, pyrimidines, and sugars have been made in variants of the Miller experiment. The University of Waterloo and University of Colorado conducted simulations in that indicated that the early atmosphere of Earth could have contained up to 40 percent hydrogenâ€"implying a possibly much more hospitable environment for the formation of prebiotic organic molecules. I think this study makes the experiments by Miller and others relevant again. The Murchison meteorite that fell near Murchison, Victoria, Australia in was found to contain over 90 different amino acids, nineteen of which are found in Earth life. Comets and other icy outer-solar-system bodies are thought to contain large amounts of complex carbon compounds such as tholins formed by these processes, darkening surfaces of these bodies. This has been used to infer an origin of life outside of Earth: The Miller and Urey experiment [7] or Ureyâ€"Miller experiment [8] was an experiment that simulated hypothetical conditions thought at the time to be present on the early Earth, and tested for the occurrence of chemical origins of life. Considered to be the classic experiment on the origin of life, it was conducted in [9] and published in by Stanley Miller and Harold Urey at the University of Chicago. That is considerably more than what Miller originally reported, and more than the 20 that naturally occur in life. The chemicals were all sealed inside a sterile array of glass tubes and flasks connected in a loop, with one flask half-full of liquid water and another flask containing a pair of electrodes. The liquid water was heated to induce evaporation, sparks were fired between the electrodes to simulate lightning through the atmosphere and water vapor, and then the atmosphere was cooled again so that the water could condense and trickle back into the first flask in a continuous cycle. Two percent of the carbon had formed amino acids that are used to make proteins in living cells, with glycine as the most abundant. Sugars, liquids, were also formed. Nucleic acids were not formed within the reaction. But the common 20 amino acids were formed, but in various concentrations. In an interview, Stanley Miller stated: Other experiments This experiment inspired many others. His experiment produced a large amount of adenine, which molecules were formed from 5 molecules of HCN. MacNevin was passing , volt sparks through methane and water vapor and produced "resinous solids" that were "too complex for analysis. It is not clear if he ever published any of these results in the primary scientific literature. Wilde submitted a paper to

Science on December 15, , before Miller submitted his paper to the same journal on February 14, He observed only small amounts of carbon dioxide reduction to carbon monoxide, and no other significant reduction products or newly formed carbon compounds. Other researchers were studying UV-photolysis of water vapor with carbon monoxide. They have found that various alcohols, aldehydes and organic acids were synthesized in reaction mixture. However, Bada noted that in current models of early Earth conditions, carbon dioxide and nitrogen N2 create nitrite]s, which destroy amino acids as fast as they form. However, the early Earth may have had significant amounts of iron and carbonate minerals able to neutralize the effects of the nitrites. When Bada performed the Miller-type experiment with the addition of iron and carbonate minerals, the products were rich in amino acids. This suggests the origin of significant amounts of amino acids may have occurred on Earth even with an atmosphere containing carbon dioxide and nitrogen. In other words, neither their DNA nor any of their other sites of metabolic activity are collected together in a discrete membrane-enclosed area. Instead, everything is openly accessible within the cell, some of which is free-floating. A distinction between prokaryotes and eukaryotes meaning true kernel, also spelled "eucaryotes" is that eukaryotes do have "true" nuclei containing their DNA. Unlike prokaryotes, eukaryotic organisms may be unicellular, as in amoebae, or multicellular, as in plants and animals. The difference between the structure of prokaryotes and eukaryotes is so great that it is sometimes considered to be the most important distinction among groups of organisms. The cell structure of prokaryotes differs greatly from that of eukaryotes. The defining characteristic is the absence of a nucleus. Also the size of Ribosomes in prokaryotes is smaller than that in eukaryotes, which is now where respiration takes place. In general, prokaryotes lack the following membrane-bound cell compartments: Instead, processes such as oxidative phosphorylation and photosynthesis take place across the prokaryotic plasma membrane. However, prokaryotes do possess some internal structures, such as cytoskeletons, and the bacterial order Planctomycetes have a membrane around their nucleoid and contain other membrane-bound cellular structures. Prokaryotes are usually much smaller than eukaryotic cells. Prokaryotes also differ from eukaryotes in that they contain only a single loop of stable chromosomal DNA stored in an area named the nucleoid, whereas eukaryote DNA is found on tightly bound and organized chromosomes. Although some eukaryotes have satellite DNA structures called plasmids, in general these are regarded as a prokaryote feature, and many important genes in prokaryotes are stored on plasmids. Prokaryotes have a larger surface-area-to-volume ratio giving them a higher metabolic rate, a higher growth rate, and, as a consequence, a shorter generation time compared to Eukaryotes. A criticism of this classification is that the word "prokaryote" is based on what these organisms are not they are not eukaryotic , rather than what they are either archaea or bacteria. In , Carl Woese proposed dividing prokaryotes into the Bacteria and Archaea originally Eubacteria and Archaebacteria because of the major differences in the structure and genetics between the two groups of organisms. This arrangement of Eukaryota also called "Eukarya" , Bacteria, and Archaea is called the three-domain system, replacing the traditional two-empire system. Eukaryotic cell[edit] The cells of eukaryotes left and prokaryotes right The origin of the eukaryotic cell was a milestone in the evolution of life, since they include all complex cells and almost all multi-cellular organisms. The timing of this series of events is hard to determine; Knoll suggests they developed approximately 1. Some acritarchs are known from at least 1, million years ago, and the possible alga Grypania has been found as far back as 2, million years ago. Fossils that are clearly related to modern groups start appearing around 1. Biomarkers suggest that at least stem eukaryotes arose even earlier. The presence of steranes in Australian shales indicates that eukaryotes were present 2. There are many different types of eukaryotic cells, though animals and plants are the most familiar eukaryotes, and thus provide an excellent starting point for understanding eukaryotic structure. Fungi and many protists have some substantial differences, however. Animal cell An animal cell is a form of eukaryotic cell that makes up many tissues in animals. The animal cell is distinct from other eukaryotes, most notably plant cells, as they lack cell walls and chloroplasts, and they have smaller vacuoles. Due to the lack of a rigid cell wall, animal cells can adopt a variety of shapes, and a phagocytic cell can even engulf other structures. There are many different cell types. For instance, there are approximately distinct cell types in the adult human body. Plant cell Plant cells are quite different from the cells of the other eukaryotic organisms. Their distinctive features are: Plastids, especially chloroplasts that contain chlorophyll, the pigment that gives plants

their green color and allows them to perform photosynthesis Higher plants, including conifers and flowering plants Angiospermae lack the flagellae and centrioles that are present in animal cells. Fungal cell Fungal cells are most similar to animal cells, with the following exceptions: A cell wall that contains chitin Less definition between cells; the hyphae of higher fungi have porous partitions called septa, which allow the passage of cytoplasm, organelles, and, sometimes, nuclei. Primitive fungi have few or no septa, so each organism is essentially a giant multinucleate supercell; these fungi are described as coenocytic. Only the most primitive fungi, chytrids, have flagella. Other eukaryotic cells Eukaryotes are a very diverse group, and their cell structures are equally diverse. Many have cell walls; many do not. Many have chloroplasts, derived from primary, secondary, or even tertiary endosymbiosis; and many do not. Some groups have unique structures, such as the cyanelles of the glaucophytes, the haptonema of the haptophytes, or the ejectisomes of the cryptomonads. Other structures, such as pseudopods, are found in various eukaryote groups in different forms, such as the lobose amoebozoans or the reticulose foraminiferans. Comparison of features of Prokaryotic and Eukaryotic cells.

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2: Biology - Wikipedia

Molecular biology is often separated from the field of cell biology, which concentrates on cellular structures (organelles and the like), molecular pathways within cells and cell life cycles. The molecules which form the basis of life provide scientists with a more predictable and mechanistic tool for scientists to study.

Introduction to Molecular Biology BIOT 3 Credits A thorough grounding in the fundamentals of biology, including a broad review of the life sciences with emphasis on molecular biology. Topics include the basic concepts and processes of cell biology, molecular biology, and immunology. The components of a cell, the processes occurring in a single cell, and the functioning of a multicellular organism are explained. Discussion also covers the use of model organisms to understand basic and applied biology. See all BIOT courses. The discount for Federal employees and their spouses and eligible dependents will be applied to out-of-state tuition and specialty graduate programs. It does not apply to doctoral programs. This discount cannot be combined with the Completion Scholarship for Maryland community college students or the Pennsylvania Completion Scholarship. Undergraduate and standard graduate program tuition for students who meet the criteria for Maryland residency will be the applicable in-state rate. Public Health Service and National Oceanic and Atmospheric Administration; and the spouses and dependents of these student groups will be the applicable military or specialty rate. View important information about the education debt, earnings, and completion rates of students enrolled in certificate programs. All students are required to pay tuition for all courses in which they are enrolled. They may be changed, or other charges may be included, as a result of the Board of Regents decisions. Notwithstanding any other provision of this or any other university publication, the university reserves the right to make changes in tuition, fees and other charges at any time such changes are deemed necessary by the university and the USM Board of Regents. Requests for services for example, transcripts, diplomas, registration will be denied until all debts are paid. Please see the USM residency policy for specific details about residency requirements. Financial aid and tuition remission for University System of Maryland employees cannot be applied to noncredit courses. Golden ID benefits may not be applied to fees, noncredit courses, specialty graduate programs, or doctoral programs. GI Bill is a registered trademark of the U. Department of Veterans Affairs. More information about education benefits offered by VA is available on the U. The UCSP requirement may be waived if you previously earned a graduate degree from a regionally accredited institution. For more information, contact your academic advisor.

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3: Introduction to Molecular Biology Information Resources (Home Page)

A science background or knowledge of molecular biology and genetics, and experience with the resources covered in the introductory course, is required for the Advanced Workshop.

Introduction to Biology Biology is the "study of life. Hopefully, this is where you will begin to develop an appreciation for the scope of topics that biology addresses. Completing this unit should take you approximately 4 hours. Basic Chemistry Life is driven by chemical processes. Many topics in chemistry overlap with basic biology principles. To fully understand biology, you must have a basic understanding and appreciation of chemistry. The readings and lectures presented below can help you prepare for the topics in the course as well serve as a resource to which you can refer throughout the semester. This unit contains a series of YouTube video lectures that will address basic chemistry topics. You may find that the importance and organization of this unit will make more sense as you proceed through the course. Completing this unit should take you approximately 5 hours. Biological Molecules All organisms contain the organic biological molecules â€" carbohydrates, proteins, lipids, and nucleic acid â€" that are essential to life. Having an understanding of the structures and functions of these molecules will help you understand what organic molecules our body needs to function properly. Cells and Cell Membranes Cells are the smallest unit of life. This unit will help you to understand the characteristics, components, and functions of a cell. By learning the structures of the cells, you can see the similarities and differences between organisms. Bacteria, plant, animal, and fungus cells are similar in many ways and contain many of the same small structures known as organelles. However, there are characteristics that can help you distinguish whether a cell belongs to an animal, plant, fungus, or bacteria. For example, all plant cells contain cell walls, while animal cells lack this particular organelle. It is the water within a cell pressing against the cell wall that gives a plant its rigidity and your celery its crunch! Completing this unit should take you approximately 10 hours. Enzymes, Metabolism, Cellular Respiration The cell uses enzymes and metabolic pathways to conduct the chemical reactions within the body. The sum total of every chemical reaction in your body is known as your "metabolism. Completing this unit should take you approximately 9 hours. Photosynthesis Have you ever wondered how a plant grows from a tiny acorn to a giant oak? Where does all that biomass come from? How does it get the energy to grow? This unit will help you answer those questions by discussing photosynthesis. Photosynthesis is the fascinating process by which plants convert light energy to chemical energy. Because plants are at the bottom of the food pyramid in almost all ecological systems, understanding how they grow and develop will give you a greater understanding of your environment. Mitosis This unit discusses the process of cellular division known as mitosis. Mitosis happens in almost every cell of your body and is responsible for growth as well as the replacement of damaged cells. Serious consequences, such as cancer, can occur if this cell cycle is disrupted in some way. The topics you will study in this unit are essential in understanding basic principles about your health. Completing this unit should take you approximately 6 hours. Meiosis Meiosis is a specialized type of cellular reproduction that only occurs in the ovaries and testes and results in an egg or sperm, respectively. Sexual reproduction is responsible for the amazing amount of diversity within a species. When sperm fertilizes an egg, the resulting offspring contain genes from the father and the mother. In essence, you contain, at least in a small part, genes from ALL of your ancestors. Are you concerned about developing a disease that another family member struggles with? These are the types of questions that can be answered with an understanding of genetics. This unit will teach you about the basic principles of inheritance and will help you understand the chances of a trait being passed from one generation to another. Gene Expression In this unit, you will learn about the universal genetic codes deoxyribonucleic acid and ribonucleic acid, which are better known as DNA and RNA. This unit will give you a greater understanding of the genetic code and its impact on your life. Study Guides and Review Exercises These study guides are intended to help reinforce key concepts in each unit in preparation for the final exam. Each unit study guide aligns with course outcomes and provides a summary of the core competencies and a list of vocabulary terms. The study guides are not meant to replace the readings and videos that make up the course. The vocabulary lists include some terms that might help you answer some of the

review items, and some terms you should be familiar with to be successful in completing the final exam for the course.

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4: Course: BIO Introduction to Molecular and Cellular Biology

3 1. Introduction to microscopic techniques Microscopes are optical devices which allow observation of objects of microscopic size (less than 70Âµm) and which are invisible for human eye.

Intuitively, the linking number represents the number of times that each curve winds around the other. The linking number is always an integer, but may be positive or negative depending on the orientation of the two curves. Since the linking number L of supercoiled DNA is the number of times the two strands are intertwined and both strands remain covalently intact , L cannot change. The reference state or parameter L0 of a circular DNA duplex is its relaxed state. The word "histone" dates from the late 19th century and is from the German "Histon", of uncertain origin: Until the early s, histones were dismissed by most as inert packing material for eukaryotic nuclear DNA, based in part on the "ball and stick" models of Mark Ptashne and others who believed transcription was activated by protein-DNA and protein-protein interactions on largely naked DNA templates, as is the case in bacteria. During the s, work by Michael Grunstein [18] demonstrated that eukaryotic histones repress gene transcription, and that the function of transcriptional activators is to overcome this repression. We now know that histones play both positive and negative roles in gene expression, forming the basis of the histone code. The view is from the top through the superhelical axis. Despite the differences in their topology, these three folds share a homologous helix-strand-helix HSH motif. Using an electron paramagnetic resonance spin-labeling technique, British researchers measured the distances between the spools around which eukaryotic cells wind their DNA. In all, histones make five types of interactions with DNA: Helix-dipoles from alpha-helices in H2B, H3, and H4 cause a net positive charge to accumulate at the point of interaction with negatively charged phosphate groups on DNA Hydrogen bonds between the DNA backbone and the amide group on the main chain of histone proteins Nonpolar interactions between the histone and deoxyribose sugars on DNA Salt bridges and hydrogen bonds between side chains of basic amino acids especially lysine and arginine and phosphate oxygens on DNA Non-specific minor groove insertions of the H3 and H2B N-terminal tails into two minor grooves each on the DNA molecule The highly basic nature of histones, aside from facilitating DNA-histone interactions, contributes to the water solubility of histones. Histones are subject to post translational modification by enzymes primarily on their N-terminal tails, but also in their globular domains. Such modifications include methylation, citrullination, acetylation, phosphorylation, SUMOylation, ubiquitination, and ADP-ribosylation. This affects their function of gene regulation. In general, genes that are active have less bound histone, while inactive genes are highly associated with histones during interphase. It also appears that the structure of histones has been evolutionarily conserved, as any deleterious mutations would be severely maladaptive. Due to the highly basic charge of all four core histones, the histone octamer is only stable in the presence of DNA or very high salt concentrations. Nucleosomes are folded through a series of successively higher order structures to eventually form a chromosome; this both compacts DNA and creates an added layer of regulatory control which ensures correct gene expression. Nucleosomes are thought to carry epigenetically inherited information in the form of covalent modifications of their core histones. The nucleosome core particle consists of about bp of DNA wrapped in 1. Adjacent nucleosomes are joined by a stretch of free DNA termed "linker DNA" which varies from 10 - 80 bp in length depending on species and tissue type. One or more DNA-binding domains are often part of a larger protein consisting of additional domains with differing function. The additional domains often regulate the activity of the DNA-binding domain. The function of DNA binding is either structural or involving transcription regulation, with the two roles sometimes overlapping. DNA-binding domains with functions involving DNA structure have biological roles in the replication, repair, storage, and modification of DNA, such as methylation. Many proteins involved in the regulation of gene expression contain DNA-binding domains. For example, proteins that regulate transcription by binding DNA are called transcription factors. The final output of most cellular signaling cascades is gene regulation. The DBD interacts with the nucleotides of DNA in a DNA sequence-specific or non-sequence-specific manner, but even non-sequence-specific recognition involves some sort of molecular complementarity between protein and DNA. Many DNA-binding domains must

recognize specific DNA sequences, such as DBDs of transcription factors that activate specific genes, or those of enzymes that modify DNA at specific sites, like restriction enzymes and telomerase. The hydrogen bonding pattern in the DNA major groove is less degenerate than that of the DNA minor groove, providing a more attractive site for sequence-specific DNA recognition. The specificity of DNA-binding proteins can be studied using many biochemical and biophysical techniques, such as gel electrophoresis, analytical ultracentrifugation, calorimetry, DNA mutation, protein structure mutation or modification, nuclear magnetic resonance, x-ray crystallography, surface plasmon resonance, electron paramagnetic resonance, cross-linking and Microscale Thermophoresis MST. In eukaryotes, the homeodomain comprises 2 helices, one of which recognizes the DNA aka recognition helix. Zinc atoms are represented by grey spheres and the coordinating cysteine sidechains are depicted as sticks. The zinc finger This domain is generally between 23 and 28 amino acids long and is stabilized by coordinating Zinc ions with regularly spaced zinc-coordinating residues either histidines or cysteines. The most common class of zinc finger Cys2His2 coordinates a single zinc ion and consists of a recognition helix and a 2-strand beta-sheet. In transcription factors these domains are often found in arrays usually separated by short linker sequences and adjacent fingers are spaced at 3 basepair intervals when bound to DNA.

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5: Introduction to Molecular Biology (BIOT) | UMUC

1 Introduction to Molecular Biology Cells are fundamental building blocks of living organisms. Cells contain a nucleus, mito-chondria and chloroplasts, endoplasmatic.

It was used again in in a work entitled Philosophiae naturalis sive physicae: The term came into its modern usage with the six-volume treatise Biologie, oder Philosophie der lebenden Natur â€"22 by Gottfried Reinhold Treviranus , who announced: The science that concerns itself with these objects we will indicate by the name biology [Biologie] or the doctrine of life [Lebenslehre]. Although modern biology is a relatively recent development, sciences related to and included within it have been studied since ancient times. Natural philosophy was studied as early as the ancient civilizations of Mesopotamia , Egypt , the Indian subcontinent , and China. However, the origins of modern biology and its approach to the study of nature are most often traced back to ancient Greece. Especially important are his History of Animals and other works where he showed naturalist leanings, and later more empirical works that focused on biological causation and the diversity of life. Medicine was especially well studied by Islamic scholars working in Greek philosopher traditions, while natural history drew heavily on Aristotelian thought, especially in upholding a fixed hierarchy of life. It was then that scholars discovered spermatozoa , bacteria , infusoria and the diversity of microscopic life. Investigations by Jan Swammerdam led to new interest in entomology and helped to develop the basic techniques of microscopic dissection and staining. In the early 19th century, a number of biologists pointed to the central importance of the cell. Then, in , Schleiden and Schwann began promoting the now universal ideas that 1 the basic unit of organisms is the cell and 2 that individual cells have all the characteristics of life , although they opposed the idea that 3 all cells come from the division of other cells. Thanks to the work of Robert Remak and Rudolf Virchow , however, by the s most biologists accepted all three tenets of what came to be known as cell theory. Carl Linnaeus published a basic taxonomy for the natural world in variations of which have been in use ever since , and in the s introduced scientific names for all his species. Although he was opposed to evolution, Buffon is a key figure in the history of evolutionary thought ; his work influenced the evolutionary theories of both Lamarck and Darwin. The discovery of the physical representation of heredity came along with evolutionary principles and population genetics. In the s and early s, experiments pointed to DNA as the component of chromosomes that held the trait-carrying units that had become known as genes. A focus on new kinds of model organisms such as viruses and bacteria , along with the discovery of the double helical structure of DNA in , marked the transition to the era of molecular genetics. From the s to present times, biology has been vastly extended in the molecular domain. Finally, the Human Genome Project was launched in with the goal of mapping the general human genome. This project was essentially completed in , [23] with further analysis still being published. The Human Genome Project was the first step in a globalized effort to incorporate accumulated knowledge of biology into a functional, molecular definition of the human body and the bodies of other organisms. Foundations of modern biology Cell theory Human cancer cells with nuclei specifically the DNA stained blue. The central and rightmost cell are in interphase , so the entire nuclei are labeled. The cell on the left is going through mitosis and its DNA has condensed. Cell theory Cell theory states that the cell is the fundamental unit of life , that all living things are composed of one or more cells, and that all cells arise from pre-existing cells through cell division. The cell is also considered to be the basic unit in many pathological processes. Finally, cells contain hereditary information DNA , which is passed from cell to cell during cell division. Research into the origin of life, abiogenesis , amounts to an attempt to discover the origin of the first cells. Evolution A central organizing concept in biology is that life changes and develops through evolution, and that all life-forms known have a common origin. The theory of evolution postulates that all organisms on the Earth , both living and extinct, have descended from a common ancestor or an ancestral gene pool. This universal common ancestor of all organisms is believed to have appeared about 3. Darwin theorized that species flourish or die when subjected to the processes of natural selection or selective breeding. Widely varied approaches to biology generate information about phylogeny. These include the comparisons of DNA sequences , a product of molecular biology more particularly

genomics , and comparisons of fossils or other records of ancient organisms, a product of paleontology. For a summary of major events in the evolution of life as currently understood by biologists, see evolutionary timeline. Evolution is relevant to the understanding of the natural history of life forms and to the understanding of the organization of current life forms. But, those organizations can only be understood in the light of how they came to be by way of the process of evolution. Consequently, evolution is central to all fields of biology. Genetics Genes are the primary units of inheritance in all organisms. A gene is a unit of heredity and corresponds to a region of DNA that influences the form or function of an organism in specific ways. All organisms, from bacteria to animals, share the same basic machinery that copies and translates DNA into proteins. The translation code from RNA codon to amino acid is the same for most organisms. For example, a sequence of DNA that codes for insulin in humans also codes for insulin when inserted into other organisms, such as plants. A chromosome is an organized structure consisting of DNA and histones. In eukaryotes, genomic DNA is localized in the cell nucleus , or with small amounts in mitochondria and chloroplasts. In prokaryotes, the DNA is held within an irregularly shaped body in the cytoplasm called the nucleoid. In turn, ACTH directs the adrenal cortex to secrete glucocorticoids , such as cortisol. The GCs then reduce the rate of secretion by the hypothalamus and the pituitary gland once a sufficient amount of GCs has been released. All living organisms , whether unicellular or multicellular , exhibit homeostasis. After the detection of a perturbation, a biological system normally responds through negative feedback that stabilize conditions by reducing or increasing the activity of an organ or system. One example is the release of glucagon when sugar levels are too low. Basic overview of energy and human life. Energy The survival of a living organism depends on the continuous input of energy. Chemical reactions that are responsible for its structure and function are tuned to extract energy from substances that act as its food and transform them to help form new cells and sustain them. The organisms responsible for the introduction of energy into an ecosystem are known as producers or autotrophs. Nearly all such organisms originally draw their energy from the sun. The majority of the rest of this biomass and energy are lost as waste molecules and heat. The most important processes for converting the energy trapped in chemical substances into energy useful to sustain life are metabolism [44] and cellular respiration. Molecular biology , Cell biology , Genetics , and Developmental biology Schematic of typical animal cell depicting the various organelles and structures. Molecular biology is the study of biology at the molecular level. Molecular biology is a study of the interactions of the various systems within a cell, including the interrelationships of DNA, RNA, and protein synthesis and how those interactions are regulated. The next larger scale, cell biology , studies the structural and physiological properties of cells , including their internal behavior , interactions with other cells, and with their environment. This is done on both the microscopic and molecular levels, for unicellular organisms such as bacteria , as well as the specialized cells of multicellular organisms such as humans. Understanding the structure and function of cells is fundamental to all of the biological sciences. The similarities and differences between cell types are particularly relevant to molecular biology. Anatomy is a treatment of the macroscopic forms of such structures organs and organ systems. Genetics provides research tools used in the investigation of the function of a particular gene, or the analysis of genetic interactions. Within organisms, genetic information is physically represented as chromosomes , within which it is represented by a particular sequence of amino acids in particular DNA molecules. Developmental biology studies the process by which organisms grow and develop. Developmental biology, originated from embryology , studies the genetic control of cell growth , cellular differentiation , and "cellular morphogenesis ," which is the process that progressively gives rise to tissues , organs , and anatomy. Model organisms for developmental biology include the round worm Caenorhabditis elegans , [50] the fruit fly Drosophila melanogaster , [51] the zebrafish Danio rerio , [52] the mouse Mus musculus , [53] and the weed Arabidopsis thaliana. Physiology Physiology is the study of the mechanical, physical, and biochemical processes of living organisms function as a whole. The theme of "structure to function" is central to biology. Physiological studies have traditionally been divided into plant physiology and animal physiology , but some principles of physiology are universal, no matter what particular organism is being studied. For example, what is learned about the physiology of yeast cells can also apply to human cells. The field of animal physiology extends the tools and methods of human physiology to non-human species.

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Plant physiology borrows techniques from both research fields. Physiology is the study the interaction of how, for example, the nervous , immune , endocrine , respiratory , and circulatory systems, function and interact. The study of these systems is shared with such medically oriented disciplines as neurology and immunology. Evolutionary Evolutionary research is concerned with the origin and descent of species , and their change over time. It employs scientists from many taxonomically oriented disciplines, for example, those with special training in particular organisms such as mammalogy , ornithology , botany , or herpetology , but are of use in answering more general questions about evolution. Evolutionary biology is partly based on paleontology , which uses the fossil record to answer questions about the mode and tempo of evolution, [57] and partly on the developments in areas such as population genetics. Systematic A phylogenetic tree of all living things, based on rRNA gene data, showing the separation of the three domains bacteria , archaea , and eukaryotes as described initially by Carl Woese. Trees constructed with other genes are generally similar, although they may place some early-branching groups very differently, presumably owing to rapid rRNA evolution. The exact relationships of the three domains are still being debated. Intermediate minor rankings are not shown. Systematics Multiple speciation events create a tree structured system of relationships between species. The role of systematics is to study these relationships and thus the differences and similarities between species and groups of species. Monera ; Protista ; Fungi ; Plantae ; Animalia. Modern alternative classification systems generally begin with the three-domain system: Archaea originally Archaebacteria ; Bacteria originally Eubacteria and Eukaryota including protists , fungi , plants , and animals [63] These domains reflect whether the cells have nuclei or not, as well as differences in the chemical composition of key biomolecules such as ribosomes. Outside of these categories, there are obligate intracellular parasites that are "on the edge of life" [64] in terms of metabolic activity, meaning that many scientists do not actually classify such structures as alive, due to their lack of at least one or more of the fundamental functions or characteristics that define life. They are classified as viruses , viroids , prions , or satellites. The scientific name of an organism is generated from its genus and species. For example, humans are listed as Homo sapiens. Homo is the genus, and sapiens the species. When writing the scientific name of an organism, it is proper to capitalize the first letter in the genus and put all of the species in lowercase. It includes ranks and binomial nomenclature.

6: Introduction â€¢ Molecular Biology Colorado College

A brief and accessible introduction to molecular biology for students and professionals who want to understand this rapidly expanding field. Recent research in molecular biology has produced a remarkably detailed understanding of how living things operate.

7: Introduction to Biology | Biology | MIT OpenCourseWare

Introduction to Molecular Biology focuses on the principles of polymer physics and chemistry and their applications to fundamental phenomena in biological sciences.

8: Introduction to molecular biology - Diamantina Institute - University of Queensland

introduction to molecular biology salwa hassan teama 2. MOLECULAR BIOLOGY Molecular biology; the study of gene structure and functions at the molecular level to understand the molecular basis of hereditary, genetic variation,.. and the expression patterns of genes.

9: An Introduction to Molecular Biology/DNA the unit of life - Wikibooks, open books for an open world

Welcome to BIO Introduction to Molecular and Cellular Biology. This course is intended for the student interested in understanding and appreciating common biological topics in the study of the smallest units within biology: molecules and cells. Molecular and cellular biology is a dynamic field.

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