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The advantage of sexual reproduction is that it generates genetic diversity, which makes a population of mating organisms better able to survive environmental pressures. Meiosis is the process of producing gametes, which are sperm cells and egg cells. Gametes have only half the number of chromosomes that normal cells have, because a sperm and an egg fuse to form a cell that has the full number of chromosomes. Genetic diversity arises due to the shuffling of chromosomes during meiosis. A man produces sperm and a woman produces eggs because their reproductive cells undergo meiosis. Meiosis starts with one cell that has the full number of chromosomes specific to each organism — human cells have 46 chromosomes. It ends with four cells, called gametes, that each have half the full number of chromosomes. Meiosis is a multi-step process in which a cell makes a copy of each strand of DNA, called a chromosome, and then divides twice. Each time it divides, it cuts its DNA content in half. In humans, a cell goes from having 46 strands of DNA, and then 96 after each is copied. The first division of meiosis cuts 96 in half into 46. The second division cuts 46 into 23, which is the number of chromosomes in a sperm or an egg. At the beginning of meiosis, the chromosomes condense from long strands into short, thick finger-like structures. In humans, condensed chromosomes look like an X. Half of the 46 chromosomes in a human cell came from the mother, while the other 23 are similar but came from the father — they form 23 pairs, like 23 pairs of non-identical twins. Chromosomes that form a pair are called homologous chromosomes. During the early part of meiosis, the homologous chromosomes pair up with their non-identical twins and exchange regions of DNA. This process is called crossing over, and results in a shuffling of DNA regions between two homologous chromosomes. Chromosomes are purposely broken and rejoined in new combinations. Meiosis not only shuffles regions of DNA between homologous chromosomes, it shuffles whole chromosomes among the four gametes that result at the end. The distribution of chromosomes among four gametes is called random segregation. If the process of "crossing over" is like tearing blue cards and red cards apart, and then taping the pieces together to get striped cards, then "random segregation" is combining a red deck and a blue deck, shuffling them, and then randomly dividing them into four decks. Random segregation produces four decks of cards that contain different combinations of blue and red cards. The third way that meiosis generates genetic diversity is through the separation of homologous chromosomes into the gametes. As described above, homologous chromosomes are like pairs of non-identical twins. One chromosome of the pair came from mom, the other from dad. Each homologous chromosome can contain the same genes, or slightly different versions of the same gene — which is why they are like non-identical twins and not identical twins. Independent assortment describes the process in which the two homologous chromosomes of a pair must go into separate gametes. This ensures that each gamete can have only one of two homologous chromosomes, meaning each can have only one version of a gene, though the original cell might have had two slightly different versions of a gene. Ph.D., David H. Nguyen., "Three Ways That Genetic Diversity Occurs During Meiosis" sciencing.com., 5 April 2018. APA Ph.D., David H. Nguyen., (2018, April 5). Three Ways That Genetic Diversity Occurs During Meiosis. sciencing.com. Retrieved from Chicago Ph.D., David H. Nguyen., Three Ways That Genetic Diversity Occurs During Meiosis last modified August 30, 2022. Last updated 27 January 2025Includes (in PDF): Review questions covering the material on the test. 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Meiosis Biology Trivia Quiz Meiosis Biology Trivia Quiz The Meiosis Biology Trivia Quiz assesses understanding of human reproductive cells, their formation through meiosis, and their genetic characteristics. It is ideal for learners seeking to deepen their knowledge of genetic... Questions: 8 | Attempts: 450 | Last updated: Sep 19, 2024 Name the two reproductive cells that humans have Meiosis Review Reading Questions (Review) Meiosis Review Reading Questions (Review) This quiz covers key concepts about meiosis and mitosis, focusing on their purposes, products, and roles in reproduction. Questions: 13 | Attempts: 124 | Last updated: Mar 22, 2023 The purpose of mitosis is To create new gametes (sex cells)/ To create new somatic cells (body cells). To drive biology students crazy. Cell Division: What Do You Know About Meiosis? Trivia Quiz Cell Division: What do you know about Meiosis? Trivia Quiz Explore the intricacies of mitosis in this trivia quiz. Understand DNA duplication, genetic variability, and the role of meiosis in reproduction. Assess your knowledge on deletion mutations, differences from mitosis, and the... Questions: 10 | Attempts: 164 | Last updated: Oct 8, 2024 In cellular reproduction which of the following processes occurs the same number of times in meiosis as it does in mitosis? The cytoplasm is divided evenly between the cells. The DNA in the chromosomes is duplicated. The cells divide in equally sized halves. The chromosomes align themselves at opposite ends of the cell. The 3 Weeks Exam Retake (1) assesses understanding of genetic processes in meiosis, focusing on genetic variation, chromosome segregation, and DNA base sequencing. It evaluates critical biological concepts essential for... Questions: 21 | Attempts: 143 | Last updated: Aug 9, 2024 Crossing over between non-sister chromatids during meiosis is significant in heredity. This process most likely leads to an increase in which of the following? The occurrence of polyploidy The expression of dominant traits This quiz focuses on Meiosis, a critical biological process for genetic diversity. It assesses understanding of phases like metaphase I, the implications of nondisjunction, and the genetic basis of conditions like Down syndrome... Questions: 19 | Attempts: 980 | Last updated: Mar 21, 2023 During metaphase I of meiosis, which of the following occurs? Centromeres of replicated chromosomes line up along the cells equator. Sister chromatids separate and move toward opposite poles of the cell. Paired homologous chromosomes line up along the cells equator. Homologous chromosomes separate and move toward opposite poles. Explore the fundamentals of cell division in the '6 Meiosis Review Quiz' This quiz assesses understanding of key concepts like daughter cells, asexual reproduction, gametes, parent cells, and zygotes, crucial for learners... 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The #PurpleSyllabus presents essential topics, readings, and multimedia related to Prince. This syllabus is an offshoot of the "Reparations, Repatriation, and Redress" symposium at the University of Minnesota and presents an archive of scholarly and popular sources on themes related to reparations. 2019 Kidney Tumor Segmentation Challenge The 2019 Kidney Tumor Segmentation Challenge (KIT19) was one of several "grand challenges" associated with the 2019 International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI19) held in Shenzhen, China. Advances in Pharmacy: Journal of Student Solutions to Pharmacy Problems (AJP) was an open access, online publication dedicated to disseminating student research relevant to pharmacy practice. The aim of this publication was to provide an accessible outlet and a learning environment to encourage student participation in rigorous research. Dream of the Red Chamber: Afterlives Dream of the Red Chamber: Afterlives is a companion to the English-language opera co-produced by the San Francisco Opera and the Hong Kong Arts Festival. News and trends in election and voting technology, registration and turnout, and election administration. A comprehensive history of Medicinal Chemistry beginning with the founding of the University of Minnesota's College of Pharmacy in 1892 until today. Journal of Opinions, Ideas, & Essays JOIE provides a venue for a wide variety of articles submitted by retired or active faculty, staff and civil service colleagues of the University. Dr. Wilson challenges readers to think about their own experience of nostalgia and how it may (or may not) fit with the ideas presented here. Ong for Everybody includes an accessible introduction and annotations to the works of Walter J. Ong, S.J. (1912-2003), an American cultural historian and philosopher. 0%(1)0% found this document useful (1 vote)8K viewsThis document is a student worksheet on meiosis. It contains questions to guide students through learning about meiosis, including its importance, the stages and events of meiosis I and II, ...SaveSave Meiosis-Webquest Answer Key For Later0%(0)0% found this document useful, undefined Ques. In meiosis the daughter cells are not similar to that of parent because of (a) Crossing over (b) Synapsis (c) Both (a) and (b) (d) None of these Ques. The daughter cells of meiosis are (a) Haploid (b) Diploid (c) Triploid (d) Polyploid Ques. The number of meiosis required to produce 500 seeds is (a) 125 (b) 250 (c) 500 (d) 625 Ques. Number of daughter cells formed at the end of meiosis are: (a) 2 (b) 4 (c) 6 (d) 8 Related: question bank on Isomerism Ques. When, during the meiotic division, do the centromeres divide? (a) Diplotene (b) Metaphase-I (c) Pachytene (d) Anaphase-II Ques. Homologous pairing in prophase I of meiosis I is called (a) Synapsis (b) Linkage (c) Crossing over (d) Syndesis Ques. When does pairing/synapsis (bivalent formation) occur in meiosis? (a) Diplotene (b) Pachytene (c) Zygotene (d) Leptotene Ques. Meiosis is found at (a) Shoot apex (b) Reproductive part (c) Leaves bud (d) Vegetative parts Related: Human Health and Disease online test Ques. Meiosis is significant because (a) It produces identical cells (b) It restores the original number of chromosomes (after fertilization) (c) There is doubling of DNA contents in the cell (d) It occurs only in vegetative cells Ques. During the meiotic division the (a) Homologous chromosomes are separated (b) The linkage is disturbed (c) The homologous chromosomes do not segregate (d) All of the above Ques. Zygotic meiosis occurs in (a) Gonads (b) Sporogya (c) Sporophytes (d) None of these Ques. Meiosis differs from mitosis as (a) It takes place in vegetative cells (b) It shows crossing over (c) It forms two cells (d) Number of chromosomes remain unchanged Related: Solid state question bank Ques. How many meiotic divisions will be necessary to produce two hundred pollen grains (a) 50 (b) 100 (c) 199 (d) 150 Ques. In meiosis, the centromere divides during (a) Prophase-I (b) Metaphase-I (c) Anaphase-I (d) Anaphase-II Ques. Which one of the following is incorrect regarding meiosis? (a) Meiosis permits great genetic diversity (b) Meiosis involves one division of nucleus and two divisions of chromosomes (c) Termination occurs during Diakinesis (d) Disjunction of chromosomes takes place during Anaphase I Ques. The study of chromosomes at meiotic diplotene shows that (a) The intimately paired chromosomes repel each other and begin to separate (b) The pairing of homologous chromosomes which had initiated in the earlier stage is completed (c) The homologous chromosomes remain united by chiasmata (d) None of the above Related: p block elements questions Ques. The second division in meiosis is called (a) Equational division (b) Reduction division (c) Multiplied division (d) None of the above Ques. Bivalents in meiosis are (a) Tetrad (b) Pairs of non-homologous chromosomes (c) Pairs of several chromatids (d) Pairs of homozygous chromosomes Ques. Before undergoing meiosis the amount of DNA of a cell (a) Halves (b) Doubles (c) Remains same (d) Quadruples Ques. Meiosis can be observed in (a) Root tips (b) Gambium (c) Anther (PMC) (d) Pollen grains Related: Permutation and combination online test Ques. The number of chromosomes after 1 phase of meiotic division in reduction division (a) Remain unchanged (b) Become doubled (c) Become halved (d) None of the above Ques. The significance of meiosis lies in (a) Reduction of the diploid number of chromosomes to haploid (b) Maintaining constancy in the number of diploid chromosomes during sexual reproduction (c) Production of genetic variability in the population of a species (d) All the above Ques. The number of meiosis required to produce 101 pollen grain is (a) 25 (b) 25.25 (c) 25.50 (d) 26 Ques. Meiosis was discovered by (a) Sutton (b) Hofmeister (c) Strasburger (d) Amici Related: Thermodynamics test questions Ques. During the first metaphase of meiosis the centromeres (a) Undergo division (b) Do not divide (c) Divide but do not separate (d) Are not identical Ques. How many meiotic division would be required to produce 101 female gametophytes in an angiosperm (a) 101 (b) 26 (c) 127 (d) None of these Ques. Meiosis can be studied in angiosperms in (a) Dividing pollen mother cells in anther (b) Dividing cells of vascular cambium (c) Shoot apical meristem (d) Root apical meristem Ques. In one meiotic cell division, the cell divides (a) Once (b) Twice (c) Three (d) Four times Related: Organic chemistry class 11 questions Ques. Four daughter cells formed after meiosis are (a) Genetically similar (b) Genetically different (c) Anucleate (d) Multinucleate Ques. In which of the following meiosis takes place (a) Pollen grains (b) Pollen tube (c) Pollen mother cells (d) Generative cells Ques. Terminal meiosis is also known as (a) Zygotic meiosis (b) Gametic meiosis (c) Sporogonic meiosis (d) None of these Ques. In pollen mother cells cytokinesis during meiosis is (a) Successive type (b) Simultaneous type (c) In some cases successive type while in others simultaneous type (d) No cytokinesis takes place Related: Biomolecules class 11 question bank Ques. Which stage connecting link between Meiosis I and Meiosis II (a) Interphase I (b) Interphase II (c) Interkinesis (d) Anaphase I Ques. The term "meiosis" was coined by (a) Hertwig and Van Bevedin (b) Sutton and Boveri (c) Hofmeister and Waldeyer (d) Farmer and Moore Ques. 200 egg cells are produced by (n meiosis) (a) 50 divisions (b) 100 divisions (c) 200 divisions (d) 400 divisions Ques. Coiling of chromatids in mitotic and meiotic division is (a) Paraneimic in both (b) Plectoneimic in both (c) Paraneimic in mitosis and plectoneimic in meiosis (d) Plectoneimic in mitosis and paraneimic in meiosis Related: questions on Carboxylic acids and their derivatives Ques. The role of meiosis (a) Formation of gametes (b) Bringing haplophase (c) Dipping diplophase (d) Completing life cycle Ques. Chromosome number is halved in meiosis during (a) Metaphase-I (b) Anaphase-I (c) Metaphase-II (d) Telophase-I Ques. In meiosis the disjunction of chromosomes occurs during (a) Metaphase I (b) Anaphase I (c) Metaphase II (d) Anaphase II Ques. Meiosis II fails after completion of meiosis I. The phenomenon is (a) Brachymeiosis (b) Dinomitosis (c) Karyokinesis (d) None of these Related: Chemical Equilibrium quiz Ques. Synapsis occurs in which of the following stages of meiosis (a) Leptotene (b) Zygotene (c) Pachytene (d) Diakinesis Ques. Second division of meiosis is (a) Reductional division (b) Multiplied division (c) Equational division (d) None of these Ques. Colchicine arrests meiosis at (a) Prophase (b) Metaphase (c) Anaphase (d) Interphase Ques. Stage connecting meiosis I and meiosis II is (a) Interphase I (b) Interphase II (c) Interkinesis (d) Anaphase I Related: Gravitational force quiz Ques. During meiosis, replication of chromosomes occurs in (a) S-phase (b) S-phase and zygotene (c) S-phase and leptotene (d) All of these Ques. Meiosis occurs in (a) Embryo sac (b) Megaspore (c) Megaspore mother cell (d) Nucellus Ques. Meiosis occurs in ferns at the time of formation of (a) Spores (b) Gametes (c) Protonema (d) Prothallus Ques. Longest phase of meiosis is (a) Prophase I (b) Prophase II (c) Anaphase I (d) Metaphase II Related: equation of a straight line quiz Ques. In meiosis, the daughter cells are not similar to that of parent because of (a) Crossing over (b) Synapsis (c) Both (a) and (b) (d) None of these Ques. In meiosis, chromosomes replicate during (a) Prophase I (b) Prophase II (c) Telophase I (d) Interphase Ques. Meiosis II performs: (a) Separation of sex chromosomes (b) Synthesis of DNA and centromere (c) Separation of homologous chromosomes (d) Separation of chromatids Ques. In meiosis, karyokinesis and cytokinesis occur (a) One time (b) Two times (c) Three times (d) None Related: the acceleration due to gravity quiz Ques. Chromosomal number is not doubled during (a) Meiosis - I (b) Meiosis - II (c) Both (d)None Ques. Terminal meiosis takes place in (a) Most animal and some plants (b) Never occurs in plants (c) Never occurs in animals (d) Is a character of prokaryotes Correct Answer Explanation Prophase I is the correct answer because it is the first phase of meiosis I, which is the process of cell division that produces gametes. During prophase I, the chromosomes condense, homologous chromosomes pair up and exchange genetic material through a process called crossing over. This phase is crucial for genetic diversity as it allows for the shuffling and recombination of genetic material. Therefore, Prophase I is the correct answer in the given sequence of meiotic phases. Correct Answer Explanation Anaphase II is the correct answer because it is the stage in meiosis where the sister chromatids separate and are pulled towards opposite poles of the cell. This is the final step before the formation of four haploid daughter cells. In Anaphase I, the homologous chromosomes separate, while in Anaphase II, the sister chromatids separate. Correct Answer Correct Answer Explanation Telophase I is the correct answer because it is the stage in meiosis where the chromosomes reach the opposite poles of the cell. During this phase, the nuclear envelope reforms around the separated chromosomes and the cytoplasm begins to divide. This marks the end of the first meiotic division and prepares the cell for the second meiotic division. Correct Answer Explanation Prophase II is the correct answer because it is the first stage of meiosis II, which is the second division of meiosis. In Prophase II, the nuclear envelope breaks down, the spindle fibers form, and the chromosomes condense. This is different from Prophase I, which is the first stage of meiosis I and involves crossing over and the pairing of homologous chromosomes. Therefore, Prophase II is the correct answer in this sequence of meiotic stages. Quiz Review Timeline (Updated): Oct 8, 2024 + Our quizzes are rigorously reviewed, monitored and continuously updated by our expert board to maintain accuracy, relevance, and timeliness. Oct 08, 2024 Quiz Edited byProProfs Editorial Team Expert Reviewed byStephen Reinhold Mitosis DNA Reproductive System Meiosis is a specialized form of cell division that occurs in sexually reproducing organisms to produce gametes (sperm and eggs). Unlike mitosis, which results in two genetically identical diploid cells, meiosis produces four genetically distinct haploid cells. This reduction in chromosome number is critical for maintaining the species' chromosome count during fertilization. Meiosis consists of two rounds of cell division, meiosis I and meiosis II, and includes unique processes like crossing over and independent assortment, which promote genetic diversity. Meiosis is essential for genetic variation, evolution, and the continuity of sexually reproducing species. This article is about Meiosis Questions and Answers. You can download all the questions and answers as PDF from the download link provided below.Molecular Biology Notes | Molecular Biology PPT | Molecular Biology MCQMeiosis Questions and Answers1. What are the key stages of meiosis, and how do they differ from mitosis? Meiosis is divided into two stages: meiosis I and meiosis II. Meiosis I is a reductional division, where homologous chromosomes separate, resulting in two haploid cells. Meiosis II is similar to mitosis, where sister chromatids separate. In contrast to mitosis, which involves one division cycle and produces identical diploid cells, meiosis involves two division cycles and results in four non-identical haploid cells. Genetic recombination also occurs during meiosis, enhancing genetic diversity.2. What happens during prophase I of meiosis, and why is it important? Prophase I is a crucial stage where homologous chromosomes pair up in a process called synapsis, forming tetrads. During this stage, crossing over occurs, where homologous chromosomes exchange segments of DNA. This recombination is vital for generating genetic diversity in the offspring. The nuclear envelope also begins to break down, and spindle fibers form, setting up the chromosome alignment for later stages of meiosis.3. How does metaphase I differ from metaphase in mitosis? In metaphase I of meiosis, homologous chromosome pairs (tetrads) line up along the metaphase plate, with each chromosome facing opposite poles. This is different from metaphase in mitosis, where individual chromosomes (composed of sister chromatids) align at the metaphase plate. The alignment in metaphase I ensures that homologous chromosomes are separated during anaphase I, reducing the chromosome number by half in the resulting cells.4. What is the significance of crossing over in meiosis? Crossing over, which occurs during prophase I, is the process where homologous chromosomes exchange genetic material. This recombination creates new combinations of alleles, increasing genetic diversity among gametes. The exchange of DNA between homologous chromosomes is random, which contributes to the genetic variation observed in offspring. Without crossing over, the genetic diversity in sexually reproducing populations would be much lower.5. What occurs during anaphase I, and how is it different from anaphase II? In anaphase I, homologous chromosomes are pulled apart and move toward opposite poles of the cell. This reduces the chromosome number by half, with each daughter cell receiving one chromosome from each homologous pair. In contrast, during anaphase II, sister chromatids are separated and distributed to the daughter cells. The separation of homologous chromosomes in anaphase I is what distinguishes meiosis from mitosis and leads to haploid cells.6. What role does independent assortment play in meiosis? Independent assortment occurs during metaphase I when homologous chromosome pairs align randomly at the metaphase plate. Each pair's orientation is independent of the others, meaning the maternal or paternal homolog can be on either side. This random arrangement results in a variety of combinations of chromosomes being passed to the gametes. Independent assortment is a major contributor to genetic variation in sexually reproducing organisms.7. How does meiosis contribute to genetic diversity? Meiosis increases genetic diversity through two key mechanisms: crossing over and independent assortment. During crossing over in prophase I, homologous chromosomes exchange genetic material, creating new allele combinations. Independent assortment in metaphase I ensures that the chromosomes are randomly distributed to the gametes. Together, these processes ensure that each gamete is genetically unique, which increases variation in offspring.8. What is the role of synapsis in meiosis? Synapsis is the process during prophase I where homologous chromosomes pair up and form tetrads. This close pairing is necessary for crossing over to occur, as it allows homologous chromosomes to exchange genetic material. Synapsis ensures that homologs are properly aligned, which is critical for their accurate separation during anaphase I. Proper synapsis is essential for maintaining chromosomal integrity and generating genetic diversity.9. How does meiosis II resemble mitosis, and how is it different from meiosis I? Meiosis II resembles mitosis in that it involves the separation of sister chromatids, resulting in daughter cells that have the same number of chromosomes as the parent cell (in this case, haploid). However, unlike mitosis, which follows DNA replication, meiosis II follows meiosis I without a second round of DNA replication. Meiosis I is a reductional division, reducing the chromosome number by half, whereas meiosis II is an equational division, maintaining the haploid state.10. What are the consequences of nondisjunction during meiosis? Nondisjunction occurs when homologous chromosomes fail to separate during meiosis I or when sister chromatids fail to separate during meiosis II. This results in gametes with an abnormal number of chromosomes, which can lead to conditions such as Down syndrome (trisomy 21) or Turner syndrome (monosomy X). Nondisjunction can cause miscarriages or developmental disorders due to the imbalance in chromosome number.11. Why is meiosis referred to as a reductional division because it reduces the chromosome number by half. In meiosis I, homologous chromosomes are separated, resulting in two daughter cells that contain one set of chromosomes (haploid) instead of two sets (diploid). This reduction is crucial for sexual reproduction, as it ensures that when two gametes fuse during fertilization, the resulting zygote will have the correct diploid chromosome number.12. How does meiosis contribute to the formation of haploid gametes? Meiosis produces haploid gametes by undergoing two rounds of division. In meiosis I, homologous chromosomes are separated, reducing the chromosome number from diploid to haploid. In meiosis II, sister chromatids are separated without further reducing the chromosome number. This process ensures that each gamete carries only one set of chromosomes, which is essential for maintaining the species' chromosome number during sexual reproduction.13. How do errors in meiosis lead to chromosomal abnormalities in offspring? Errors in meiosis, such as nondisjunction or improper chromosome segregation, can lead to chromosomal abnormalities. When chromosomes fail to separate properly, it results in gametes with too many or too few chromosomes. If such gametes are involved in fertilization, the resulting offspring may have an abnormal chromosome number, leading to conditions like trisomy or monosomy. These abnormalities can cause developmental disorders, miscarriages, or genetic diseases.14. What is the difference between spermatogenesis and oogenesis in meiosis? Spermatogenesis is the process of meiosis in males, resulting in the production of four viable sperm cells from each primary spermatocyte. In contrast, oogenesis in females results in one viable egg and three polar bodies from each primary oocyte. Oogenesis involves unequal cytokinesis, where most of the cytoplasm is retained in the egg, while the polar bodies degenerate. This ensures that the egg has sufficient resources for early embryonic development.15. Why is meiosis essential for sexual reproduction? Meiosis is essential for sexual reproduction because it reduces the chromosome number by half, producing haploid gametes (sperm and eggs). During fertilization, these haploid gametes fuse to form a diploid zygote with the correct chromosome number. Without meiosis, the chromosome number would double with each generation, leading to genetic instability. Meiosis also introduces genetic diversity through recombination and independent assortment, which is critical for evolution and adaptation.