

Review Sheet Meiosis

Lester BIOL 150

General things to do to prepare for the exam:

- study the PowerPoints
- write out the answers to the learning objectives found with each PowerPoint
- listen to my lecture recordings

Chapter 13

Define: genetics, gene, heredity, variation, gametes, and locus.

Compare and contrast sexual and asexual reproduction.

What is a clone and how can it be produced?

What are somatic cells and how many chromosomes are in them (for humans)?

Describe a karyotype. Where do chromosomes come from? What process? What phase?

What are autosomes? Sex chromosomes? How many of each in humans?

What are homologous chromosomes?

Define haploid and diploid.

What is a zygote and how is it formed?

A diploid organism produces gametes by what process?

A haploid organism produces gametes by what process?

Describe the phases including key events for each phase of meiosis.

Define: synapsis, crossing over, chiasmata (chiasma), tetrad, and sister chromatids.

Compare and contrast mitosis with meiosis. Which part of meiosis is most similar to mitosis? How?

Describe and explain the four mechanisms that contribute to genetic variation.

How many possible combinations for chromosomes are there in humans? How many possible combinations at fertilization?

What is a recombinant chromosome and how is it produced during meiosis?

Describe the evolutionary significance of genetic variation within populations.

Sample Test Questions

Which of the following statements defines a *genome*?

- A) the complete set of an organism's polypeptides
- B) the complete set of a species' polypeptides
- C) a karyotype
- D) the complete set of an organism's genes and other DNA sequences

Asexual reproduction occurs during which of the following processes?

- A) meiosis
- B) mitosis
- C) fertilization
- D) the exchange of chromosomes between organisms of different species

Which of the following statements is correct in comparing sexual and asexual reproduction?

- A) Asexual reproduction, but not sexual reproduction, is characteristic of only plants and fungi.
- B) In sexual reproduction, individuals transmit half of their nuclear genes to each of their offspring.
- C) In asexual reproduction, offspring are produced by fertilization without meiosis.
- D) Asexual reproduction produces only haploid offspring.

Which of the following statements is true of a species that has a chromosome number of $2n = 16$?

- A) The species is diploid with 32 chromosomes per cell.
- B) The species has 16 sets of chromosomes per cell.
- C) Each diploid cell has eight homologous pairs of chromosomes.
- D) A gamete from this species has four chromosomes.

A particular organism has 46 chromosomes in its karyotype. Which of the following statements is correct regarding this organism?

- A) It must be human.
- B) It must be an animal.
- C) It reproduces sexually.
- D) It produces gametes with 23 chromosomes.

A triploid cell contains three sets of homologous chromosomes. If a cell of a diploid species that normally has 42 chromosomes per cell is triploid, this cell would be expected to have which of the following sets of chromosomes?

- A) 63 chromosomes in 31 1/2 pairs
- B) 63 chromosomes in 21 sets of 3
- C) 63 chromosomes, each with 3 sister chromatids
- D) 21 chromosome pairs and 21 unique chromosomes

In a human karyotype, chromosomes are arranged in 23 pairs. If we choose one of these pairs, such as pair 14, which of the following do the two chromosomes of the pair have in common?

- A) length and position of the centromere only
- B) length, centromere position, and staining pattern only
- C) length, centromere position, staining pattern, and traits coded for by their genes
- D) They have nothing in common except that they are X-shaped.

Which of the following characteristics do homologous chromosomes exhibit?

- A) They carry information for different traits.
- B) They carry information for the same traits.
- C) They carry the same alleles.
- D) They align on the metaphase plate in meiosis II.

Which of the following statements is correct regarding the human X chromosomes?

- A) It is present in every somatic cell of males and females.
- B) It is the same size as other chromosomes and has the same number of genes.
- C) It carries genes that determine an individual's biological sex.
- D) It is referred to as an autosome.

Which of the following statements correctly describes a karyotype?

- A) It is a display of all of the cell types in an organism.
- B) It is an organized image of a cell's chromosomes.
- C) It reveals the appearance of an organism.
- D) It is a display of a cell's mitotic stages.

If a cell has completed meiosis I and the first cytokinesis, and is just beginning meiosis II, which of the following is an appropriate description of its genetic contents?

- A) It has half the amount of DNA as the cell that began meiosis.
- B) It has half the chromosomes but twice the DNA of the parent cell.
- C) It has one-fourth the DNA and one-half the chromosomes as the parent cell.
- D) It is genetically identical to another cell formed from the same meiosis I event.

Which of the following statements describes the chromosomal makeup of each daughter cell after telophase of meiosis I?

- A) The cells are diploid, and the chromosomes are each composed of a single chromatid.
- B) The cells are diploid, and the chromosomes are each composed of two chromatids.
- C) The cells are haploid, and the chromosomes are each composed of a single chromatid.
- D) The cells are haploid, and the chromosomes are each composed of two chromatids.

How do cells at the completion of meiosis compare with cells that are in prophase of meiosis I?

- A) The cells have half the number of chromosomes and half the amount of DNA.
- B) The cells have the same number of chromosomes and half the amount of DNA.
- C) The cells have half the number of chromosomes and one-fourth the amount of DNA.
- D) The cells have half the amount of cytoplasm and twice the amount of DNA.

Which of the following events happens at the conclusion of meiosis I?

- A) Homologous chromosomes of a pair are separated from each other.
- B) The chromosome number per cell remains the same.
- C) Sister chromatids are separated.
- D) Four daughter cells are formed.

During which of the following processes do sister chromatids separate from each other?

- A) during meiosis I only
- B) during meiosis II only
- C) during both mitosis and meiosis I
- D) during both mitosis and meiosis II

Somatic cells of roundworms have four individual chromosomes per cell. How many chromosomes would you expect to find in an ovum from a roundworm?

- A) four
- B) two
- C) eight
- D) a diploid number

Which of the following processes occur during meiosis but not mitosis?

- A) Haploid cells fuse to form diploid cells.
- B) Haploid cells multiply into more haploid cells.
- C) Diploid cells form haploid cells.
- D) A diploid cell combines with a haploid cell.

Which of the following statements describes one characteristic of each chromosome in a cell during the entire process of meiosis I?

- A) Each chromosome is paired with a homologous chromosome.
- B) Each chromosome consists of two sister chromatids joined by a centromere.
- C) Each chromosome consists of a single strand of DNA.
- D) Each chromosome is joined with its homologous pair to form a synaptonemal complex.

During which of the following processes do homologous pairs of chromosomes align adjacent to one another at the metaphase plate of a cell?

- A) metaphase of mitosis
- B) metaphase I of meiosis
- C) telophase II of meiosis
- D) metaphase II of meiosis

During which of the following phases of meiosis do centromeres split and sister chromatids migrate to opposite poles of the cell?

- A) anaphase I
- B) telophase I
- C) anaphase II
- D) telophase II

During which of the following processes does independent assortment of chromosomes occur?

- A) in meiosis I only
- B) in meiosis II only
- C) in mitosis and meiosis I
- D) in mitosis and meiosis II

How does natural selection apply to sexual reproduction as opposed to asexual reproduction?

- A) Sexual reproduction results in many new gene combinations, some of which will lead to differential reproduction.
- B) Sexual reproduction results in the greatest number of new mutations.
- C) Sexual reproduction allows the greatest number of offspring to be produced.
- D) Sexual reproduction utilizes far less energy than asexual reproduction.

A human cell containing 22 autosomes and a Y chromosome is

- A) a sperm.
- B) an egg.
- C) a zygote.
- D) a somatic cell of a male.