

Chapter 11 Review questions

The genetic material in bacteria consists of:

- a. Several circular DNA molecules
- b. One circular RNA molecule
- c. Many rod-like DNA molecules with protein
- d. One circular DNA molecule
- e. DNA in mitochondria

A bacterial cell splits into 2 new cells by:

- a. Duplication
- b. Forming a cell plate
- c. Forming a cell furrow
- d. Mitosis
- e. Fission

The daughter cells of binary fission are:

- a. Structurally identical
- b. Chromosomally different
- c. Genetically identical
- d. Structurally identical and genetically identical
- e. Not genetically the same as the parent cell

Which of the following organisms does not reproduce cells by mitosis and cytokinesis?

- a. cow
- b. bacterium
- c. mushroom
- d. cockroach
- e. banana tree

The molecules that make up a chromosome are

- a. DNA and RNA.
- b. DNA and proteins.
- c. proteins and lipids.
- d. nucleotides and nucleosides.
- e. proteins and phospholipids.

Diploid cells of the fruit fly *Drosophila* have 10 chromosomes. How many chromosomes does a *Drosophila* gamete have?

- a. one
- b. two
- c. five
- d. ten
- e. twenty

Human body cell nuclei contain:

- a. 46 pairs of chromosomes
- b. 44 pairs of chromosomes
- c. 23 unpaired chromosomes
- d. 22 pairs of chromosomes
- e. 23 pairs of chromosomes

A eukaryotic chromosome is made up of:

- a. DNA only
- b. Protein and nucleic acid
- c. Centromeres and centrioles
- d. Loops of naked DNA
- e. DNA and RNA only

During the "S" portion of interphase, what is the cell doing?

- a. resting
- b. general cell metabolism
- c. synthesizing DNA
- d. making a spindle
- e. undergoing differentiation

When does chromosome replication occur in a eukaryotic cell?

- a. Prophase
- b. Metaphase
- c. Anaphase
- d. Interphase
- e. Telophase

The longest period of a cell's life cycle is:

- a. Prophase
- b. Telophase
- c. Interphase
- d. Anaphase
- e. Metaphase

Which of the following does not take place during the G₁ or G₂ phases of the cell cycle?

- a. Synthesis of ATP
- b. Growth of the cell
- c. Cellular respiration
- d. Enzyme activity
- e. Replication of DNA

The cells of the intestinal epithelium are continually dividing, replacing dead cells lost from the surface of the intestinal lining. If you examined a population of intestinal epithelial cells under the microscope, most of the cells would:

- a. be in meiosis.
- b. be in mitosis.
- c. be in interphase.
- d. have condensed chromosomes.
- e. b and d.

Cell reproduction in prokaryotic cells differs from eukaryotic cells in that:

- a. Prokaryotic cells reproduce asexually but eukaryotic cells do not.
- b. Each prokaryotic cell has a circular chromosome but the chromosomes of eukaryotic cells are linear.
- c. Prokaryotic cells lack nuclei and do not replicate their DNA before dividing but eukaryotic cells have nuclei and replicate their DNA before dividing.
- d. Prokaryotic chromosomes have DNA and protein but eukaryotic chromosomes are made of only DNA.
- e. They do not differ significantly in any way.

Which of these sequences correctly describes the cell cycle?

- a. $\rightarrow G_1 \rightarrow G_2 \rightarrow S \rightarrow$ prophase \rightarrow metaphase \rightarrow anaphase \rightarrow telophase \rightarrow
- b. $\rightarrow S \rightarrow G_2 \rightarrow$ prophase \rightarrow metaphase \rightarrow anaphase \rightarrow telophase $\rightarrow G_1 \rightarrow$
- c. $\rightarrow G_1 \rightarrow S \rightarrow G_2$ prophase \rightarrow anaphase \rightarrow metaphase \rightarrow telophase \rightarrow
- d. \rightarrow prophase \rightarrow metaphase \rightarrow telophase \rightarrow anaphase $\rightarrow G_1 \rightarrow S \rightarrow G_2 \rightarrow$
- e. $\rightarrow G_1 \rightarrow S \rightarrow G_2 \rightarrow$ metaphase \rightarrow prophase \rightarrow anaphase \rightarrow telophase \rightarrow

A cell is cleaved into 2 approximately equal halves, each with about the same amount of cytoplasm, during:

- a. G_2 phase
- b. cytophase
- c. cytokinesis
- d. spindle apparatus formation
- e. interphase

If there are 12 chromosomes in an animal cell in the G_1 stage of the cell cycle, what is the diploid number of chromosomes for this organism?

- a. 6
- b. 12
- c. 24
- d. 36
- e. 48

During mitotic anaphase, chromatids migrate

- a. from the poles of the cell toward the metaphase plate.
- b. from the metaphase plate toward the poles.
- c. toward the nuclear envelope.
- d. along with their sister chromatids toward one pole.
- e. along with the other member of the homologous pair toward the metaphase plate.

The microtubules of the mitotic spindle attach to a specialized structure in the centromere region of each chromosome, called the

- a. kinetochore.
- b. nucleosomes.
- c. equatorial plate.
- d. nucleotide.
- e. centrosome.

How do daughter cells at the end of mitosis and cytokinesis compare with their parent cell when its was in G_1 of the cell cycle?

- a. The daughter cells have half the amount of cytoplasm and half the amount of DNA.
- b. The daughter cells have half the number of chromosomes and half the amount of DNA.
- c. The daughter cells have the same number of chromosomes and half the amount of DNA.
- d. The daughter cells have the same number of chromosomes and the same amount of DNA.
- e. The daughter cells may have new combinations of genes due to crossing over.

The formation of a cell plate is beginning across the middle of a cell and nuclei are reforming at opposite ends of a cell. What kind of a cell is this?

- a. an animal cell in metaphase
- b. an animal cell in telophase
- c. an animal cell undergoing cytokinesis
- d. a plant cell in metaphase
- e. a plant cell undergoing cytokinesis

Cell division usually occurs as two events, namely:

- a. Interphase and mitosis
- b. Mitosis and cytokinesis
- c. Nuclear division and chromosomal division
- d. Interphase and cytoplasmic division
- e. Interphase and cytokinesis

Cytokinesis refers to the division of the:

- a. Cytoplasm
- b. Nucleus
- c. Mitochondria
- d. Centrioles
- e. Chromosomes

Cells that result from mitosis have identical:

- a. Kinds of proteins
- b. Numbers of proteins
- c. Genetic information
- d. Kinds and numbers of proteins
- e. Numbers of mitochondria

Sister chromatids are:

- a. Duplicate chromosomes held together by a common centromere
- b. Specialized gamete-forming cells
- c. Non-functional chromosomes
- d. Homologous pairs of chromosomes
- e. Different in their genetic content

Mitosis in humans usually results in the formation of:

- a. 2 diploid cells
- b. 4 diploid cells
- c. 2 haploid cells
- d. 4 haploid cells
- e. Sperm or egg cells

During which stage of mitosis do chromosomes line up at the equator of the spindle apparatus?

- a. Prophase
- b. Metaphase
- c. Anaphase
- d. Telophase
- e. The chromosomes do not line up at all

Which of the following does not occur during prophase?

- a. The nuclear membrane disintegrates
- b. Nucleoli break up
- c. The spindle apparatus forms
- d. The chromosomes condense
- e. DNA replicates

Microtubules become attached to each chromatid at its:

- a. Centriole
- b. Centromere
- c. Aster
- d. Kinetochore
- e. Distal end

During which stage of mitosis do sister chromatids move away from each other?

- a. Prophase
- b. Metaphase
- c. Anaphase
- d. Telophase
- e. They do not move away from each other at all

A plant cell splits into two new cells by:

- a. Binary fission
- b. Forming a cell plate
- c. Forming a cell furrow
- d. Forming a spindle apparatus
- e. Nuclear disintegration

Cytokinesis is evident in animal cells when:

- a. Constriction occurs around the equator
- b. Chromosomes are observable
- c. Cell plate formation occurs
- d. A spindle apparatus forms
- e. Prophase begins

In plant cells, cytokinesis is accomplished by the formation of

- a. a membrane furrow.
- b. an equatorial plate.
- c. a kinetochore.
- d. a cell plate.
- e. a spindle.

Cell plate formation is accomplished by:

- a. Endoplasmic reticulum
- b. Spindle fibers
- c. Cytoskeleton
- d. Golgi complex
- e. Mitochondria

The division of the cytoplasm:

- a. Occurs as part of mitosis in all cells
- b. Is limited to certain highly specialized cells
- c. Involves the formation of a cell plate in plant cells
- d. Results in zygote formation
- e. Also causes the nucleus to divide

Suppose a slide containing 100 cells is made from a random sample of cells growing in a petri plate. The average time for a complete cell cycle to occur in the petri plate is 24 hours. 10 cells on the slide are in prophase, 3 are in metaphase, 6 in anaphase, 8 in telophase, and 73 are in interphase. How many hours, on average, does a cell in the petri plate spend in interphase?

- a. 73 hours
- b. 24 hours
- c. 17.5 hours
- d. 6.5 hours
- e. One cannot tell from the information given

All of the following are characteristics of telophase of mitosis, EXCEPT

- a. cytokinesis begins
- b. each chromosome is made of two chromatids
- c. the nuclear membrane reappears
- d. chromosomes begin to uncoil
- e. microtubules disappear

If there are 20 centromeres in a cell, how many chromosomes are there?

- a. 10
- b. 20
- c. 30
- d. 40
- e. 50

Which of the following is a haploid?

- a. Zygote
- b. Gamete (sex cell)
- c. Muscle cell
- d. Embryo
- e. Brain cell

Sexual reproduction by necessity involves which two processes?

- a. Meiosis and fertilization
- b. Mutation and translocation
- c. Nondisjunction and pleiotropy
- d. Mitosis and fertilization
- e. Differentiation and specialization

In sexually reproducing organisms, the source of chromosomes in the offspring is:

- a. Almost all from one parent, usually the father
- b. Almost all from one parent, usually the mother
- c. Half from the father and half from the mother
- d. The X comes from the mother and the autosomes come from the father
- e. A random mixing of chromosomes from both parents

Genetically diverse offspring result from

- a. mitosis.
- b. cloning.
- c. sexual reproduction.
- d. cytokinesis.
- e. anaphase.

During asexual reproduction, the genetic material of the parent is passed on to the offspring by

- a. homologous pairing.
- b. meiosis and fertilization.
- c. mitosis and cytokinesis.
- d. meiosis and cytokinesis.
- e. going to G_0 in the cell cycle.

Asexual reproduction produces genetically identical individuals because

- a. chromosomes do not have to replicate.
- b. it involves chromosome replication without cytokinesis.
- c. no meiosis or fertilization takes place.
- d. the only cell division that occurs is meiosis.
- e. cytokinesis occurs prior to mitosis.

Meiosis can occur

- a. in all organisms.
- b. only in diploid organisms.
- c. only in multicellular organisms.
- d. only in haploid organisms.
- e. only in unicellular organisms.

Which does not happen during meiosis?

- a. Independent assortment
- b. Production of diploid cells
- c. Synapsis
- d. Crossing-over
- e. Segregation

Gametes differ from body cells in:

- a. Having only one member of each pair of homologous chromosomes
- b. Being haploid
- c. Functioning in sexual reproduction
- d. Having half the amount of genetic material
- e. All the above choices are correct

All of the following take place during meiosis except:

- a. Two S phases of interphase
- b. Crossing over
- c. Reduction of chromosome number from $2n$ to $1n$
- d. Segregation of homologous chromosomes
- e. Pairing of similar chromosomes during Prophase I

Meiosis:

- a. Occurs in most somatic cells of animals
- b. Produces spores or gametes, depending on the organism
- c. Produces diploid cells
- d. Occurs during the S phase of the cell cycle
- e. Occurs in animals but not in plants

Meiosis:

- a. Is a purely random division of chromosomes
- b. Doubles the number of chromosomes
- c. Reduces the number of chromosomes by half
- d. Does not change the number of chromosomes
- e. Allows chromosomes to split in half

Meiosis results in the production of:

- a. Diploid cells with unpaired chromosomes
- b. Diploid cells with paired chromosomes
- c. Haploid cells with unpaired chromosomes
- d. Haploid cells with paired chromosomes
- e. None of the above choices is correct

During anaphase of meiosis I, what segregates?

- a. Sister chromatids
- b. The spindle
- c. Homologous chromosomes
- d. Non-allelic genes
- e. The nucleolus

Reciprocal exchange of genetic material between similar chromosomes is called:

- a. Synapsis
- b. Segregation
- c. Tetrad formation
- d. Meiosis
- e. Crossing-over

The earliest event of meiosis among those listed is:

- a. Chromosomes move to the equator of the spindle.
- b. Chromatids separate and migrate to opposite poles.
- c. Crossing over occurs.
- d. Homologous chromosomes pair up along their lengths.
- e. Segregation occurs.

Chromosomes exchange genetic material by:

- a. Segregation
- b. Mitosis
- c. Synapsis
- d. Fertilization
- e. Crossing over

Between the two divisions of meiosis there is:

- a. Crossing-over
- b. A pairing of homologous chromosomes
- c. Replication of selected genes
- d. Segregation and independent assortment of chromosomes
- e. No chromosome replication

The products of meiosis are:

- a. one nucleus containing twice as much DNA as the parent nucleus.
- b. two genetically identical cells.
- c. four nuclei containing half as much DNA as the parent nucleus.
- d. four genetically identical nuclei.
- e. two genetically identical nuclei.

The four haploid nuclei found at the end of meiosis differ from one another in their exact genetic composition. Some of this difference is the result of

- a. cytokinesis.
- b. DNA replication.
- c. sister chromatid separation.
- d. spindle formation.
- e. crossing over.

Chromosome number is reduced during meiosis because the process consists of

- a. two cell divisions without any chromosome replication.
- b. a single cell division without any chromosome replication.
- c. two cell divisions in which half of the chromosomes are destroyed.
- d. two cell divisions and only a single round of chromosome replication.
- e. four cell divisions with no chromosome replication.

Just after telophase I, each cell contains:

- a. One full set of chromosomes, each with 2 chromatids
- b. Two full sets of chromosomes, each with 2 chromatids
- c. One full set of chromosomes, each with a single chromatid
- d. Two full sets of chromosomes, each with a single chromatid
- e. None of the above choices is correct

A diploid cell contains 6 chromosomes. After meiosis I, each of the cells contains:

- a. 3 maternal and 3 paternal chromosomes each time
- b. A mixture of maternal and paternal chromosomes totaling 3
- c. 6 maternal or 6 paternal chromosomes each time
- d. A mixture of maternal and paternal chromosomes totaling 6
- e. 3 pairs of chromosomes

An organism has a diploid chromosome number of 10. A cell, from this organism, in metaphase I of meiosis has:

- a. 10 pairs of chromosomes
- b. 20 chromosomes
- c. 10 chromatids
- d. 5 chromosomes
- e. 10 chromosomes

Homologous chromosomes pair up (synapsis) during:

- a. Mitosis
- b. Meiosis I
- c. Meiosis II
- d. Mitosis and Meiosis II
- e. Protein synthesis

The chromosome number is reduced from diploid to haploid during:

- a. Mitosis
- b. Meiosis I
- c. Meiosis II
- d. Interphase
- e. S phase of mitosis

Which occurs in meiosis I but not in meiosis II?

- a. Diploid daughter cells are produced
- b. Chromosomes without chromatids line up at the equator
- c. Centromeres divide
- d. Synapsis of homologous chromosomes occurs
- e. The spindle apparatus forms

The actual reduction of the chromosome number in meiosis occurs during:

- a. Interphase
- b. Mitosis
- c. Telophase
- d. Meiosis II
- e. Meiosis I

An exchange of corresponding DNA segments occurs during:

- a. Prophase
- b. Anaphase II
- c. Prophase II
- d. Anaphase I
- e. Prophase I

Chromosomes of a homologous pair separate from each other during:

- a. Anaphase I
- b. Anaphase II
- c. Metaphase I
- d. Prophase II
- e. Metaphase II

The two cells at the end of meiosis I:

- a. Rarely continue into meiosis II
- b. Function as gametes
- c. Are diploid
- d. Are haploid
- e. Can continue as body cells

At the end of telophase II, each of the 4 resulting cells has:

- a. One full set of chromosomes, each with 2 chromatids
- b. Two full sets of chromosomes, each with 2 chromatids
- c. One full set of chromosomes, each with a single chromatid
- d. Two full sets of chromosomes, each with a single chromatid
- e. The same genetic constitution as the body cells that produced it

The second meiotic division causes which of the following?

- a. $2n \longrightarrow 1n$
- b. $1n \longrightarrow 1n$
- c. $2n \longrightarrow 2n$
- d. $1n \longrightarrow 2n$
- e. None of the above choices is correct

Centromeres split during:

- a. Anaphase I and anaphase II of meiosis
- b. Anaphase of mitosis and anaphase I of meiosis
- c. Anaphase of mitosis and anaphase II of meiosis
- d. The S portion of interphase
- e. Cytokinesis of mitosis and meiosis II

Which occurs during meiosis II but not meiosis I?

- a. Independent assortment of chromosomes
- b. Centromeres divide
- c. Diploid number reduced to haploid number
- d. Crossing-over
- e. All of the above choices are correct

The main function of meiosis II is:

- a. Separate sister chromatids during anaphase
- b. Reduce the number of gametes by half
- c. Reduce the number of chromosomes by half
- d. Increase genetic variability by crossing over
- e. To allow homologous chromosomes to pair up

Sister chromatids move away from each other during:

- a. Anaphase I
- b. Cytokinesis
- c. Metaphase II
- d. Telophase II
- e. Anaphase II

Each sperm cell of a horse contains 32 chromosomes. How many chromosomes are there in each of the horse's body cells?

- a. 16
- b. 32
- c. 16 pairs
- d. Either 16 or 64, depending on the cell type
- e. 64

If there are 12 chromosomes in a cell that has just completed meiosis II, what is the diploid number of chromosomes for that organism?

- a. 6
- b. 12
- c. 24
- d. Either 6 or 24, depending on the cell type
- e. 24 pairs

Haploid cells:

- a. Can result from meiosis
- b. Have one member of each pair of homologous chromosomes
- c. Function as gametes or spores in sexually reproducing organisms
- d. Cannot be produced by mitosis
- e. Both choices a and c are correct

Which of the following statements is false?

- a. Meiosis separates homologous chromosomes in a diploid cell to produce haploid daughter cells containing one copy of each type of chromosome.
- b. During prophase I, homologous chromosomes pair up and exchange DNA.
- c. During meiosis II, paired homologous chromosomes move up to the equator of the cell.
- d. During anaphase I, homologous chromosomes separate.
- e. In meiosis II, the sister chromatids of each chromosome separate.

Segregation of homologous chromosomes occurs during:

- a. Metaphase of meiosis I
- b. Metaphase of meiosis II
- c. Anaphase of meiosis I
- d. Anaphase of meiosis II
- e. Telophase of meiosis I

Which of the following occurs in mitosis but not in meiosis?

- a. Cells genetically identical to parents are made
- b. Centrioles divide
- c. Crossing over
- d. Independent assortment of chromosomes
- e. Pairing up of similar chromosomes during prophase

Chromosomes are present in pairs in the body cells of animals. What is their origin?

- a. One pair from each parent
- b. All may have come from one parent
- c. One member of each pair from each parent
- d. Varying numbers from each parent
- e. X chromosomes from the mother and autosomes from the father

Meiosis reduces the chromosome number by:

- a. Discarding some of the chromosomes
- b. Reducing the length of each chromosome by half
- c. Duplicating DNA once, followed by 2 cell divisions
- d. Independent assortment of chromosomes during meiosis I
- e. The formation of polar bodies

Which is not a source of variety in sexually reproducing species?

- a. Crossing over
- b. DNA replication
- c. Distribution of chromosomes in gametes
- d. Fertilization
- e. Independent assortment of chromosomes during meiosis I