

## Meiosis

1. P. J. van Beneden proposed that an egg and a sperm, each containing half the complement of chromosomes found in somatic cells, fuse to produce a single cell called a \_\_\_\_\_.
2. \_\_\_\_\_ is a process of nuclear division in which the number of chromosomes in certain cells is halved during gamete formation.
3. \_\_\_\_\_ cells such as gametes contain one set of chromosomes.
4. Organisms that undertake sexual reproduction alternate between \_\_\_\_\_ and fertilization.
5. The two homologous chromosomes pair along their length early in the first nuclear division. During this physical joining genetic exchange occurs between them in a process called \_\_\_\_\_.
6. In \_\_\_\_\_ mode of reproduction, the chromosomes of the daughter cells and the parent cells are identical.
7. Sexual reproduction and the close association between homologous chromosomes that occurs during meiosis probably evolved as a mechanism to repair \_\_\_\_\_ damage.
8. Sexual reproduction is significant in increasing genetic \_\_\_\_\_.
9. Unlike meiosis I, there is no doubling of \_\_\_ before the start of meiosis II.
10. Evidence of crossing over can often be seen under the light microscope as an X-shaped structure known as \_\_\_\_\_.
11. The fusion of male gamete cells with female gamete cells is called
  - A. syngamy
  - B. meiosis
  - C. mitosis
  - D. recombination
  - E. synapsis
12. Diploid organisms use meiosis for the development of gametes. Meiosis consist of how many rounds of nuclear division?
  - A. one
  - B. two
  - C. three
  - D. four
  - E. answer not given

13. The pairing of chromosomes along their lengths which is essential for crossing-over is referred to as
- A. syngamy
  - B. synapsis
  - C. a tetrad
  - D. recombination
  - E. centromere
14. A common form of reproduction in arthropods involves the development of an adult from an unfertilized egg. This is called
- A. syngamy
  - B. binary fission
  - C. mitosis
  - D. meiosis
  - E. parthenogenesis
15. The cell produced by the fusion of an egg and a sperm is the
- A. gamete
  - B. haploid
  - C. zygote
  - D. germ line cell
  - E. somatic cell
16. The zygote has
- A. one copy of each chromosome
  - B. one full haploid complement of chromosomes
  - C. chromosomes identical to those of a sperm cell
  - D. chromosomes identical to those of an egg cell
  - E. two copies of each chromosome
17. The reduction division that separates two haploid complements from each other is called
- A. mitosis
  - B. meiosis
  - C. syngamy
  - D. asexual reproduction
  - E. binary fission
18. All of the following animal cells are diploid except
- A. gametic
  - B. muscles
  - C. nerves
  - D. skin
  - E. reproductive organ

19. In animals such as *Hydra* and corals, new individuals arise as buds on the body of an existing animal. This is called budding, which is a form of
- A. gamete formation
  - B. syngamy
  - C. meiosis
  - D. asexual reproduction
  - E. fertilization
20. The point of connection between the two sister chromatids before anaphase of mitosis separates them is called the
- A. homologue
  - B. kinetochore
  - C. centromere
  - D. microtubule complex
  - E. synapsis
21. Which of the following produces identical cells?
- A. meiosis
  - B. mitosis
  - C. gamete formation
  - D. syngamy
  - E. fertilization
22. In animals, which of the following cells can undergo mitosis?
- A. somatic cells
  - B. germ line cells
  - C. gametes
  - D. haploid cells
  - E. egg and sperm cells
23. In animals, the cells that will eventually undergo meiosis to produce gametes are set aside early in the development. These are
- A. haploid cells
  - B. germline cells
  - C. sex cells
  - D. zygotes
  - E. sperm and egg cells
24. In one of the first steps in meiosis, the
- A. clearly defined spindle apparatus appears in the center of the cell
  - B. chromatids separate and move to opposite ends of the cell
  - C. half chromosomes are made inactive
  - D. homologous pairs of chromosomes pair up along their length
  - E. chromosomes become invisible

25. Chromosomes exchange genetic information by
- A. fertilization
  - B. mitosis
  - C. syngamy
  - D. DNA replication
  - E. crossing over
26. Between the two divisions of meiosis there is
- A. a full cell cycle
  - B. a pairing of homologues
  - C. replication of some parts of the chromosomes
  - D. no S phase
  - E. random combination among chromatids
27. Crossing over of chromosomes takes place in
- A. prophase II
  - B. prophase I
  - C. interphase II
  - D. interphase I
  - E. metaphase II
28. The synaptonemal complex develops early in meiosis. It is
- A. a cluster of chromatids at the end of the cell
  - B. a framework of microtubules that organize chromatids
  - C. a lattice of proteins that holds homologues together
  - D. a set of two homologues lined side by side
  - E. the wound up regions of DNA molecules
29. At the end of telophase II of meiosis, each of the four resulting cells contains
- A. one full set of chromosomes, each with two chromatids
  - B. two full sets of chromosomes, each with two chromatids
  - C. one full set of chromosomes, each a single chromatid
  - D. two full sets of chromosomes, each a single chromatid
  - E. a different number of chromosomes
30. The four haploid cells resulting from meiosis may further divide by mitosis in which of the following organisms?
- A. plants
  - B. fungi
  - C. many protists
  - D. animals
  - E. only in a, b, and c

31. Which of the following are types of asexual reproduction?
- A. budding
  - B. parthenogenesis
  - C. binary fission
  - D. syngamy
  - E. a, b, and c
32. Among the honeybees, some eggs develop into adults without fertilization. Such eggs develop into
- A. haploid males
  - B. haploid females
  - C. diploid males
  - D. diploid females
  - E. queen bees
33. Parthenogenesis occurs even among vertebrates. In some lizards, fishes, and amphibians, which reproduce this way, the developmental process starts with
- A. syngamy
  - B. binary fission
  - C. budding
  - D. an unfertilized egg undergoing mitotic nuclear division without cleavage to produce a diploid cell
  - E. fragmentation
34. Sexual reproduction increases genetic variability through
- A. crossing over in prophase I of meiosis
  - B. independent assortment in meiosis
  - C. fertilization
  - D. binary fission
  - E. a, b, and c
35. In plants, during their alternation of generation, haploid individuals produce
- A. zygotes
  - B. diploid individuals
  - C. haploid gametes
  - D. diploid gametes
  - E. clusters of diploid cells

36. One of the most likely explanations for the evolutionary origin of sexual reproduction is that
- A. organisms could then move onto land
  - B. DNA replication errors could be corrected by recombination
  - C. more and larger offspring could be produced
  - D. haploid cells require less energy and raw materials
  - E. gamete production is more successful than asexual reproduction
37. Which of the following is an explanation for independent assortment, a factor in producing genetic variability?
- A. In anaphase I, where how one pair separates does not affect how any other pair separates.
  - B. Chromosomes are divided into daughter cells in a random fashion.
  - C. In prophase I, which chromosomes pairs with which other one is completely random.
  - D. Each chromosome is capable of a different function.
  - E. Chromosomes can have different functions in various types of cells of the same organism.
38. Meiosis and mitosis are both processes that involve nuclear division. What is the difference between the two?
- A. Mitosis is nuclear division, which ultimately leads to haploid gametes. Meiosis is nuclear division, which ultimately leads to diploid somatic cells.
  - B. Mitosis is nuclear division, which ultimately leads to diploid somatic cells. Meiosis is nuclear division, which ultimately leads to haploid gametes.
  - C. Mitosis is nuclear division, which ultimately leads to diploid gametes. Meiosis is nuclear division, which ultimately leads to haploid somatic cells.
  - D. Mitosis is nuclear division, which ultimately leads to syngamy. Meiosis is nuclear division, which ultimately leads to zygotes.
39. After fertilization, the resulting zygote develops by which of the following processes?
- A. mitosis
  - B. meiosis
  - C. syngamy
  - D. synapsis
  - E. reduction division
40. The homologous chromosomes (homologues) pair up during meiosis I. Each homologue pairs along its entire length. This process is called
- A. syngamy
  - B. synapsis
  - C. meiosis
  - D. mitosis
  - E. crossing over

41. A reproductive biologist is examining reproductive cells at the end of meiosis I. She notices that each of the two resulting cells are haploid. She also knows that meiosis II will produce haploid cells. How can her observations be explained?
- A. There must be an error and she needs to refocus her microscope and look again.
  - B. The cells that resulted from meiosis I are in fact haploid but are composed of two sister chromatids. The sister chromatids will be pulled apart during meiosis II, producing haploid gametes.
  - C. The cells that resulted from meiosis I are in fact diploid and this explains her observational error and also her knowledge of the meiosis II resulting in haploid cells.
  - D. The cells that resulted from meiosis I are in fact haploid, but her knowledge of the result of meiosis II is not accurate, at least for this particular cell type.
  - E. The cells that she observed are abnormal and will require further observations.
42. Crossing over occurs during prophase I of meiosis I. The two sister chromatids of each homologous pair of chromosomes remain attached by
- A. a common centromere and the synapsis
  - B. a common centromere and the chiasmata
  - C. a common centromere and the recombination synapsis
  - D. a common centromere and the synaptonemal complex
  - E. a common centromere and the spindle fibers
43. The majority of the meiosis I is spent in prophase I and metaphase I. After metaphase I is completed, anaphase I and telophase I quickly proceed, thus ending meiosis I. What immediately follows meiosis I?
- A. DNA synthesis
  - B. prophase II
  - C. metaphase II
  - D. developing of a synapsis
  - E. crossing over of the homologues
44. Hypotheses abound as to why sexual reproduction began and why it is maintained. Which of the hypotheses is described in the following statement? This hypothesis proposes that sexual reproduction allows populations to store or keep in the heterozygous condition recessive alleles that are currently “bad” but perhaps have promise in the future.
- A. The Miller’s Ratchet Hypothesis
  - B. The Contagion Hypothesis
  - C. The DNA Repair Hypothesis
  - D. The Red Queen Hypothesis
  - E. The Evolutionary Consequence Hypothesis

45. All of the following are processes that promote new genetic combinations except
- crossing over
  - random fertilization
  - independent assortment
  - parthenogenesis
  - natural selection
46. Livestock owners and breeders have most likely maximized their abilities to greatly improve size and speed of the animals that they raise. This is a consequence of
- too many crossing over events in previous livestock generations
  - not enough crossing over events in previous livestock generations
  - existing genetic combinations have been nearly exhausted as well as the limited amount of genetic variability that existed to begin with
  - using artificial insemination instead of allowing animals to breed on their own
47. Meiosis also has been called reduction division because
- New somatic cells are produced but with a reduction in the required amount of time, which promotes faster wound healing.
  - New gametes are produced but their numbers are reduced.
  - There is a reduction in the chromosome number during two separate nuclear and cell divisions to produce gametes.
  - There is a reduction in the chromosome number during two separate nuclear and cell divisions to produce somatic cells.
  - There is an initial reduction in the chromosome number during the first division followed by an increase in chromosome number, the second division quickly follows the increase in number of chromosomes.
48. Match each of the following (a letter may be used more than once or not at all)
- |   |                 |
|---|-----------------|
| _____ A. One of a pair of chromosomes with similar genetic information and from different sources like the sperm and egg. | 1. chiasma      |
| _____ B. Several X-shaped structures may be visible under the microscope and indicate where crossing over has occurred.   | 2. homologue    |
| _____ C. A lattice of protein holds two replicated chromosomes in precise register with one another.                      | 3. kinetochore  |
| _____ D. Four chromatids are held together by a zipper-like structure.  | 4. synapsis     |
| _____ E. A process in which pairs of homologous complex chromosomes line up side by side.                                 | 5. synaptonemal |

### Answer Key

No. on Test	Correct Answer
1	zygote
2	Meiosis
3	Haploid
4	meiosis
5	recombination
6	asexual
7	chromosomal
8	variability
9	DNA
10	chiasma
11	A
12	B
13	B
14	E
15	C
16	E
17	B
18	A
19	D
20	C
21	B
22	A
23	B
24	D
25	E
26	D
27	B
28	C
29	C
30	E
31	E
32	A
33	D
34	E

35	C
36	B
37	A
38	B
39	A
40	B
41	B
42	D
43	B
44	D
45	D
46	C
47	C
48	1-B, 2-A, 3-E, 4-E, 5-D