Chapter 2—Cells and Cell Division

MULTIPLE CHOICE

1. The process of meiosis results in ____.
   A. the production of four identical cells
   B. no change in chromosome number from parental cells
   C. a doubling of the chromosome number
   D. a reduction in chromosome number
   E. two diploid cells

   ANS: D PTS: 1

2. In the cell cycle, the G2 phase represents ____.
   A. the stage of DNA synthesis
   B. splitting of the chromosomes into chromatids
   C. a period of growth
   D. the stage of actual cell division
   E. the stage just prior to meiosis

   ANS: C PTS: 1

3. Ribosomes are organelles that function in ____.
   A. plasma membrane selectivity
   B. cellular energy production
   C. synthesis of gene products
   D. transport of materials throughout the cytoplasm
   E. DNA replication

   ANS: C PTS: 1

4. Which of the following genetic diseases involve defects in DNA repair, which affects cell division?
   A. Gaucher disease and Werner syndrome
   B. Kearns-Sayre syndrome and progeria
   C. Progeria and Werner syndrome
   D. Gaucher disease and cystic fibrosis
   E. Progeria and Werner syndrome

   ANS: E PTS: 1

5. Autosomes represent ____.
   A. all chromosomes including the sex chromosomes
   B. the half of the chromosomes inherited from one parent
   C. all chromosomes other than the sex chromosomes
   D. chromosome pairs with unlike members
   E. those chromosomes found only in gametes

   ANS: C PTS: 1

6. During meiosis in an organism where $2n = 8$, how many chromatids will be present in a cell at the beginning of meiosis II?
   A. 2
   B. 4
   C. 6

D. 8
E. 12

ANS: D PTS: 1

7. The Hayflick limit describes ____.
   A. the size limit to which a cell can grow
   B. the number of divisions a cultured cell can undergo
   C. the largest number of chromosomes an organism can possess
   D. the most cells an organism can have
   E. how rapidly DNA replication occurs

   ANS: B PTS: 1

8. In meiosis, homologous chromosomes separate in ____.
   A. metaphase I
   B. anaphase I
   C. metaphase II
   D. anaphase II
   E. telophase

   ANS: B PTS: 1

9. A cell that could not form spindle fibers could not perform ____.
   A. energy production
   B. gas exchange across the plasma membrane
   C. meiosis
   D. DNA replication
   E. protein synthesis

   ANS: C PTS: 1

10. Which of the following is an event that does NOT occur in prophase of mitosis?
    A. The chromosomes are duplicated.
    B. The nuclear envelope starts to break up.
    C. The mitotic spindle begins to form.
    D. The chromosomes begin to condense.
    E. All of these are events that occure in prophase of mitosis.

    ANS: A PTS: 1

11. A cell in G_0 state is a cell ____.
    A. that will shortly enter G_1
    B. that never divides
    C. that has just finished mitosis but has not yet begun cytokinesis
    D. in cytokinesis
    E. just after cytokinesis

    ANS: B PTS: 1

12. Centromeres are described by all of the following events except one. Select the exception.
    A. They divide in anaphase of mitosis.
    B. They connect sister chromatids.
    C. They attach chromosomes to spindle fibers.
    D. They cross over during prophase I of meiosis.
    E. There are no exceptions. All of these events describe centromeres.

ANS: D PTS: 1

13. Which of the following are NOT haploid?
    A. Polar bodies and secondary spermatocytes
    B. Primary oocytes and spermatids
    C. Secondary spermatocytes and spermatogonia
    D. Primary oocytes and spermatogonia
    E. Secondary spermatocytes and spermatids

    ANS: D PTS: 1

14. The underlying problem with Gaucher diseases is ___.
    A. the spontaneous breakdown of red blood cells
    B. the accumulation of fat in white blood cells
    C. the breakdown of the myelin sheath around nerves
    D. a hypertrophied spleen
    E. the lack of critical liver enzymes

    ANS: B PTS: 1

15. Which of the following biomolecules is directly important for membrane structure and function?
    A. Polysaccharides
    B. Steroids
    C. DNA
    D. Phospholipids
    E. ATP

    ANS: D PTS: 1

16. Which of the following is NOT a function of proteins?
    A. Energy carrier
    B. Structure of bones
    C. Enzymes
    D. Hormones
    E. All of these are functions of proteins

    ANS: A PTS: 1

17. Which of the following organelles is NOT involved with protein synthesis?
    A. The rough endoplasmic reticulum
    B. The Golgi complex
    C. The nucleus
    D. The lysosomes
    E. All of these organelles are involved in protein synthesis

    ANS: D PTS: 1

18. With which organelle are ribosomes most closely associated?
    A. The Golgi complex
    B. Lysosomes
    C. Mitochondria
    D. Smooth endoplasmic reticulum
    E. Rough endoplasmic reticulum

    ANS: E PTS: 1

19. How many different types of chromosomes do humans possess?
    A. 22
    B. 23
    C. 24
    D. 42
    E. 46

    ANS: C PTS: 1

20. In meiosis, when do cells become haploid?
    A. After telophase I
    B. After telophase II
    C. During anaphase I
    D. During anaphase II
    E. After prophase II

    ANS: A PTS: 1

21. In meiosis of oogenesis, how many mature eggs result?
    A. 1
    B. 2
    C. 3
    D. 4

    ANS: A PTS: 1

22. In spermatogenesis, what cells form in meiosis II?
    A. Primary spermatocytes
    B. Secondary spermatocytes
    C. Spermatids
    D. Mature sperm
    E. More than one of these

    ANS: C PTS: 1

23. Which of the following occurs between meiosis I and meiosis II?
    A. DNA replication
    B. Crossing over
    C. Random assortment
    D. Reduction of chromosome number
    E. None of these occur between meiosis I and meiosis II

    ANS: E PTS: 1

TRUE/FALSE

1. Skin cells typically do not divide.

    ANS: F PTS: 1

2. Mitotic divisions reduce the number of chromosomes found in daughter cells.

    ANS: F PTS: 1

3. Cytokinesis usually occurs just prior to mitosis.

   ANS: F PTS: 1

4. Autosomal chromosome pairs are identical, whereas the sex chromosome pair in males is not.

   ANS: T PTS: 1

5. "Crossing over" is partially responsible for our genetic diversity.

   ANS: T PTS: 1

6. Crossing over occurs between chromatids of homologous chromosome pairs.

   ANS: T PTS: 1

7. There are 92 chromosomes in a normal human cell undergoing mitosis at the anaphase stage.

   ANS: T PTS: 1

8. A polar body, once formed, has no further function and dies.

   ANS: T PTS: 1

COMPLETION

1. There are _____ autosomes present in a human egg.

   ANS: 22

   PTS: 1

2. The chromosomal structure that anchors the spindle fiber to the chromosome is _____.

   ANS: the centromere

   PTS: 1

3. If a cell was to stop dividing, it would stop in the _____ part of the cell cycle.

   ANS: G1

   PTS: 1

4. In mitosis, chromatids separate and move to the center of the cell during _____.

   ANS: metaphase

   PTS: 1

5. In many respects, the events of prophase seem to be the reverse of those occurring in _____.

ANS: telophase

PTS: 1

6. In meiosis, sister chromatids separate and move to opposite poles of the spindle during _____.

   ANS: anaphase II

   PTS: 1

7. In cell division, toward the end of nuclear division, the cytoplasm divides by a process called _____ to produce two identical cells.

   ANS: cytokinesis

   PTS: 1

8. The only cytoplasmic organelles besides nuclei that contain DNA are the _____.

   ANS: mitochondria

   PTS: 1

9. Ribosomes exist either free in the cytoplasm or attached to the membranes of _____.

   ANS: rough endoplasmic reticulum

   PTS: 1

10. One primary spermatocyte produces _____ (how many?) functional sperm(s); one primary oocyte produces _____ functional egg(s).

    ANS: 4; 1

    PTS: 1

SHORT ANSWER

1. Since only a relatively small number of genes is active in most specialized cells of the body, why must mitosis involve the replication of a complete set of genes?

   ANS:
   Answer not provided.

   PTS: 1

2. From an evolutionary standpoint, does it seem logical that mitosis evolved before meiosis, and that meiosis is really a specialized form of mitosis? Or should mitosis be regarded as a degenerate form of meiosis?

ANS:
Answer not provided.

PTS: 1

3. Would an understanding of the mechanism of the Hayflick limit lead to an increase in the human life span?

ANS:
Answer not provided.

PTS: 1

4. Describe the cell cycle. Do all cells go through this cycle at the same time?

ANS:
Answer not provided.

PTS: 1

5. What is accomplished by the unequal cytokinesis of oogenesis?

ANS:
Answer not provided.

PTS: 1

6. Describe the two genetic recombination events accomplished in meiosis.

ANS:
answer not provided

PTS: 1

7. Compare and contrast events and results of oogenesis and spermatogenesis.

ANS:
Answer not provided

PTS: 1

8. Compare and contrast mitosis with meiosis I.

ANS:
Answer not provided

PTS: 1

9. Compare and contrast mitosis with meiosis II.

ANS:
Answer not provided.

PTS: 1

10. Compare and contrast meiosis I and meiosis II, phase by phase.

ANS:
Answer not provided.

PTS: 1

11. Based on the events of oogenesis, what would be an obvious and simple method for determining the sex of an Olympic athlete? Explain.

ANS:
Answer not provided.

PTS: 1

MATCHING

Match the following events of the cell cycle with their descriptions.

A. Metaphase	E. Anaphase
B. S phase	F. G2
C. G1	G. Cytokinesis
D. Telophase	H. Prophase

1. Centromeres divide
2. Nuclear envelope disappears
3. Mitochondria divide
4. Chromosomes form sister chromatids
5. Actual cell division
6. Centrioles divide and migrate to opposite poles
7. Chromosomes line up at the center of the cell
8. Chromosomes condense

1. ANS: E PTS: 1
2. ANS: H PTS: 1
3. ANS: F PTS: 1
4. ANS: B PTS: 1
5. ANS: G PTS: 1
6. ANS: H PTS: 1
7. ANS: A PTS: 1
8. ANS: H PTS: 1

Match the disease with its underlying metabolic problem.

A. Gaucher disease	D. MELAS syndrome
B. Werner syndrome	E. Progeria
C. Menkes disease	F. Cystic fibrosis

9. DNA repair defects — death in teens
10. Copper metaboloism abnormality in the Golgi complex
11. Mitochondria disorder
12. Problem with chloride transport across plasma membrane

13. Fat deposits in white blood cells, spleen, and bone marrow
14. DNA repair defects — death in late 40s

9. ANS: E PTS: 1
10. ANS: C PTS: 1
11. ANS: D PTS: 1
12. ANS: F PTS: 1
13. ANS: A PTS: 1
14. ANS: B PTS: 1