**Cells and Cell Division**

**Human Heredity Principles and Issues**

**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

 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

 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

 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

 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

 6. During meiosis in an organism where 2*n* = 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

 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

 8. In meiosis, homologous chromosomes separate in \_\_\_\_.

|  |  |
| --- | --- |
| A. | metaphase I |
| B. | anaphase I |
| C. | metaphase II |
| D. | anaphase II |
| E. | telophase |

ANS: B

 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

 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

 11. A cell in G0 state is a cell \_\_\_\_.

|  |  |
| --- | --- |
| A. | that will shortly enter G1 |
| 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

 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

 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

 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

 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

 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

 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

 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

 19. How many different types of chromosomes do humans possess?

|  |  |
| --- | --- |
| A. | 22 |
| B. | 23 |
| C. | 24 |
| D. | 42 |
| E. | 46 |

ANS: C

 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

 21. In meiosis of oogenesis, how many mature eggs result?

|  |  |
| --- | --- |
| A. | 1 |
| B. | 2 |
| C. | 3 |
| D. | 4 |

ANS: A

 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

 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

**TRUE/FALSE**

 1. Skin cells typically do not divide.

ANS: F

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

ANS: F

 3. Cytokinesis usually occurs just prior to mitosis.

ANS: F

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

ANS: T

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

ANS: T

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

ANS: T

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

ANS: T

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

ANS: T

**COMPLETION**

 1. There are \_\_\_\_\_\_\_\_\_\_ autosomes present in a human egg.

ANS: 22

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

ANS: the centromere

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

ANS: G1

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

ANS: metaphase

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

ANS: telophase

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

ANS: anaphase II

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

ANS: cytokinesis

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

ANS: mitochondria

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

ANS: rough endoplasmic reticulum

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

ANS: 4; 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.

 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.

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

ANS:

Answer not provided.

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

ANS:

Answer not provided.

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

ANS:

Answer not provided.

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

ANS:

answer not provided

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

ANS:

Answer not provided

 8. Compare and contrast mitosis with meiosis I.

ANS:

Answer not provided

 9. Compare and contrast mitosis with meiosis II.

ANS:

Answer not provided.

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

ANS:

Answer not provided.

 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.

**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

 2. ANS: H

 3. ANS: F

 4. ANS: B

 5. ANS: G

 6. ANS: H

 7. ANS: A

 8. ANS: H

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

 10. ANS: C

 11. ANS: D

 12. ANS: F

 13. ANS: A

 14. ANS: B