

Cell Division Exam (MYP)**Multiple Choice**

Identify the letter of the choice that best completes the statement or answers the question.

- _____ 1. What is a genome?
- the complete complement of an organism's genes
 - a specific sequence of polypeptides within each cell
 - a specialized polymer of four different kinds of monomers
 - a specific segment of DNA that is found within a prokaryotic chromosome
 - an ordered display of chromosomes arranged from largest to smallest
- _____ 2. What is a chromatid?
- a chromosome in G₁ of the cell cycle
 - a replicated chromosome
 - a chromosome found outside the nucleus
 - a special region that holds two centromeres together
 - another name for the chromosomes found in genetics
- _____ 3. The correct sequence of steps in the M phase of the cell cycle is
- prophase, prometaphase, metaphase, anaphase, telophase.
 - prophase, metaphase, prometaphase, anaphase, telophase.
 - prophase, prometaphase, metaphase, anaphase, telophase, cytokinesis.
 - prophase, metaphase, anaphase, telophase, cytokinesis.
 - cytokinesis, telophase, prophase, prometaphase, metaphase, anaphase.
- _____ 4. The centromere is a region in which
- chromatids are attached to one another.
 - metaphase chromosomes become aligned.
 - chromosomes are grouped during telophase.
 - the nucleus is located prior to mitosis.
 - new spindle microtubules form.
- _____ 5. Starting with a fertilized egg (zygote), a series of five cell divisions would produce an early embryo with how many cells?
- 4
 - 8
 - 16
 - 32
 - 64
- _____ 6. What is a karyotype?
- the set of unique physical characteristics that define an individual
 - the collection of all the mutations present within a genome
 - a unique combination of chromosomes found in a gamete
 - a system of classifying cell nuclei
 - a display of every pair of homologous chromosomes within a cell, organized according to size and shape

- _____ 7. If the liver cells of an animal have 24 chromosomes, how many chromosomes do its sperm cells have?
- 6
 - 12
 - 24
 - 48
 - 64
- _____ 8. Which of the following statements about genes is *incorrect*?
- Genes correspond to segments of DNA.
 - Many genes contain the information needed for cells to synthesize enzymes and other proteins.
 - During fertilization, both the sperm and the ovum contribute genes to the resulting fertilized egg.
 - Under normal circumstances, each chromosome contains precisely one gene.
 - Genetic differences can result from changes in the DNA called mutations.
- _____ 9. How do the daughter cells at the end of mitosis and cytokinesis compare with their parent cell when it was in G₁ of the cell cycle?
- The daughter cells have half the amount of cytoplasm and half the amount of DNA.
 - The daughter cells have half the number of chromosomes and half the amount of DNA.
 - The daughter cells have the same number of chromosomes and half the amount of DNA.
 - The daughter cells have the same number of chromosomes and the same amount of DNA.
 - The daughter cells have the same number of chromosomes and twice the amount of DNA.
- _____ 10. Which of the following is the term for a human cell that contains 22 pairs of autosomes and two X chromosomes?
- an unfertilized egg cell
 - a sperm cell
 - a male somatic cell
 - a female somatic cell
 - both A and D
- _____ 11. After telophase I of meiosis, the chromosomal makeup of each daughter cell is
- diploid, and the chromosomes are composed of a single chromatid.
 - diploid, and the chromosomes are composed of two chromatids.
 - haploid, and the chromosomes are composed of a single chromatid.
 - haploid, and the chromosomes are composed of two chromatids.
 - tetraploid, and the chromosomes are composed of two chromatids.

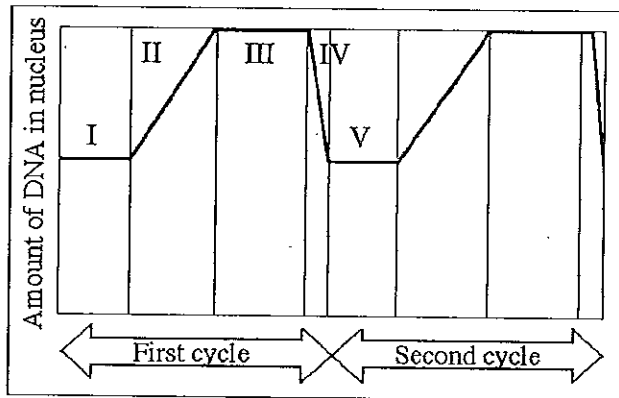
- _____ 12. Asexual reproduction and sexual reproduction are different in that
- individuals reproducing asexually transmit 100% of their genes to their progeny, whereas individuals reproducing sexually only transmit 50%.
 - asexual reproduction produces offspring that are genetically identical to the parents, whereas sexual reproduction gives rise to genetically distinct offspring.
 - asexual reproduction involves a single parent, whereas sexual reproduction involves two.
 - asexual reproduction only requires mitosis, whereas sexual reproduction always involves meiosis.
 - all of the above
- _____ 13. Eukaryotic sexual life cycles show tremendous variation. Of the following elements, which do *all* sexual life cycles have in common?
- alternation of generations
 - meiosis
 - fertilization
 - gametes
 - spores
- I, IV, and V
 - I, II, and IV
 - II, III, and IV
 - II, IV, and V
 - all of the above
- _____ 14. If a cell has 8 chromosomes at metaphase of mitosis, how many chromosomes will it have during anaphase?
- 1
 - 2
 - 4
 - 8
 - 16
- _____ 15. All of the following are functions of meiosis in plants *except*
- production of spores.
 - reduction of chromosome number by half.
 - independent assortment of chromosomes.
 - crossing over and recombination of homologous chromosomes.
 - production of identical daughter cells.
- _____ 16. In animals, meiosis results in gametes, and fertilization results in
- spores.
 - gametophytes.
 - zygotes.
 - sporophytes.
 - clones.

- _____ 17. Chromosomes first become visible during _____ of mitosis.
- prometaphase
 - telophase
 - prophase
 - metaphase
 - anaphase
- _____ 18. Cytokinesis usually, but not always, follows mitosis. If a cell completed mitosis but not cytokinesis, the result would be a cell with
- a single large nucleus.
 - high concentrations of actin and myosin.
 - two abnormally small nuclei.
 - two nuclei.
 - two nuclei but with half the amount of DNA.
- _____ 19. Regarding mitosis and cytokinesis, one difference between higher plants and animals is that in plants
- the spindles contain microfilaments in addition to microtubules, whereas animal spindles do not contain microfilaments.
 - sister chromatids are identical, but they differ from one another in animals.
 - a cell plate begins to form at telophase, whereas animals a cleavage furrow is initiated at that stage.
 - chromosomes become attached to the spindle at prophase, whereas in animals chromosomes do not become attached until anaphase.
 - spindle poles contain centrioles, whereas spindle poles in animals do not.
- _____ 20. Independent assortment of chromosomes is a result of
- the random and independent way in which each pair of homologous chromosomes lines up at the metaphase plate during meiosis I.
 - the random nature of the fertilization of ova by sperm.
 - the random distribution of the sister chromatids to the two daughter cells during anaphase II.
 - the relatively small degree of homology shared by the X and Y chromosomes.
 - all of the above
- _____ 21. For a species with a diploid number of 10 chromosomes, how many different combinations of maternal and paternal chromosomes are possible for the gametes?
- 5
 - 25
 - 32
 - 100
 - about 10,000
- _____ 22. How does the sexual life cycle increase the genetic variation in a species?
- by allowing independent assortment of chromosomes
 - by allowing random fertilization
 - by allowing crossing over
 - A and B only
 - A, B, and C

- _____ 23. Which of the following organisms does *not* reproduce cells by mitosis and cytokinesis?
- cow
 - bacterium
 - mushroom
 - cockroach
 - banana tree
- _____ 24. A cell containing 92 chromatids at metaphase of mitosis would, at its completion, produce two nuclei containing how many chromosomes?
- 12
 - 16
 - 23
 - 46
 - 92
- _____ 25. In animals, somatic cells are produced by mitosis and _____ are produced by meiosis.
- gametes
 - clones
 - zygotes
 - spores
 - diploid cells
- _____ 26. In some organisms, mitosis occurs without cytokinesis occurring. This will result in
- cells with more than one nucleus.
 - cells that are unusually small.
 - cells lacking nuclei.
 - destruction of chromosomes.
 - cell cycles lacking an S phase.
- _____ 27. One difference between a cancer cell and a normal cell is that
- the cancer cell is unable to synthesize DNA.
 - the cell cycle of the cancer cell is arrested at the S phase.
 - cancer cells continue to divide even when they are tightly packed together.
 - cancer cells cannot function properly because they suffer from density-dependent inhibition.
 - cancer cells are always in the M phase of the cell cycle.
- _____ 28. All of the following occur during mitosis *except* the
- condensing of chromosomes.
 - uncoupling of chromatids at the centromere.
 - formation of a spindle.
 - synthesis of DNA.
 - disappearance of the nucleolus.

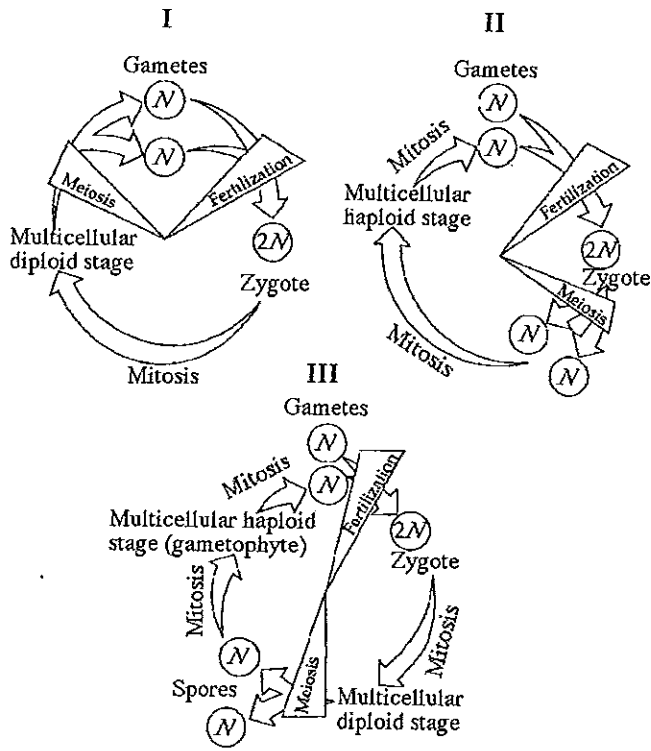
- _____ 29. Measurements of the amount of DNA per nucleus were taken on a large number of cells from a growing fungus. The measured DNA levels ranged from 3 to 6 picograms per nucleus. In which stage of the cell cycle was the nucleus with 6 picograms of DNA?
- G₀
 - G₁
 - Middle of S
 - G₂
 - Metaphase
- _____ 30. For a species with a haploid number of 23 chromosomes, how many different combinations of maternal and paternal chromosomes are possible for the gametes?
- 23
 - 46
 - 460
 - 920
 - about 8 million
- _____ 31. How do the two members of a pair of homologous chromosomes differ from each other?
- their length
 - the identity and relative position of the genes present on each of the chromosomes
 - their staining patterns
 - the position of the centromere within each of the chromosomes
 - the precise sequence of the DNA within each of the chromosomes
- _____ 32. The somatic cells derived from a single-celled zygote divide by which process?
- meiosis
 - mitosis
 - replication
 - cytokinesis alone
 - binary fission
- _____ 33. Which of the following is *true* of a species that has a chromosome number of $2n = 16$?
- The species is diploid with 32 chromosomes.
 - The species has 16 sets of chromosomes.
 - There are 8 homologous pairs.
 - During the S phase of the cell cycle there will be 32 separate chromosomes.
 - A gamete from this species has 4 chromosomes.
- _____ 34. Which of the following is *true of the process of meiosis*?
- Two diploid cells result.
 - Four diploid cells result.
 - Four haploid cells result.
 - Four autosomes result.
 - Four chiasmata result.
- _____ 35. How do cells at the completion of meiosis compare with cells that have replicated their DNA and are just about to begin meiosis?
- They have twice the amount of cytoplasm and half the amount of DNA.
 - They have half the number of chromosomes and half the amount of DNA.
 - They have the same number of chromosomes and half the amount of DNA.
 - They have half the number of chromosomes and one-fourth the amount of DNA.
 - They have half the amount of cytoplasm and twice the amount of DNA.

Use the figure below to answer the following question.



- _____ 36. Mitosis is represented by which number?
- I
 - II
 - III
 - IV
 - V
- _____ 37. G_1 is represented by which number(s)?
- I and V
 - II and IV
 - III
 - IV
 - V
- _____ 38. Which number represents DNA synthesis?
- I
 - II
 - III
 - IV
 - V

Refer to the life cycles illustrated in the figure below to answer the following questions.



- _____ 39. Which of the life cycles is typical for animals?
- I only
 - II only
 - III only
 - I and II
 - I and III
- _____ 40. Which of the life cycles is typical for plants and some algae?
- I only
 - II only
 - III only
 - I and II
 - I and III

Name: _____

ID: A

For the following questions, match the key event of meiosis with the stages listed below.

- | | | | |
|------|-------------|-------|--------------|
| I. | prophase I | V. | prophase II |
| II. | metaphase I | VI. | metaphase II |
| III. | anaphase I | VII. | anaphase II |
| IV. | telophase I | VIII. | telophase II |

- _____ 41. Tetrads of chromosomes are aligned at the center of the cell; independent assortment soon follows.
- I
 - II
 - IV
 - VII
 - VIII
- _____ 42. Synapsis of homologous pairs occurs; crossing over may occur.
- I
 - II
 - IV
 - VI
 - VII
- _____ 43. Centromeres of sister chromatids uncouple and chromatids separate.
- II
 - III
 - IV
 - V
 - VII

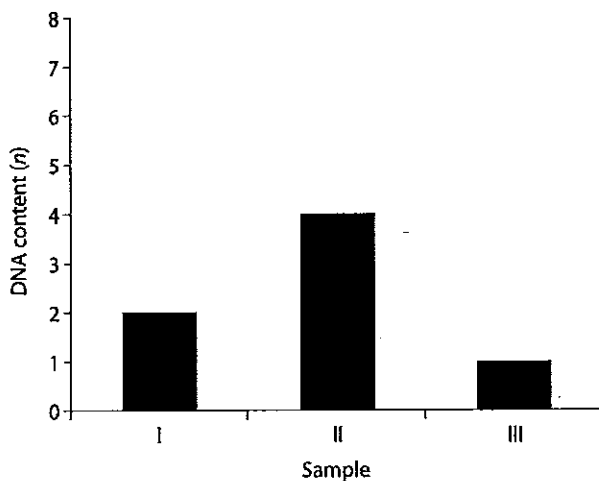
Use the following key to answer the following questions. Each answer may be used once, more than once, or not at all.

- The statement is true for mitosis only.
- The statement is true for meiosis I only.
- The statement is true for meiosis II only.
- The statement is true for mitosis and meiosis I.
- The statement is true for mitosis and meiosis II.

- _____ 44. A cell divides to produce two daughter cells that are genetically identical.
- A
 - B
 - C
 - D
 - E

- _____ 45. Homologous chromosomes synapse and crossing over occurs.
- A
 - B
 - C
 - D
 - E
- _____ 46. Independent assortment of chromosomes occurs.
- A
 - B
 - C
 - D
 - E
- _____ 47. The process is preceded by replication of the DNA.
- A
 - B
 - C
 - D
 - E

You isolate DNA from three different cell types of an organism, determine the relative DNA content for each type, and plot the results on the graph shown in the figure below. Refer to the graph to answer the following questions.

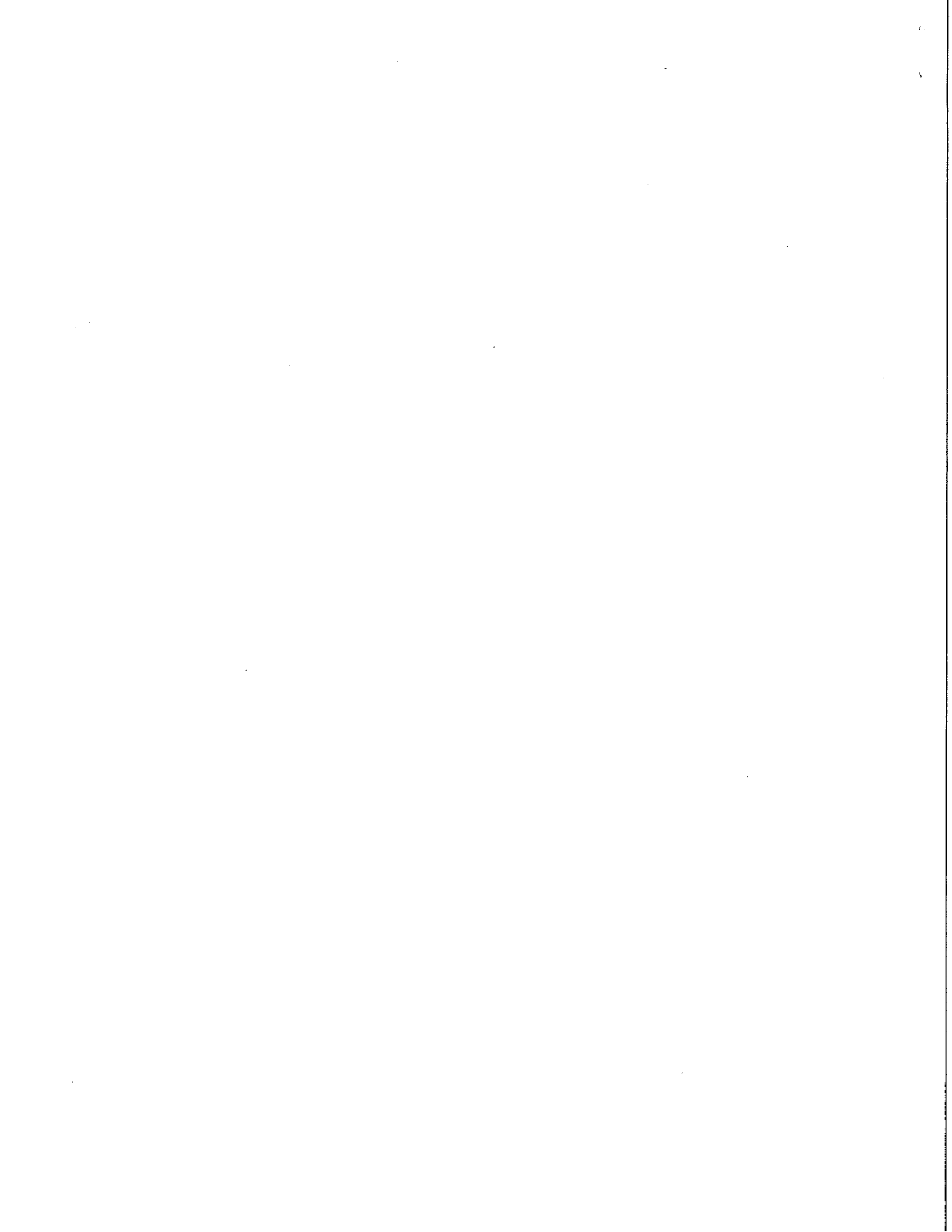


- _____ 48. If the cells were from a plant, which sample might represent a gametophyte cell?
- I
 - II
 - III
 - either I or II
 - either II or III

Name: _____

ID: A

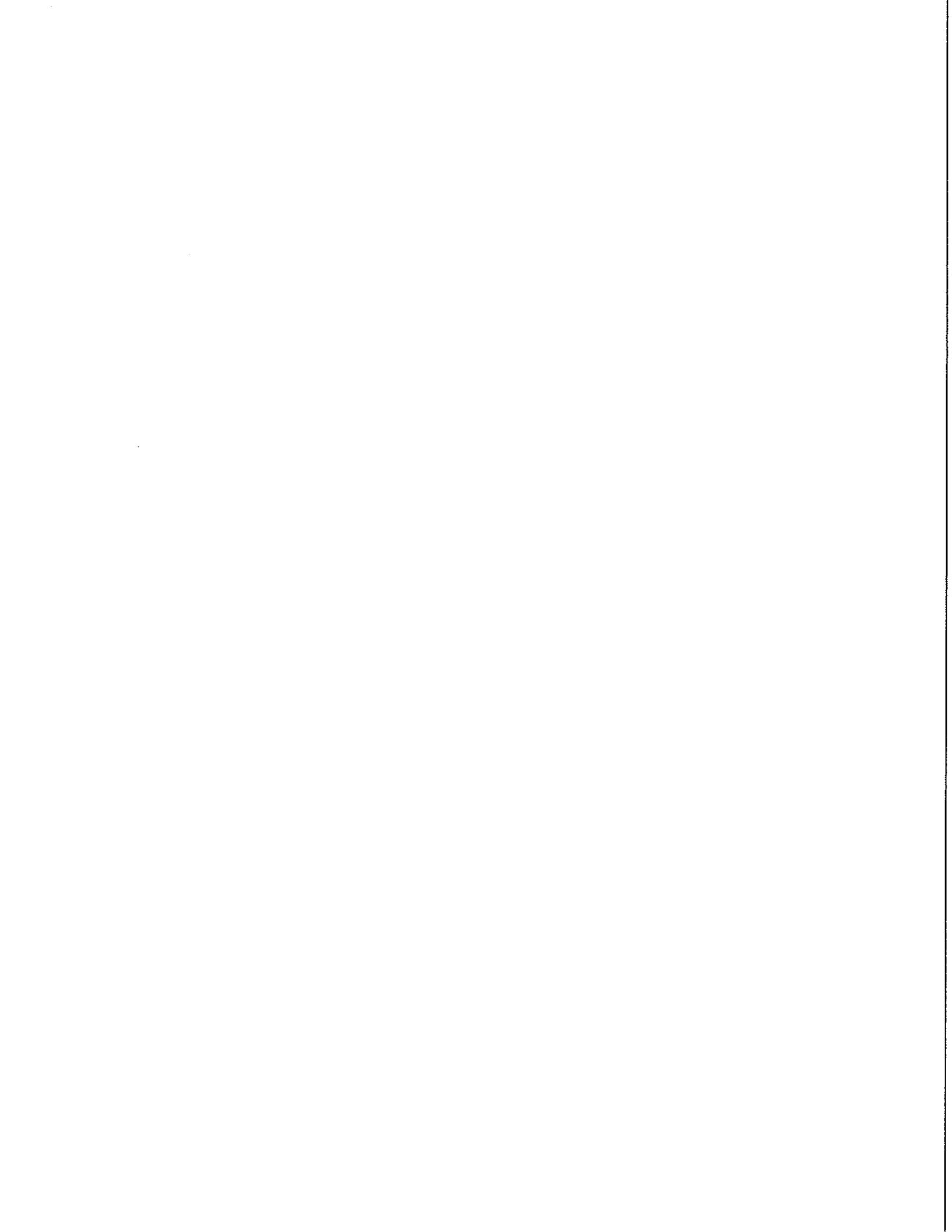
- _____ 49. Which sample might represent an animal cell in G₂ phase of the cell cycle?
- a. I
 - b. II
 - c. III
 - d. both I and II
 - e. both II and III
- _____ 50. Which sample might represent a sperm cell?
- a. I
 - b. II
 - c. III
 - d. either I or II
 - e. either II or III



Cell Division Exam (MYP)
Answer Section

MULTIPLE CHOICE

- | | |
|------------|---------------------------------|
| 1. ANS: A | TOP: Concept 13.1 |
| 2. ANS: B | TOP: Concept 12.1 |
| 3. ANS: C | TOP: Concept 12.2 |
| 4. ANS: A | TOP: Concept 12.1 |
| 5. ANS: D | TOP: Concept 12.1 |
| 6. ANS: E | TOP: Concept 13.2 |
| 7. ANS: B | TOP: Concept 13.2 |
| 8. ANS: D | TOP: Concept 13.1 |
| 9. ANS: D | TOP: Concept 12.1, Concept 12.2 |
| 10. ANS: D | TOP: Concept 13.2 |
| 11. ANS: D | TOP: Concept 13.3 |
| 12. ANS: E | TOP: Concept 13.1 |
| 13. ANS: C | TOP: Concept 13.2 |
| 14. ANS: E | TOP: Concept 12.2 |
| 15. ANS: E | TOP: Concept 13.2, Concept 13.3 |
| 16. ANS: C | TOP: Concept 13.2 |
| 17. ANS: C | TOP: Concept 12.2 |
| 18. ANS: D | TOP: Concept 12.2 |
| 19. ANS: C | TOP: Concept 12.2 |
| 20. ANS: A | TOP: Concept 13.4 |
| 21. ANS: C | TOP: Concept 13.4 |
| 22. ANS: E | TOP: Concept 13.4 |
| 23. ANS: B | TOP: Concept 12.2 |
| 24. ANS: D | TOP: Concept 12.2 |
| 25. ANS: A | TOP: Concept 13.2 |
| 26. ANS: A | |
| 27. ANS: C | |
| 28. ANS: D | TOP: Concept 12.2 |
| 29. ANS: D | TOP: Concept 12.2 |
| 30. ANS: E | TOP: Concept 13.4 |
| 31. ANS: E | TOP: Concept 13.2 |
| 32. ANS: B | TOP: Concept 12.2 |
| 33. ANS: C | TOP: Concept 13.2 |
| 34. ANS: C | TOP: Concept 13.3 |
| 35. ANS: D | TOP: Concept 13.3 |
| 36. ANS: D | TOP: Concept 12.2 |
| 37. ANS: A | TOP: Concept 12.2 |
| 38. ANS: B | TOP: Concept 12.2 |



- | | |
|------------|-------------------|
| 39. ANS: A | TOP: Concept 13.2 |
| 40. ANS: C | TOP: Concept 13.2 |
| 41. ANS: B | TOP: Concept 13.3 |
| 42. ANS: A | TOP: Concept 13.3 |
| 43. ANS: E | TOP: Concept 13.3 |
| 44. ANS: A | TOP: Concept 13.3 |
| 45. ANS: B | TOP: Concept 13.3 |
| 46. ANS: B | TOP: Concept 13.3 |
| 47. ANS: D | TOP: Concept 13.3 |
| 48. ANS: C | TOP: Concept 13.3 |
| 49. ANS: B | TOP: Concept 13.3 |
| 50. ANS: C | TOP: Concept 13.3 |

