

AP Biology Chapter 9 The Cell Cycle Exam

Name _____ date _____

1. ____ Beginning with a fertilized egg (zygote), a series of five cell divisions would produce an early embryo with how many cells?

- A) 4
- B) 8
- C) 16
- D) 32
- E) 64

Answer: D

2. ____ Eukaryotic chromatin is composed of

- A) condensed DNA only.
- B) DNA and RNA.
- C) DNA and carbohydrates.
- D) DNA and proteins.
- E) DNA and ribosomes.

Answer: D

3. ____ What is produced if a cell completes mitosis but does not undergo cytokinesis?

- A) two cells, one cell containing two nuclei and a second cell without a nucleus
- B) two cells, each cell with half of the genetic material of the parent cell
- C) two cells, each cell with an identical nucleus containing the genetic material of the parent cell
- D) one cell with one nucleus containing half of the genetic material of the parent cell
- E) one cell with two nuclei, each identical to the nucleus of the parent cell

Answer: E

4. ____ Humans produce skin cells by mitosis and gametes by meiosis. The nuclei of skin cells produced by mitosis will have

- A) half as much DNA as the nuclei of gametes produced by meiosis.
- B) the same amount of DNA as the nuclei of gametes produced by meiosis.
- C) twice as much DNA as the nuclei of gametes produced by meiosis.
- D) four times as much DNA as the nuclei of gametes produced by meiosis.

Answer: C

5. ____ Compared to most prokaryotic cells, eukaryotic cells typically have

- A) more DNA molecules and larger genomes.
- B) the same number of DNA molecules but larger genomes.
- C) the same number of DNA molecules and similarly sized genomes.
- D) fewer DNA molecules but larger genomes.
- E) fewer DNA molecules and smaller genomes.

Answer: A

6. ____ During mitosis in animal cells, at which phase do centrioles begin to move apart?

- A) prophase
- B) prometaphase
- C) metaphase
- D) anaphase
- E) telophase

Answer: A

7. ____ If there are 20 chromatids in a cell at anaphase of mitosis, how many chromosomes are there in each daughter cell following cytokinesis?

- A) 5
- B) 10
- C) 20
- D) 40

Answer: B

8. ____ Where do the microtubules of the spindle originate during mitosis in animal cells?

- A) centromere
- B) centrosome
- C) centriole
- D) chromatid
- E) kinetochore

Answer: B

9. ____ Taxol is an anticancer drug extracted from the Pacific yew tree that binds to microtubules and prevents their depolymerization. Actively dividing cells treated with Taxol become blocked in which phase of mitosis?

- A) prophase
- B) prometaphase
- C) metaphase
- D) anaphase
- E) telophase

Answer: C

10. ____ Which of the following are primarily responsible for cytokinesis in plant cells but not in animal cells?

- A) spot desmosomes
- B) tubulin and dynein
- C) actin and myosin
- D) centrioles and centromeres
- E) Golgi-derived vesicles

Answer: E

11. ____ Movement of the chromosomes during anaphase would be most affected by a drug that prevents

- A) nuclear envelope breakdown.
- B) cell wall formation.
- C) elongation of microtubules.
- D) shortening of microtubules.
- E) formation of a cleavage furrow.

Answer: D

12. ____ A group of cells is assayed for DNA content immediately following mitosis and is found to have an average of 8 picograms of DNA per nucleus. How many picograms would be found at the end of S and the end of G₂?

- A) 8; 8
- B) 8; 16
- C) 16; 8
- D) 16; 16
- E) 12; 16

Answer: D

13. ____ A group of cells is assayed for DNA content immediately before beginning mitosis and is found to have an average of 16 picograms of DNA per nucleus. How many picograms would be in a cell nucleus following completion of mitosis and cytokinesis?

- A) 4
- B) 8
- C) 16
- D) 32

Answer: B

14. ____ At which phase of mitosis do the sister chromatids become daughter chromosomes?

- A) prophase
- B) prometaphase
- C) metaphase
- D) anaphase
- E) cytokinesis

Answer: D

15. ____ What is a cleavage furrow?

- A) a ring of vesicles forming a cell plate
- B) an indentation between daughter prokaryotic cells
- C) a groove in the plasma membrane between daughter nuclei
- D) the metaphase plate where chromosomes attach to the spindle

Answer: C

16. ____ A plant-derived protein known as colchicine can be used to poison cells by blocking the formation of the spindle. Which of the following would result if colchicine is added to a sample of cells in G₂?

- A) The cells would immediately die.
- B) The cells would be unable to begin M and stay in G₂.
- C) The chromosomes would condense and become visible in prophase but could not move in an orderly way.
- D) Chromosome condensation would occur, but the chromosomes would fail to align at the metaphase plate.

Answer: C

17. ____ Where are the motor proteins that move chromosomes toward the poles of the mitotic spindle located?

- A) on the centrioles
- B) in the centrosomes
- C) on the kinetochores
- D) along the length of kinetochore microtubules

Answer: C

18. ____ When a cell is in late anaphase of mitosis, which of the following may be seen?

- A) a clear area in the center of the dividing cell
- B) decondensing chromosomes clustered at the poles
- C) individual chromatids beginning to separate from one another
- D) chromosomes clustered tightly at the center of the dividing cell
- E) nuclear envelopes forming at the poles

Answer: A

19. ____ Cells from advanced malignant tumors frequently have very abnormal chromosomes as well as an abnormal number of chromosomes. What might explain the association between malignant tumors and chromosomal abnormalities?

- A) Cancer cells replicate chromosomes multiple times per cell cycle.
- B) Cancer cells are no longer anchorage dependent.
- C) Cell cycle checkpoints are not in place to stop cells with chromosome abnormalities.
- D) Cells with abnormal chromosomes have increased metabolism.

Answer: C

20. ____ Which is the first checkpoint in the cell cycle where a cell will be caused to exit the cycle if this point is not passed?

- A) G₀
- B) G₁
- C) G₂
- D) S
- E) M

Answer: B

21. ____ Which of the following is released by platelets in the vicinity of an injury?

- A) PDGF
- B) separase
- C) protein kinase
- D) cyclin

Answer: A

22. ____ The cell cycle is regulated at the molecular level by a set of proteins known as

- A) ATPases.
- B) separase proteins.
- C) cohesins.
- D) cyclins.

Answer: D

23. ____ Density-dependent inhibition is explained by which of the following?

- A) As cells become more numerous, they begin to squeeze against each other, restricting their size and ability to produce growth factors.
- B) As cells become more numerous, the protein kinases they produce begin to compete with each other, such that the proteins produced by one cell essentially cancel those produced by its neighbor.
- C) As cells become more numerous, the cell surface proteins of adjacent cells bind to each other and send signals that inhibit cell division.
- D) As cells become more numerous, the level of waste products increases, eventually slowing down metabolism.

Answer: C

24. ____ Which of the following is true concerning cancer cells?

- A) They exhibit density-dependent inhibition when growing in culture.
- B) They must be attached to a substrate to divide in culture.
- C) They evade the normal controls that trigger programmed cell death.
- D) They stop dividing in culture when growth factors are depleted.

Answer: C

25. ____ Why do neurons and some other specialized cells divide infrequently?

- A) They no longer have active nuclei.
- B) They no longer carry receptors for signal molecules.
- C) They have been shunted into G₀.
- D) They no longer produce cyclins.

Answer: C

26. ____ Most animal cells exhibit anchorage dependence, which means that in order to divide

- A) all chromosomes must be attached to spindle microtubules.
- B) nonkinetochore microtubules from opposite poles must overlap and be attached by motor proteins.
- C) cell-surface phospholipids must be attached to those of adjoining cells.
- D) cells must be attached to a substrate or extracellular matrix of a tissue.

Answer: D

27. ____ The protein complex that activates progress through the M phase checkpoint will allow which of the following to occur?

- A) cleavage of cohesin proteins by separase allowing anaphase to complete
- B) modification of separase by cohesins allowing only a few chromatids to separate
- C) disassembly of spindle microtubules at the centromere
- D) assembly of spindle microtubules

Answer: A

28. ____ Researchers began a study of a cultured cell line. Their preliminary observations showed them that the cell line did not exhibit either density-dependent inhibition or anchorage dependence. What could they conclude right away?

- A) The cells originated in the nervous system.
- B) The cells show characteristics of tumors.
- C) The cells have altered series of cell cycle phases.
- D) The cells were originally derived from an elderly organism.

Answer: B

29. ____ For a chemotherapeutic drug to be useful for treating cancer cells, which of the following is most desirable?

- A) It is safe enough to limit all apoptosis.
- B) It does not affect metabolically active cells.
- C) It only attacks cells that are density dependent.
- D) It targets only rapidly dividing cells.

Answer: D

30. ____ You have a series of cells, all of which were derived from tumors. How might you determine which ones are malignant?

- A) Identify the ones that are not dividing uncontrollably.
- B) Identify the ones with higher rates of apoptosis.
- C) Identify the ones with aberrant chromosome number or structure.
- D) Identify the ones with elongated cell cycles.

Answer: C

Please use the following information to answer the questions 31-33.

The unlettered circle at the top of Figure 9.1 shows a diploid nucleus with four chromosomes that have not yet replicated. There are two pairs of homologous chromosomes, one long and the other short. One haploid set is black, and the other is gray. The circles labeled A-E show various combinations of these chromosomes.

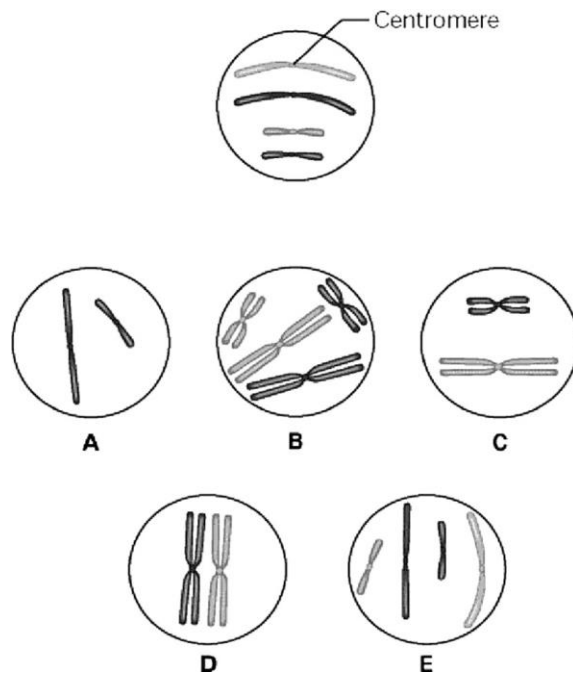


Figure 9.1

31. ____ Which image displays the chromosomal composition of one daughter nucleus at telophase of mitosis?

- A) A
- B) B
- C) C
- D) D
- E) E

Answer: E

32. ____ What is the correct chromosomal condition for a nucleus at prophase of mitosis?

- A) A
- B) B
- C) C
- D) D
- E) E

Answer: B

33. ____ What is the correct chromosomal condition for a nucleus in G1 of the cell division cycle?

- A) A
- B) B
- C) C
- D) D
- E) E

Answer: E

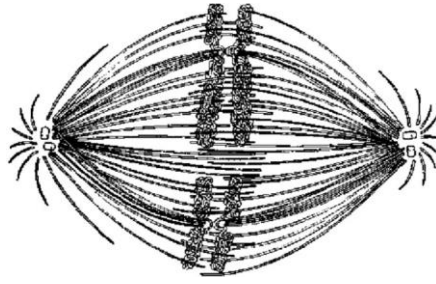


Figure 9.2

34. ____ If the cell whose nuclear material is shown in Figure 9.2 continues toward completion of mitosis, which of the following events would occur next?

- A) cell membrane synthesis
- B) alignment of chromosomes at the metaphase plate
- C) segregation of daughter chromosomes toward the poles
- D) formation of telophase nuclei
- E) synthesis of sister chromatids

Answer: C

Please use the following information to answer the questions 35-40.

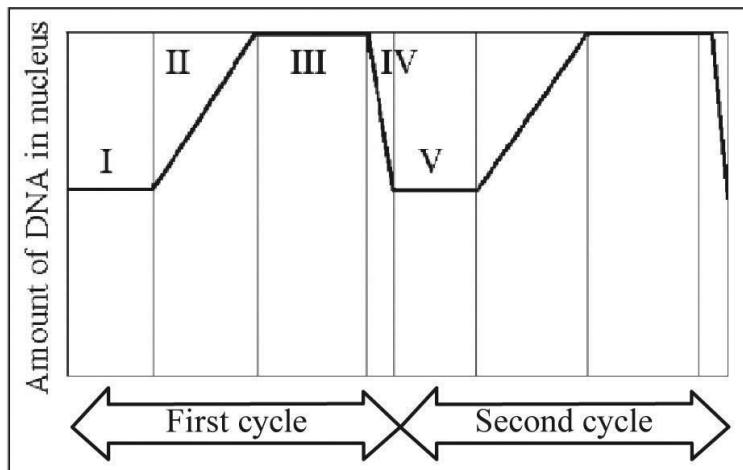


Figure 9.3

35. ____ In Figure 9.3, mitosis is represented by which numbered parts of the cycle?

- A) I
- B) II
- C) III
- D) IV
- E) V

Answer: D

36. ____ In Figure 9.3, G₁ is represented by which numbered parts of the cycle?

- A) I or V
- B) II or IV
- C) III only
- D) IV only
- E) V only

Answer: A

37. ____ In Figure 9.3, DNA synthesis is represented by which numbered parts of the cycle?

- A) I
- B) II
- C) III
- D) IV
- E) V

Answer: B

38. ____ In Figure 9.3, which number represents the point in the cell cycle during which the chromosomes are replicated?

- A) I
- B) II
- C) III
- D) IV
- E) V

Answer: B

39. ____ In Figure 9.3, which of the numbered regions would contain cells at metaphase?

- A) I and IV
- B) II only
- C) III only
- D) IV only
- E) V only

Answer: D

40. ____ In Figure 9.3, G₂ is represented by which numbered parts of the cycle?

- A) I or V
- B) II or IV
- C) III only
- D) IV only
- E) V only

Answer: C

Please use the following information to answer the questions 41-42.

The data in Table 9.1 were obtained from a study of the length of time spent in each phase of the cell cycle by cells of three eukaryotic organisms designated beta, delta, and gamma.

Cell Type	G ₁	S	G ₂	M
Beta	18	24	12	16
Delta	100	0	0	0
Gamma	18	48	14	20

Table 9.1
Minutes Spent in Cell Cycle Phases

41. ____ Which of the following is the most plausible explanation for the difference in time spent in S phase by beta and gamma?

- A) Gamma is unicellular and beta is multicellular.
- B) Beta is tetraploid and gamma is diploid.
- C) Gamma contains more DNA than beta.
- D) Beta reproduces asexually and gamma reproduces sexually.
- E) Beta is a plant cell and gamma is an animal cell.

Answer: C

42. ____ The best conclusion concerning delta is that the cells

- A) contain no DNA.
- B) contain only one chromosome that is very small.
- C) are actually in the G₀ phase.
- D) synthesize DNA in the G₁ phase

Answer: C

43. ____ Several organisms, including a number of protists, have intermediate mitotic organization. Which of the following is the most probable hypothesis regarding these intermediate forms of cell division?

- A) They represent a form of cell reproduction that must have evolved completely separately from those of other organisms.
- B) They demonstrate that these species are not closely related to any of the other protists and may well be a different kingdom.
- C) They rely on totally different proteins for the processes they undergo.
- D) They may be more closely related to plant forms that also have unusual mitosis.
- E) They show some but not all of the evolutionary steps toward complete mitosis.

Answer: E

Please use the following information to answer the questions 44-45.

Nucleotides can be radiolabeled before they are incorporated into newly forming DNA and can therefore be assayed to track their incorporation. In a set of experiments, a student-faculty research team introduced labeled T nucleotides into the culture of dividing human cells at specific times.

44. ____ Which of the following questions might be answered by such a method?

- A) How many cells are produced by the culture per hour?
- B) What is the length of the S phase of the cell cycle?
- C) When is the S chromosome synthesized?
- D) How many picograms of DNA are made per cell cycle?
- E) When do spindle fibers attach to chromosomes?

Answer: B

45. ____ The research team used the setup to study the incorporation of labeled nucleotides into a culture of lymphocytes (White Blood Cells) and found that the lymphocytes incorporated the labeled nucleotide at a significantly higher level after a pathogen was introduced into the culture. They concluded that
- A) the presence of the pathogen made the experiment too contaminated to trust the results.
 - B) their tissue culture methods needed to be relearned.
 - C) infection causes lymphocytes to divide more rapidly.
 - D) infection causes cell cultures in general to reproduce more rapidly.
 - E) infection causes lymphocyte cultures to skip some parts of the cell cycle.

Answer: C

46. ____ Through a microscope, you can see a cell plate beginning to develop across the middle of a cell and nuclei forming on either side of the cell plate. This cell is most likely
- A) an animal cell in the process of cytokinesis.
 - B) a plant cell in the process of cytokinesis.
 - C) a bacterial cell dividing.
 - D) a plant cell in metaphase.

Answer: B

47. ____ In the cells of some organisms, mitosis occurs without cytokinesis. This will result in
- A) cells with more than one nucleus.
 - B) cells that are unusually small.
 - C) cells lacking nuclei.
 - D) cell cycles lacking an S phase.

Answer: A

48. ____ Which of the following does *not* occur during mitosis?
- A) condensation of the chromosomes
 - B) replication of the DNA
 - C) separation of sister chromatids
 - D) spindle formation

Answer: B

49. ____ A particular cell has half as much DNA as some other cells in a mitotically active tissue. The cell in question is most likely in
- A) G₁.
 - B) G₂.
 - C) prophase.
 - D) metaphase.

Answer: A

50. ____ The drug cytochalasin B blocks the function of actin. Which of the following aspects of the animal cell cycle would be most-disrupted by cytochalasin B?
- A) spindle formation
 - B) spindle attachment to kinetochores
 - C) cell elongation during anaphase
 - D) cleavage furrow formation and cytokinesis

Answer: D