Ch. 12 The Cell Cycle
1) How many chromosomes are in the middle cell?

a) 1
b) 2
c) 4
d) 8
1) How many chromosomes are in the middle cell?

a) 1
b) 2
c) 4
d) 8
2) At what part of the cell cycle would you see a chromosome that looks like this?

a) $G_1$

b) $G_2$

c) M

d) S
2) At what part of the cell cycle would you see a chromosome that looks like this?

a) $G_1$

b) $G_2$

c) M

d) S
3) The chromosome begins M phase looking as shown. When does it split?

a) prophase
b) prometaphase
c) metaphase
d) anaphase
e) telophase
3) The chromosome begins M phase looking as shown. When does it split?

a) prophase
b) prometaphase
c) metaphase
d) anaphase
e) telophase
4) Which best describes the kinetochore?

a) a structure composed of several proteins that associate with the centromere region of a chromosome and that can bind to spindle microtubules

b) the centromere region of a metaphase chromosome where the DNA can bind with spindle proteins

c) the array of vesicles that will form between two dividing nuclei and give rise to the metaphase plate

d) the ring of actin microfilaments that will cause the appearance of the cleavage furrow

e) the core of proteins that forms the cell plate in a dividing plant cell
4) Which best describes the kinetochore?

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d) the ring of actin microfilaments that will cause the appearance of the cleavage furrow

e) the core of proteins that forms the cell plate in a dividing plant cell
5) A new cell is found and separation of its chromosomes is examined. If the darker patches in the yellow lines are places where the spindle was bleached with a laser, what do these images tell us?

a) Chromosomes are separated by microfilaments.
b) Chromosomes are not separated.
c) Microtubules shorten at the centrosome end.
d) Microtubules shorten at the chromosome end.
5) A new cell is found and separation of its chromosomes is examined. If the darker patches in the yellow lines are places where the spindle was bleached with a laser, what do these images tell us?

a) Chromosomes are separated by microfilaments.
b) Chromosomes are not separated.
c) **Microtubules shorten at the centrosome end.**
d) Microtubules shorten at the chromosome end.
6) Which statement about typical eukaryotic chromosomes just before and after M phase is incorrect?

a) These chromosomes are not in a fully condensed state.
b) Both contain double-stranded DNA molecules.
c) Both have just one kinetochore structure associated with their centromere.
d) Both have many proteins associated with the chromosomal DNA.
e) Typically, both are linear structures with distinct ends.
6) Which statement about typical eukaryotic chromosomes just before and after M phase is incorrect?

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b) Both contain double-stranded DNA molecules.
c) **Both have just one kinetochore structure associated with their centromere.**
d) Both have many proteins associated with the chromosomal DNA.
e) Typically, both are linear structures with distinct ends.
7) From prophase through metaphase of mitosis, each chromosome has _____ DNA molecules, while from anaphase through telophase of mitosis, each chromosome has _____ DNA molecule(s).

a) two; one  
b) $2n; 1n$  
c) homologous; nonhomologous  
d) condensed; decondensed  
e) nonsister chromatid; sister chromatid
7) From prophase through metaphase of mitosis, each chromosome has _____ DNA molecules, while from anaphase through telophase of mitosis, each chromosome has _____ DNA molecule(s).

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b) $2n$; $1n$  
c) homologous; nonhomologous  
d) condensed; decondensed  
e) nonsister chromatid; sister chromatid
8) Of the events of a typical cell division listed below, which is most likely to occur third in an animal cell that is going through mitosis?

a) Kinetochore proteins associated with the centromeres bind with associated microtubules.

b) Segregation of complete genomic sets of chromosomes occurs.

c) The nuclear envelope membranes are converted from flat bilayers into many spherical vesicles.

d) The number of chromosomes in the cell doubles as double-chromatid chromosomes are split into pairs of single-chromatid chromosomes.

e) Vesicles fuse to one another to form new nuclear envelope membranes.
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d) **The number of chromosomes in the cell doubles as double-chromatid chromosomes are split into pairs of single-chromatid chromosomes.**

e) Vesicles fuse to one another to form new nuclear envelope membranes.
9) Which event will likely occur next in a eukaryotic cell entering prometaphase?

a) The chromosome material will condense.
b) Chromosomes will be moved toward alignment at the metaphase plate.
c) Kinetochore will link some microtubules to the centromeres.
d) The nuclear membranes will fragment into vesicles.
e) Microtubules will elongate into the nuclear space.
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c) Kinetochore will link some microtubules to the centromeres.
d) **The nuclear membranes will fragment into vesicles.**
e) Microtubules will elongate into the nuclear space.
10) Which statement comparing cancer cells and normal somatic cells would lose points on a test?

a) Cancer cells often deactivate their apoptosis systems.
b) Cancer cells are not as sensitive to contact inhibition.
c) The cell cycle often proceeds faster in cancer cells.
d) Cancer cells are more mobile and less dependent on anchorage.
e) Cancer cells have more effective DNA repair activities.
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a) Cancer cells often deactivate their apoptosis systems.
b) Cancer cells are not as sensitive to contact inhibition.
c) The cell cycle often proceeds faster in cancer cells.
d) Cancer cells are more mobile and less dependent on anchorage.

e) **Cancer cells have more effective DNA repair activities.**
11) If you were given a slide and told that the cells on it were performing cytokinesis, how would you tell if you had plant cells or animal cells?

a) Look for a cell plate or a cleavage furrow.

b) Look for condensed or decondensed chromosomes.

c) Look for an intact or a dispersed nuclear membrane.

d) Look for more or less layers in the cell wall.
11) If you were given a slide and told that the cells on it were performing cytokinesis, how would you tell if you had plant cells or animal cells?

a) Look for a cell plate or a cleavage furrow.
b) Look for condensed or decondensed chromosomes.
c) Look for an intact or a dispersed nuclear membrane.
d) Look for more or less layers in the cell wall.
12) Which comes immediately after S phase in the cell cycle?

a) G₁
b) G₂
c) mitosis
d) cytokinesis
12) Which comes immediately after S phase in the cell cycle?

a) \( G_1 \)

b) \( G_2 \)

c) mitosis

d) cytokinesis
13) If a cell that had two copies of each chromosome, but problems with the spindle caused the sister chromatids to remain attached to each other and to only one spindle pole, what cells would result?

a) cells with 2 copies of each chromosome and 2 copies of each chromosome
b) cells with 3 copies of each chromosome and 1 copy of each chromosome
c) cells with 6 copies of each chromosome and 2 copies of each chromosome
d) cells with 4 copies of each chromosome and 0 copies of each chromosome
e) cells with 1 copy of each chromosome and 1 copy of each chromosome
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c) cells with 6 copies of each chromosome and 2 copies of each chromosome
d) cells with 4 copies of each chromosome and 0 copies of each chromosome
e) cells with 1 copy of each chromosome and 1 copy of each chromosome
14) From the pole to the chromosome, what is the correct order?

a) centrosome, microtubule, kinetochore, chromosome
b) microtubule, kinetochore, chromosome, centrosome
c) centrosome, kinetochore, microtubule, chromosome
d) centrosome, kinetochore, chromosome, microtubule
14) From the pole to the chromosome, what is the correct order?

a) centrosome, microtubule, kinetochore, chromosome
b) microtubule, kinetochore, chromosome, centrosome
c) centrosome, kinetochore, microtubule, chromosome
d) centrosome, kinetochore, chromosome, microtubule
15) You are observing a line of rat cells and see that they repeatedly make mistakes in the cell cycle by going through the G₂ checkpoint too early. This could be due to a

a) problem with expression of a cyclin.
b) misplaced MPF.
c) defective chromosome.
d) misfolded centromere protein.
15) You are observing a line of rat cells and see that they repeatedly make mistakes in the cell cycle by going through the $G_2$ checkpoint too early. This could be due to a

a) **problem with expression of a cyclin.**
b) misplaced MPF.
c) defective chromosome.
d) misfolded centromere protein.
16) If you used a very fine glass needle to pull one chromosome away from the metaphase plate during metaphase, which checkpoint would not be passed until this was corrected?

a) $G_1$ checkpoint
b) $G_2$ checkpoint
c) M checkpoint
d) S checkpoint
e) any checkpoint
If you used a very fine glass needle to pull one chromosome away from the metaphase plate during metaphase, which checkpoint would not be passed until this was corrected?

a) $G_1$ checkpoint
b) $G_2$ checkpoint
c) M checkpoint
d) S checkpoint
e) any checkpoint
17) Binary fission is more like animal cell division than plant cell division because

a) bacteria and animals have more organelles than plants.
b) bacteria and animals both pinch in to separate the cytoplasm into two pieces.
c) bacteria and animals use microfilaments to divide the cell.
d) bacteria and animals both have two copies of each chromosome, while plants have four.
17) Binary fission is more like animal cell division than plant cell division because

a) bacteria and animals have more organelles than plants.

b) **bacteria and animals both pinch in to separate the cytoplasm into two pieces.**

c) bacteria and animals use microfilaments to divide the cell.

d) bacteria and animals both have two copies of each chromosome, while plants have four.
Ch. 13 Meiosis & Sexual Life Cycles
1) In animals, fertilization is to zygote as meiosis is to which of the following?

a) mitosis
b) diploid
c) chromosome
d) replication
e) gamete
1) In animals, fertilization is to zygote as meiosis is to which of the following?

a) mitosis
b) diploid
c) chromosome
d) replication
e) gamete
2) Privet shrubs and humans each have a diploid number of 46 chromosomes per cell. Why are the two species so dissimilar?

a) Privet chromosomes undergo only mitosis.
b) Privet chromosomes are shaped differently.
c) Human chromosomes have genes grouped together differently.
d) The two species have appreciably different genes.
e) Privets do not have sex chromosomes.
2) Privet shrubs and humans each have a diploid number of 46 chromosomes per cell. Why are the two species so dissimilar?

a) Privet chromosomes undergo only mitosis.
b) Privet chromosomes are shaped differently.
c) Human chromosomes have genes grouped together differently.
d) **The two species have appreciably different genes.**
e) Privets do not have sex chromosomes.
3) Why is it more practical to prepare karyotypes by viewing somatic diploid cells rather than haploid gametes?

a) Somatic diploid cells do not contain organelles to interfere with karyotyping.

b) Both sets of chromosomes, which are present in somatic diploid cells, need to be examined.

c) DNA in haploid gametes will not stain.

d) The chromosomes are larger in a somatic diploid cell.

e) Haploid gametes do not have sex chromosomes.
3) Why is it more practical to prepare karyotypes by viewing somatic diploid cells rather than haploid gametes?

a) Somatic diploid cells do not contain organelles to interfere with karyotyping.

b) **Both sets of chromosomes, which are present in somatic diploid cells, need to be examined.**

c) DNA in haploid gametes will not stain.

d) The chromosomes are larger in a somatic diploid cell.

e) Haploid gametes do not have sex chromosomes.
4) In diploid species, diploid cells may undergo either mitosis or meiosis. Haploid cells may undergo mitosis (for certain species) but not meiosis because

a) the sister chromatids cannot separate.
b) the synaptonemal complex is too strong.
c) crossing over has occurred.
d) cohesins are no longer present.
e) homologous chromosomes cannot pair.
4) In diploid species, diploid cells may undergo either mitosis or meiosis. Haploid cells may undergo mitosis (for certain species) but not meiosis because

a) the sister chromatids cannot separate.
b) the synaptonemal complex is too strong.
c) crossing over has occurred.
d) cohesins are no longer present.

e) **homologous chromosomes cannot pair.**
5) How and at what stage is independent assortment accomplished?

a) pairing of homologs during meiosis I
b) separation of homologs during anaphase II
c) separation of homologs during meiosis II
d) metaphase alignment during meiosis I
e) telophase separation during meiosis I
5) How and at what stage is independent assortment accomplished?

a) pairing of homologs during meiosis I
b) separation of homologs during anaphase II
c) separation of homologs during meiosis II
d) metaphase alignment during meiosis I
e) telophase separation during meiosis I
6) What allows sister chromatids to finally separate, and in which phase of meiosis does this occur?

a) release of cohesin along sister chromatid arms in anaphase I
b) crossing over of chromatids in prophase I
c) release of cohesin at centromeres in anaphase I
d) release of cohesin at centromeres in anaphase II
e) crossing over of homologs in prophase I
6) What allows sister chromatids to finally separate, and in which phase of meiosis does this occur?

a) release of cohesin along sister chromatid arms in anaphase I
b) crossing over of chromatids in prophase I
c) release of cohesin at centromeres in anaphase I
d) **release of cohesin at centromeres in anaphase II**
e) crossing over of homologs in prophase I
7) Normal gametes produced from one meiotic event

a) are genetically identical to each other.
b) each have the same chromosome number.
c) are genetically identical to the cells produced from meiosis I.
d) are genetically identical to the parent cell.
e) each have the same mutations.
7) Normal gametes produced from one meiotic event

a) are genetically identical to each other.
b) each have the same chromosome number.
c) are genetically identical to the cells produced from meiosis I.
d) are genetically identical to the parent cell.
e) each have the same mutations.
8) Crossing over begins to occur during

a) anaphase I.
b) anaphase II.
c) prophase I.
d) metaphase II.
e) telophase II.
8) Crossing over begins to occur during

a) anaphase I.
b) anaphase II.
c) prophase I.
d) metaphase II.
e) telophase II.
9) In this cell, what phase is represented?

a) mitotic metaphase  
b) meiosis I anaphase  
c) meiosis I metaphase  
d) meiosis II anaphase  
e) meiosis II metaphase
9) In this cell, what phase is represented?

a) mitotic metaphase  
b) meiosis I anaphase  
c) **meiosis I metaphase**  
d) meiosis II anaphase  
e) meiosis II metaphase
10) Why does sexual reproduction (via meiosis) have an advantage over asexual reproduction (via mitosis)?

a) Meiosis is more efficient at producing offspring.
b) Meiosis allows two parents to invest resources in offspring.
c) Meiosis allows for more competition.
d) Meiosis increases genetic variation among offspring.
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a) Meiosis is more efficient at producing offspring.
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c) Meiosis allows for more competition.
d) **Meiosis increases genetic variation among offspring.**
11) The mosquito *Aedes aegypti* has a karyotype of $2n = 6$. Which diagram shows this?

a) 

b) 

c) 

d)
11) The mosquito *Aedes aegypti* has a karyotype of $2n = 6$. Which diagram shows this?

a) 

b) 

c) 

d)
12) The mosquito *Aedes aegypti* has a karyotype of \(2n = 6\). Which diagram shows a proper metaphase I?

a) 

b) 

c) 

d)
The mosquito *Aedes aegypti* has a karyotype of $2n = 6$. Which diagram shows a proper metaphase I?

a) ![Diagram A]

b) ![Diagram B]

c) ![Diagram C]

d) ![Diagram D]
13) The mosquito *Aedes aegypti* has a karyotype of $2n = 6$. Which diagram shows a proper metaphase II?

a)

b)

c)

d)
13) The mosquito *Aedes aegypti* has a karyotype of $2n = 6$. Which diagram shows a proper metaphase II?

a) ![Diagram A]

b) ![Diagram B]

c) ![Diagram C]

d) ![Diagram D]
A haploid set of unreplicated chromosomes \((n = 3)\) of the mosquito \textit{Aedes aegypti} has a mass of 1.5 pg. What is the mass of DNA in single \textit{Aedes aegypti} cell in prophase I?

a) 1.5 pg  
b) 3 pg  
c) 4.5 pg  
d) 6 pg
14) A haploid set of unreplicated chromosomes \((n = 3)\) of the mosquito *Aedes aegypti* has a mass of 1.5 pg. What is the mass of DNA in single *Aedes aegypti* cell in prophase I?

a) 1.5 pg
b) 3 pg
c) 4.5 pg
d) 6 pg
15) A haploid set of unreplicated chromosomes \((n = 3)\) of the mosquito *Aedes aegypti* has a mass of 1.5 pg. What is the mass of DNA in single *Aedes aegypti* cell in prophase II?

a) 1.5 pg  
b) 3 pg  
c) 4.5 pg  
d) 6 pg
15) A haploid set of unreplicated chromosomes \((n = 3)\) of the mosquito *Aedes aegypti* has a mass of 1.5 pg. What is the mass of DNA in single *Aedes aegypti* cell in prophase II?

a) 1.5 pg  
b) 3 pg  
c) 4.5 pg  
d) 6 pg
16) A haploid set of unreplicated chromosomes \((n = 3)\) of the mosquito *Aedes aegypti* has a mass of 1.5 pg. What is the mass of DNA in single *Aedes aegypti* cell at the end of telophase II?

a) 1.5 pg  
b) 3 pg  
c) 4.5 pg  
d) 6 pg
16) A haploid set of unreplicated chromosomes \((n = 3)\) of the mosquito *Aedes aegypti* has a mass of 1.5 pg. What is the mass of DNA in single *Aedes aegypti* cell at the end of telophase II?

a) 1.5 pg  
b) 3 pg  
c) 4.5 pg  
d) 6 pg
17) The mosquito *Aedes aegypti* has a karyotype of $2n = 6$. Through independent assortment alone, how many chromosomal combinations can be made during meiosis?

a) 3  

b) 6  

c) 8  

d) 36
17) The mosquito *Aedes aegypti* has a karyotype of $2n = 6$. Through independent assortment alone, how many chromosomal combinations can be made during meiosis?

a) 3
b) 6
c) 8
d) 36
18) The mosquito *Aedes aegypti* has a karyotype of $2n = 6$. Through independent assortment and recombination, how many chromosomal combinations can be made during meiosis?

a) 12  
b) 36  
c) 144  
d) many millions
18) The mosquito *Aedes aegypti* has a karyotype of $2n = 6$. Through independent assortment and recombination, how many chromosomal combinations can be made during meiosis?

a) 12  
b) 36  
c) 144  
d) many millions
18.5 Cancer results from genetic changes that affect cell cycle control.
1) Which of the following would not typically cause a proto-oncogene to become an oncogene?

a) gene suppression
b) translocation
c) amplification
d) point mutation
e) retroviral activation
1) Which of the following would not typically cause a proto-oncogene to become an oncogene?

a) gene suppression
b) translocation
c) amplification
d) point mutation
e) retroviral activation
32.1 Animals are multicellular, heterotrophic, eukaryotes with tissues that develop from embryonic layers
1) Which of the following triploblastic organisms is incorrectly paired with its body cavity classification?

a) flatworm—pseudocoelomate
b) earthworm—coelomate
c) planarian—acoelomate
1) Which of the following triploblastic organisms is incorrectly paired with its body cavity classification?

a) flatworm—pseudocoelomate
b) earthworm—coelomate
c) planarian—acoelomate
2) In which type of cleavage pattern does each cell have the capacity to develop into a complete embryo?

a) determinate cleavage
b) indeterminate cleavage
c) spiral cleavage
d) none of the above
2) In which type of cleavage pattern does each cell have the capacity to develop into a complete embryo?

a) determinate cleavage

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d) none of the above
3) In which type of cleavage pattern does each cell have the capacity to develop into a complete embryo?

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3) In which type of cleavage pattern does each cell have the capacity to develop into a complete embryo?

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b) indeterminate cleavage
c) spiral cleavage
d) none of the above
47.1 Fertilization and cleavage initiates embryonic development

47.2 Morphogenesis in animals involve specific changes in cell shape, position, and survival
1) The formation of the fertilization membrane and the slow block to polyspermy are dependent on

a) the entrance of potassium ions into the egg.
b) the departure of sodium ions from the egg.
c) the entrance of calcium ions into the egg.
d) the departure of hydrogen ions from the egg.
1) The formation of the fertilization membrane and the slow block to polyspermy are dependent on

a) the entrance of potassium ions into the egg.

b) the departure of sodium ions from the egg.

c) the entrance of calcium ions into the egg.

d) the departure of hydrogen ions from the egg.
2) Diploidy is first reestablished following

a) fertilization.
b) gastrulation.
c) parthenogenesis.
d) organogenesis.
e) ovulation.
2) Diploidy is first reestablished following

a) fertilization.
b) gastrulation.
c) parthenogenesis.
d) organogenesis.
e) ovulation.
3) Development must occur in the order of which of the following sequences?

a) fertilization → cleavage → blastula → organogenesis → gastrula

b) fertilization → cleavage → blastula → gastrula → organogenesis

c) cleavage → blastula → gastrula → fertilization → organogenesis

d) gastrula → organogenesis → blastula → cleavage → fertilization

e) organogenesis → cleavage → gastrula → blastula → fertilization
3) Development must occur in the order of which of the following sequences?

a) fertilization → cleavage → blastula → organogenesis 
gastrula

b) fertilization → cleavage → blastula → gastrula → organogenesis

c) cleavage → blastula → gastrula → fertilization → organogenesis

d) gastrula → organogenesis → blastula → cleavage → fertilization

e) organogenesis → cleavage → gastrula → blastula → fertilization
4) In humans, identical twins are produced by the separation of cells during

a) gastrulation.
b) organogenesis.
c) pattern formation.
d) blastomere cleavage.
e) the development of the notochord.
4) In humans, identical twins are produced by the separation of cells during

a) gastrulation.
b) organogenesis.
c) pattern formation.
d) **blastomere cleavage.**
e) the development of the notochord.
5) Which embryonic germ layer is incorrectly matched with one of its derivatives?

a) endoderm—nervous and sensory systems
b) mesoderm—excretory and reproductive systems (excluding germ cells)
c) ectoderm—jaws and teeth
5) Which embryonic germ layer is incorrectly matched with one of its derivatives?

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