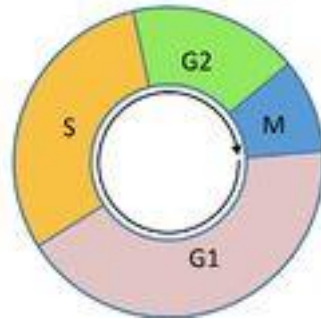


Multiple Choice Review – Mitosis & Meiosis

1. Which of the following accurately describes the one of the major divisions of mitosis?
 - a. During the mitotic phase, cells are performing their primary function and preparing for cell division.
 - b. During the mitotic phase, halving of the actual chromosome number occurs
 - c. During interphase, halving of the actual chromosome number occurs
 - d. During interphase, cells are performing their primary function and preparing for cell division.

Below is an illustration representing the cell cycle. Use this illustration to respond to questions 2, 3, 4 and 5 below.

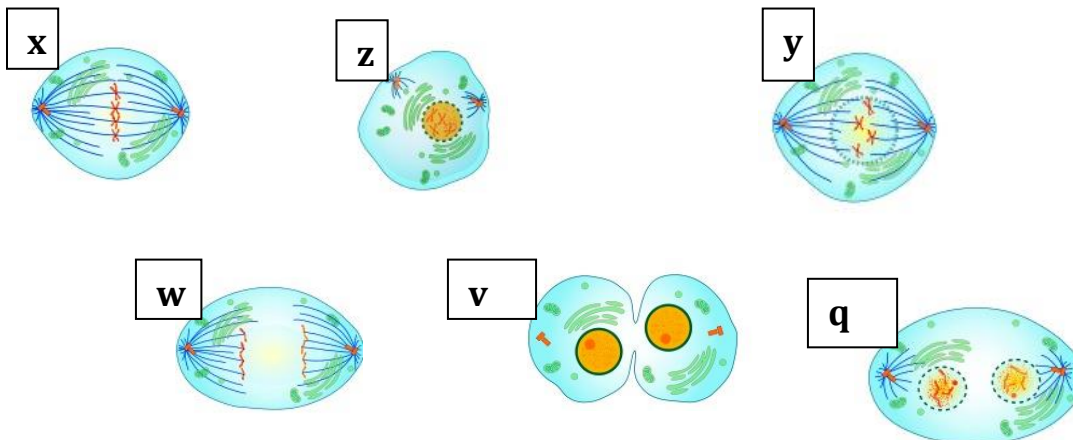


<http://en.wikipedia.org/wiki/Chemotherapy>

2. Which phases of the cycle shown above represent interphase?
 - a. phases M, G1, and S
 - b. phases G1, S, and G2
 - c. phases S, G2, and M
 - d. phases G1 and G2
3. Which of the following accurately describes the actions occurring during the phase entitled S?
 - a. Each chromosome is duplicated; each chromosome results in two sister chromatids attached at a centromere.
 - b. The chromosome number is halved in preparation for cell division.
 - c. The cell enlarges, proteins are increased and organelles duplicated.
 - d. Cell reaches maximum size and adds more proteins.

4. Which of the following accurately describes the actions occurring during the phase entitled G1?
- Each chromosome is duplicated; each chromosome results in two sister chromatids attached at a centromere.
 - The chromosome number is halved in preparation for cell division.
 - The cell enlarges, proteins are increased and organelles duplicated.
 - Cell reaches maximum size and adds more proteins.
5. If the circle of the cell cycle also represents the time an average cell spends in each phase, which of the following is correct?
- Cells spend the majority of their time in the mitosis phase.
 - Cells spend more than 75% of their time in interphase.
 - Cells spend approximately 50% of their time in interphase
 - Cells spend approximately 75% of their time in mitosis and cytokinesis.

Below are six (6) images that represent the major phase of one type of cell reproduction. Use these images to respond to questions 6, 7, 8, and 9 below.



6. Which of the following represents the correct sequence, based upon the images above? (the letters used to identify each image have no bearing on the image itself)
- x,z,y,w,v,q
 - q,w,x,y,v,z
 - v,z,y,x,w,q
 - z,y,x,w,q,v

7. During the phase labeled as “y” in the above images, which of the following occurs?
- Spindles are nearly complete and attached to kinetochores; nuclear membrane is disappearing.
 - Spindles are disappearing after moving the chromosomes to the center; nuclear envelope is re-forming..
 - Chromosomes duplicate and become connected by centromeres; chromosomes are being pulled apart.
 - During this section of interphase, chromosomes are not yet duplicated.
8. During the phase labeled as “w” in the above images, which of the following occurs?
- Spindles are complete and attached to kinetochores; spindles are pushing chromosomes to the center of the cell.
 - Chromosomes have not yet duplicated; will duplicate during this phase.
 - Chromosomes duplicate and become connected by kinetochores; chromosomes are being pulled apart.
 - Chromatids separate at centromeres; spindle fibers pull them to the poles.
9. Which of the six (6) images above does not belong in the phase known as mitosis and what is this phase called?
- Z, this is interphase
 - q, this is cytokinesis
 - v, this is cytokinesis
 - w, this is meiosis
10. Which of the following accurately describes cytokinesis in plant cells?
- A contractile ring forms followed by a cleavage furrow, splitting the cell into two.
 - A plate forms from vesicles fused together in the center of the cell, separating the cell into two.
 - A contractile ring forms followed by a plate, splitting the cell into two.
 - A plate forms from vesicles, followed by a cleavage furrow, separating the cell into two.

11. Major checkpoints exist to regulate the cycle of cell reproduction. How do these checkpoints function?
- Each cell will undergo cell reproduction unless at, each of three checkpoints, the message changes from “go” to “stop”.
 - Cells will not undergo cellular reproduction unless, at each of three checkpoints, the message changes from “stop” to “go”.
 - Each cell will undergo cell reproduction if, at two of the three checkpoints, a direct message of “stop” is received.
 - Cells will undergo cell reproduction unless contact inhibition occurs and the control system sends a stop signal.
12. Trisomy 21 is the most common chromosome number abnormality. Which of the following describes the specific chromosome number abnormality and the syndrome it causes?
- Trisomy 21 occurs when there are only 21 pairs of chromosomes and results in Turner’s syndrome.
 - Trisomy 21 occurs when there are three sets of each chromosome and results in Down’s syndrome.
 - Trisomy 21 occurs when there are three sets of 21 pairs of chromosomes, or a total of 63 chromosomes and results in Turner’s syndrome.
 - Trisomy 21 occurs when there are three #21 chromosomes, and results in Down’s syndrome.
13. Chromosome pairs are often referred to as **homologous** chromosomes. What does this term mean and how does an organism inherit such pairs?
- This refers to the few chromosomes that have exactly the same gene messages for traits, with both chromosomes inherited from either mother or father.
 - This refers to the chromosomes that have exactly the same gene messages for traits, with one chromosome inherited from the mother and one from the father.
 - This refers to chromosomes that have the same shape and with genes controlling the same traits, with one chromosome inherited from the mother and one from the father.
 - This refers to chromosomes that have the same shape and with genes controlling the same traits, with both chromosomes inherited from either mother or father.

The illustration below shows two different version of cat coat color. Use this illustration to respond to question 14 below.

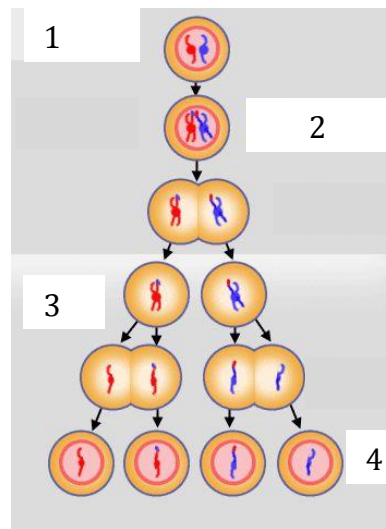


14. In the illustration above, the white and red coat color represent which of the following?
- different alleles found on homologous chromosomes
 - the same alleles found on homologous chromosomes.
 - different alleles found on one chromosome
 - the same alleles found on one chromosome
15. Which of the following accurately states the end result of meiosis?
- four diploid cells
 - one diploid cell
 - four haploid cells
 - one haploid cell
16. During which division does the halving of chromosomes occur?
- meiosis I
 - meiosis II
 - Both meiosis I and II
 - mitosis II
17. A genetic rearrangement often occurs during meiosis that increases genetic variation in offspring. What is this event and when it is most likely to occur during meiosis?
- crossing over; during anaphase II
 - crossing over; during telophase I
 - spontaneous mutations; during metaphase I
 - independent assortment; during metaphase I.

There are numerous ways in which homologous chromosomes can be combined during independent assortment. We can quantify this by using the following formula: Given n pairs of chromosomes, there are 2^n ways of combining homologous chromosomes. Use this information to respond to questions 18 and 19 below.

18. Fruit flies (*Drosophila melanogaster*) have a diploid number of chromosomes of eight (8). Therefore, their haploid number is four (4). How many different ways can fruit fly homologues be combined?
- 256 different ways
 - 16 different ways
 - 4 different ways
 - 2 different ways
19. Spinach (*Spinacia oleracea*) cells have a haploid number of 5 chromosomes. How many different ways can spinach homologues be combined?
- 25 different ways
 - 4 different ways
 - 1024 different ways
 - 32 different ways

The illustration below represents the phases of one type of cellular reproduction. Use this illustration to respond to questions 20, 21 and 22 below.



http://www.tokresource.org/tok_classes/biobiobio/biomenue/meiosis

20. The area labeled 1 represents which type of cellular reproduction?
- mitosis 1
 - mitosis 2
 - meiosis 1
 - meiosis 2

21. During the step labeled as 2 in the illustration above, an event occurs that leads to greater genetic variation. What is this event and during which phases does it occur?
- independent assortment, anaphase 1
 - crossing over, prophase 1
 - independent assortment, metaphase 2
 - crossing over, metaphase 1
22. The cells labeled 4 in the illustration above are considered to be which type of cells?
- diploid gametes
 - haploid gametes
 - diploid body cells
 - haploid body cells

The table below shows partial data from an onion root tip lab (prometaphase, and prophase are combined in this example). Use this information to respond to questions 23, 24 and 25 below.

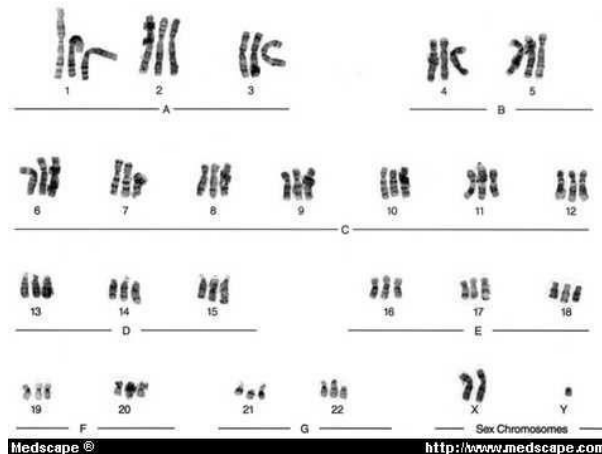
Phase of mitosis	Total # of cells in this phase	Total number of cells in all phases**
Prophase	40	200
metaphase	10	200
anaphase	10	200
telophase	10	200

**interphase included although not listed in this table of data

23. What percentage of cells viewed were identified to be in each of the phases: prophase, metaphase, anaphase and telophase?
- 40, 10, 10, 10
 - 400, 100, 100, 100
 - 20, 5, 5, 5
 - 2.0, 1.0, 1.0, 1.0
24. Given the information provided in the table above, what percentage of the total cells viewed were in interphase?
- 35%.
 - 95%
 - 30%
 - 65%

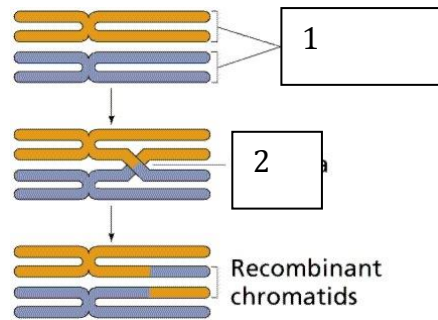
25. Assume that, on average, it takes 1,440 minutes for onion root tip cells to complete the cell cycle. Based upon this information, how long is an onion root cell typically in prophase?
- 144 minutes
 - 288 minutes
 - 2,880 minutes
 - 72 minutes
26. Assume that, on average, it takes 1,440 minutes for onion root tip cells to complete the cell cycle. Based upon this information, typically how long is an onion root cell in interphase?
- 504 minutes
 - 936 minutes
 - 1,296 minutes
 - 1,008 minutes
27. During meiosis nondisjunction may occur. Which of the following accurately describes nondisjunction?
- This occurs when chromosomes fail to separate during meiosis.
 - This occurs when chromosomes break and fragments are passed on.
 - This occurs when chromosomes cross over and trade genetic information.
 - This occurs when only three instead of four cells are produced from meiosis.
28. What determines “maleness” in humans?
- An extra Y chromosome, resulting in YY
 - A single X chromosome, resulting in XO
 - A single Y chromosome, regardless of number of X chromosomes.
 - A single X chromosome, regardless of the presence of any Y chromosomes.

Below is an image of a human karyotype. Use this image to respond to questions 29 and 30 below.



29. What condition is shown in the human karyotype seen above?
- aneuploidy
 - haploidy
 - diploidy
 - polyploidy
30. What is the sex chromosome designation for this individual and are they considered male or female?
- XXY, male
 - XXY, female
 - YYX, male
 - YYX, female
31. Which of the following is accurate when describing mitosis in human cells?
- All cells in the human body are able to perform mitosis for repair or continued growth.
 - Most cells in the human body undergo mitosis, except for those “stuck” in the G₀ phase or that perform meiosis.
 - All human cells are able to undergo mitosis, except for those performing meiosis.
 - Once a human has stopped growing, very few cells continue to undergo mitosis.
32. When treating many types of cancer, the treatments often result in loss of hair (as one side effect). Why is this a common side effect?
- Treatments target cells that divide infrequently, such as cancer cells and hair follicle cells.
 - Treatments target cells that divide slowly, such as cancer cells and hair follicle cells.
 - Treatments target cells that divide quickly, such as cancer cells and hair follicle cells.
 - Treatments are administered and the hair follicle cells do not have enough resources to reproduce.
33. For which types of cancer, generally, would stem cell transplants and/or bone marrow transplant be used?
- These are more typically used to treat cancers of blood forming tissues, such as lymphomas.
 - These are more typically used to treat epithelial tissue cancers, known as carcinomas.
 - These are more typically used to treat connective tissue cancers known as sarcomas.
 - These are more typically used to treat dangerous skin cancers, known as melanomas.

Below is an image representing an event that often occurs during cell reproduction. Use this image to respond to questions 34, 35 and 35 below.



<http://www2.estrellamountain.edu/faculty/farabee/biobk/biobookmeiosis.html>

34. In the illustration above, two pairs of chromosomes are labeled “1”. Which of the following is the accurate text label for these chromosomes?
- heterogeneous chromosomes
 - nondisjunction chromosomes
 - homologous chromosomes
 - male sex chromosomes
35. In the illustration above, one set of chromosomes is labeled “2”; most specifically an area found where the chromosomes are twisted. What is this specific area called?
- crossing junction
 - chiasmata
 - centromere
 - kinetochore
36. During which type of cellular reproduction does crossing over occur?
- Only during mitosis
 - During mitosis and meiosis.
 - Only during meiosis.
 - During mitosis of eukaryotic cells.
 - cell
37. Chromosomes in humans and many other organisms can be divided into two types. What are these two types, and for which type is aneuploidy typically more harmful?
- Somatic and autosomal chromosomes; somatic
 - Sex and autosomal chromosomes; autosomal
 - Sex and somatic chromosomes; sex
 - Sex and autosomal; sex

38. Polyploidy is lethal in human beings, however for some organisms it can result in larger organisms. Which organisms may flourish under polyploidy conditions?
- protists
 - bacteria
 - prokaryotic cells
 - plants
39. Comparing mitosis and meiosis, which of the following is an accurate statement?
- Most plant and animal cells undergo mitosis however only animals are able to perform meiosis.
 - Most plant and animal cells undergo mitosis however only plants are able to perform meiosis.
 - Most plant and animal cells undergo mitosis; both plants and animals are able to perform meiosis.
 - Plants perform mitosis while animals perform meiosis.
40. Which of the following accurately describes a phase we call the G_0 phase?
- This is a part of mitotic interphase where certain cells are never given the signal to proceed with cell reproduction.
 - This is a part of meiosis interphase where sex cells are not given the signal to proceed with cell division.
 - This is a part of mitotic interphase where cells are not given a “stop” signal and cancer cells are produced.
 - This is a part of meiosis interphase where sex cells are not given a “stop” signal and cancer cells are produced.

Answer Key

Question #	Correct response		Question #	correct response
1	D		21	B
2	B		22	B
3	A		23	C
4	C		24	D
5	B		25	B
6	D		26	B
7	A		27	A
8	D		28	C
9	C		29	D
10	B		30	A
11	B		31	B
12	D		32	C
13	C		33	A
14	A		34	C
15	C		35	B
16	A		36	C
17	B		37	B
18	B		38	D
19	D		39	C
20	C		40	A