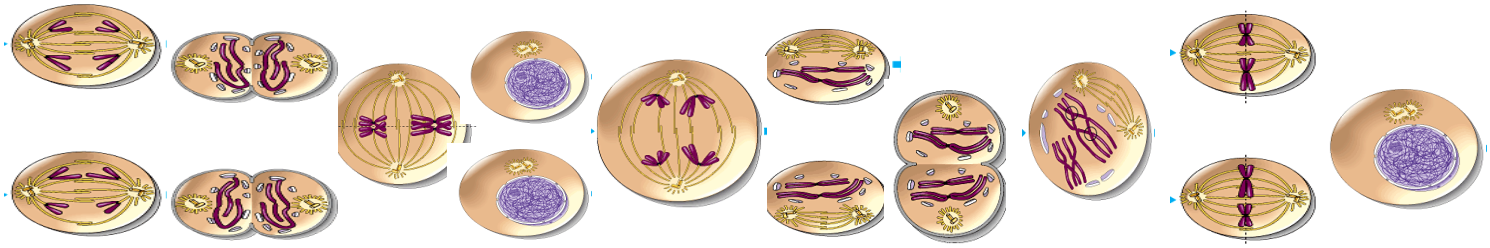
Name _____

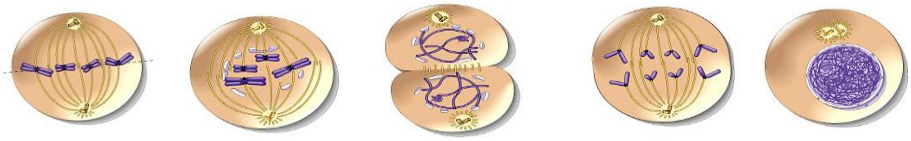
Cell Division **Study Guide**

1) Is this cell division process Mitosis or Meiosis (**circle**)? Number the phases 1-10 in the order that they occur.



_____ _____ _____ _____ _____ _____ _____ _____ _____ _____

2) Is this cell division process Mitosis or Meiosis (**circle**)? Number the phases 1-5 in the order that they occur.



_____ _____ _____ _____ _____

MM Review: Tell whether the description or cell diagram best applies to **Mitosis** or **Meiosis**, **BOTH** or **Neither**

A= Meiosis **B** =Mitosis **C** = BOTH Mitosis & Meiosis **D** = Neither Mitosis nor Meiosis

____ 3. involves ripping "double" chromosomes into "single" chromosomes

____ 4. Creates new gene combinations through "crossing over"

____ 5. produces daughter cells with "single" chromosomes at the end

____ 6. produces daughter cells with "double" chromosomes at the end

____ 7. involves "double" chromosomes lining up single file on the equator of the cell

____ 8. functions in growth, replacing lost cells, and repairing injuries

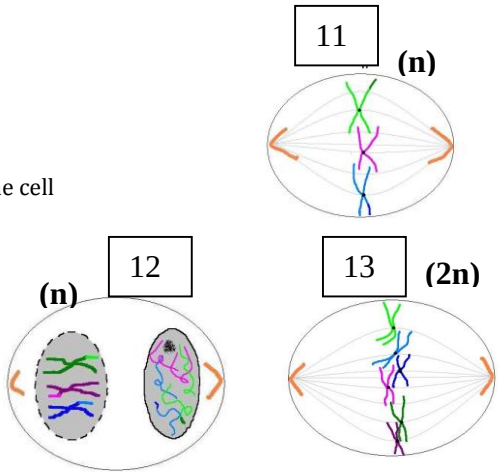
____ 9. begins with a Haploid cell

____ 10. Produces diploid daughter cells

____ 11. see diagram #11

____ 12. see diagram #12

____ 13. see diagram #13



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14. Meiosis is often described (by Mr. R) as the "Mix-E, Mix-E, cut your DNA in half" story. Explain two different ways that Meiosis creates genetic variety ensuring that no 2 gametes are ever identical.

Mix-E #1 =

Mix-E #2 =

15. At the end of HUMAN Mitosis cell division, four daughter cells are produced: 2 cells each contain **44** "single" chromosomes, one cell has **2** "double" chromosomes, and the last cell has NO chromosomes. CIRCLE which of the following things most likely went WRONG during Mitosis cell division?

a. 1 spindle fiber was broken
b. 2 spindle fibers were broken
c. the centrioles were broke
d. The chromatin replicated twice
e. The chromatin failed to replicate
f. cytokinesis failed to happen
g. cytokinesis happened twice

16. Number the following steps of **Mitosis** Cell Division in the correct order:

_____ cytokinesis happens

_____ the chromosomes line up single file on the equator line of the cell

_____ the nucleolus and nuclear membrane reappear

_____ the nucleolus and nuclear membrane disappear

_____ the sister chromatids are ripped apart and pulled to opposite poles of the cell

17. How many <u>total</u> eggs are produced by ONE ovary cell during Meiosis (oogenesis)?

18. How many <u>total</u> sperm are produced by ONE testis cell during Meiosis (spermatogenesis)?

19. How many <u>total</u> chromosomes are usually found in a human body cell like skin, heart, liver, etc. ?

20. How many <u>total</u> chromosomes are usually found in a human sperm or egg cell ?

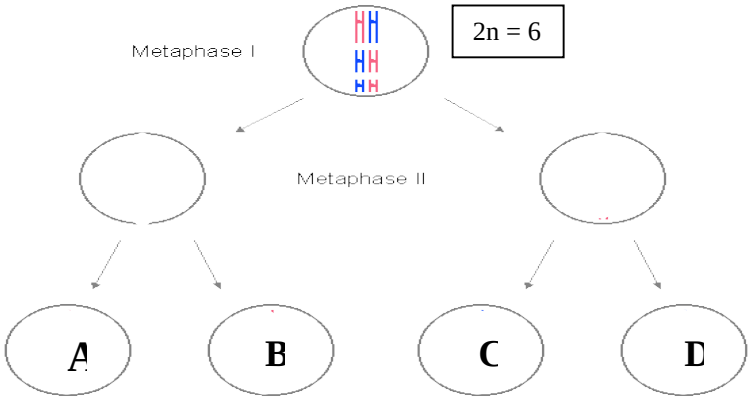
21. Which of the following is a <u>haploid</u> cell?

a. liver cell	b. testis cell	c. skin cell
d. egg	e. blood cell	f. both b and d

22. CIRCLE any of the following cell cycle phases when **<u>sister chromatids</u>** are visible?
    a. interphase
    b. prophase
    c. metaphase
    d. anaphase
    e. telophase

23. Two gametes each containing 4 chromosomes join during fertilization.
    How many chromosomes will the zygote cell contain? _____

24. A cell with **14** chromosomes undergoes mitosis twice. How many chromosomes will each daughter cell have? _____

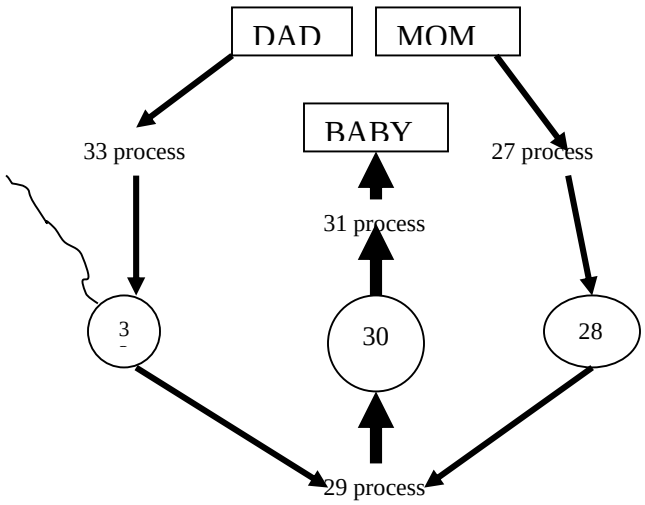


25. If the process of **meiosis** shown here proceeds normally, how many chromosomes will cells A, B, C, and D have? _____

26. Complete the matrix table below to compare spermatogenesis vs. oogenesis

characteristics	Spermatogenesis	Oogenesis	S = same D = different
1. WHO does this type of cell division?			
2. WHAT does this type of cell division produce?			
3. WHERE does this type of cell division happen…..location?			
4. WHEN does this type of cell division happen?			
5. HOW does the cytoplasm divide?			
6. # times the cell divides?			
7. # of gametes produced?			

27. Name the process happening at #27 ? _____
28. How many chromosomes are in the **egg** ? _____
29 Name the process happening at #29 ? _____
30. How many chromosomes are in the **zygote** ? _____
31. Name the process happening at #9? _____
32. How many chromosomes in the **sperm** ? _____
33. Name the process happening at #33 ? _____
34. Is the sperm cell Haploid or Diploid ? _____
35. Is the zygote Haploid or Diploid ? _____



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36. Draw a diagram of a cell with a diploid number of **6** (2n = 6) during the following stages of cell division:

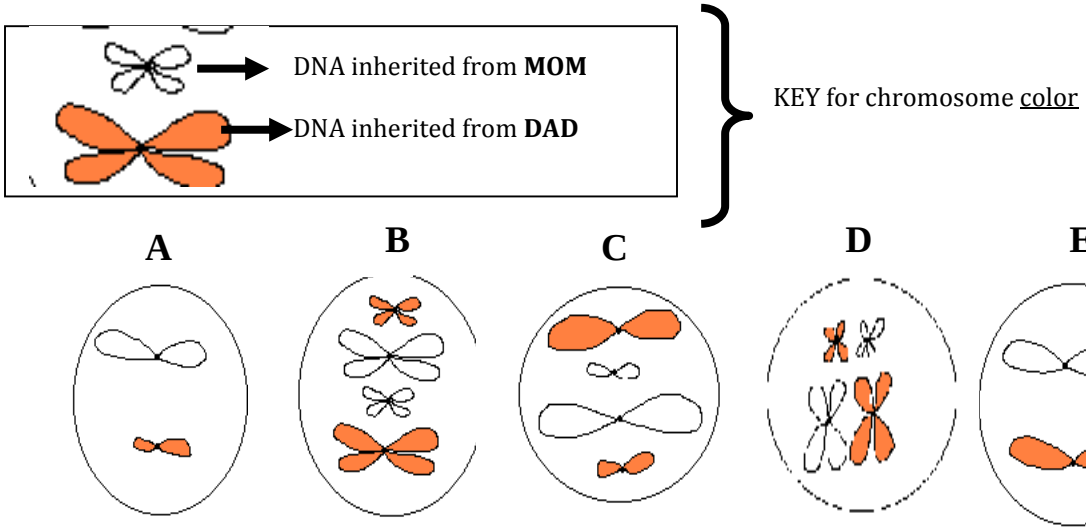
During **Mitosis** as the chromosomes line up in the middle of the cell (equator)

A daughter cell formed immediately at the end of **Mitosis**

During **Meiosis I** as the chromosomes line up in the middle of the cell (equator)

A gamete (sperm or egg) formed at the end of **Meiosis II**

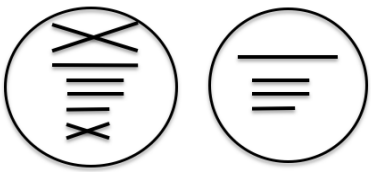
Carefully study the **5** diagrams of **Mosquito** cells below and then answer questions 37-42; each diagram shows a specific stage from either Mitosis or Meiosis cellular division.

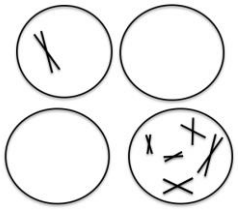


37. Which cell above has chromosomes LINED UP on the equator during a middle stage (**metaphase**)of **Mitosis**? _____
38. Which cell above was formed at the end of **Mitosis**? _____
39. Which cell above has chromosomes LINED UP on the equator during the middle of **Meiosis I** (**Metaphase I**)? _____
40. Which cell above was formed at the end of **Meiosis II** ? _____
41. How many total chromosomes are in the nucleus of a mosquito body cell like a blood cell or wing cell? _____
42. Explain which cell above is visually NOT accurate?

What Went Wrong During Meiosis? First study your Meiosis diagrams (2n=6) and then identify what went wrong during meiosis (to create each gamete diagram below at the end of meiosis) by matching the appropriate choices from the list below:

A) 1 spindle fiber pair was broken during Anaphase 1	H) Cytokinesis failed to happen after Telophase 1
B) 1 spindle fiber pair was broken during Anaphase 2 in 1 cell	I) Cytokinesis failed to happen after Telophase 2 in 1 cell
C) 1 spindle fiber pair was broken during Anaphase 2 in each cell	J) Cytokinesis failed to happen after Telophase 2 in each cell
D) 2 spindle fiber pairs were broken during Anaphase 1	K) The centrioles never formed during Prophase 1
E) 2 spindle fiber pairs were broken during Anaphase 2 in 1 cell	L) Centrioles never formed during Prophase 2 in 1 cell
F) 2 spindle fiber pairs were broken in Anaphase 2 in each cell	M) Centrioles never formed during Prophase 2 in each cell
G) The chromatin NEVER replicated	N) The chromatin replicated twice





43 _____ 44. _____ 45. _____

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46. Only DNA mutations in which cells below could be inherited by the next generation?
    a. egg b. skin c. pollen
    d. testes e. heart f. sprm

47. Given the original strand,
    Identify and label the different mutations.
    There may be more than one for one of the strands.

Codons in mRNA

First base	Second base U	Second base C	Second base A	Second base G	Third base
U	UUU, UUC: Phenylalanine; UUA, UUG: Leucine	UCU, UCC, UCA, UCG: Serine	UAU, UAC: Tyrosine; UAA, UAG: Stop	UGU, UGC: Cysteine; UGA: Stop; UGG: Tryptophan	U C A G
C	CUU, CUC, CUA, CUG: Leucine	CCU, CCC, CCA, CCG: Proline	CAU, CAC: Histidine; CAA, CAG: Glutamine	CGU, CGC, CGA, CGG: Arginine	U C A G
A	AUU, AUC, AUA: Isoleucine; AUG: Start	ACU, ACC, ACA, ACG: Threonine	AAU, AAC: Asparagine; AAA, AAG: Lysine	AGU, AGC: Serine; AGA, AGG: Arginine	U C A G
G	GUU, GUC, GUA, GUG: Valine	GCU, GCC, GCA, GCG: Alanine	GAU, GAC: Aspartic Acid; GAA, GAG: Glutamic Acid	GGU, GGC, GGA, GGG: Glycine	U C A G

Original Strand:	**CTC**	**GGA**	**CTA**	**TTA**	**CGC**
Mutated Strand 1:	CCG	GAC	TAT	TAC	GC
Mutated Strand 2:	CTC	GCA	CTA	TTA	CGC
Mutated Strand 3:	CTC	GTG	ACT	ATT	ACG C

48. Some substitution mutations can be called **silent** mutations because they result in the same protein being produced. Look at the codon-amino acid chart above and explain why this can happen.

49. Explain how one small substitution mutation in a gene containing 300 nucleotides can still result in a protein that doesn't function and may cause a disease?

50. A DNA mutation causes a change in which part of the DNA structure?

51. List 3 general categories of things that can CAUSE a DNA molecule to mutate?

52. What is the root cause of ALL types of Cancer?

53. Explain the difference between a Malignant cancer and a cancer that begins to Metastasize?