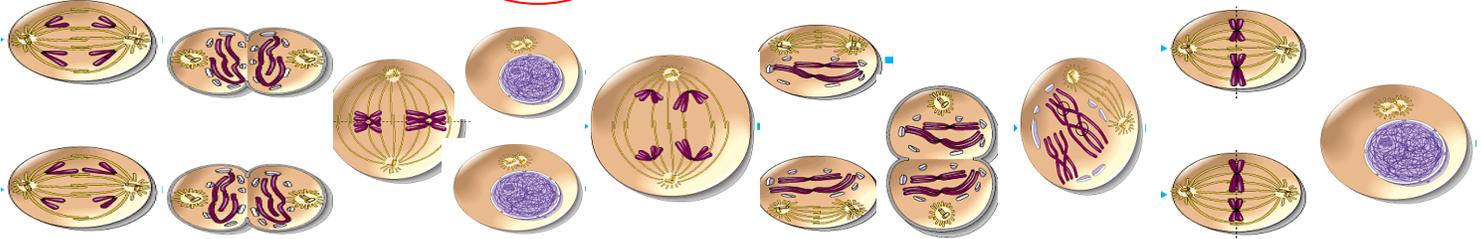


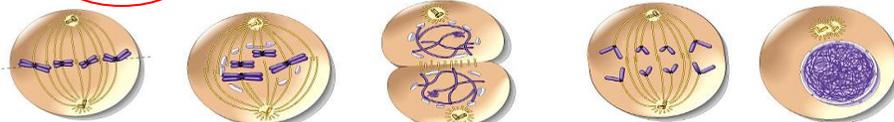
DNA & Cell Division Study Guide

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



9 10 3 6 4 7 5 2 8 1

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

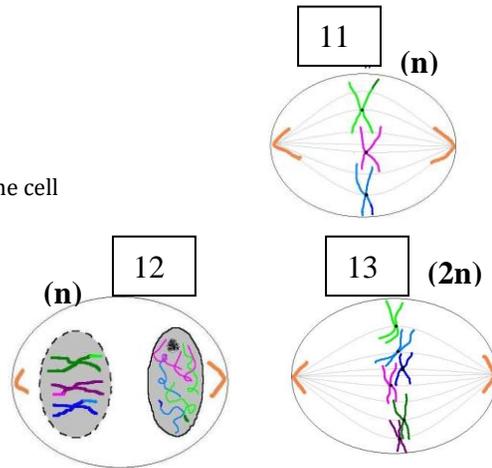


3 2 5 4 1

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

- C 3. involves ripping “double” chromosomes into “single” chromosomes
- A 4. Creates new gene combinations through “crossing over”
- C 5. produces daughter cells with “single” chromosomes at the end
- D 6. produces daughter cells with “double” chromosomes at the end
- C 7. involves “double” chromosomes lining up single file on the equator of the cell
- B 8. functions in growth, replacing lost cells, and repairing injuries
- D 9. begins with a Haploid cell
- B 10. Produces diploid daughter cells
- A 11. see diagram #11
- A 12. see diagram #12
- B 13. see diagram #13



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 = **Crossing-over during Prophase 1**

Mix-E #2 = **Random alignment of each homologous chromosome pair during Metaphase 1 = Law of Independent Assortment**

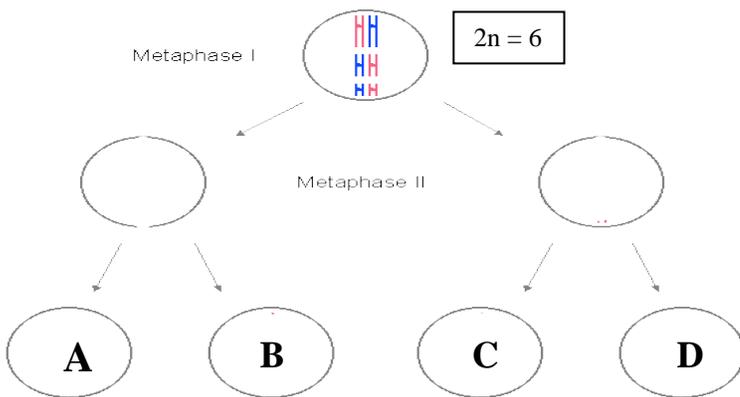
15. At the end of HUMAN Mitosis cell division, four daughter cells are produced: 2 cells each contain **44** “single” chromosomes, one cell has **2** “double” chromosomes, and the last cell has **NO** chromosomes. **CIRCLE** which of the following things most likely went **WRONG** during Mitosis cell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

- 5 cytokinesis happens
- 2 the chromosomes line up single file on the equator line of the cell
- 4 the nucleolus and nuclear membrane reappear
- 1 the nucleolus and nuclear membrane disappear
- 3 the sister chromatids are ripped apart and pulled to opposite poles of the cell

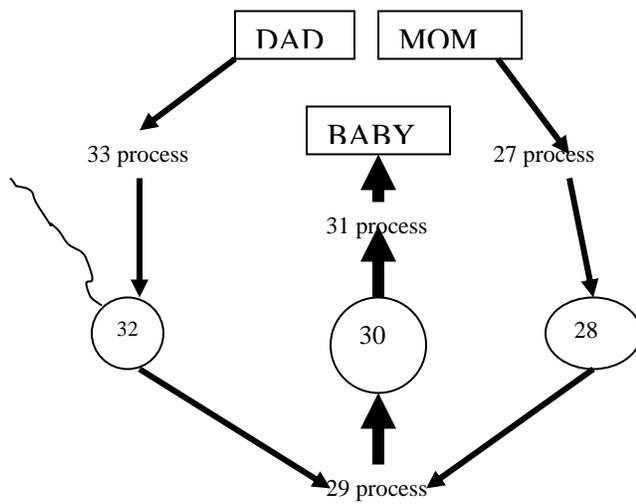
17. How many total eggs are produced by ONE ovary cell during Meiosis (oogenesis)? **1**
18. How many total sperm are produced by ONE testis cell during Meiosis (spermatogenesis)? **4**
19. How many total chromosomes are usually found in a human body cell like skin, heart, liver, etc. ? **46**
20. How many total chromosomes are usually found in a human sperm or egg cell ? **23**
21. Which of the following is a haploid cell?
- liver cell
 - testis cell
 - skin cell
 - egg**
 - blood cell
 - both b and d
22. CIRCLE any of the following cell cycle phases when sister chromatids are visible?
- interphase
 - prophase**
 - metaphase**
 - anaphase
 - telophase
23. Two gametes each containing 4 chromosomes join during fertilization.
How many chromosomes will the zygote cell contain? **8**
24. A cell with **14** chromosomes undergoes mitosis twice. How many chromosomes will each daughter cell have? **14**



25. If the process of **meiosis** shown here proceeds normally, how many chromosomes will cells A, B, C, and D have? **3**
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?	males	females	D
2. WHAT does this type of cell division produce?	sperm	eggs	D
3. WHERE does this type of cell division happen.....location?	testes	ovary	D
4. WHEN does this type of cell division happen?	Puberty to death	Start before birth, continue at puberty, finish at fertilization	D
5. HOW does the cytoplasm divide?	equally	unequally	D
6. # times the cell divides?	2	2	S
7. # of gametes produced?	4	1	D

27. Name the process happening at #27 ? Meiosis
28. How many chromosomes are in the **egg** ? 23
29. Name the process happening at #29 ? Fertilization
30. How many chromosomes are in the **zygote** ? 46
31. Name the process happening at #31 ? Mitosis
32. How many chromosomes in the **sperm** ? 23
33. Name the process happening at #33 ? Meiosis
34. Is the sperm cell Haploid or Diploid ? Haploid
35. Is the zygote Haploid or Diploid ? Diploid



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.

KEY for chromosome color

A

B

C

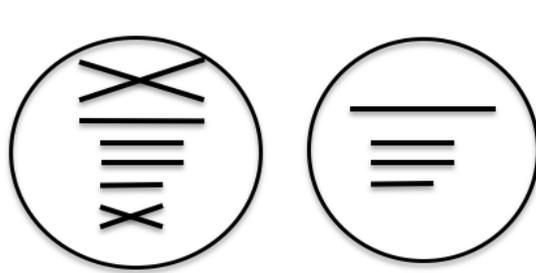
D

E

37. Which cell above has chromosomes LINED UP on the equator during a middle stage (**metaphase**) of **Mitosis**? B
38. Which cell above was formed at the end of **Mitosis**? C
39. Which cell above has chromosomes LINED UP on the equator during the middle of **Meiosis I** (**Metaphase I**)? D
40. Which cell above was formed at the end of **Meiosis II**? A
41. How many total chromosomes are in the nucleus of a mosquito body cell like a blood cell or wing cell? 4
42. Explain which cell above is visually NOT accurate? **B...chromosomes are not aligned "long-skinny" along the equator**

What Went Wrong During Meiosis? First study your Meiosis FLIP BOOK 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 |



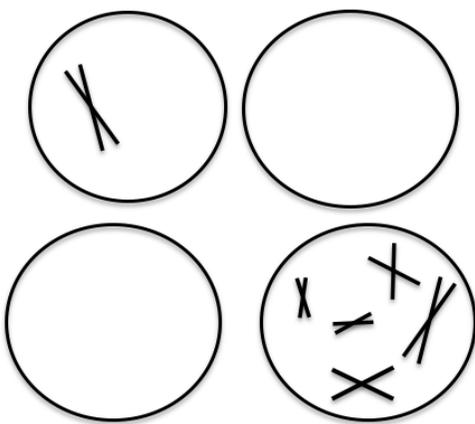
H E

43. _____



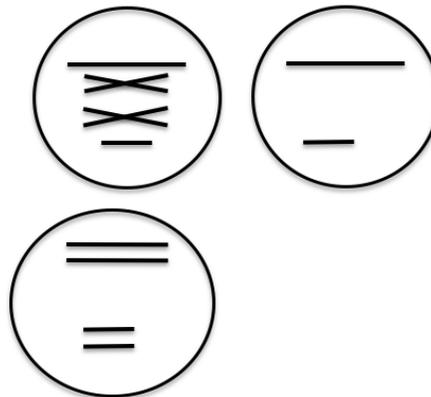
H E J or I

44. _____



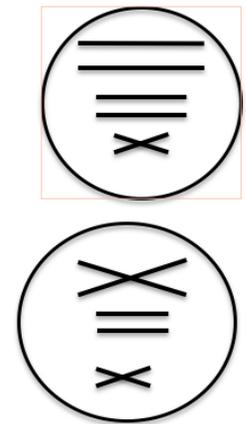
K M

45. _____



I A E

46. _____



J B E

47. _____