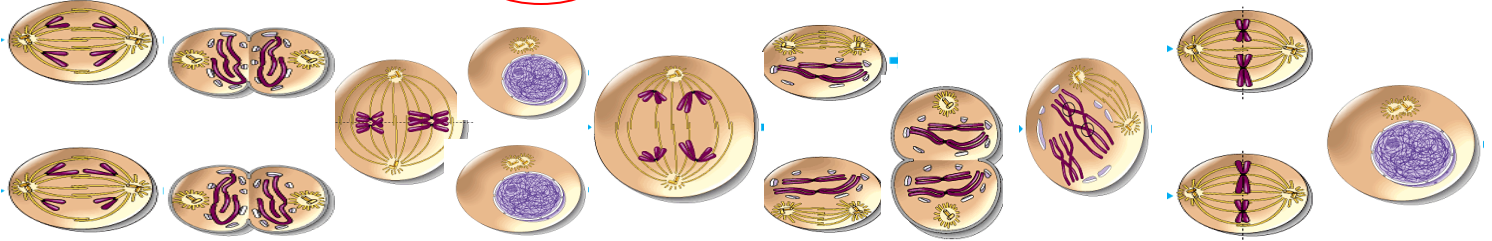


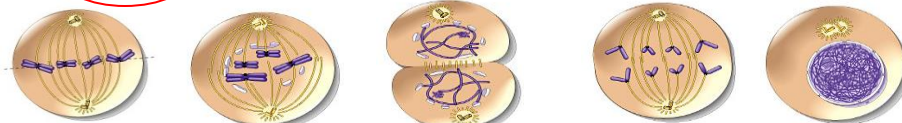
### DNA & Cell Division Study Guide

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.

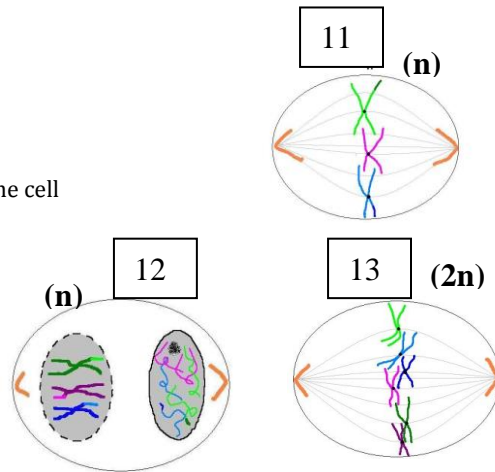


3    2    5    4    1

**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**

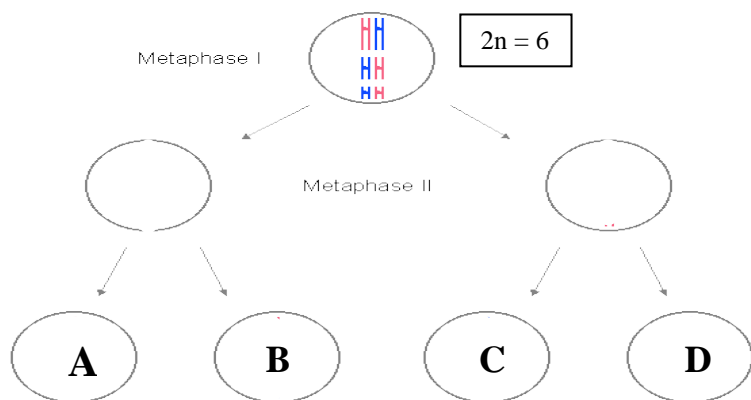
15. At the end of HUMAN Mitosis cell division, four daughter cells are produced: 2 cells each contain **44** “single” chromosomes, one cell has **2** “double” chromosomes, and the last cell has **NO** chromosomes. **CIRCLE** which of the following things most likely went **WRONG** during Mitosis cell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

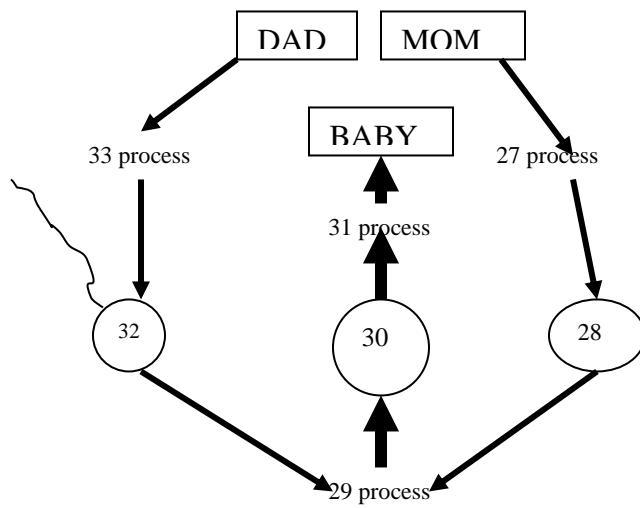
17. How many total eggs are produced by ONE ovary cell during Meiosis (oogenesis)? **1**
18. How many total sperm are produced by ONE testis cell during Meiosis (spermatogenesis)? **4**
19. How many total chromosomes are usually found in a human body cell like skin, heart, liver, etc. ? **46**
20. How 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**



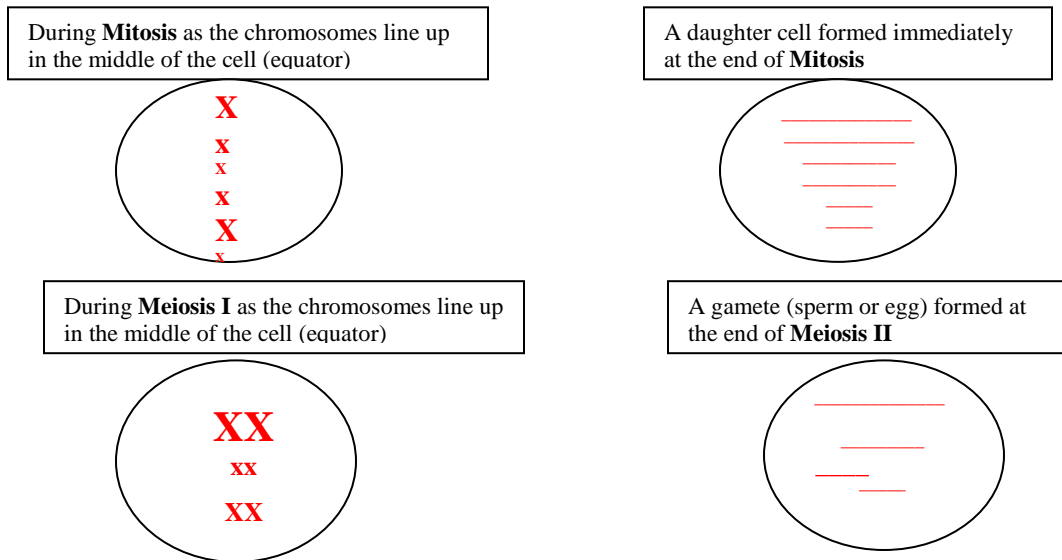
25. If the process of **meiosis** shown here proceeds normally, how many chromosomes will cells A, B, C, and D have? **3**
26. Complete the matrix table below to compare spermatogenesis vs. oogenesis

| characteristics   | Spermatogenesis  | Oogenesis  | S = same<br>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                         |

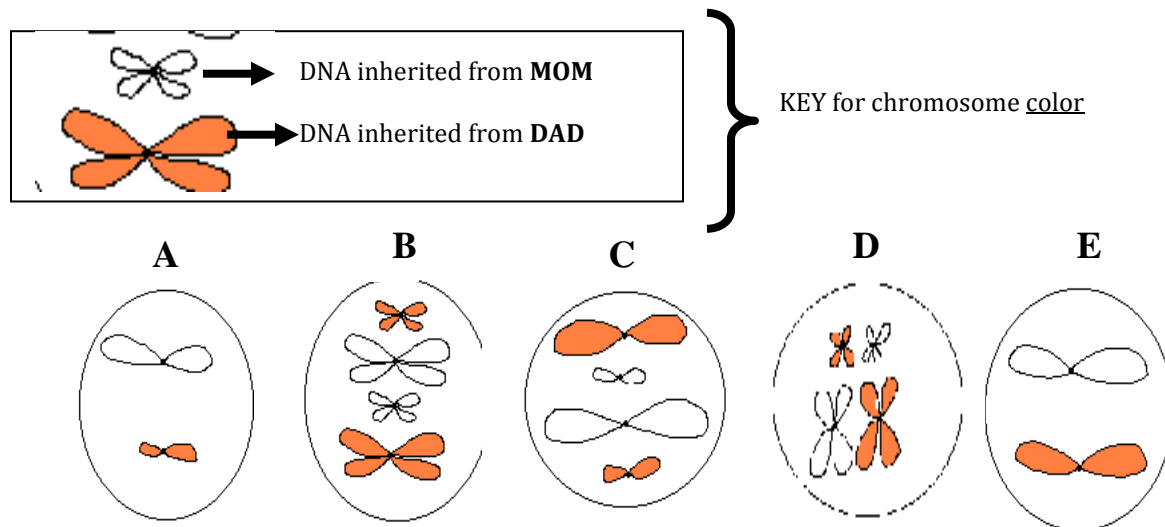
27. Name the process happening at #27 ? Meiosis
28. How many chromosomes are in the **egg** ? 23
29. Name the process happening at #29 ? Fertilization
30. How many chromosomes are in the **zygote** ? 46
31. Name the process happening at #31 ? Mitosis
32. How many chromosomes in the **sperm** ? 23
33. 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:



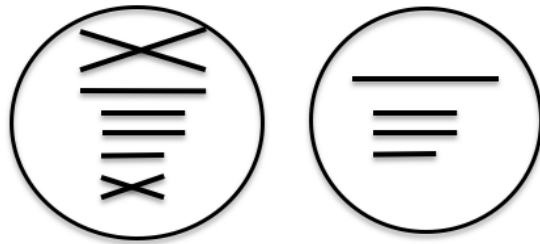
Carefully study the 5 diagrams of **Mosquito** cells below and then answer questions 37-42; each diagram shows a specific stage from either Mitosis or Meiosis cellular division.



37. Which cell above has chromosomes LINED UP on the equator during a middle stage (**metaphase**) of **Mitosis**? 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                              |



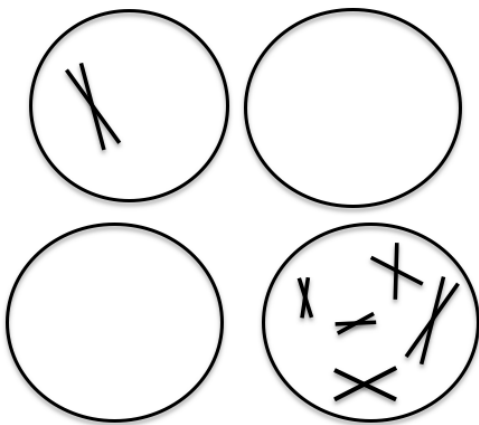
**H E**

43. \_\_\_\_\_



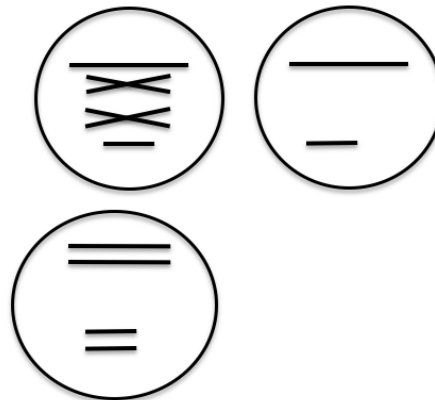
**H E J or I**

44. \_\_\_\_\_



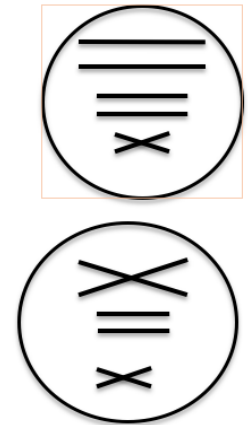
**K M**

45. \_\_\_\_\_



**I A E**

46. \_\_\_\_\_



**J B E**

47. \_\_\_\_\_