Science Review

I. Vocabulary:
   A. trait: each characteristic passed on
   B. genes: segments of DNA on chromosomes
      1. Each chromosome consists of hundreds of genes.
      2. Each plays an important role in determining the characteristics and functions of the cell.
   C. Homologous chromosome: the chromosomes that make up a pair, one chromosome from each parent
      1. Human body cells have 46 chromosomes, each parent contributes 23. Result is 23 pairs of chromosomes.
   D. gamete: sex cells that have the half the number of chromosomes in body cells.
   E. haploid: cell with n number of chromosomes
   F. fertilization: the process by which one haploid gamete combines with another
   G. diploid: result of fertilization.
      1. cell with 2n number of chromosomes.
      2. In the human case, 2(23) = 46.
   H. Meiosis: type of cell division that reduces the number of chromosomes, therefore is referred to as reduction division
      1. Interphase: cells carry out metabolic processes, including **the replication of DNA.** The cell, before interphase, had 46 chromosomes, this gets replicated into 46 pairs of chromosomes, aka 92 chromosomes.
      2. Prophase I: As a cell enters this phase, the replicated chromosomes become visible. Synapsis takes place, and they begin to form pairs. Crossing over occurs, exchanging genetic information. Nuclear envelope breaks down and spindle fibers begin formation.
      3. Metaphase I: Chromosome centromeres attach to spindle fibers and they line up **as pairs** at the equator.
      4. Anaphase I: Homologous chromosomes separate and move to the opposite poles of the cell. At this point, divide 92/2 and you will have the amount of chromosomes each pole has, which is 46.
      5. Telophase I: Spindles break down, the cell divides.
      6. Prophase II: Chromosomes condense, spindles form in each new cell. Spindles attach to chromosomes.
      7. Metaphase II: Centromeres line up randomly at the equator of each cell.
      8. Anaphase II: Centromeres split, sister chromatids separate and move to opposite poles. Each side has exactly 23 chromosomes, making it a haploid cell.
      9. Telophase II: Four nuclei form around chromosomes. Spindles break down, and cells divide.
      10. Products: four cells have formed.
      11. p.275 study!
      12. p.275 overview is in this paper.
   I. Gregor Mendel: the father of genetics, an Austrian monk and plant breeder
   J. inheritance: passing of traits to the next generation
   K. genetics: the science of heredity
   L. allele: defined as an alternative form of a single gene passed from generation to generation.
   M. dominant: appears and is visible
      1. Represented by a capital letter
   N. recessive: masked, but present
      1. Represented by a lowercase letter.
   O. Homozygous: an organism with two of the same alleles for a particular trait

1. *Example: YY or yy*

P. Heterozygous: an organism with two different alleles for a particular trait
   1. *Example: Yy*
   2. When alleles are present in the heterozygous state, dominant trait will be observed.

Q. genotype: organism's allele pairs

R. phenotype: observable characteristic or outward expression of an allele pair

S. law of segregation: two alleles for each trait separate during meiosis

T. hybrids: heterozygous organisms

U. monohybrid: involves hybrids for a single trait

V. dihybrids: heterozygous for both traits

W. law of independent assortment: states a random distribution of alleles occurs during gamete formation.

X. Punnett squares: method developed to predict possible offspring of a cross between two genotypes.

Y. genetic recombination: combination of genes produced by crossing over and independent assortment
   1. Calculated using 2^n, where n is the number of chromosome pairs.
   2. In humans the possible number of combinations after fertilization would be 2^23x2^23, or more than 70 trillion.

Z. linked genes: travel together through meiosis
   1. The farther apart two genes are the higher the crossover frequency.

AA. Polyploidy: most species have diploid cells, but some have polyploid cells. Polyploidy is the occurrence of one or more extra sets of all chromosomes in an organism.
   1. A triploid organism for example would be 3n instead of diploid's 2n.
   2. In humans, polyploidy is always lethal.
      a) (This could be the topic for a damn movie.)
         (1) "You were the first one to be born polyploid, John."
         (2) "…what?"
         (3) "You're mature enough to understand now that you're in HS."
         (4) "But… that's not possible…"
         (5) "That's why they're chasing you, and that's why you can control shit with your mind"
         (6) "OH SHIT THAT'S AWESOME"
         (7) *robs bank 200 miles away, ships money through USPS*
   3. Polyploidy rarely occurs in animals.
   4. Often, polyploid plants have increased vigor and size…*insert dank meme*

You are ready. Now go study, take the test, and enjoy some pizza when the time comes ;)

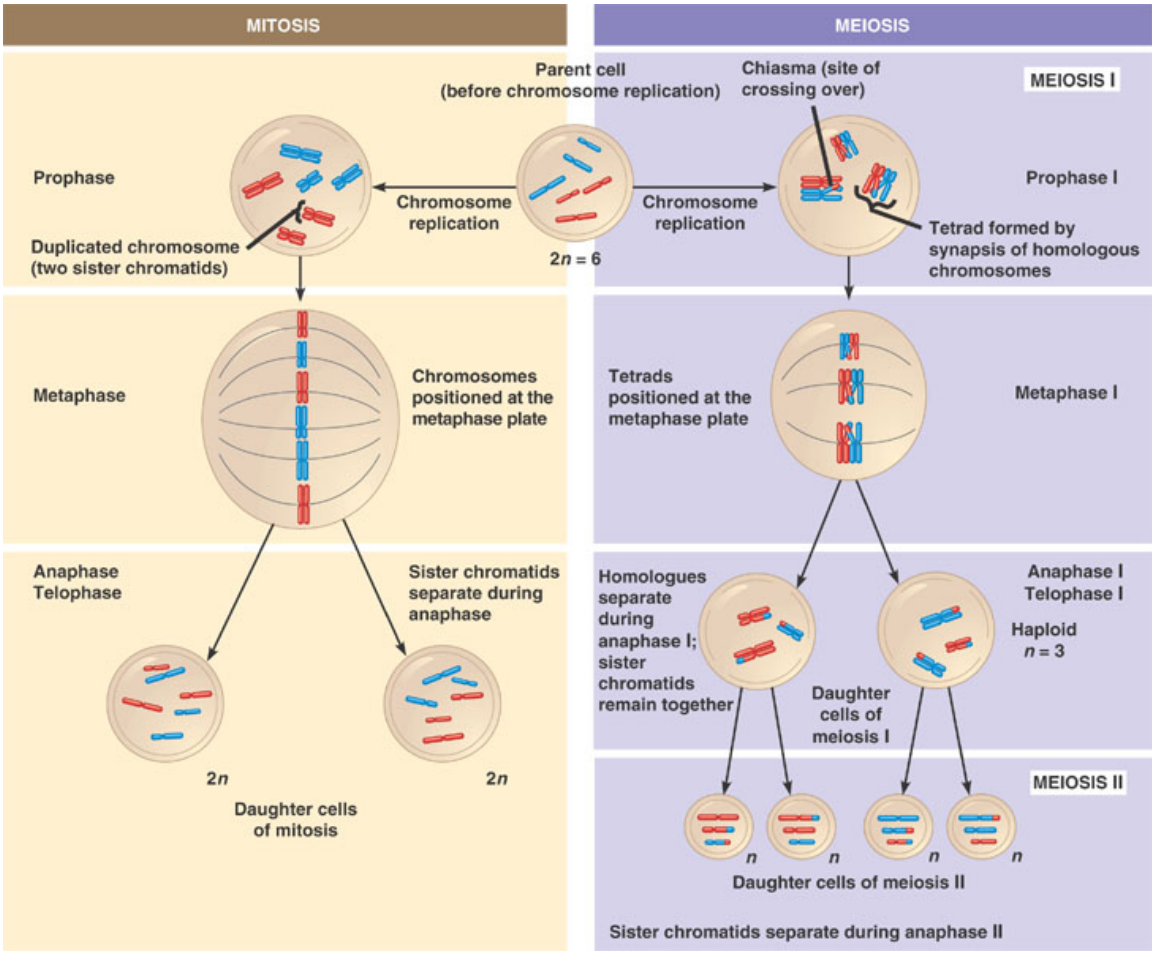
(that's if we do this right, of course.)

ps. review was made in a hurry so if there's any errors feel free to point them out and I'll correct them. Also if something is left out tell me too.

Really good practice sheet for Punnett Squares and some other resources
http://www.biology.arizona.edu/mendelian_genetics/problem_sets/dihybrid_cross/03t.html

https://d3jc3ahdjad7x7.cloudfront.net/kGuQGN8Dt9nxVFSwT57RE1jlGc3vdUOh3rDVzz1vemovrhBC.pdf

Mitosis	Meiosis
DNA division occurs during mitosis.	Two sets of division occur during meiosis, meiosis I and meiosis II.
DNA replication occurs during interphase.	DNA replication occurs once before meiosis I.
Synapsis of homologous chromosomes does not occur.	Synapsis of homologous chromosomes occurs during prophase I
Two identical cells are formed per cell cycle	Four haploid cells are formed per cycle
The daughter cells are genetically identical.	The daughter cells are not genetically identical because of crossing over.
Mitosis occurs only in body cells.	Meiosis occurs only in reproductive cells.
Mitosis is involved in growth and repair.	Meiosis is involved in the production of gametes and providing genetic variation in organisms.

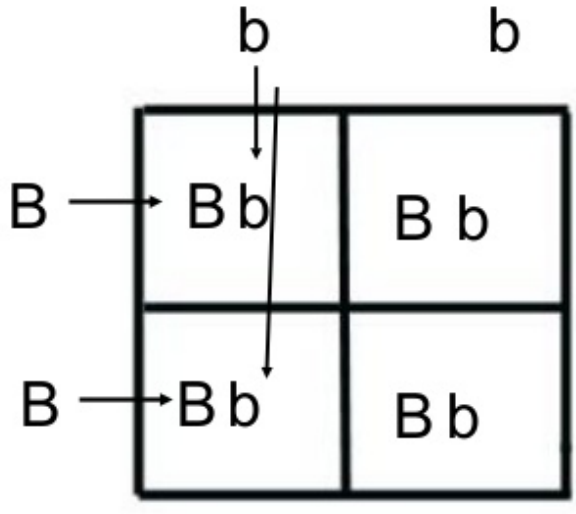


B = brown eyes b = blue eyes

A father is homozygous for brown eyes and the mother is homozygous for blue eyes. What is the expected outcome?

Father = BB

Mother = bb



100 % heterozygous

0 % homozygous