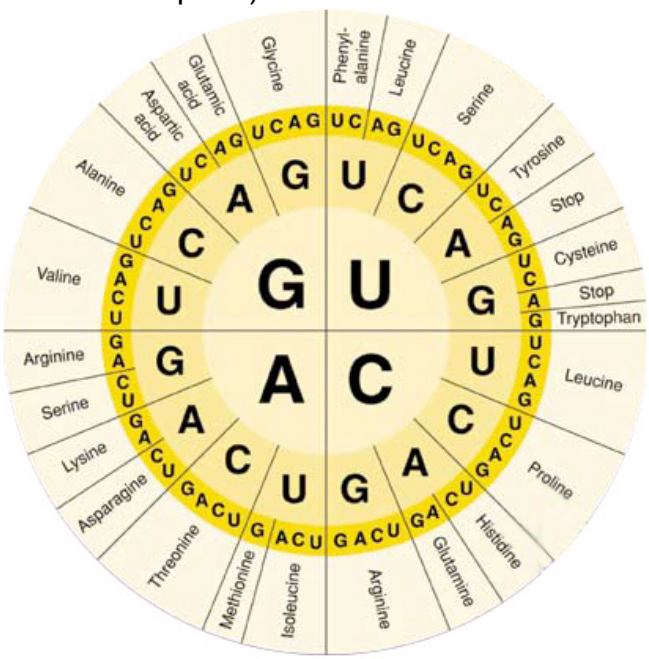
Midterm Exam Review

1. How many chromosomes are in a “normal” human karyotype? 46
2. How would Down’s syndrome be detected on a karyotype? Extra chromosome (trisomy) #21
3. Know how to read the genetic code chart (both circle and square).

1st letter	Second Letter: U		C		A		G		3rd letter
U	UUU	Phe	UCU	Ser	UAU	Tyr	UGU	Cys	U
	UUC		UCC		UAC		UGC		C
	UUA	Leu	UCA		UAA	Stop	UGA	Stop	A
	UUG		UCG		UAG	Stop	UGG	Trp	G
C	CUU	Leu	CCU	Pro	CAU	His	CGU	Arg	U
	CUC		CCC		CAC		CGC		C
	CUA		CCA		CAA	Gln	CGA		A
	CUG		CCG		CAG		CGG		G
A	AUU	Ile	ACU	Thr	AAU	Asn	AGU	Ser	U
	AUC		ACC		AAC		AGC		C
	AUA		ACA		AAA	Lys	AGA	Arg	A
	AUG	Met	ACG		AAG		AGG		G
G	GUU	Val	GCU	Ala	GAU	Asp	GGU	Gly	U
	GUC		GCC		GAC		GGC		C
	GUA		GCA		GAA	Glu	GGA		A
	GUG		GCG		GAG		GGG		G



4. What is the difference between a point mutation and a chromosomal mutation? A point mutation affects only one nucleotide in a sequence of DNA. For example, 5’-AGGGAC-3’ to 5’-AGCGAC-3’. A chromosomal mutation is when there is an extra (trisomy) or missing chromosome (monosomy) due to non-disjunction (failure of chromosomes to separate during meiosis). An example of a chromosomal mutation would be down’s syndrome.
5. What is produced during transcription? Transcription is the process of making a strand of mRNA from a gene on a DNA molecule. This process occurs in the nucleus.
6. What is produced during translation? Translation is the process of making proteins from the codons on the mRNA. This occurs in the ribosomes.
7. Know the base pair rule in DNA. A=T, C=G (for RNA, A=U)
8. Genes contain instructions for assembling what? Proteins
9. What can a karyotype show? Extra or missing chromosomes, and the gender (XY or XX)
10. What are the sex chromosomes of a male? Female? Male = XY, female = XX
11. What sex chromosomes does a father give to his child? Male has a 50% chance of making sperm that contain an X chromosome, 50% for a Y sperm. All females’ eggs will contain one X chromosome.
12. What sex chromosomes does a mother give to her child? Mother can only give an X chromosome
13. What is genotype? The alleles (portions of a gene) of an individual. Ex. Rr

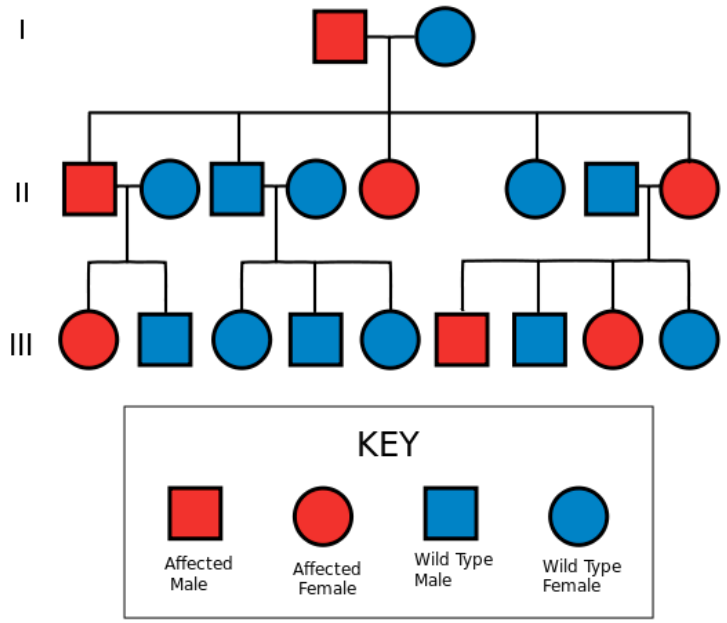
14. What is phenotype? The physical characteristic that an organism has due to genes. Ex. Red flower
15. Understand the different blood types.

Blood Type	Genotype		Can Receive Blood From:
A	$i^A i$ $i^A i^A$	AA AO	A or O
B	$i^B i$ $i^B i^B$	BB BO	B or O
AB	$i^A i^B$	AB	A, B, AB, O
O	$i\,i$	OO	O

16. Most sex linked genes are located where? On the X chromosome
17. Why is colorblindness more common in males than in females? Since males are XY and only have one X chromosome, they only need to have one affected allele to have the trait. Since females have two X's, they will need to have both alleles to have said trait.
18. What is "DNA Fingerprinting" and what is it based on? We did this lab today!! It's based on the idea that no two people (except identical twins) have the same DNA; so no two people will have the same DNA "fingerprint".
19. What restriction enzymes and what do they do? Restriction enzymes are used in DNA fingerprinting. They cut strands of DNA at a particular sequence that they recognize.
20. What is gel electrophoresis and what can it be used to determine? We did this today. It can be used to determine who committed a crime, paternity tests, if organisms' DNA is similar (relatedness), to check for a certain gene on a strand of DNA, etc.
21. What are the similarities and differences between DNA and RNA?

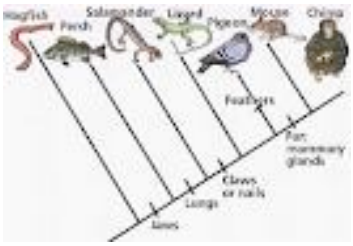
Similarities = both have phosphate and bases cytosine, guanine, and adenine
Differences = DNA has sugar deoxyribose/ RNA has sugar ribose, DNA is double stranded/ RNA is single stranded, DNA has thymine/RNA has uracil

22. What are codominance, incomplete dominance, and polygenic traits?
Codominance = both traits are expressed (ex. Red and white speckled flower)
Incomplete dominance = heterozygous is in between both homozygous traits (RR = red, Rr is pink, and rr is white)
23. What is the difference between a dominant and recessive allele? Dominant is usually expressed more than recessive and is written with a capital letter and recessive is written lowercase.
24. What is haploid and diploid? Haploid is one copy of each chromosome (n), diploid is two of each chromosome (2n)
25. What is selective breeding and what does it produce? Selective breeding is when humans pick the traits they want in an organism and breed for that trait. It produces little variety in a population.
26. What is a pedigree and what can it be used for? Can be used to tell how a trait is inherited, what people have a trait, etc.



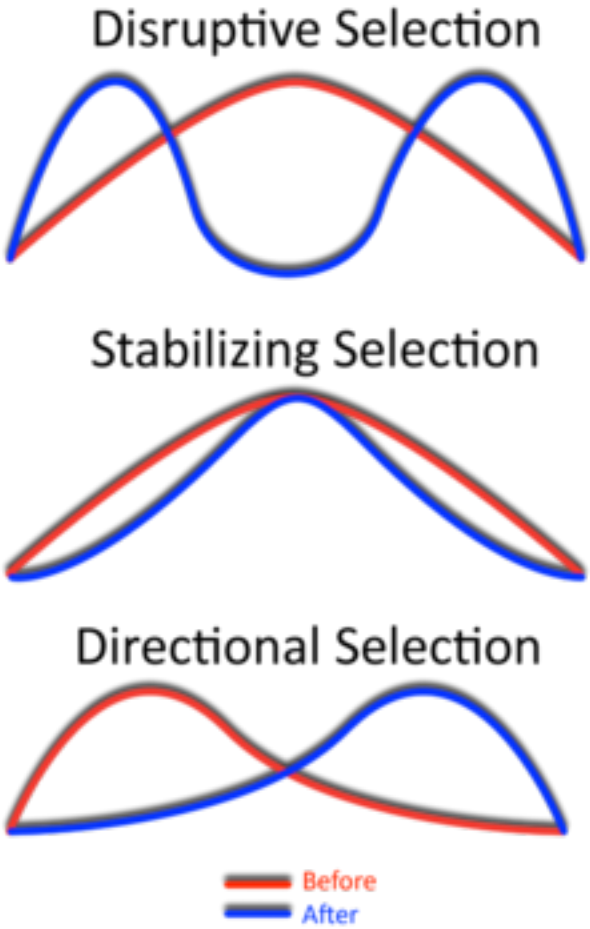
27. What is homozygous dominant, homozygous recessive, and heterozygous? RR, rr, Rr
28. Be able to conduct monohybrid crosses. See genetics quiz
29. Be able to conduct dihybrid crosses. See genetics quiz
30. Darwin traveled to several places. What place influenced him the most? Galapagos Islands

31. What did Darwin observe on the Galapagos Islands? Many different species with similarities (tortoises and finches).
32. What trait did Darwin notice about the Giant Land Tortoises? That they had traits suited to their environment. With tortoises, he noticed that their shells were different (saddle-back vs. domed).
33. What trait did Darwin notice about the Finches? ? That they had traits suited to their environment. The finches beaks were different shapes depending on what food they ate.
34. What is natural selection? The process by which organisms that are best suited to their environment (due to the possession of adaptations to that environment) will survive better and produce more offspring.
35. What is survival of the fittest? (what does fittest mean?) Fitness refers to an organism's possession of adaptations that give it a higher likelihood of survival. Thus, survival of the fittest.
36. What is inheritance of acquired characteristics? Acquired characteristics (characteristics gained within your lifetime) are NOT inherited. If I cut my arm off, my children will not be born with one arm because my cutting my arm off does not depend on my genes.
37. What book did Darwin write? *On the Origin of Species (by Means of Natural Selection)*
38. What is the difference between natural selection and artificial selection? Artificial selection is what humans deem the best traits (humans pick them). Natural selection "chooses" what traits are best suited for the environment.
39. What is the 3 word definition for evolution? Change over time
40. What is the gene pool? Hypothetical spot where all genes for a trait in a population are.
41. The 2 main sources of genetic variation are? Mutations and gene shuffling (crossing over)
42. What is the advantage of a polygenic trait over a single gene trait? Polygenic trait results in higher variation in a population. This will give the population a better chance of survival if adverse conditions develop in the environment.
43. What is the difference between common names and scientific names? Common names can differ amongst different regions/languages. Scientific names are the same everywhere.
44. Why did scientists come up with scientific names? ^^So there's no confusion!!
45. Know how to write scientific names. What font? What is capitalized and what is lower case? *Genus (capitalized) species (not capital).* Written in italics. Example: *Homo sapiens*
46. What is the first word of a scientific name? What is the second? See above
47. Know how to read a dichotomous key.
48. What do fossils show? Tissues of dead organisms. Can show similarities in structure to living organisms.
49. Know how to read a cladogram.



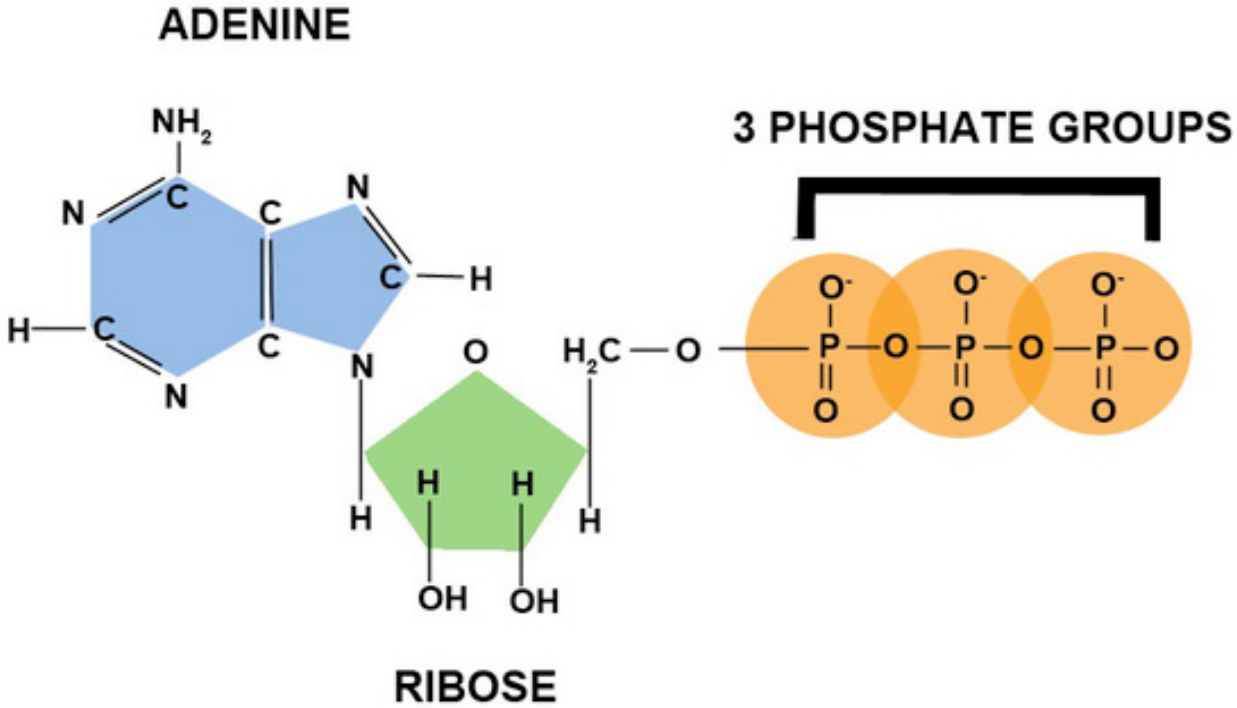
50. What are homologous structures, analogous structures, and vestigial structures?
Homologous = similar structure, different function (limbs of mammals)
Analogous = different structure, same function (wings of moth, bat, bird all used for flying)
Vestigial = structure that is smaller is size or is no longer used. Evidence of ancestor with that trait. Ex. Leg bones in whales; appendix in humans

51. Know and understand the 3 types of natural selection (disruptive, directional, and stabilizing)



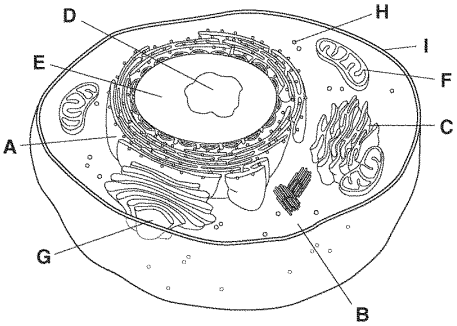
52. A hypothesis is useful only if it can be _____. tested
53. How many variables are tested in an experiment? one
54. What kingdoms contain organisms with cell walls? Plantae, Eubacteria, Archaebacteria, Fungi

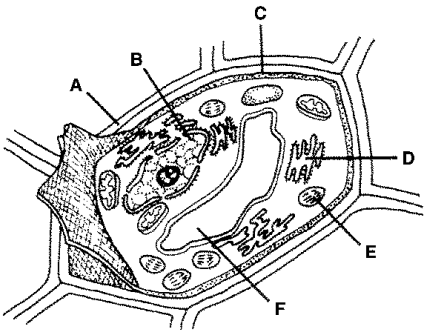
55. Why does diffusion occur? Because molecules are always in motion. Move from high concentration to low concentration.
56. What is homeostasis? A balance
57. What is metabolism? Breakdown of materials in the cell/body
58. What are the monomers of proteins? What are the main functions of proteins? Amino acids; proteins fight infections, speed up reactions, build and repair tissues, move things, etc.
59. What are the monomers of lipids? What are the main functions of lipids? Glycerol and fatty acids; lipids are used for energy storage
60. What are the monomers of carbohydrates? What are the main functions of carbohydrates? Monosaccharides; main source of energy
61. What are the monomers of nucleic acids? What are the main functions of nucleic acids? Nucleotides; store and transmit heredity
62. What are the levels of organization from atom → biosphere? Atom, molecule, organelle, cell, tissue, organ, organ system, organisms, population, community, ecosystem, biosphere
63. What is the ATP molecule made of?



64. What is the equation of photosynthesis? Know the reactants and products. $6H_2O + 6CO_2$ + energy (reactants)→ $C_6H_{12}O_6 + 6O_2$ (products)
65. What is the equation of cellular respiration? Know the reactants and products. Directly the opposite of #64
66. What are pigments? What is the main pigment in most plants? Light absorbing molecules. Chlorophyll.
67. There are 2 major categories of cells. What are these categories based on? Prokaryotes/Eukaryotes. Whether or not they have a nucleus. Pro = No, Eu = Do
68. What is osmosis? Diffusion of water

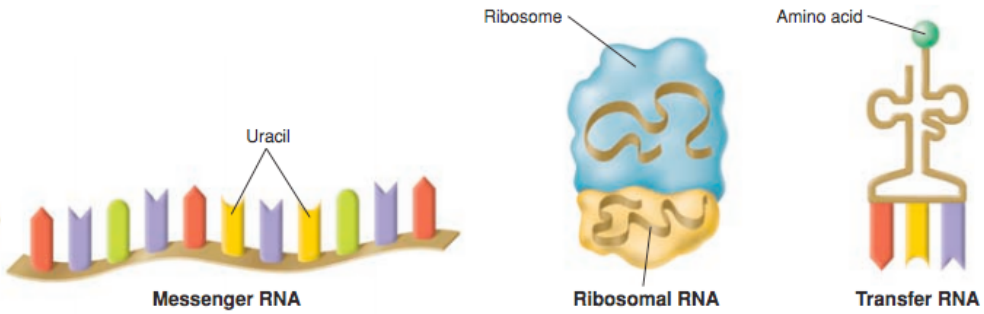
69. Label the organelles of the cell and know the function of each.





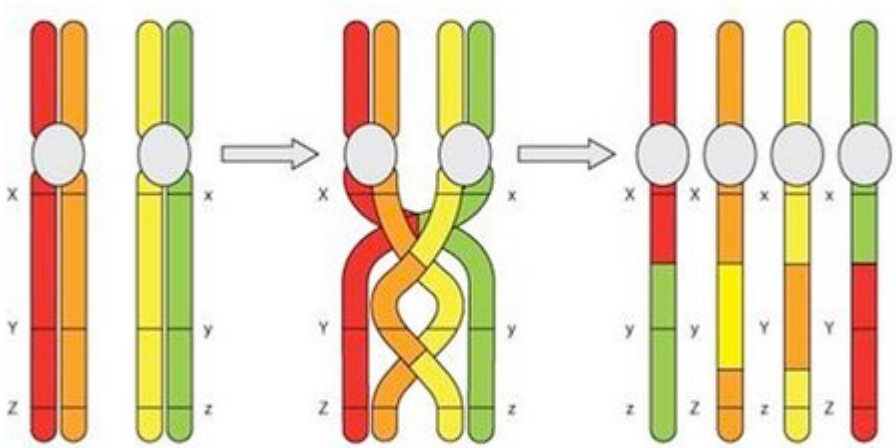
There is a labeled diagram of this on schoolweb

70. In DNA, what determines the traits of an organism? The order of nitrogen bases
71. What are the components of the DNA molecule? Deoxyribose, phosphates, nitrogen bases
72. Who were Robert Hooke, Leeuwenhoek, Schleiden, Schwann, and Virchow?
    Hooke= looked at cork under first microscope
    Leewenhoek = looked at living single-celled microorganisms)"animalcules" under improved microscope. First to look at living stuff.
    Schleiden, Schwann, Virchow = made cell theory
73. Know the process of cellular respiration.
    See diagram on schoolweb
74. Understand how many ATP molecules get made in glycolysis and in total with O2
    Glycolysis = 2 ATP, Cellular respiration (with O2) = 36 ATP
75. Why do plants appear green? They reflect (don't absorb) green light
76. In what organelle does photosynthesis take place? Chloroplast
77. In what organelle does cellular respiration take place? Mitochondria
78. What is the difference between aerobic and anaerobic? Aerobic = with oxygen, anaerobic = without
79. What causes your muscles to burn? Build up of lactic acid
80. What is the difference in the products of mitosis and meiosis?
    Mitosis = 2 identical, diploid cells. Only occurs in somatic cells.
    Meiosis = 4 genetically different haploid cells. Occurs in gametes.
81. What is a codon and an anticodon?
    Codon is on the mRNA strand. It is three letters; each codes for an amino acid.
    Anti-codon is on the tRNA strand. It's job is to bind to the correct codon to ensure proper amino acids are brought to the ribosome.
82. What are the 3 types of RNA and what do they look like?

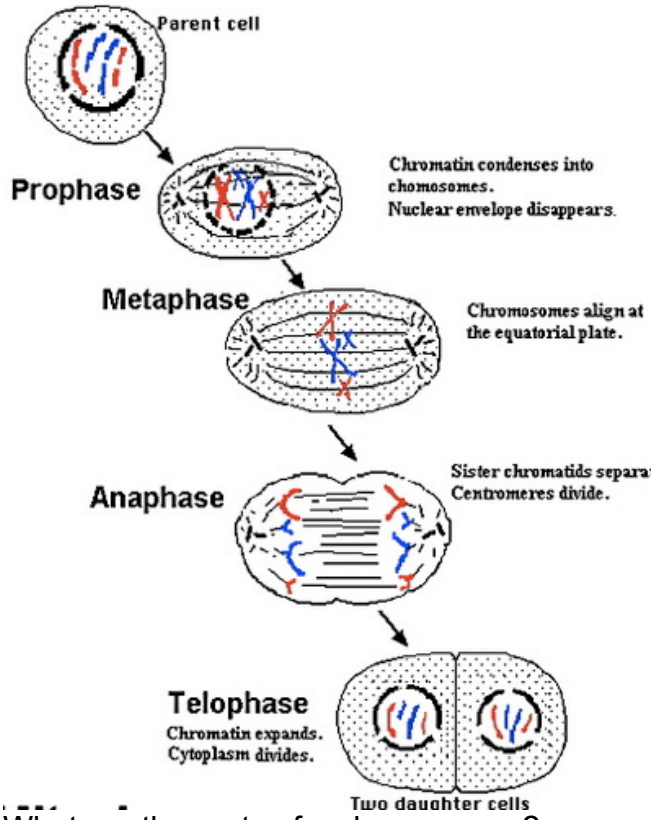


Types of RNA The three main types of RNA are messenger RNA, ribosomal RNA, and transfer RNA. Ribosomal RNA is combined with proteins to form ribosomes.

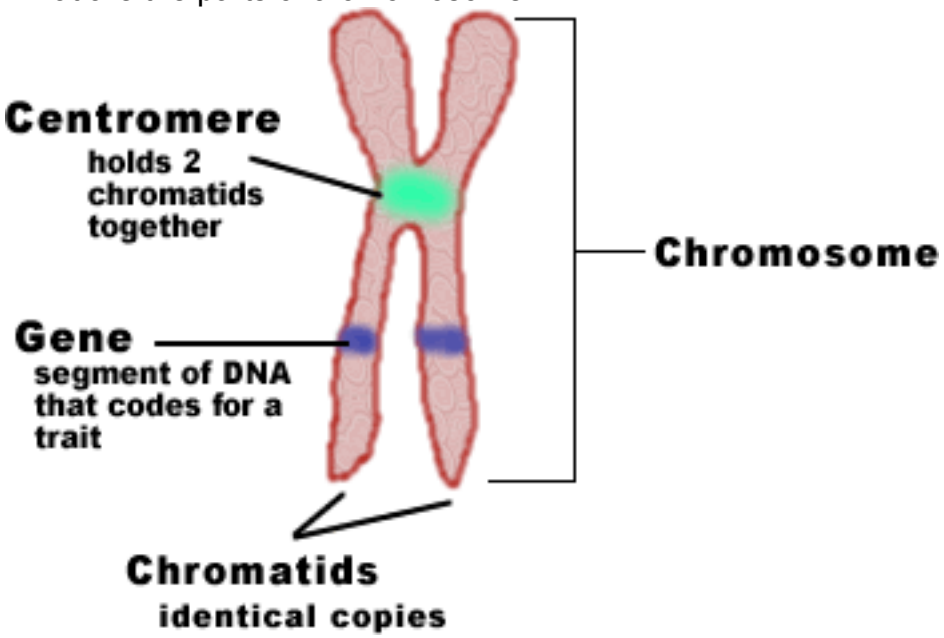
83. What is crossing over and what does it look like?
Occurs during meiosis. Ensures all gametes are genetically different.



84. What are the steps of Mitosis? Know what each step looks like. PMAT!! No interphase or cytokinesis!



85. What are the parts of a chromosome?



86. What is the difference between a polymer and a monomer? Many monomers make up a polymer. A monomer are the "pieces" of a larger molecule. Ex. Amino acid is a monomer for a protein (polypeptide)

87. What are centrioles and what is their role in mitosis and meiosis? They are responsible for ensuring spindle fibers are formed and ensuring things are in the right spot during mitosis/meiosis

88. What are spindle fibers and what is their role in mitosis and meiosis? See above
89. What is the process of DNA replication? DNA is unwound/unzipped by DNA helicase, each half of DNA serves as a template for new strand to be build, DNA polymerase brings in new nucleotides to build new strand. Each new DNA molecule contains one old strand and one new strand.
90. What is produced during DNA replication? 2 identical strands of DNA
91. What has to separate during DNA replication? Two strands of DNA molecules; hydrogen bonds are broken
92. Why must cells divide? Volume increases faster than surface area. Cell builds up too much waste and needs too much food/O2 than can go out/in. Too much demand on DNA
93. What is the same in every cell in the body? DNA
94. What is cell specialization? Give examples in your body. Occurs in multicellular organisms where each cell has a special job. Ex. Red blood cells carry oxygen and nerve cells transmit impulses
95. What is the difference between an autotroph and a heterotroph?

Autotroph makes its own food, heterotrophs must eat other things to survive