Mendelian Genetics (Inheritance)

keywords/quesions	notes	extra info	i get it
	I. Background		☐
	A. Gregor Mendel (1822-1884. He was a monk.		☐
	1. Discoveries in 1865 --> credit around 1900		☐
	2. worked with pea plants		☐
	3. distinguished varieties of peas		☐
	4. established "true breeding" strains		☐
	5. worked on cross-breeding AKA hybridization		☐
	II. Mendel's Experiments - many on pea traits		☐
	A. example of experiment -		☐
	1. Cross: Parental (P) generation: Round seed X wrinkeled seed		☐
	2. results: First filial generation (F1) --> all round! ohsh!		☐
	3. then Mendel self fertilized some F1 plants. (F1 X F1)		☐
	4. Results : F2 generation, 5474 round; 1850 wrinkled , a 2.96:1 ratio.		☐
	5. the crazy part is that Mendel repeated many many true breeding crosses, then F1 crosses and got a generalizable 3:1 of "dominant" to "recessive" in the F2 gen.		☐
	B. Mendel's explanation for his results.		☐
	1. for each trait, each organism has 2 genes (this is not always true, especially in animals like humans; new discovery 11/2006 that shows that some humans have multiple copies of each certain genes, and other humans have none. Very unexpected...)		☐

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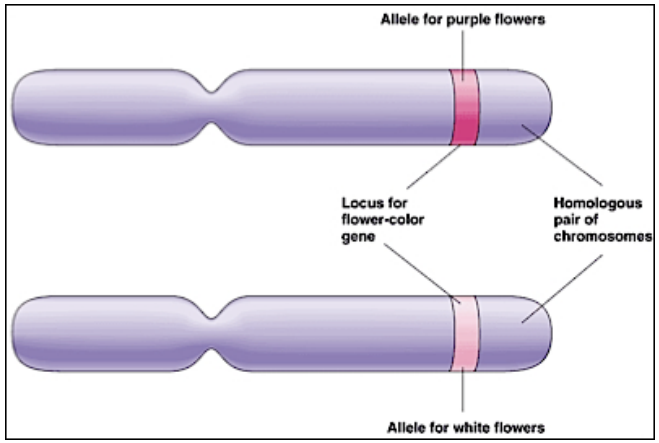
	2. Alternative forms of the same gene are called **alleles**  		☐
	a. For example: gene for pea color, then a green allele and yellow allele.		☐
	3. If alleles are the same in both chromosomes --> "**homozygous**" for trait, (green/green)		☐
	4. If alleles are diff. --> "**heterozygous**" (green/yellow)		☐
	5. If organism is heterozygous, the allele that "appears" or that is expressed is called the **dominant** allele. Usually represented by capital letter symbol (expressed = phenotype)		☐
	6. Allele that is hidden is called **recessive** allele		☐
	7. What alleles code for = genotype		☐
	8. What alleles show up = phenotype		☐
	III. When organism makes gametes, alleles separate, which is called segregation		☐
	A. only one allele in each gamete (remember 2n--> n in meiosis!)		☐
	B. From a heterozygote, 50% of gametes will be dom. and 50% will be recessive.		☐
	C. Hey,then why is there a 3:1 ratio in the F2 of a heterozygote cross?		☐
	1. Use a punnet square to figure it out:		☐
	a. How to use punnett squares:		☐
	i. write out genotypes of parents		☐

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	ii. write out gametes		☐
	iii. combine gametes		☐
	iv. analyze!		☐
	IV. Types of Mendelian crosses		☐
	A. monohybrid cross - one trait, one gene pair. (P=purple; p= white)		☐
	1. Can use monohybrid cross if you don't know a genotype of individual with dom phenotype. Breed it with a homozygous rec indiv. and look at the offspring results. Called a test cross.		☐
	B. Dihybrid cross - 2 traits, 2 genes, 4 possible alleles.		☐
	1. F1 heterozygote cross results in F2 gen with 9:3:3:1 ratio. Dom/Dom:Dom/Rec: Rec/Dom : Rec/Rec		☐
	2. Why does this crazy ratio happen? The answer is the principle of **independent assortment**--> One allele does not affect the others.		☐
	C. Using a testcross to find unknown genotypes.		☐
	1. only works for things that can be mated with each other.		☐
	2. requires a full generation to get results.		☐
	3. How to do it:		☐
	a. get unkown genotype and mate it with known homozygous recessive individual (known because recent ancestors were also homo. rec.)		☐
	b. look at offspring:		☐
	i. if phenotype is homo. dom., then offspring should be _____		☐
	ii. if phenotype is hetero., then offspring should be _____		☐
	D. Mendelian Genetics and Probability		☐
	1. probability is the chance that something occurs.		☐

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	2. **rule of multiplication** - used when two events are independent from each other. like sex of child, or coin flips.		☐
	3. **rule of addition** - used when there is more than one way to get the same result. usually when heterozygotes and homo. dom. are possible. It is the sum of different probabilities.		☐
	4. How to solve specific stuff with out punnet squares!		☐
	a. Multiply probabilities!!!!!!		☐
	i. e.g. What is the probability you get AaBBCCDd from AaBbCcDd X AaBbCcDd ?		☐
	I prob of Aa =1/2		☐
	II prob of BB = 1/4		☐
	III prob of CC = 1/4		☐
	IV prob of Dd = 1/2		☐
	ii. so, to solve 1/2 times 1/4 times 1/4 times 1/2 equals 1/64! it is not like wow, it is like whoa!		☐
	V. Pedigrees track traits across generations.		☐
	A. Rules for pedigrees. carrier = heterozygote.		☐

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	VI. SIngle gene Autosomal traits in humans		☐
	A. recessive		☐
	1. albinism		☐
	2. cystic fibrosis		☐
	3. galactosemia		☐
	4. phenylketonuria		☐
	5. sickle cell didease (aka sickle cell anemia)		☐
	6. Tay-Sachs		☐
	B. Dominant		☐
	1. achondroplasia		☐
	2. huntington's disease		☐
	C. hypercholesterolemia		☐
	VII. NON-Dominant/Recessive Genetics		☐
	A. Incomplete Dominance		☐
	1. Hypbrids have phenotype that is between parents phenotypes.		☐
	a. red + white = pink		☐
	b. in humans - hypercholesterolemia		☐
	B. Codominance - both show up.		☐
	1. in humans - Blood groups		☐

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	C. Pleiotropy - when one gene affects many traits.		☐
	1. sickle cell gene		☐
	D. Polygenic traits - many genes, one phenotype		☐
	1. skin color		☐
	E. Linked Genes - genes on same chromosome. Do not assort independently		☐
	1. linkage maps.		☐
	2. Morgan's Drosophila		☐
	F. Sex Linkage - genes on X chromosome. A sex-linked trait has a gene on the X chromosome.		☐
	1. red - green colorblindness		☐
	2. hemophilia		☐
	3. Duchenne Muscular Dystrophy		☐