Darwin

natural selection	selection due to environmental stresses - survival of the fittest
pangenesis	a mixing of characteristics from parents

Lamarckism

epigenetics	presence of methyl groups attached to DNA bases controls the expression of genes & changes cellular behaviour
methylation status changes in response to ageing, diseases (cancer), & environmental factors (diet)	

Mendel

laws of inheritance	study of alleles (hereditable factors)
deductions	genes come in pairs & are inherited as distinct units (1 from each parent)
	the segregation of parental genes & their appearance in the offspring tracked as dominant or recessive traits
	there are mathematical patterns of inheritance from one generation to the next
peas?	grown in small area
	lots of offspring
	produce pure plants when allowed to self-pollinate over several generations
	can be artificially cross-pollinated
self-pollination	Mendel produced pure strains by self-pollinating for several generations
	male anther + female stigma, germination occurs
	example: if p = tall x short, f1 = all tall, f2 = 3/4 tall & 1/4 short
particulate inheritance	physical traits are inherited as 'particles' - now known as chromosomes & DNA
example crossing pure plants:	p = TT x tt
	f1 = all hydrids: Tt
	f2 = hybrid x hydrid: TT, Tt. Tt, tt
1st law: principle of dominance	**an organism with alternate forms of an allele will express dominant form**
	alleles can be dominant or recessive - one dominant allele will display its phenotype
	cross pure parents for contrasting traits results in only one form of the trait in the next generation
	all offspring heterozygous & express only dominant trait

Mendel (cont)

2nd law: principle of segregation	**each inherited trait is defined by a pair of alleles - parental alleles segregate during meiosis.**
	during formation of gametes, the two alleles responsible for a trait separate - meiosis
	alleles for trait are recombined at fertilisation, producing offspring's genotype
3rd law: principle of independent assortment	**alleles for different traits are not dependent on one another for their expression**
	allele pairs separate independently during formation of gametes (meiosis)

Mendel's crosses

1. p	TT x tt
2. f1	Tt x Tt
3. f2 test cross	Tt x tt

he didn't know at f1 whether tall plants were homozygous or heterozygous so you use a test cross & use homozygous recessive from p to unmask other traits & determine genotype of f2 - if they all come out the same then it was homozygous

experiment

200 people given sulphadimidine, urine taken after 6 hours, treated so main metabolite from exrcetion stained blue

samples put in colorimeter - intensity of colour is proportional to amount of metabolite

data sorted into ranges based on optical density & plotted on histogram

family included: all fast apart from eldest daughter, therefore parents are Ff Ff & she has ff

other crosses

dihybrid	p = RRYY X rryy
	gametes = RY & ry
	F1 = RrYy (all yellow & round)
	F2 = 9/16Y + R, 3/16 Y + r, 3/16 y + R, 1/16 y + r. (four different pea phenotypes)
mono hydrid heterozygous cross	Aa x Aa
	genotype ratio: 1:2:1
	phenotype ratio: 3:1
dihybrid heterozygote cross	AaBb x AaBb
	genotype ratio: 1:2:2:1:4:1:2:2:1
	phenotype ratio: 9:3:3:1

other crosses

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	gametes = RY & ry
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other crosses (cont)

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	genotype ratio: 1:2:1
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	genotype ratio: 1:2:2:1:4:1:2:2:1
	phenotype ratio: 9:3:3:1

Mendel's law exceptions

1. incomplete dominance	sometimes neither allele is fully dominant over the other so the two alleles are both capital letters & one has an apostrophe e.g. R R'
	when these alleles come together they portray a mixing of the two phenotypes
2. codominance	both alleles of a gene are dominant & the heterozygous phenotype has both traits expressed equally so the two alleles are two capital letters e.g. W(hite) B(rown)
3. multiple alleles	human blood type is governed by presence of 3 different alleles: A B O & each person has 2/3 in their DNA
	A & B are codominant with each other
	A & B are purely dominant over O
	O is recessive
	blood type gene is I, e.g. for A = IA, B = IB, O =i

type A = IAIA or IAi
type B = IBIB or IBi
type AB = IAIB
type O = ii

sex-linked traits

traits located on sex chromosomes, X & Y. XX = females, XY= males. many sex-linked traits carried on X chromosome.

Hemophilia is caused by recessive gene on X chromosome - severity is related to amount of clotting factor in blood

colour blindness is a recessive sex-linked condition on the X, caused by lack of colour receptors in the eye, results in inability to see some colours correctly. more common in males, patients unable to distinguish shades of red-green.