

Definitions:

- A gene is A section of DNA that codes for a specific trait (a heritable factor)
- A gene locus is The location of a gene on the DNA strand.
- Alleles are different forms of the same gene (can be dominant or recessive)
- Mutations are permanent changes in the sequence of bases in a gene
- A genome is all of the genetic information in the genes of an organism
- An amino acid sequence is the specific order of amino acids in a protein

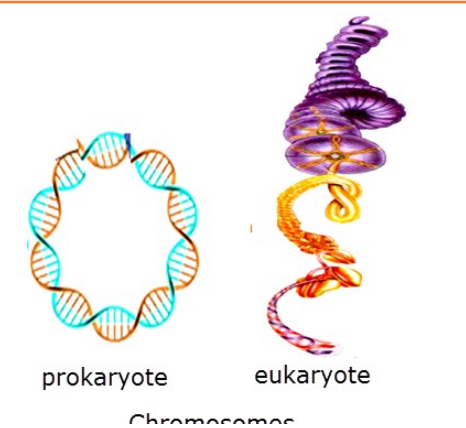
Base substitution mutations - cause sickle cell anaemia

What are the effects of a base substitution on each of the following

DNA	mRNA	amino acid sequence	haemoglobin
There is a permanent change in the sequence of bases in the DNA GAG --> GTG CTC CAC	The mRNA codon transcribed is changed from GAG to GUG	GAG codes for GLU but GUG codes for VAL so the amino acid GLU becomes VAL	The change in amino acid changes the shape of the haemoglobin

How can databases be used by biologists for the following:

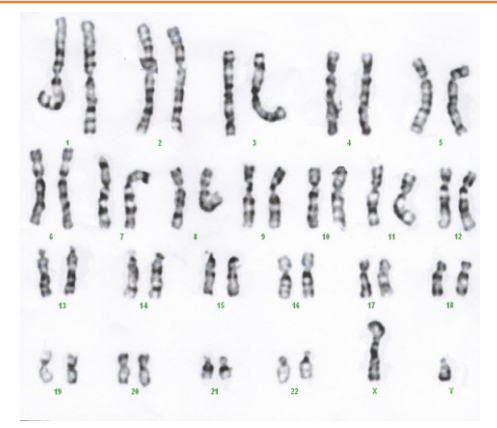
- To store the information from the human genome project  
*As base sequences are discovered they are added to data bases.*
- To find specific DNA base sequences  
*A biologist can search for a specific sequence in all the published data bases*
- To help find the function of specific genes  
*Correlations can be found between genes and characteristics in the stored genomes*
- In the classification of living organisms  
*similarities in the DNA between species can be compared using the databases*



Compare the arrangement of DNA in a prokaryote with that of a eukaryote.

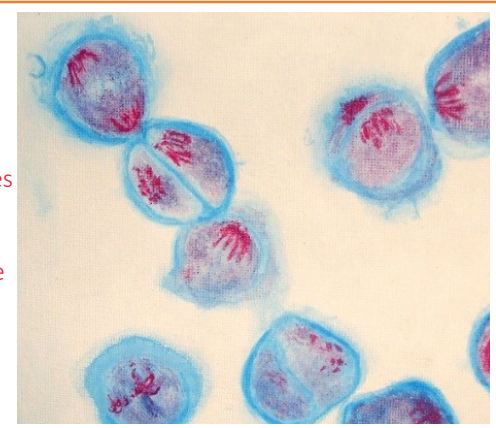
Prokaryotes have one single circular DNA molecule (and sometimes plasmids) no histone proteins are associated

Eukaryotes have many linear chromosomes DNA is associated with histone proteins There are no plasmids



What is the difference between a karyogram and a karyotype?  
A karyogram is the diagram, of photos on card, or digital representations. Karyotype refers to the actual chromosomes in the cells

What are sister chromatids?  
Two chromatids on the same chromosome & homologous chromosomes? A pair of chromosomes each containing the same genes as the other.



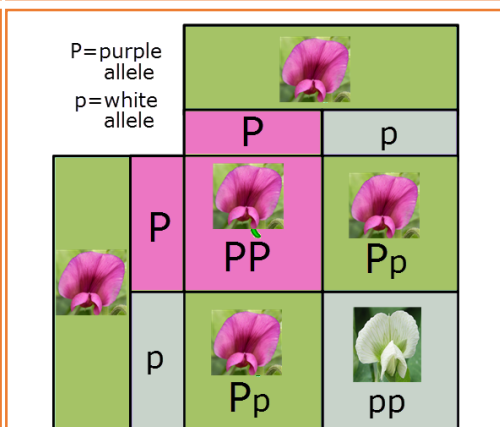
Meiosis – write 3 words to summarize each phase of meiosis

- P I Prophase - DNA coils up
- M I Metaphase chromosomes line up
- A I Anaphase - homologous chromosomes separate. Cell cytoplasm splits
- T I Telophase & cytokinesis - DNA coils up
- P II Prophase II - Chromosomes line up
- M II Metaphase II - Chromatids separate
- A II Anaphase II - cells divide again
- T II Telophase II & cytokinesis - forming 4 haploid cells

Mendelian genetics and peas simple inheritance and punnet grids

Show the cross between two heterozygous plants. Name the

- parental genotypes Pp and Pp
- gametes P or p
- offspring genotype 1PP:2Pp:1pp
- offspring phenotype 3 pink:1 white



Non-disjunction can cause the condition called Downs syndrome

To obtain cells for a karyotype analysis using karyograms doctors use these two methods:  
Chorionic villus sampling & Amniocentesis

Risks to unborn baby and mother are:

**Sex-linked inheritance** is when the gene (and it's alleles) are found on the X chromosome (or 'sex chromosomes')

Symbols for alleles for Sex linked haemophilia are X<sup>H</sup> X<sup>h</sup> y- (only 3)

Symbols for alleles for red-green colour blindness are X<sup>R</sup> X<sup>r</sup> y-

**Dominant, recessive and co-dominant alleles in ABO blood groups**

The allele symbols for ABO blood groups are: I<sup>A</sup> I<sup>B</sup> i

**Multiple alleles** is when There are more than two alleles for a gene

Blood group genotypes can be Group A = I<sup>A</sup>I<sup>A</sup> I<sup>A</sup>i & Group B = I<sup>B</sup>I<sup>B</sup> or I<sup>B</sup>i

PCR is a technique that can make multiple copies of DNA very rapidly using heating and cooling cycles

Gel Electrophoresis can separate fragments of DNA of different sizes

DNA profiling is comparing the pattern of DNA fragments which separate in gel electrophoresis between the DNA of different people

Genetically modified organisms (GMOs)

Examples of GMO Bacteria that can be genetically engineered to make a useful product are:

- E. coli to make insulin
- E. coli to make human growth hormone

**Natural clones** occur in many species, examples include;  
a-sexual reproduction / vegetative reproduction or identical twins.

Therapeutic cloning is Production of cells for use in the treatment of a patient

Reproductive cloning by somatic cell transfer is the production of a new organism using an adult cell nucleus and an e-nucleated egg cell.

Mutagens & radiation can cause cancer

**Ethics**

Risks of GMO crops  
GMO pollen could pollinate wild species There could be unexpected effects on other species (e.g. in pest resistant crops)

Benefits of GMO crops  
Increased crop yield reduced use of pesticides (e.g. in pest resistant crops)

