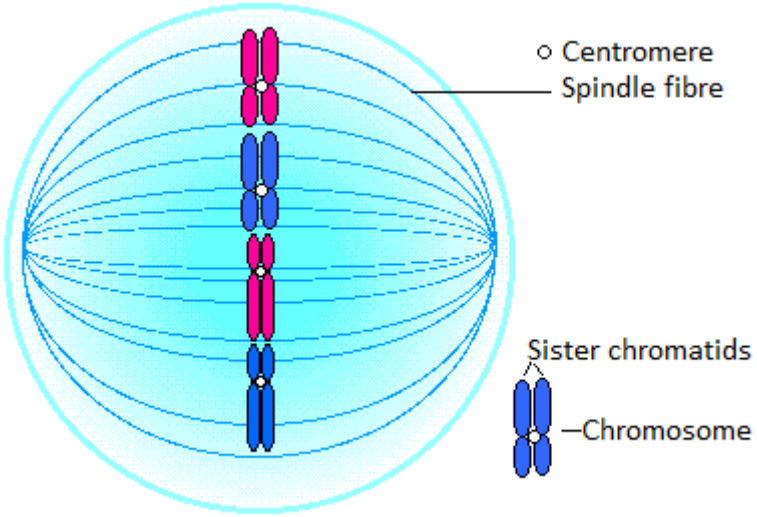
GENETICS

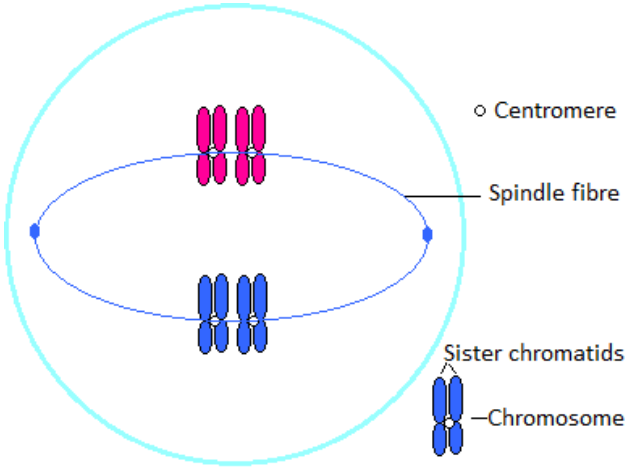
1. If an animal somatic cell has 22 pairs of chromosomes, state the number of chromosomes found in the gametes.
   22

2. What is the diploid number of chromosomes for human cells?
   46

3. Draw a diagram of a cell during metaphase of Mitosis with a 4 chromosomes. Include at least 3 labels.



4. Draw a diagram of the same cell during metaphase of Meiosis.



5. In cattle, Polled is <u>dominant</u> to horned which is <u>recessive</u> and Uniform coat is dominant to spotted.

   a) Define the underlined terms.

Dominant will always appear in the phenotype of an individual if it is in the genotype. Eg. TT and Tt are both tall as Tall(T) is dominant to short(t).
Recessive will only appear in the phenotype if the dominant trait is absent. Eg. Short tt.

6. What is meant by a test cross or back cross?
   A test cross is done to determine if an individual is pure breeding or heterozygous for a trait. A cross is done using a pure breeding recessive trait.

   Is the individual TT or Tt. Cross with tt and if any offspring appear like the recessive then the individual has to be heterozygous.

Parents:	TT x tt	Tt x tt
Possible gametes:	T t	T t t
F1 genotype:	Tt	Tt tt
F1 phenotype:	All tall	Tall Short

7. In shorthorn cattle, coat colour shows a lack of dominance; the heterozygous condition is roan. Show the genotypes and phenotypes of the progeny for each of the following crosses:

   b) A red bull and a white cow

Parents:	RR x WW
Possible gametes:	R W
F1 genotype:	RW
F1 phenotype:	Roan

   c) A roan bull and a white cow

Parents:	RW x WW
Possible gametes:	R W W
F1 genotype:	RW WW
F1 phenotype:	Roan White

   d) Two roan parents

Parents:	RW x RW
Possible gametes:	R W R W
F1 genotype:	RR RW RW WW
F1 phenotype:	Red Roan Roan White

Incomplete dominance or lack of dominance. Example of barley straw 800mm crossed with 500mm gives offspring with straw length 650mm.

The ratios of 3:1(monohybrid), 1:1:1:1(dihybrid with double recessive) and 9:3:3:1(dihybrid) may not be asked. Example from 2011 Q7 higher level.

**Contnuous variation – Where height is not tall or short but all different heights in between, remember standing in front of whiteboard from the smallest of you to the tallest!

F1 Hybrid

The simplest way to define an F1 hybrid is to take an example. A plant breeder takes a variety of carrot that shows great resistance to root fly but has poor taste and takes a very sweet tasting variety with poor fly resistance. The best plant of each type is then taken and self-pollinated each year and, each year, the seed is re-sown. This is called 'fixing' the gene.

The breeder now takes the two plants with fixed genes and cross pollinates the two by hand the result is known as an F1 hybrid. Plants are grown from seed produced and the result of this cross pollination should have a good fly resistance and be sweet tasting.

The breeders hold the parents of this cross and produce F1 seeds every year. Because a lot of work is involved, F1 seeds can be very expensive.

http://www.thompson-morgan.com/vegetables/vegetable-seeds/carrot-and-parsnip-seeds/carrot-flyaway-f1/966TM