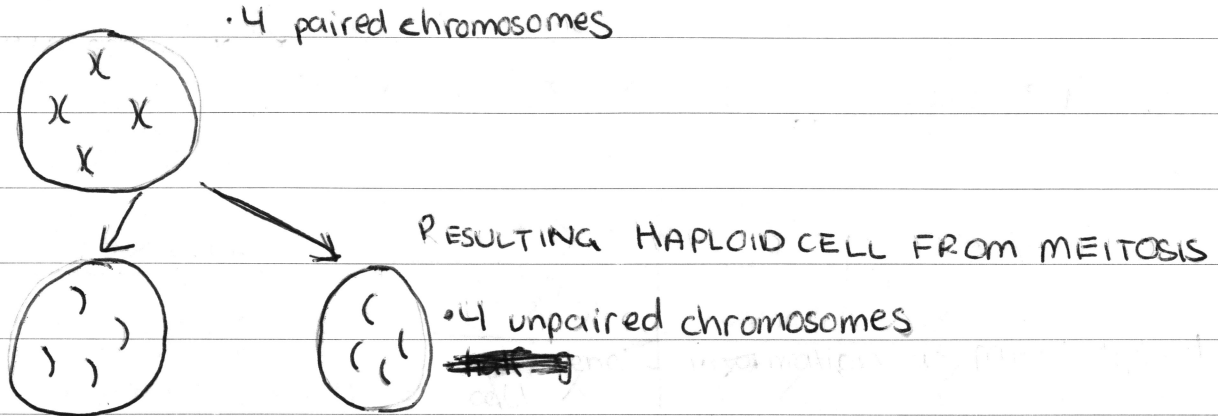


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a)

Mutation	Effect on Chromosome Number				
Trisomy	Trisomy involves the development of 3 chromosomes instead of 2 for each number. For example Down Syndrome is when 3 chromosomes of 21 are present instead of 2.				
Polyploidy	Polyploidy is when several genotypes are possible. This increases the chromosome number				
Base Substitution	<p>Base substitution occurs when a base in the DNA sequence is replaced with another therefore effecting the resulting protein produced and chromosome number. eg.</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="border-right: 1px solid black; padding-right: 10px;">original strand</td> <td>mutated strand</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 10px;"> C A T T a T A A </td> <td> (C) A T T C T A A </td> </tr> </table>	original strand	mutated strand	C A T T a T A A	(C) A T T C T A A
original strand	mutated strand				
C A T T a T A A	(C) A T T C T A A				

b) DIPLOID CELL



c) i) The genes for ~~both the~~ vision defect ~~and~~ ~~the limb defect~~ are recessive. and the limb defect is dominant.

ii) ~~Parent~~ VISION DEFECT

Parent 9 and 10:

~~Parent 9 and 10~~ XX and X^vY

	X	X
X	xx	xx
Y	xY	xY

All of their children will not have vision defect. This is same as when genes are linked or not linked as neither parent carries or has the disorder.

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LIMB DEFECT

X^1X^1 - affected female

X^1Y - non-affected male

Parent Genotype: X^1X^1 and X^1Y

	X^1	X^1	<u>LINKED</u>
X^1	X^1X^1	X^1X^1	
Y	X^1Y	X^1Y	

50% will ~~be~~ have limb defect

50% will not

1:1 ratio.

If the genes were not linked the ratio would be 1:0, all would be affected.

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d)i) Gene data can be collected through DNA sequencing. Once this data has been collected it can be analysed through electrophoresis. The position of the genes can then be determined. Finally the percentage of ~~total~~ likelihood for the genes to ~~cross~~ crossover is determined. The lower the chance the closer they are. Therefore the relative position of ~~total~~ linked genes can be determined.

ii) The Human Genome Project could not be achieved by studying linkage maps as ~~many~~^{many} DNA found were "false" and did not code for anything, also many genes are not linked and therefore would not be considered. Finally mutations could not be accounted for such as base substitution and frame shift. Therefore the Human Genome Project could not be achieved by studying linkage maps.

e) Gene cloning refers to the production of an identical copy of the original gene. Gene cascades involves the study of inheritance of the genetic information. Our understanding of these two areas has led to the development of new applications for technology.

The ability to clone a favourable gene allows for the ~~production of~~ development of gene therapy and ~~genes~~ ^{treatment of} diseases, such as Diabetes. Scientists were able to isolate and copy the gene for insulin production and insert it into a diabetic patient.

Through the use of gene cloning one can ensure that all genetic information is found in the daughter cells and no mutation has occurred through ~~at~~ crossing over.

The understanding of gene cascades has allowed scientists to research the patterns of inheritance and therefore control it. This understanding combined with the understanding of gene cloning has led to the development of an artificial chromosome ~~that~~ by cloning many genes and ~~mimicking~~ ^{mimicking} gene cascades to create a whole chromosome.

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Therefore our understanding of gene cloning and gene cascades has led to the development of new applications for technologies such as the production of a whole artificial chromosome.

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