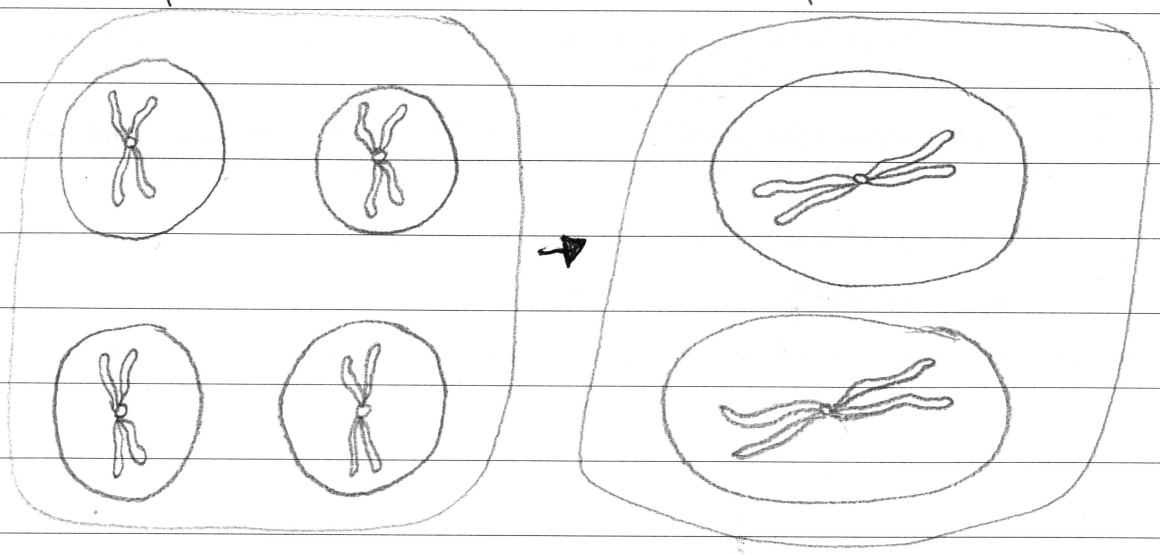
Start here.

a)

	Trisonomy	Polyploidy	Base substitution
Description	An extra on any chromosome e.g. extra on chromosome 21 causes down syndrome	An extra pair or multiple extra pairs of chromosomes e.g. wheat hybrids.	The mutation of the forming of a protein or creation of stop codon by incorrect translation or transcription.
affect on chromosomal numbers.	No affect to chromosomal numbers, mutation within chromosome	One or more extra pairs of chromosomes increases chromosomal numbers	No affect to chromosomal numbers, mutation within chromosome

b)



c) i Limb defect is recessive and vision defect may be [redacted] dominant.

ii

Linked genes VvLL

	VL	vL
VL	VVLL	VvLL
vL	VvLL	vvLL

25% limb defect only

75% vision defect only

3:1

V → defect

v → normal

L → normal

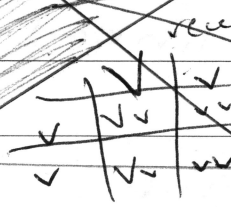
L → defect

Next page

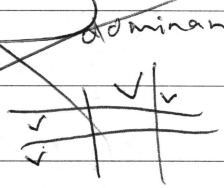
25% vision defect only

50% vision + limb defects

recessive

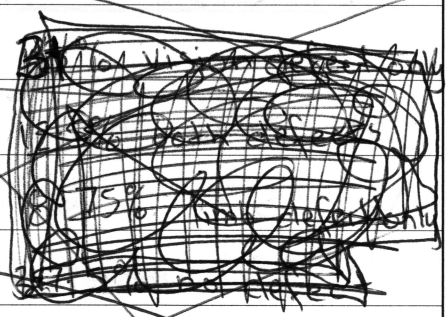


dominant



Not linked genes VvLL

	V	v	L	L
V	VV	Vv	VL	VL
v	Vv	vv	vL	vL
L	VL	vL	LL	LL
L	VL	vL	LL	LL



5 - 5 - 2 - 4 3:9:9:1

limb eye both neither

~~both~~ none limb vision both

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c) i Limb defect is recessive and vision defect is dominant.

ii E – eye defect L – normal

e – normal l – limb defect

Linked Genes EeLl

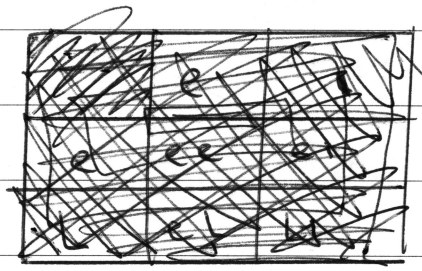
	EL	el
EL	EELL	EeLl
el	EeLl	eell

25% limb defect only

75% vision defect only

3:1

Not-linked genes EeLl



	E	e	L	l
E	EE	Ee	EL	El
e	Ee	ee	eL	el
L	EL	eL	LL	Ll
l	El	el	Ll	ll

31.25% Vision only

18.75% limb only

12.5% both defects

37.5% no defect

5:3:2:6

You may ask for an extra Writing Booklet if you need more space.

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d) i when genes are closer together on the chromosome they are more likely to be linked as the likeliness of them being seperated during meiosis is low. To collect data to examine these findings scientists insert radioactive dye onto two genes which are believed to be linked and track their position during meiosis and on the chromosome.

ii The human genome project could not be achieved by studying linkage maps primarily because this would mean a human breeding programe be put into place ~~with~~ which is unethical and unpractical. secondly, linkage maps take decades to construct and the human genome program would have been achieved in a shorter period of time by using other processes. Lastly, linkage maps are not always as accurate or reliable as other methods to study the humane genome.

e) Many new technologies have developed from our understanding of gene cloning and gene cascades.

Cloning of a single gene has been used to aid medicine in its search for cures to various illnesses. The cloning of the gene that produces insulin in the human body has enabled diabetics to take human insulin rather than pig or cow insulin, and also to hope that this technology may oneday develop into a cure for diabetes completely.

Gene cloning has also been used to improve agriculture through transgenic species such as B.T cotton and corn as well as the Belgian Blue Cow. Both these are bred using gene cloning, and in the case of the Belgian Blue cow selective breeding also, to increase their value and capacity to achieve a higher profit. The development of

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further technologies in agriculture is being achieved by the growing understanding of gene cloning and gene cascades.
whole animal cloning is the next step after gene cloning and a thorough understanding of gene cascades. Dolly the sheep was the first whole animal clone and the technology used to create her is developing at a faster rate as our understanding of gene cloning and gene cascades deepens.
Through the understanding of gene cascades that we have achieved today, scientists are beginning to experiment with technologies which may help to eradicate birth defects caused by a malfunctioning or mutated HOX genes. Scientists have manipulated gene cascades to the point where they are able to create a fly that had no wings but arms in the

Start here.

position where wings should be.
This experimentation and deepening understanding is a hint at the future technologies which may develop through our understanding of gene cloning and gene cascades.

Many new technologies are developing as a result of our understanding of gene cloning and gene cascades and as these understanding deepens, the technologies available will increase.