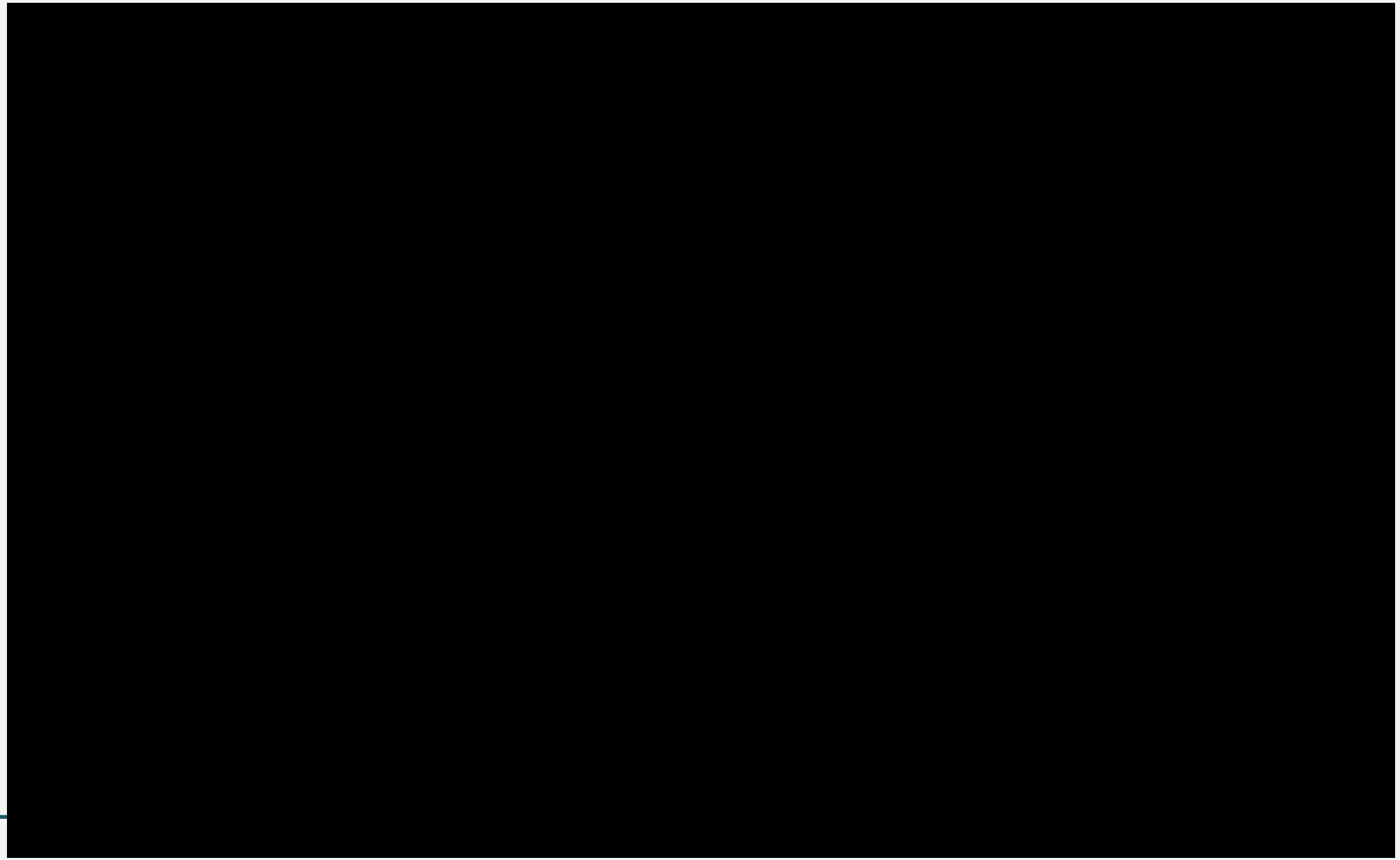
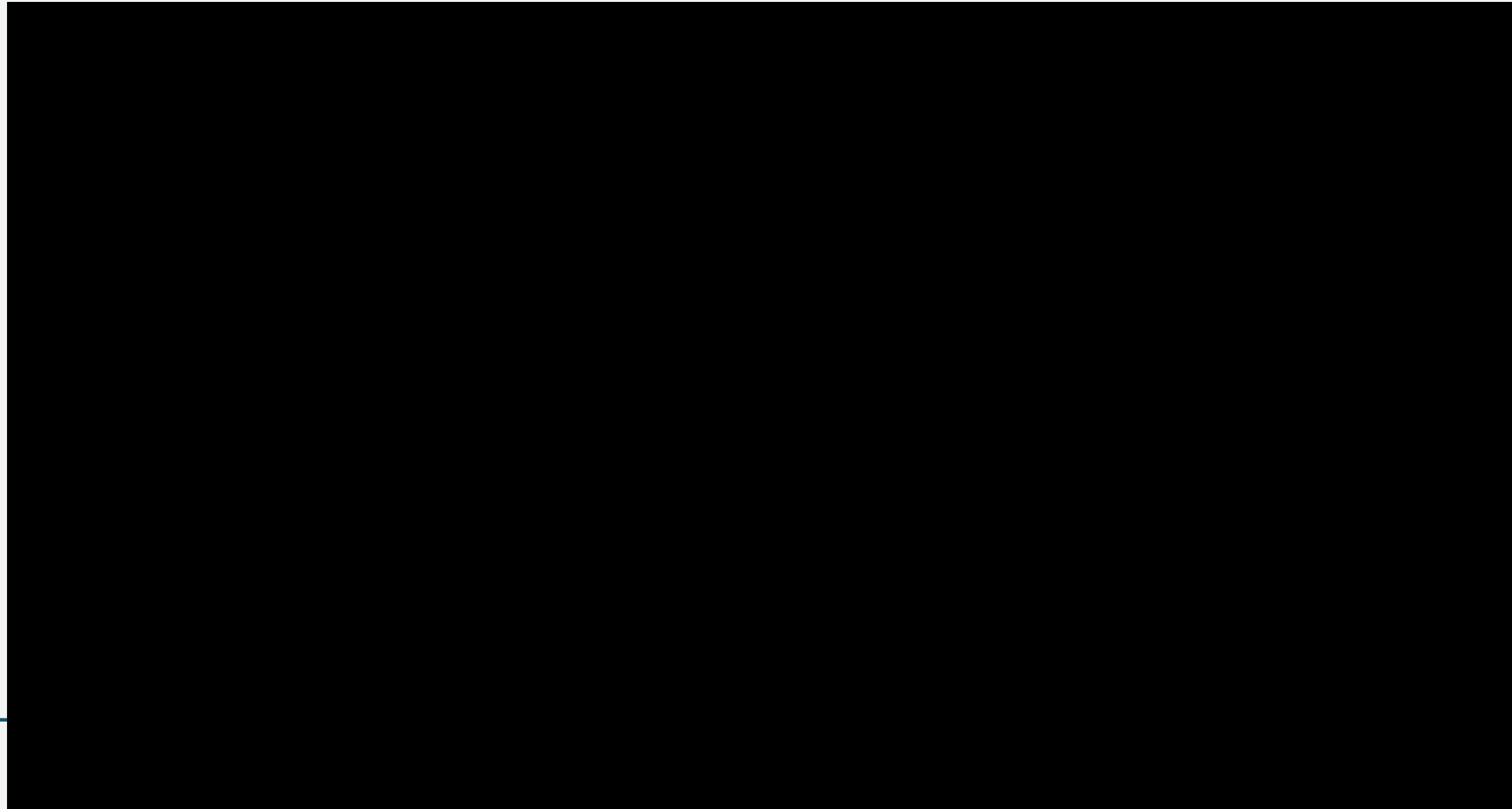
GENETICS & HEREDITY

4A Mr. Erick Santizo

Introduction:



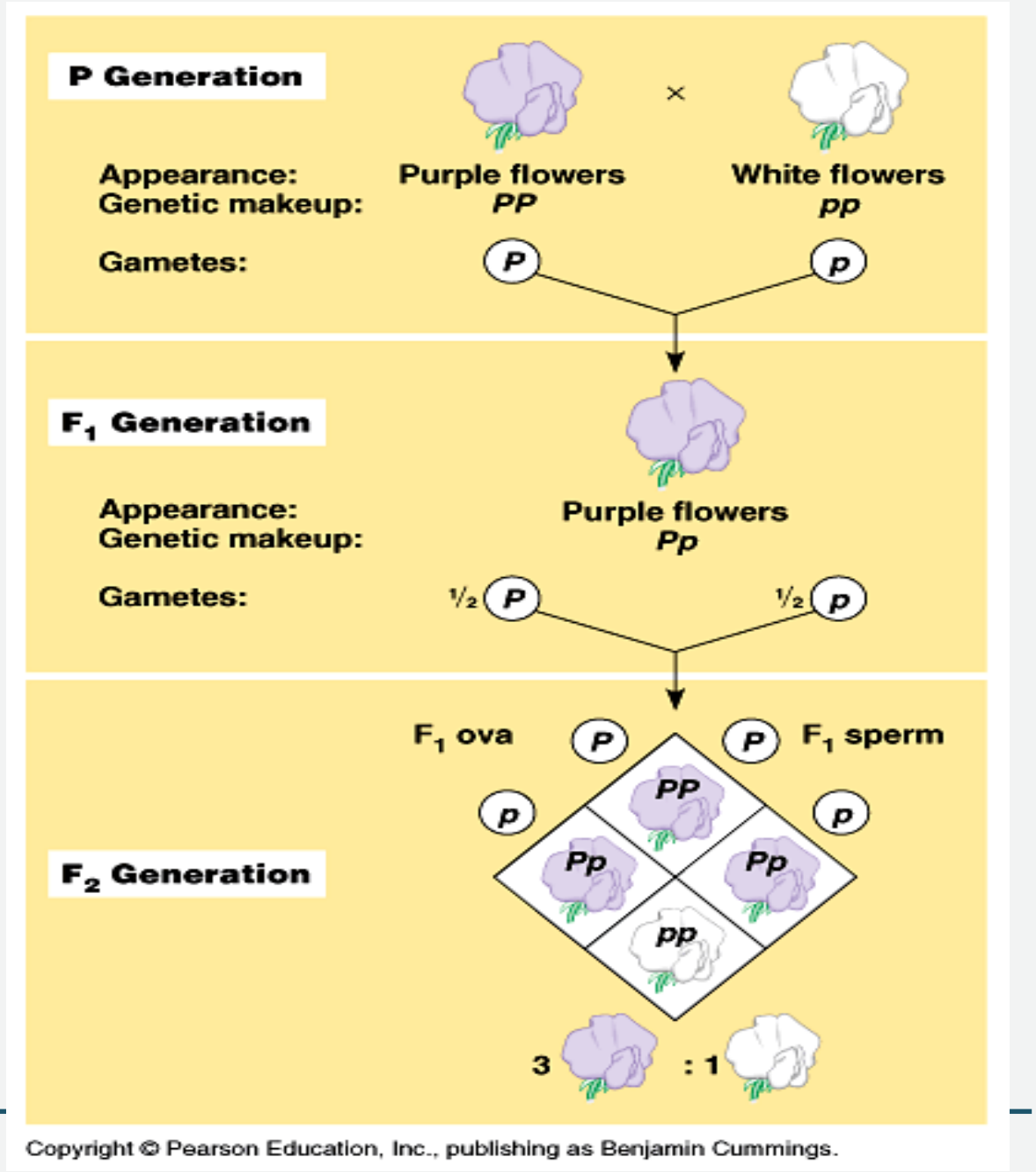
Explore: Gregor Mendel ground breaking research.



Explain

1. ALL THE PLANTS OF THE F1 GENERATION WERE ALWAYS JUST ONE TYPE.

2. THERE WERE ALWAYS 3:1 RATIO OF TYPES IN THE F2 GENERATION. THREE QUARTERS WERE TALL, ONE QUARTER WERE DWARF..



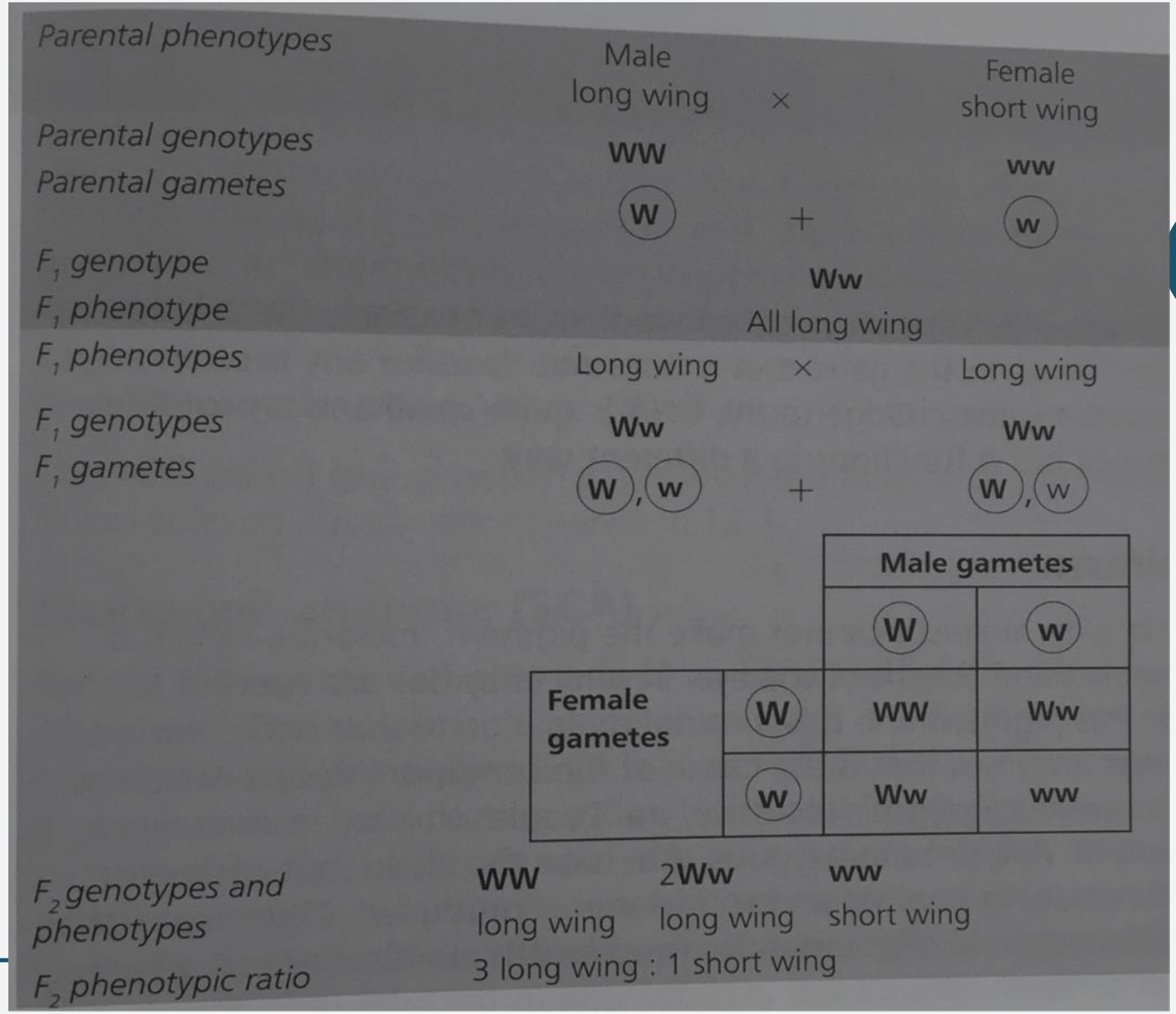
Genetic diagram :Monohybrid inheritance cross

WORK OUT: GENETIC CROSS OF FRUIT FLIES
A MALE WITH LONG WINGS IS CROSSED WITH A FEMALE WITH SHORT WINGS AND THEN MALES AND FEMALES OF THE NEXT GENERATION ARE CROSSED.

WHAT ARE THE GENOTYPES?
WHAT IS THE PHENOTYPE?

Easter time ☺

ANSWER



Parental phenotypes	Male long wing	×	Female short wing
Parental genotypes	**WW**		**ww**
Parental gametes	(**W**)	+	(**w**)
F_1 genotype	**Ww**		
F_1 phenotype	All long wing		
F_1 phenotypes	Long wing	×	Long wing
F_1 genotypes	**Ww**		**Ww**
F_1 gametes	(**W**), (**w**)	+	(**W**), (w)

		Male gametes	
		(**W**)	(**w**)
Female gametes	(**W**)	**WW**	**Ww**
	(**w**)	**Ww**	**ww**

F_2 genotypes and phenotypes	**WW** long wing	2**Ww** long wing	**ww** short wing
F_2 phenotypic ratio	3 long wing : 1 short wing		

Try this:

1. Fruit flies with grey bodies are crossed with fruit flies with ebony bodies. All the offspring had grey bodies, when these offspring were crossed among themselves, ¼ of the flies in the next generation had ebony bodies and the rest were grey. Using the symbols G for the allele for grey body and g for the allele for ebony body, draw a genetic diagram to explain this result.

2. A fruit fly with a grey body was crossed with a fruit fly with a black body; 50% of the offspring had grey bodies and 50% had black bodies. Show how you get these results.

2nd question: called a test cross.

Need to write down possible genotypes:

- In a test cross the factor under investigation is the unknown genotype of an organism showing the dominant feature. A Tall pea plant could have the genotype TT or Tt. You must control every other possible variable including the genotype of the plant you breed it with.
- The only genotype you can be certain of is the genotype of plants showing the recessive feature (dwarf plants). They must have the genotype 'tt'.

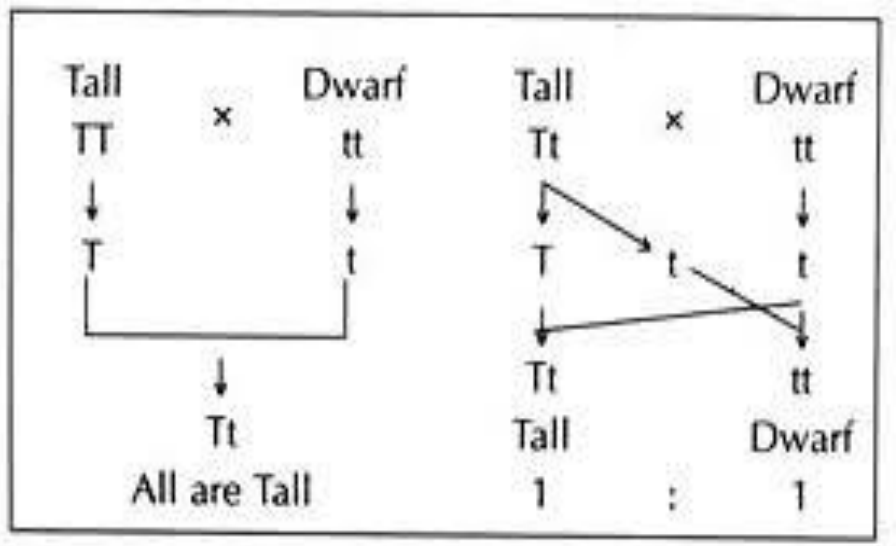
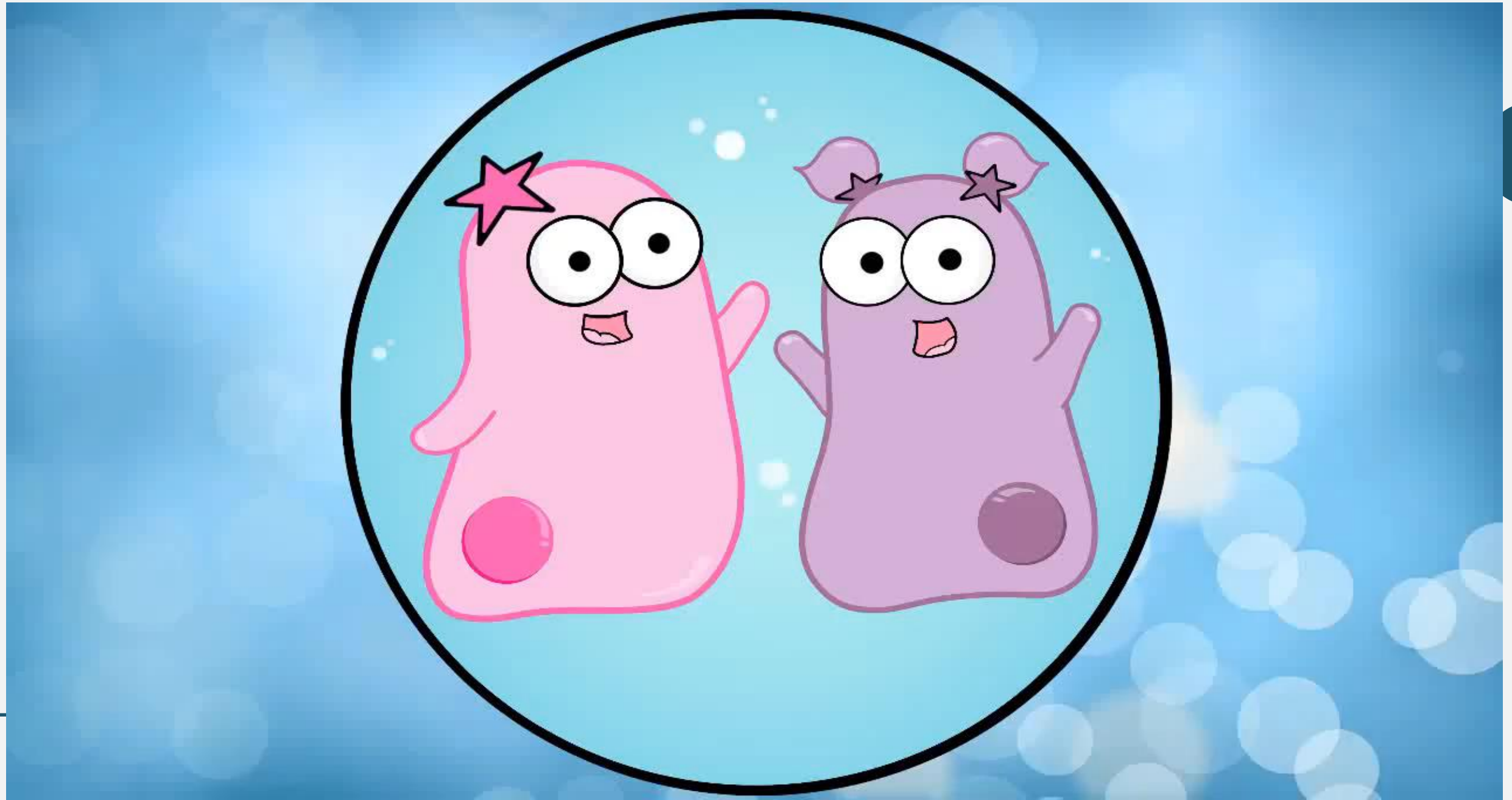


Fig. 6.7: Test cross to confirm the genotype of tall plant.

TRY QUESTIONS 15 MINUTES

Elaboration



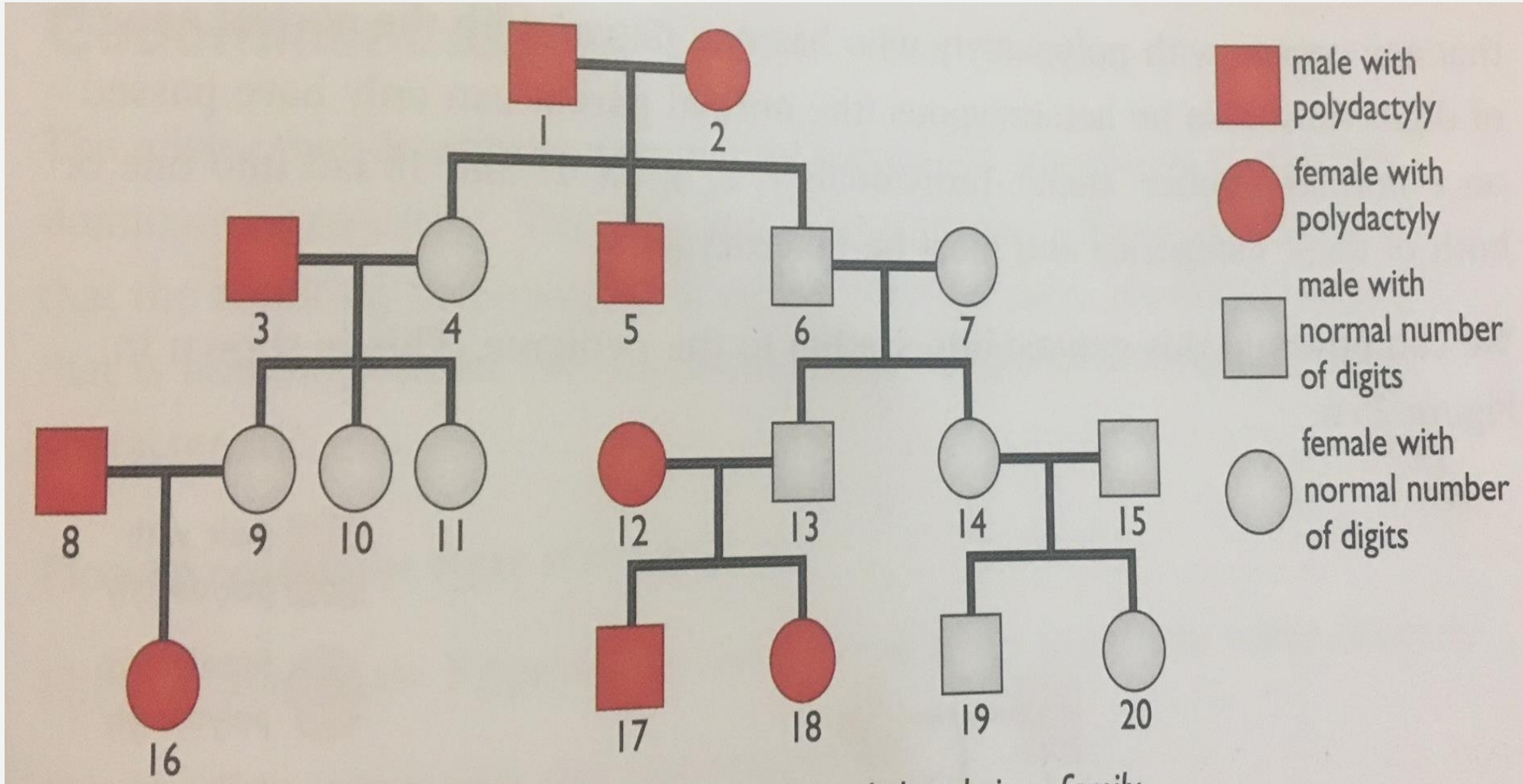
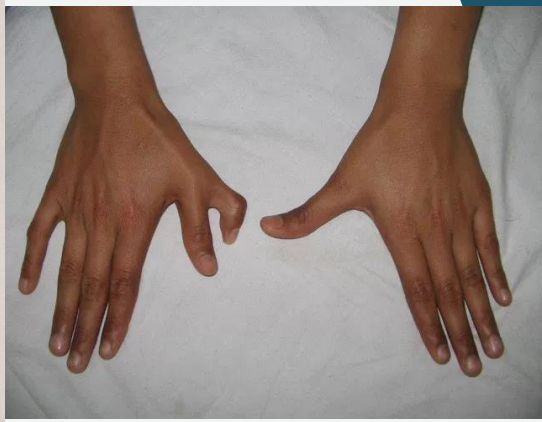
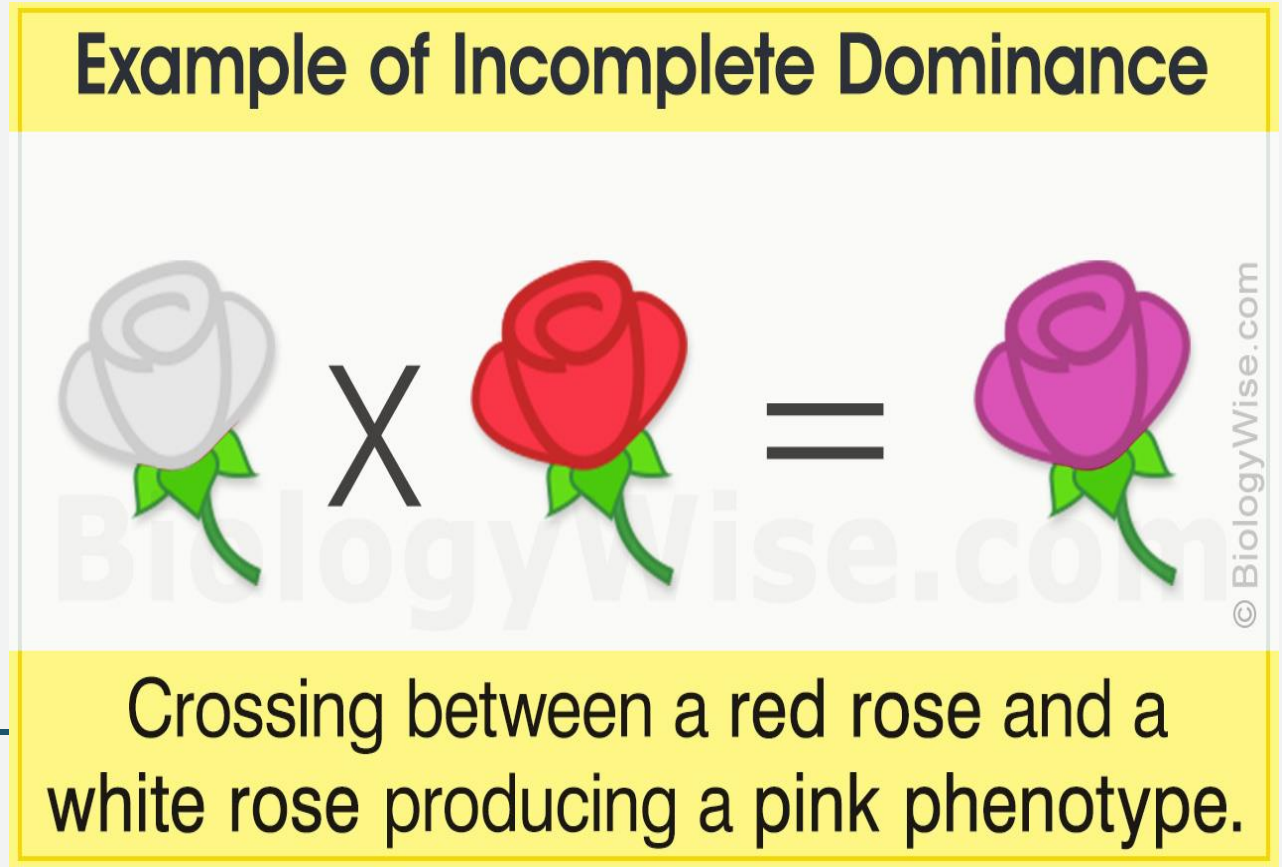


Figure 25.5 *A pedigree showing the inheritance of polydactyly in a family.*

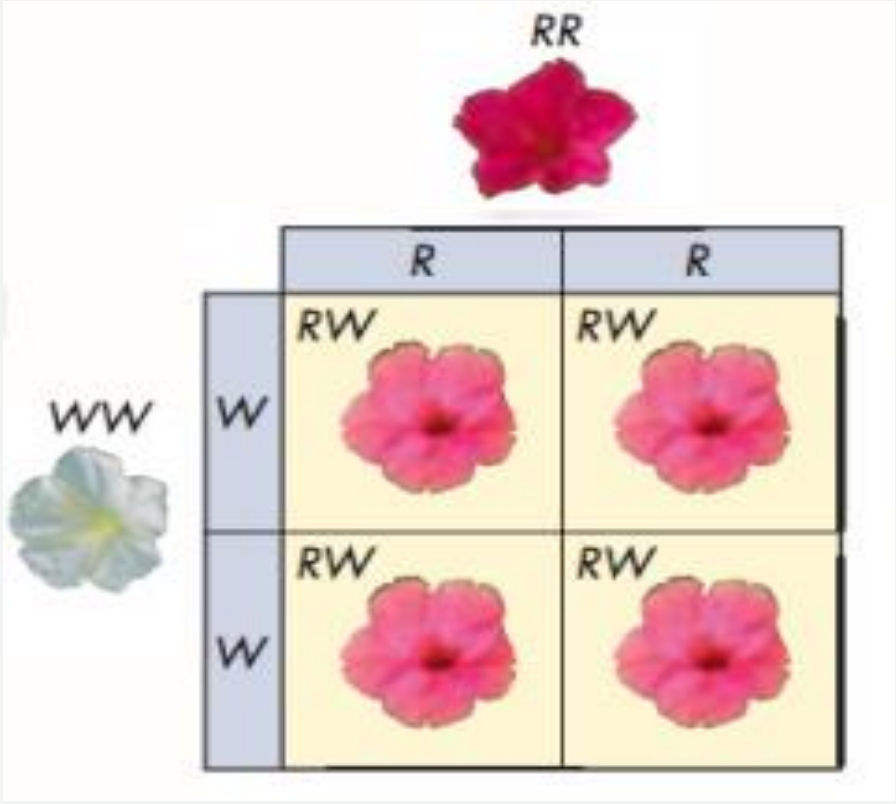


Incomplete dominant alleles



- Alleles are not always completely dominant or recessive
- Results heterozygous have a new phenotype.
- A blend of two phenotypes.

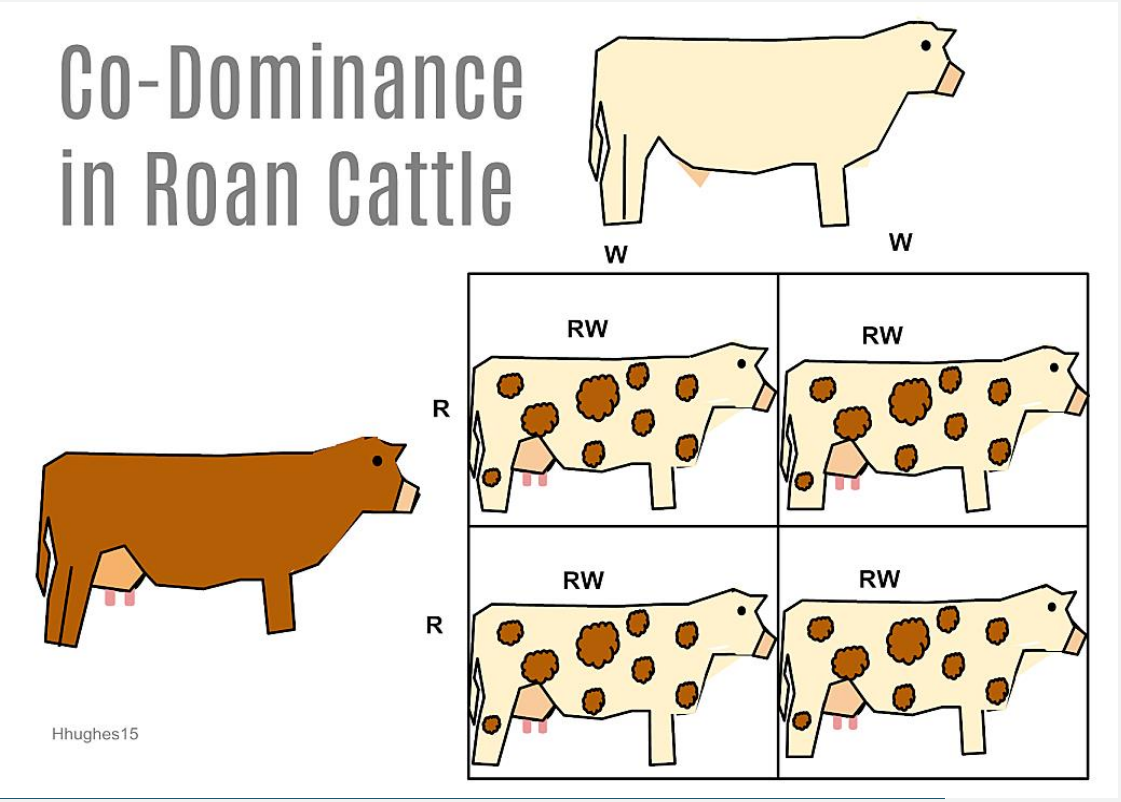
plants



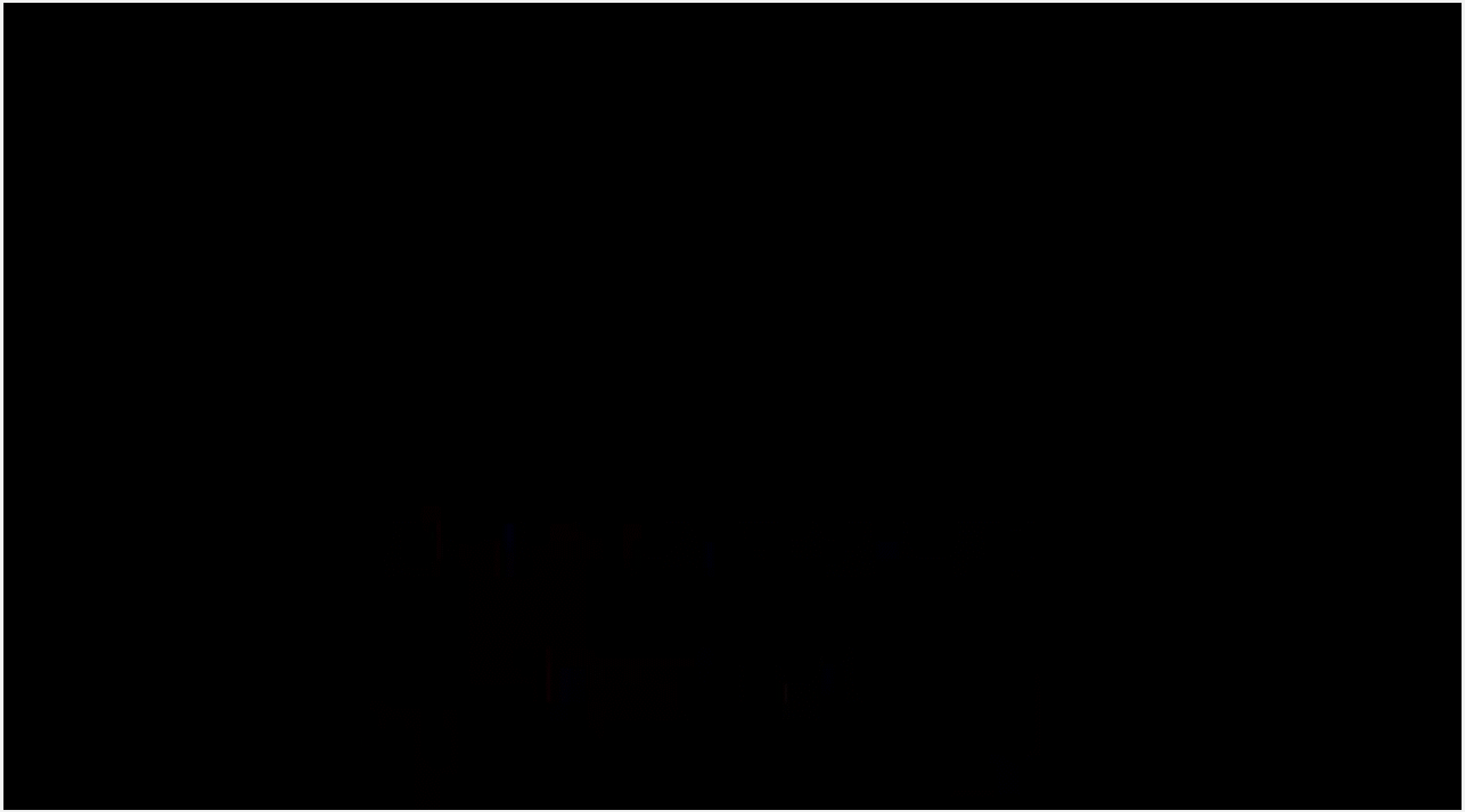
- RR – Red flowers
- rr – white flowers
- Rr – heterozygous, form new phenotype (pink)

Codominance

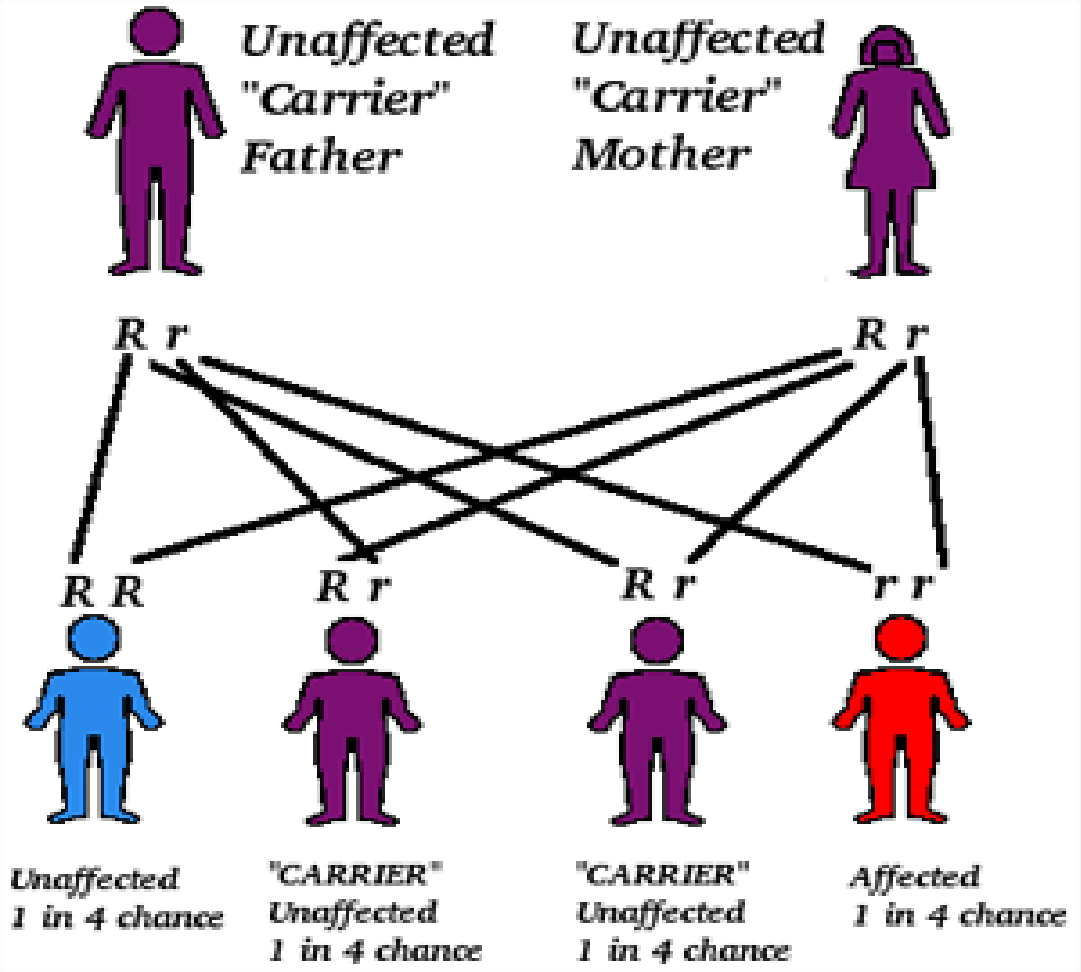
- Both phenotypes coexist together, that is the reason some cows look black and white.



Blood type	Genotype	
A	I^A, I^O	AO
	I^A, I^A	AA
B	I^B, I^O	BO
	I^B, I^B	BB
AB	I^A, I^B	AB
O	$I^O I^O$	OO



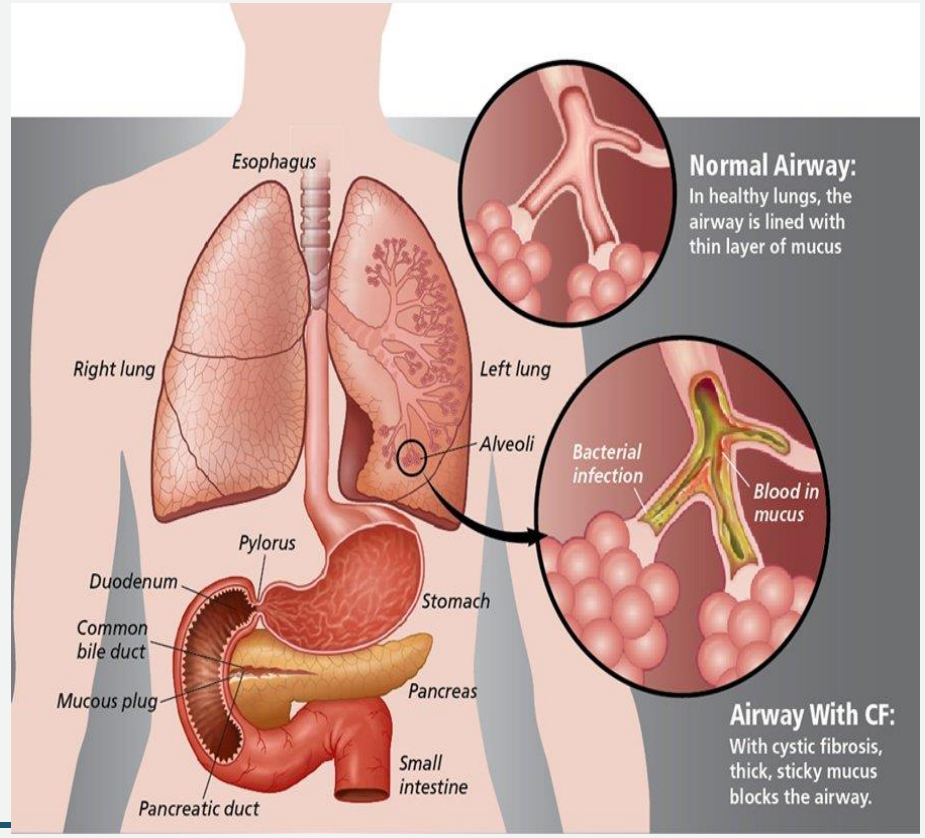
Autosomal / inherited disorders



- A genetic disease: is determined by a recessive allele.
- It makes heterozygous for the condition appear outwardly normal. (they are often 'carrier')
- Examples: cystic fibrosis and sickle –cell anemia.

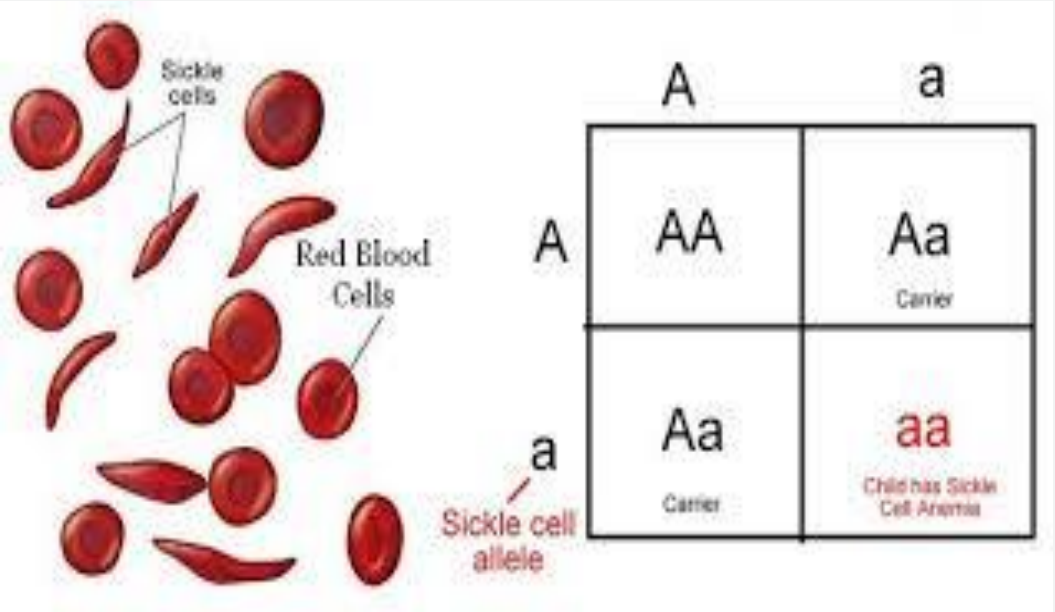
Cystic fibrosis

	C	c
C	CC	Cc
c	Cc	cc



- Condition determined by a recessive allele that controls the production of mucus by cells in the glands throughout the body.
- Effects on pancreatic duct by blocking it, so pancreatic enzymes cannot reach the small intestine. Affects digestions of carbohydrates , lipids and proteins.
- Cannot be easily removed out of the lungs by the cilia, affects gas exchange.
- Often die young.
- Gene therapy helps to cure.

Sickle cell anaemia



- Also determined by a recessive gene. An allele which codes for production of haemoglobin.
- Causes redblood cells to have a sickle shape.
- Effects: tends to form blood clots that block capillaries. A stroke can result or organs loose oxygen. (sick cell crisis)
- Easily burst, fragile,
- Benefits: Can’t contract Malaria.

Albinism

	A	a
A	AA	Aa
a	Aa	aa

- Not a genetic disease, but a condition where the pigment in the skin, hair and irises of the eyes fails to develop..
- Determined by a recessive gene.
- ‘a’ recessive pigmentation
- ‘A’ dominant normal pigmentation
- Aa is heterozygous and carriers of gene.
- Two normally pigmented people could produce an albino child.

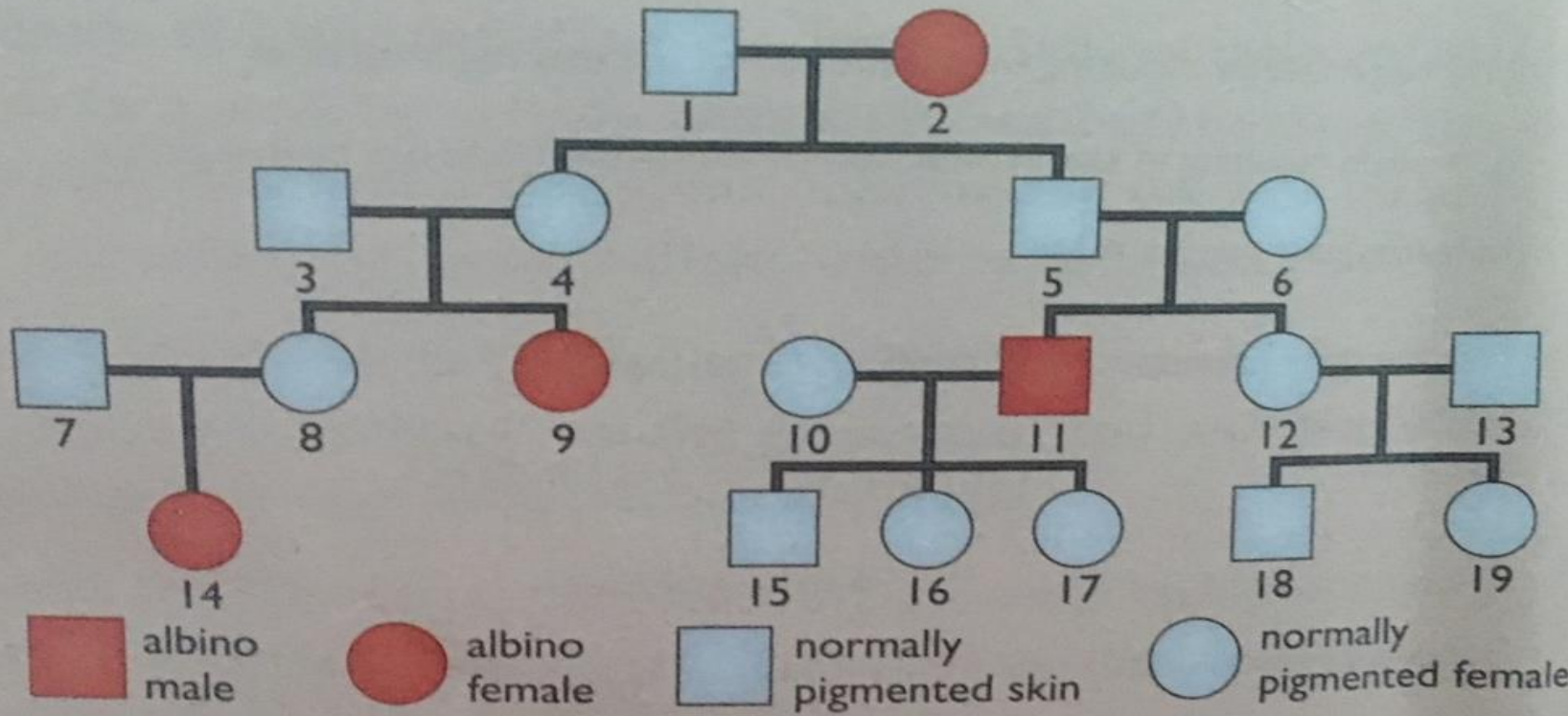
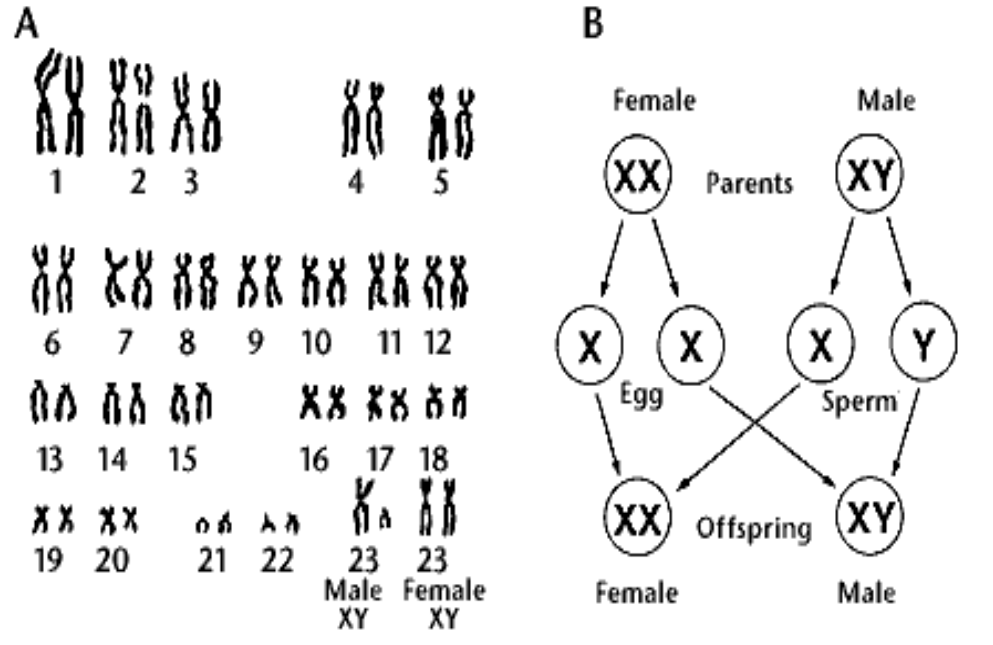


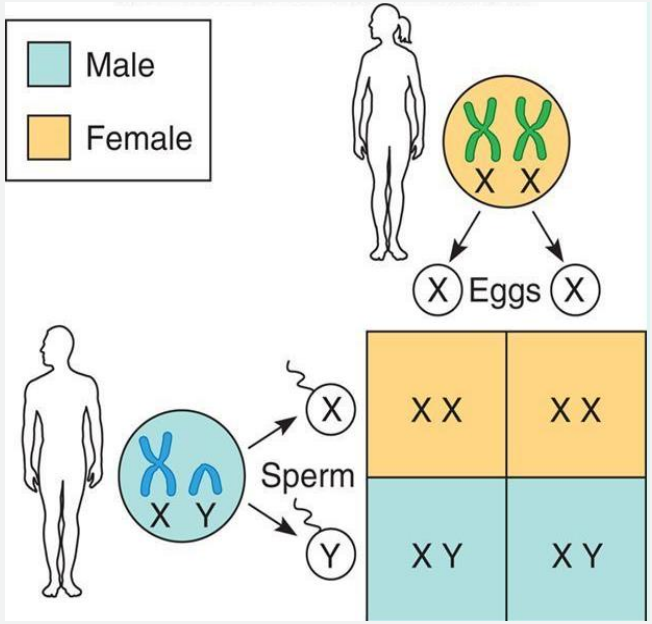
Figure 25.16 *Pedigree of albinism.*

13. What is albinism?
14. What are the genotypes of individuals 10 and 11? Give evidence from the pedigree to justify your answers.
15. If individuals 10 and 11 were to have another child, what is the chance that the child would be (a) female, (b) an albino and (c) both? Give evidence from the pedigree to justify your answers.

Sex determination



- There are two X chromosomes in all cells of females (except the egg cells)
- One X and one Y chromosome in all cells of males (except the sperm cells)
- Ratio is 1:1 50% chance of male or female



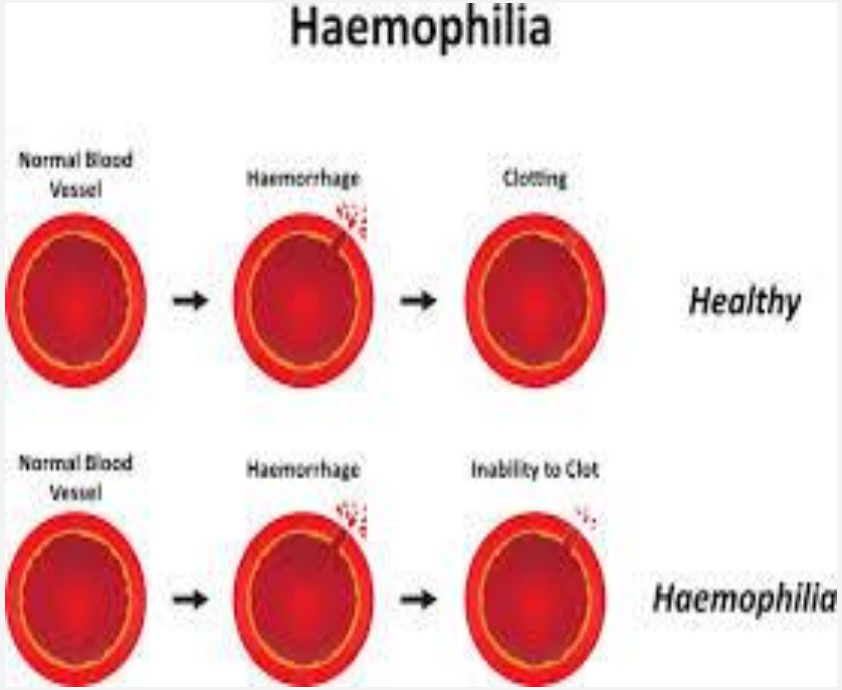
Sex-linked genes

$X^B X^B$ – Homozygous dominant normal
$X^B X^b$ – Heterozygous carrier
$X^b X^b$ – Homozygous recessive; sex linked condition is present

$X^B Y$ Normal
$X^b Y$- sex linked present.

- Females have two copies of each gene "X" chromosome.
- Male have only one chromosome. So they have only one copy of specific genes.
- Genes that are found on the X chromosomes and not on the Y chromosomes are called SEX LINKED Genes.
- B= normal allele
- b= sex-linked condition

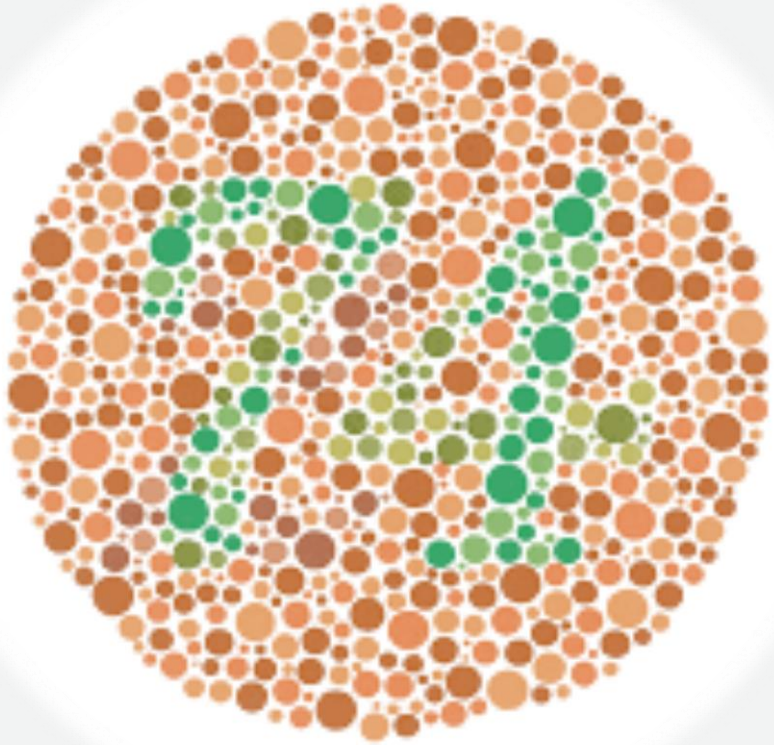
Haemophilia



- Inherited disease of the blood where if the person gets grazed, bruised or cut, they bleed for a longer period than normal as the blood cannot clot properly.
- H- allele: Normal allele
- h- sex linked condition.

	X^H	X^h
X^H	X^HX^H	X^HX^h
Y	X^HY	X^hY

Colour blindness



- Red- green colour blindness is another inherited sex-linked condition.
- Men stand a higher chance of suffering from it than women.
- Normal allele cause a protein to be produced that forms one of the pigments in the cone cells in the retina of the eye.
- The recessive allele does not cause this protein to be formed.
- Normal allele cannot distinguish red from green.