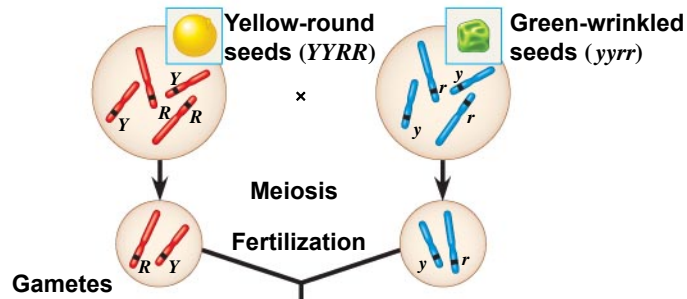


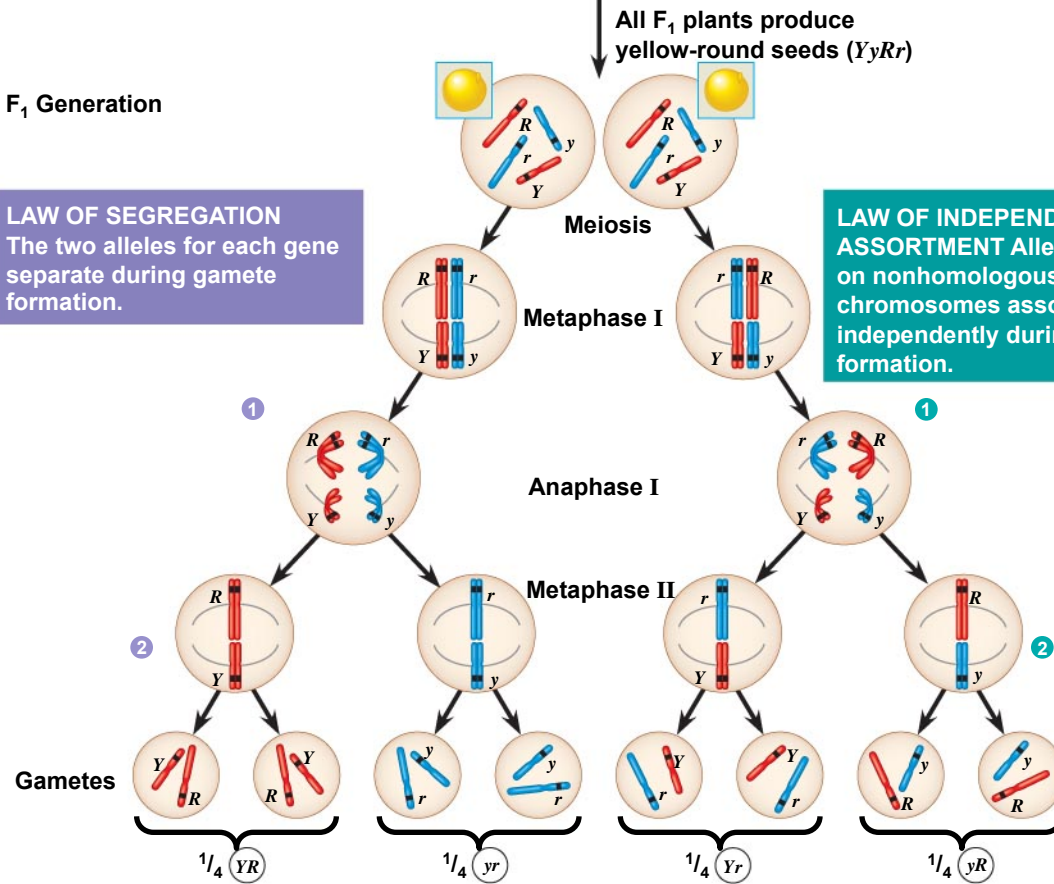
P Generation



F₁ Generation

LAW OF SEGREGATION
The two alleles for each gene separate during gamete formation.

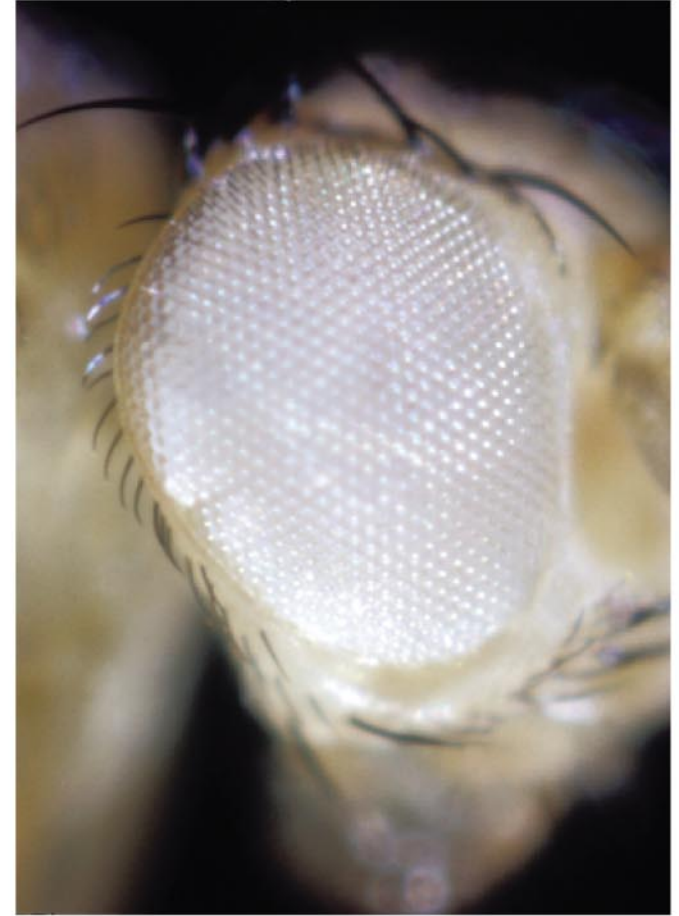
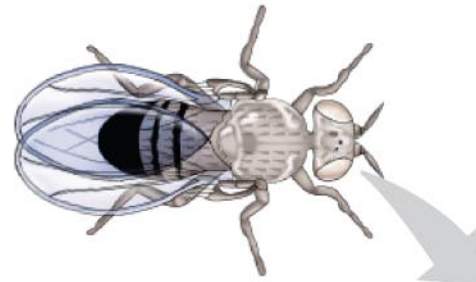
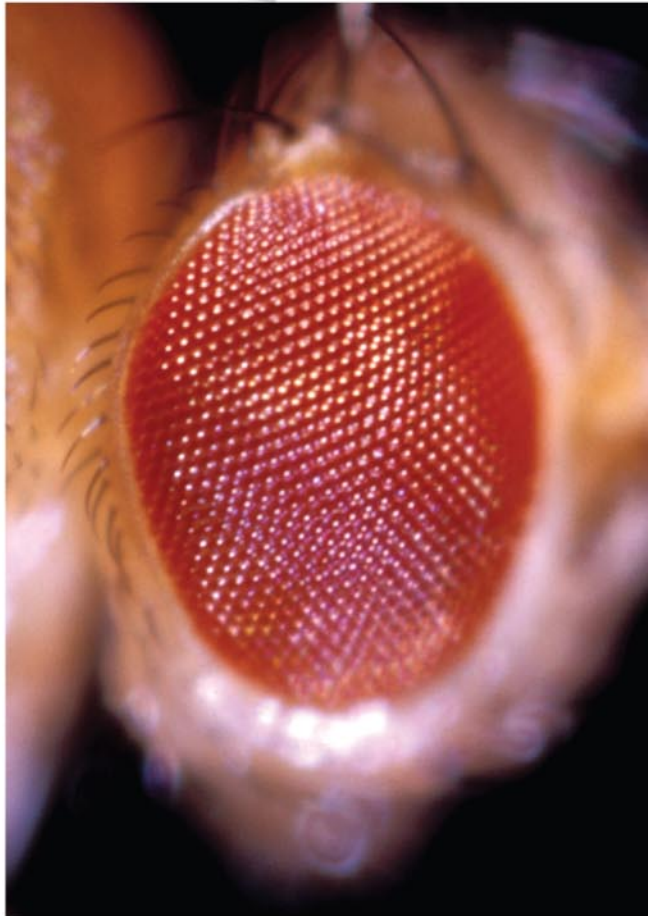
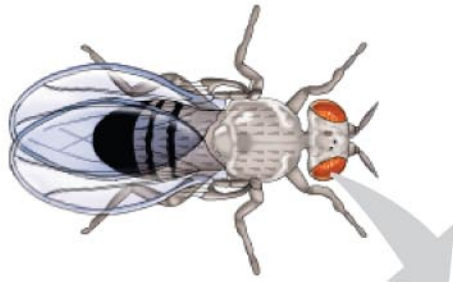
LAW OF INDEPENDENT ASSORTMENT Alleles of genes on nonhomologous chromosomes assort independently during gamete formation.



F₂ Generation

An F₁ × F₁ cross-fertilization

9 : 3 : 3 : 1



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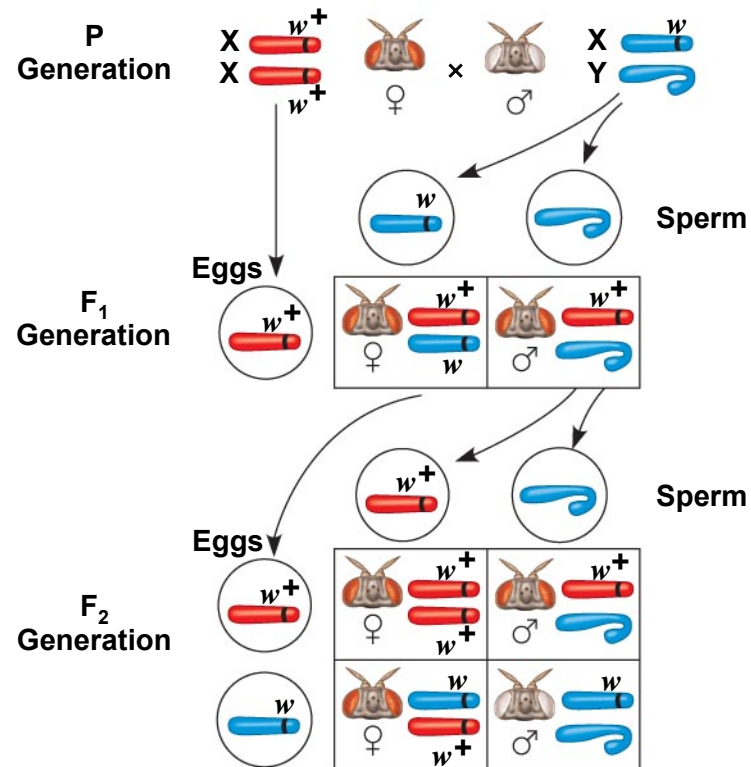
EXPERIMENT

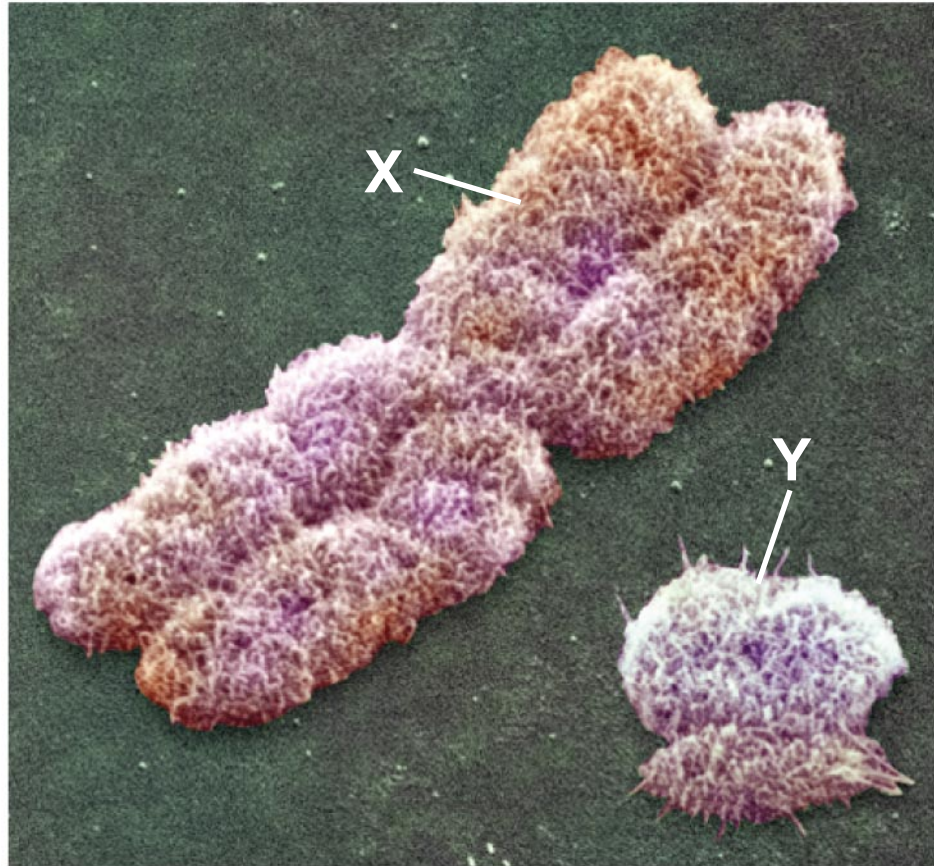


RESULTS

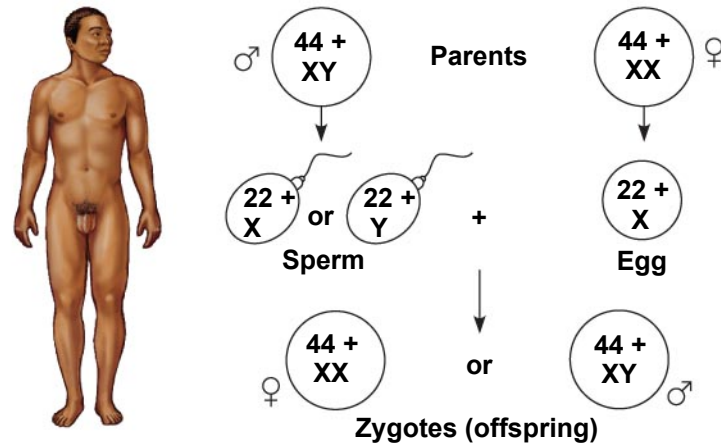


CONCLUSION

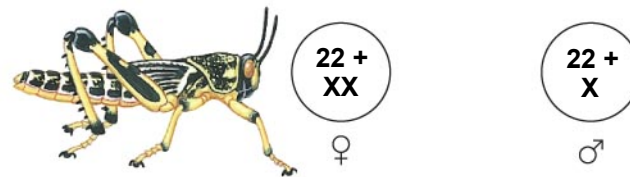




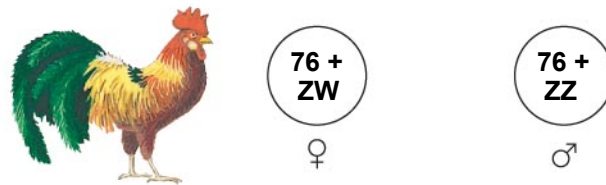
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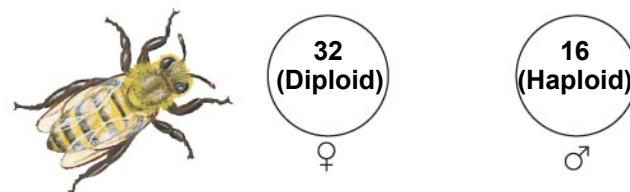
(a) The X-Y system



(b) The X-0 system

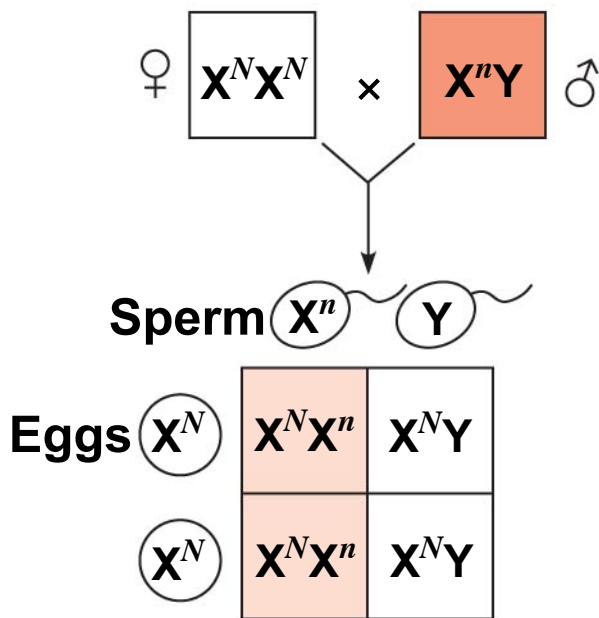


(c) The Z-W system

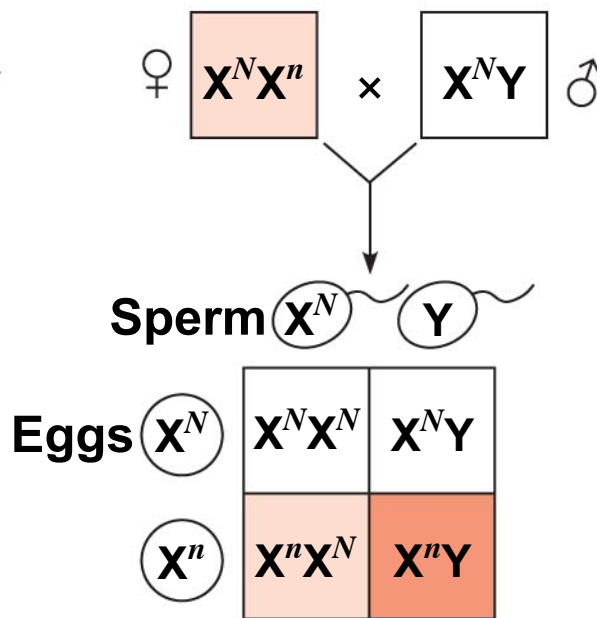


(d) The haplo-diploid system

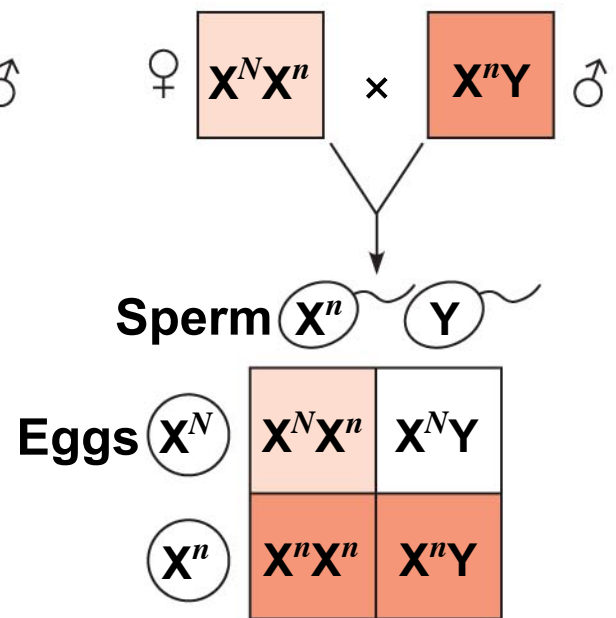
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(a)

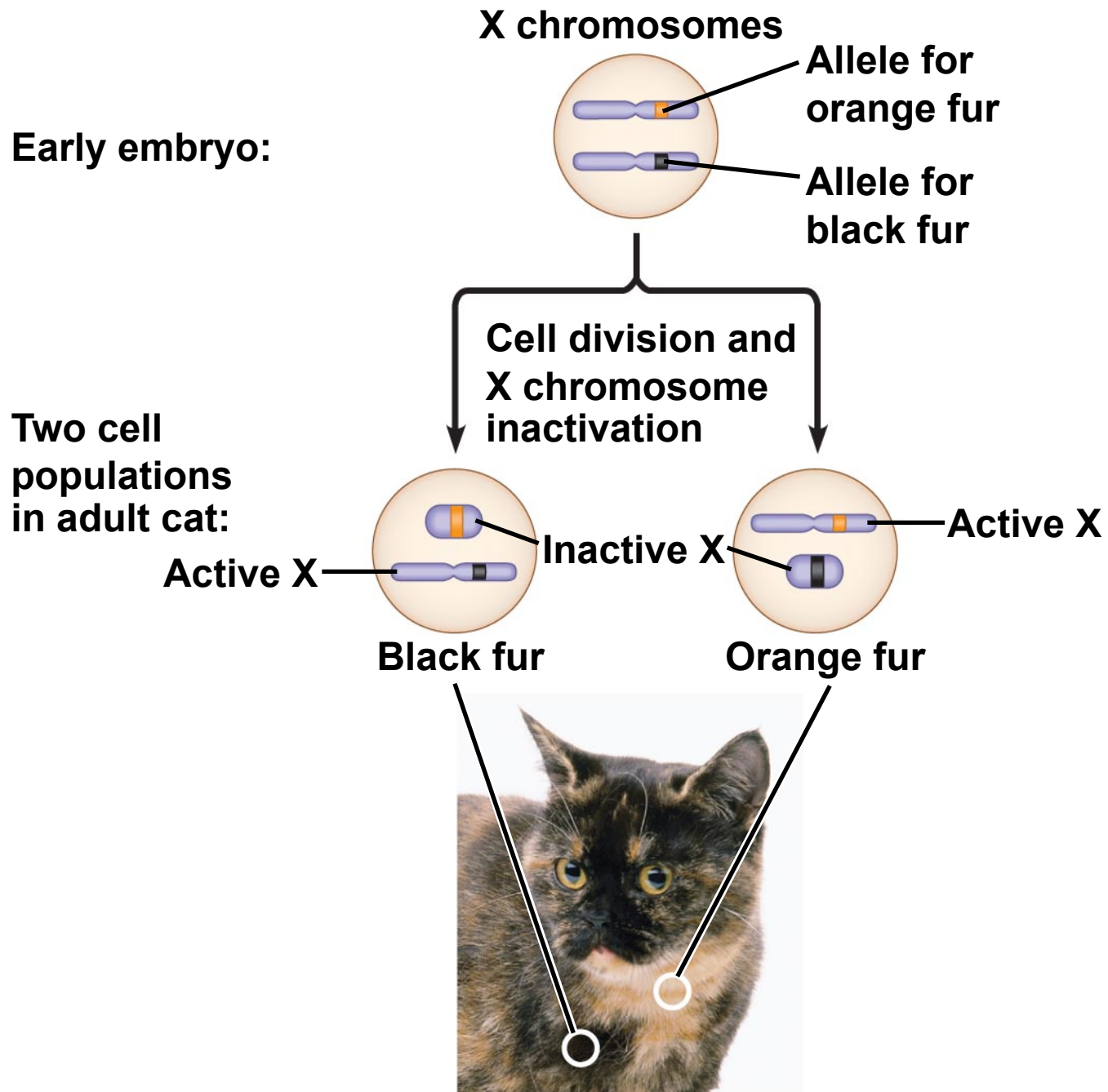


(b)



(c)

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EXPERIMENT

P Generation (homozygous)

Wild type
(gray body,
normal wings)

$b^+ b^+ vg^+ vg^+$



x



Double mutant
(black body,
vestigial wings)

$b b vg vg$

F₁ dihybrid
(wild type)

$b^+ b vg^+ vg$



TESTCROSS
x



Double mutant

$b b vg vg$

Testcross
offspring

Eggs

$b^+ vg^+$

$b vg$

$b^+ vg$

$b vg^+$

$b vg$
Sperm

Wild type (gray-normal)	Black- vestigial	Gray- vestigial	Black- normal
$b^+ b vg^+ vg$	$b b vg vg$	$b^+ b vg vg$	$b b vg^+ vg$

PREDICTED RATIOS

If genes are located on different chromosomes:

1 : 1 : 1 : 1

If genes are located on the same chromosome *and*
parental alleles are always inherited together:

1 : 1 : 0 : 0

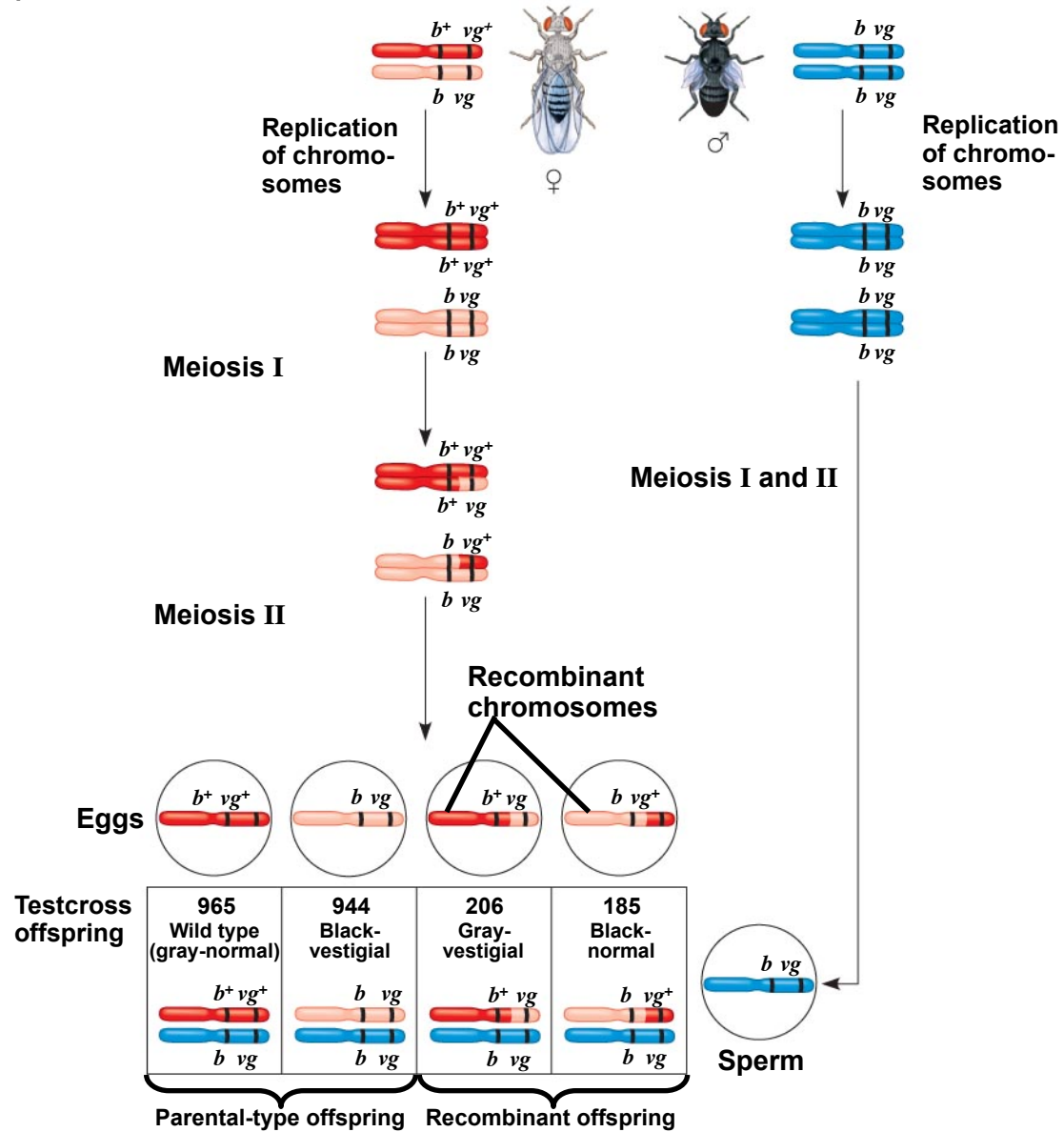
965 : 944 : 206 : 185

RESULTS

**Testcross
parents**

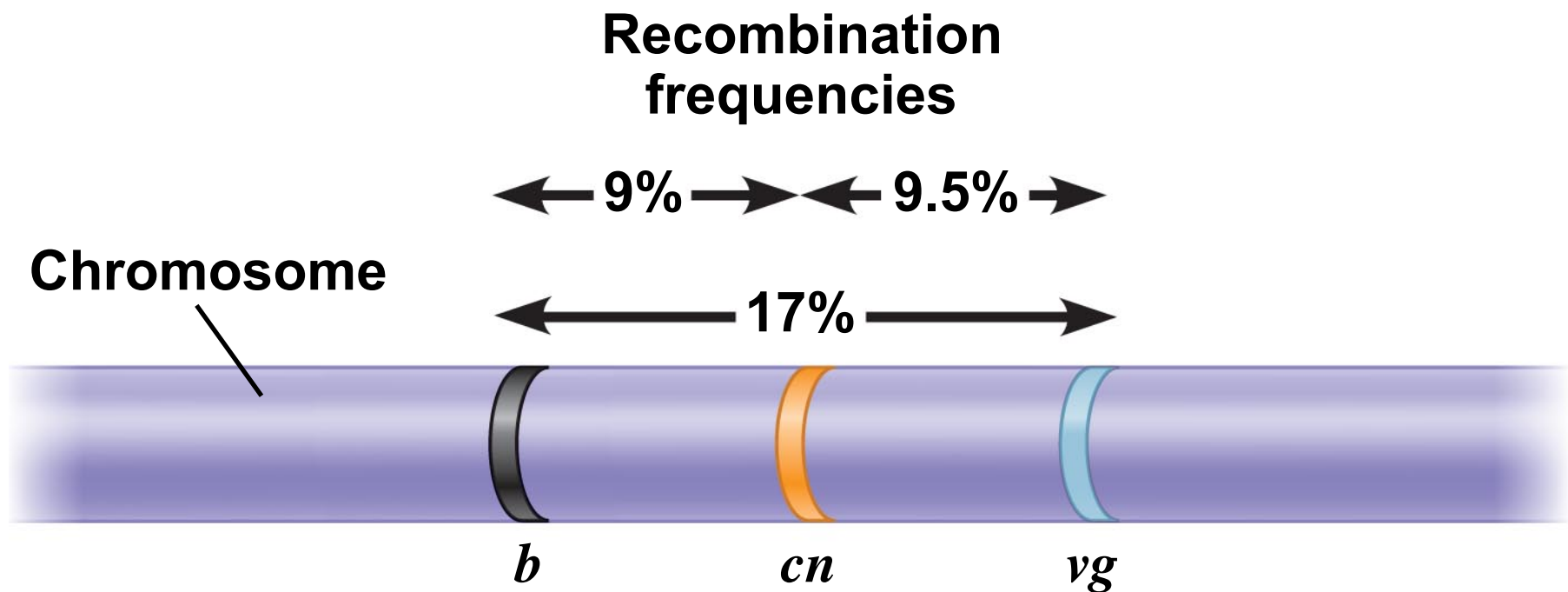
**Gray body, normal wings
(F₁ dihybrid)**

**Black body, vestigial wings
(double mutant)**



$$\text{Recombination frequency} = \frac{391 \text{ recombinants}}{2,300 \text{ total offspring}} \times 100 = 17\%$$

RESULTS



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Mutant phenotypes

Short
aristae

Black
body

Cinnabar
eyes

Vestigial
wings

Brown
eyes



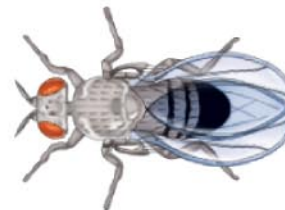
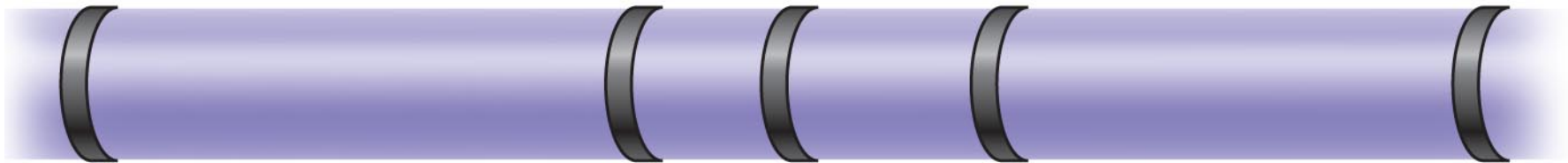
0

48.5

57.5

67.0

104.5



Long aristae
(appendages
on head)

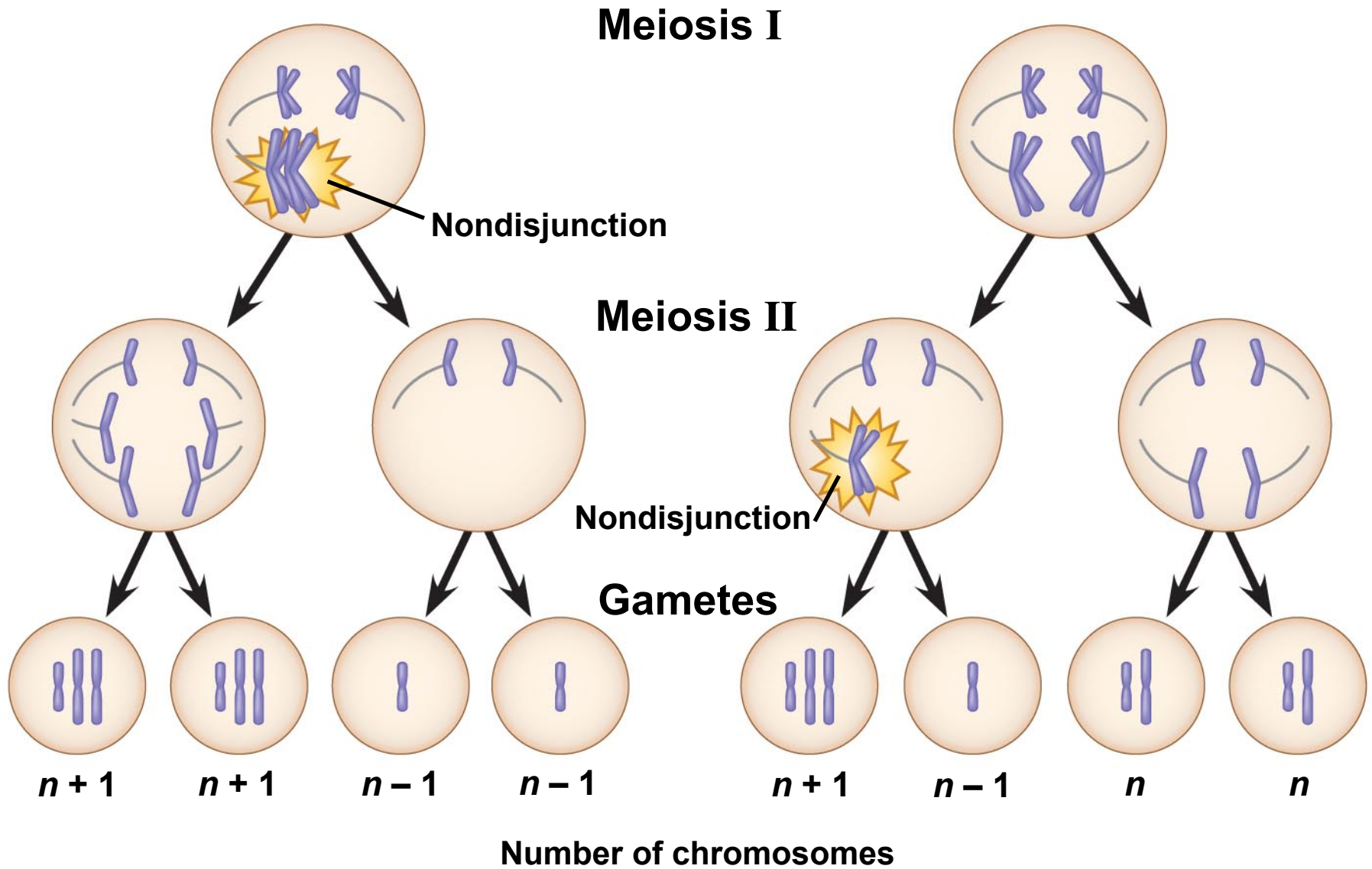
Gray
body

Red
eyes

Normal
wings

Red
eyes

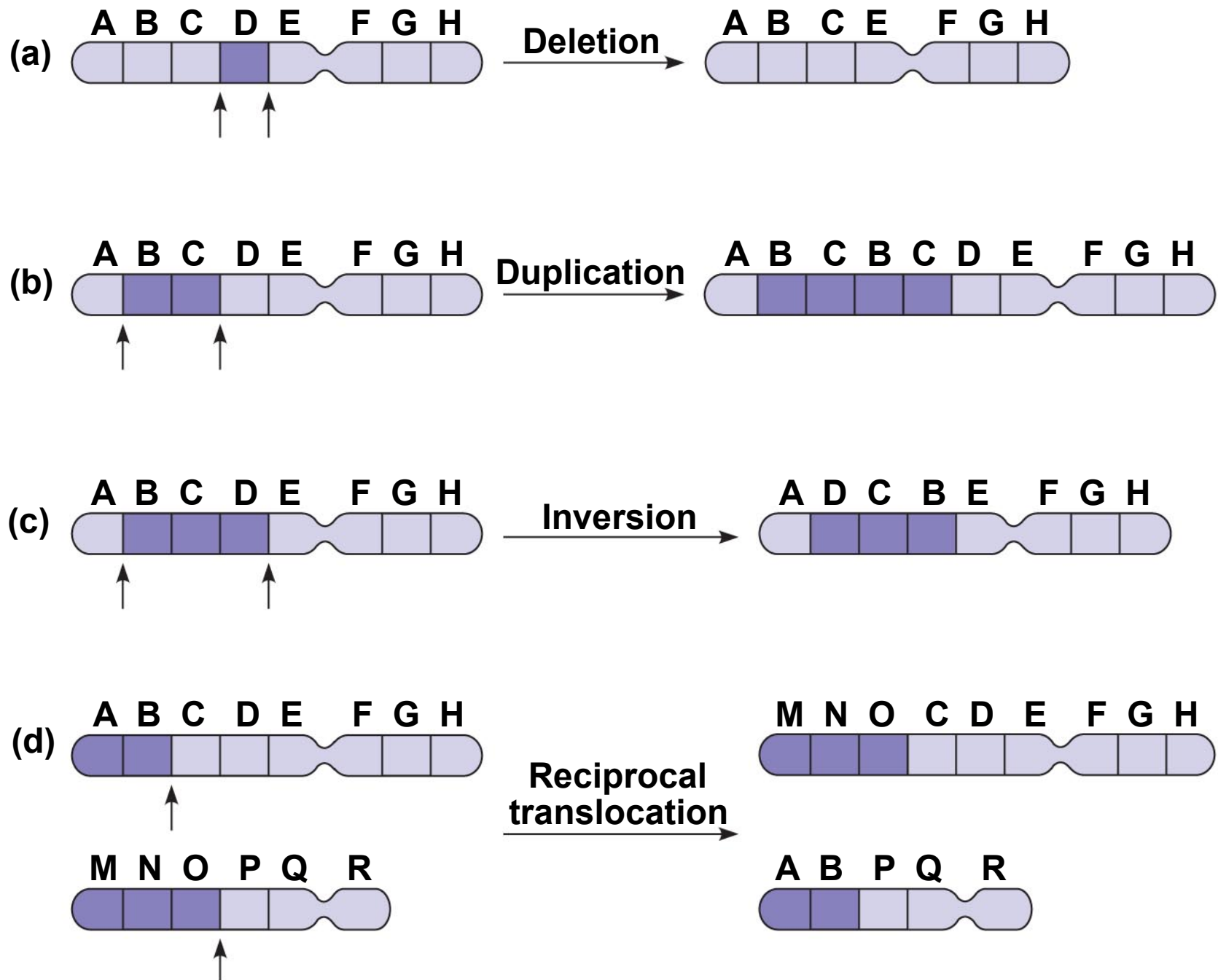
Wild-type phenotypes

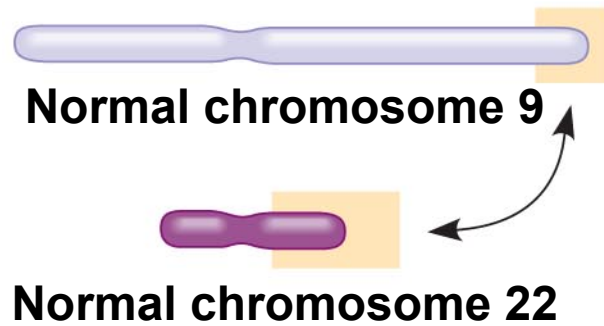


(a) Nondisjunction of homologous chromosomes in meiosis I

(b) Nondisjunction of sister chromatids in meiosis II

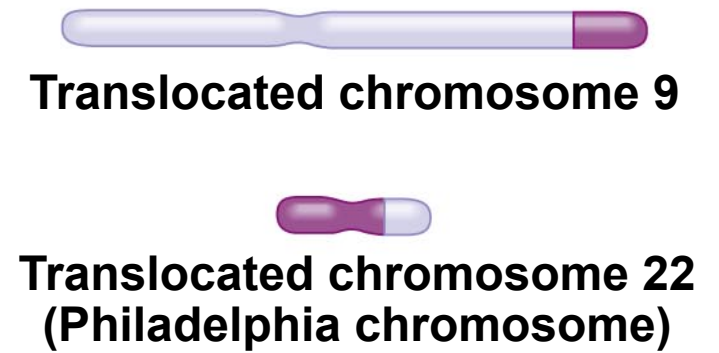
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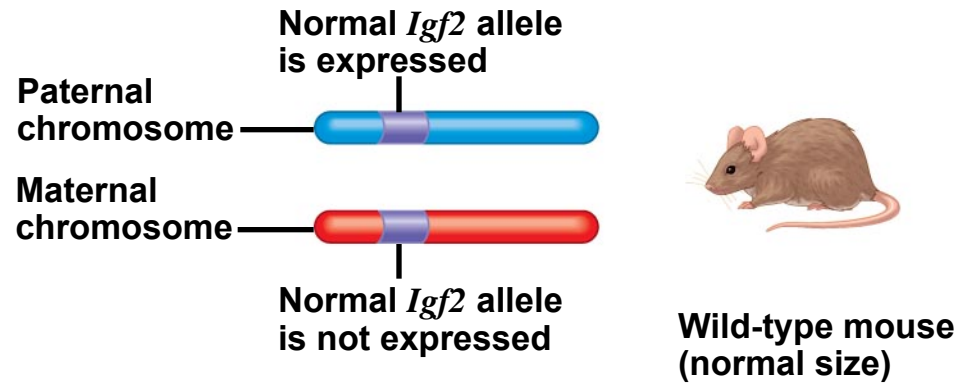


**Reciprocal
translocation**

A horizontal arrow points from the normal chromosomes on the left to the translocated chromosomes on the right.



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(a) Homozygote

Mutant *Igf2* allele inherited from mother



Normal size mouse (wild type)

Mutant *Igf2* allele inherited from father



Dwarf mouse (mutant)

Normal *Igf2* allele is expressed



Mutant *Igf2* allele is not expressed

Mutant *Igf2* allele is expressed



Normal *Igf2* allele is not expressed

(b) Heterozygotes