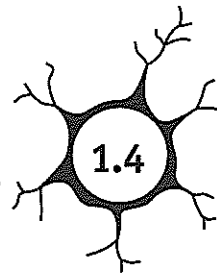
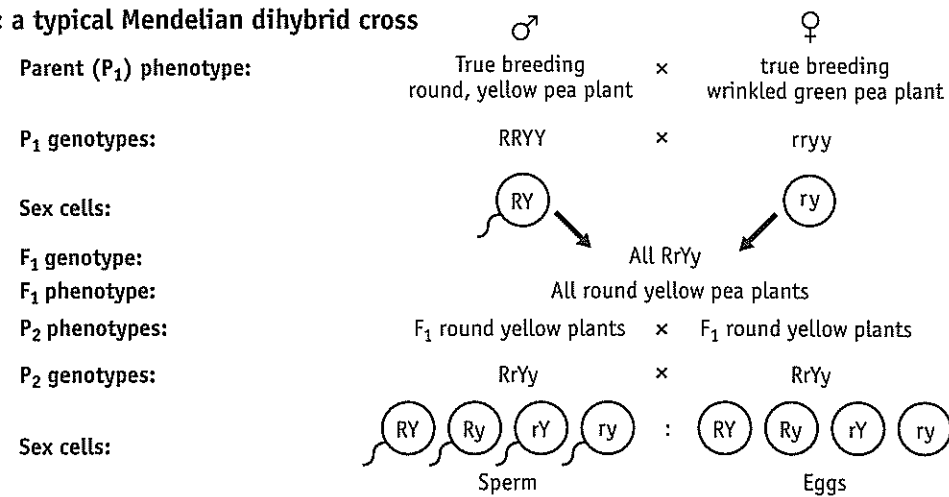


# 1 GENETICS

## Dihybrid cross genetics



### Worked example: a typical Mendelian dihybrid cross



F<sub>2</sub> genotypes take into account all possible combinations of sperm and eggs. You may find a Punnett Square useful here (below right).

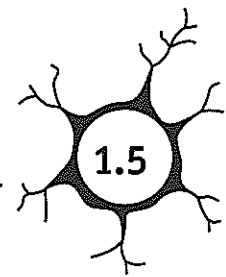
		Eggs			
		RY	Ry	rY	ry
Sperm	RY	RRYY	RRYy	RrYY	RrYy
	Ry	RRYy	RRyy	RrYy	Rryy
	rY	RrYY	RrYy	rrYY	rrYy
	ry	RrYy	Rryy	rrYy	rryy

**F<sub>2</sub> phenotypes and phenotypic ratios**  
 Round yellow : round green : wrinkled yellow : wrinkled green  
 9 : 3 : 3 : 1

- In Mendel's pea plants, the gene for tallness (T) is dominant over its allele for dwarf plants (t). The gene for round peas (R) is dominant over its allele for wrinkled peas (r). Calculate the phenotypes and phenotypic ratios of the following crosses:
  - TtRr × TtRr
  - TtRr × ttRr
  - ttRr × TtRr
  - TTrr × ttRR
- In guinea pigs rough coat is dominant over smooth coat and black coat is dominant over white coat. (Assume that the genes are independent.) If a homozygous rough black animal is crossed with a smooth white one, what will be the appearance and phenotypic ratios of:
  - the F<sub>1</sub>;
  - the F<sub>2</sub>;
  - the offspring of a cross of the F<sub>1</sub> back with the rough, black parent;
  - the offspring of the F<sub>1</sub> crossed with the smooth white parent.
- In the fruit fly *Drosophila melanogaster*, long wing (L) is dominant over vestigial wing (l), and hairless body (H) is dominant over hairy body (h). Work out the phenotypic ratios of the following matings:
  - a hairy female, heterozygous for vestigial wing × vestigial wing male which is heterozygous for the hairy character
  - vestigial winged, hairy male × homozygous normal female
  - LlHh × LlHh
  - llHh × Llhh
- For each cross in question 3, work out the percentage chance of producing long-winged, hairless fruit fly.
- In watermelons, the genes for green colour (G) and short shape (S) are dominant over the alleles for striped colour (g) and long shape (s). Work out the appearance of the offspring if a plant with long, striped fruit is crossed with a double heterozygote plant for these characteristics.

# 1 GENETICS

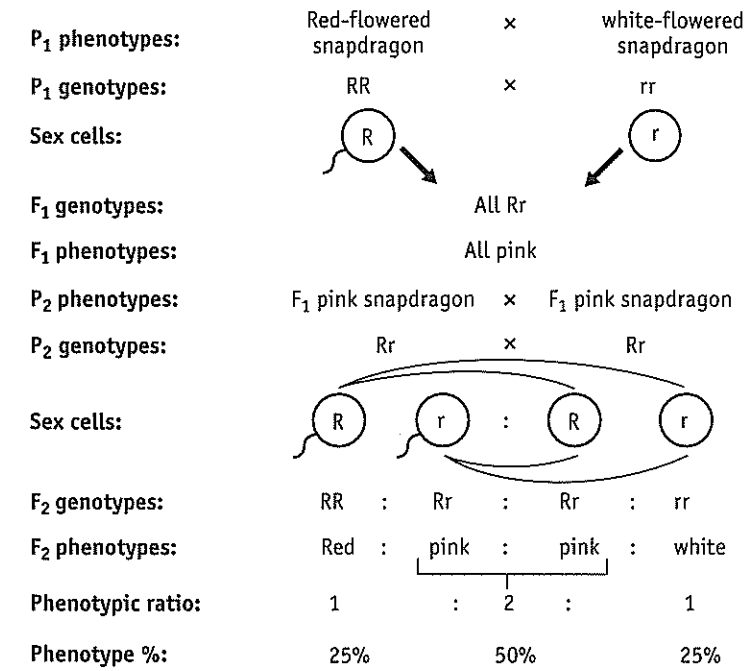
## Incomplete dominance



Incomplete dominance is a type of heredity where Mendel's Law of Dominance does not operate. In this type of heredity, the hybrid (or heterozygous individual) is different from both pure-bred parents.

### Worked example

In snapdragons, the gene for red flower colour (R) is incompletely dominant over the gene for white flower colour (r). Heterozygous individuals (Rr) produce pink flowers.



- In snapdragons where red flower colour (R) is incompletely dominant over white flower colour (r), what will be the flower colour of the offspring and genotypic ratios for each of the following crosses?
  - pink-flowered plant × red-flowered plant
  - white × pink
  - red × white
  - pink × pink
- How would you produce snapdragon seeds that would all yield pink-flowered plants when sown?
- In Andalusian fowls, black plumage (B) is incompletely dominant over white plumage (b). The heterozygous fowls are blue. Calculate the percentage chance of producing blue Andalusian fowls in each of the following crosses:
  - black cock × white hen
  - blue hen × black cock
  - blue hen × blue cock
  - blue cock × white hen
- After several matings of tan-coloured birds, a breeder noted the following average offspring numbers: 23 white, 26 brown, 53 tan birds. Work out a cross that would produce the following results:
  - 50% of all offspring are brown
  - 100% of all offspring are tan
  - 50% of all offspring are tan
  - 25% of all offspring are white