

Solutions

Each answer shows the steps, then the **result**.

2.1

- a gene is a **length of DNA that codes for one protein**

2.2

- a human female has sex chromosomes **XX**

2.3

- **genotype**: the alleles an organism carries
- **phenotype**: the observable characteristic those alleles produce

2.4

- **homozygous recessive**: both alleles are the recessive form
- e.g. **tt**, which would give a short plant

2.5

- probability $\frac{1}{2}$ or 50%
- a sperm carries X or Y in equal numbers, so either is equally likely

3.1 B

- an allele is an **alternative form of a gene**
- A is a chromosome; C is the product; D is a cell structure

3.2

(a)

- the egg always carries **X**; the sperm carries **X or Y**
- so XX or XY **depends on the sperm**

(b)

- ratio **1 : 1**

3.3

- the base sequence sets the **order of amino acids**
- that gives the protein its **shape**, which decides its job

3.4

(a)

- homozygous black: **BB**
- brown: **bb**

(b)

- parents $BB \times bb$
- gametes all B and all b
- all offspring **Bb**
- all **black**, because B is dominant

(c)

- parents $Bb \times Bb$
- gametes B and b from each
- offspring BB, Bb, Bb, bb
- phenotype ratio **3 black : 1 brown**

(d)

- the black parent must be **Bb** (heterozygous)
- a brown offspring is **bb** and got a b from each parent
- so the black parent carries a **b** as well as B

(e)

- every egg carries **X**, so the egg cannot vary
- a sperm carries **X or Y**, which decides XX or XY