Solutions

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

2.1

- A blend of the two (e.g. pink)

2.2

- Type AB – both the I^A and I^B alleles are fully expressed (codominance)

2.3

- Males have only one X chromosome, so a single recessive allele is expressed (no second X to mask it)

3.1 C

- codominance

3.2

(a)

- $RW \times RW$ gives $1\,RR : 2\,RW : 1\,WW$ = 1 red : 2 pink : 1 white

(b)

- The heterozygote (pink) is a distinct phenotype, so there are three phenotypes (1 : 2 : 1) instead of two (3 : 1)

3.3

- The mother carries one color-blind X allele; she can pass that X to her son, and since he has only one X (from her), he will be color-blind

3.4

(a)

- maternal (mitochondrial) inheritance
- the affected daughter passes the condition to both her children, but the affected son passes it to neither of his: only mothers transmit it

(b)

- the trait is coded by mitochondrial DNA, and mitochondria are passed on in the egg's cytoplasm, not by the sperm
- mitochondria are randomly sorted into gametes and daughter cells, not segregated in pairs by meiosis, so there are no Mendelian ratios

3.5

(a)

- the genes are linked (on the same chromosome), so the parental combinations AB and ab are mostly inherited together
- the few Ab and aB offspring are recombinants, produced by crossing over between the genes in meiosis

(b)

- recombination frequency $= \dfrac{93 + 97}{412 + 398 + 93 + 97} = \dfrac{190}{1000} = \mathbf{19}\%$

3.6 B

- haplodiploidy: males from unfertilized eggs have one set of chromosomes; females have two