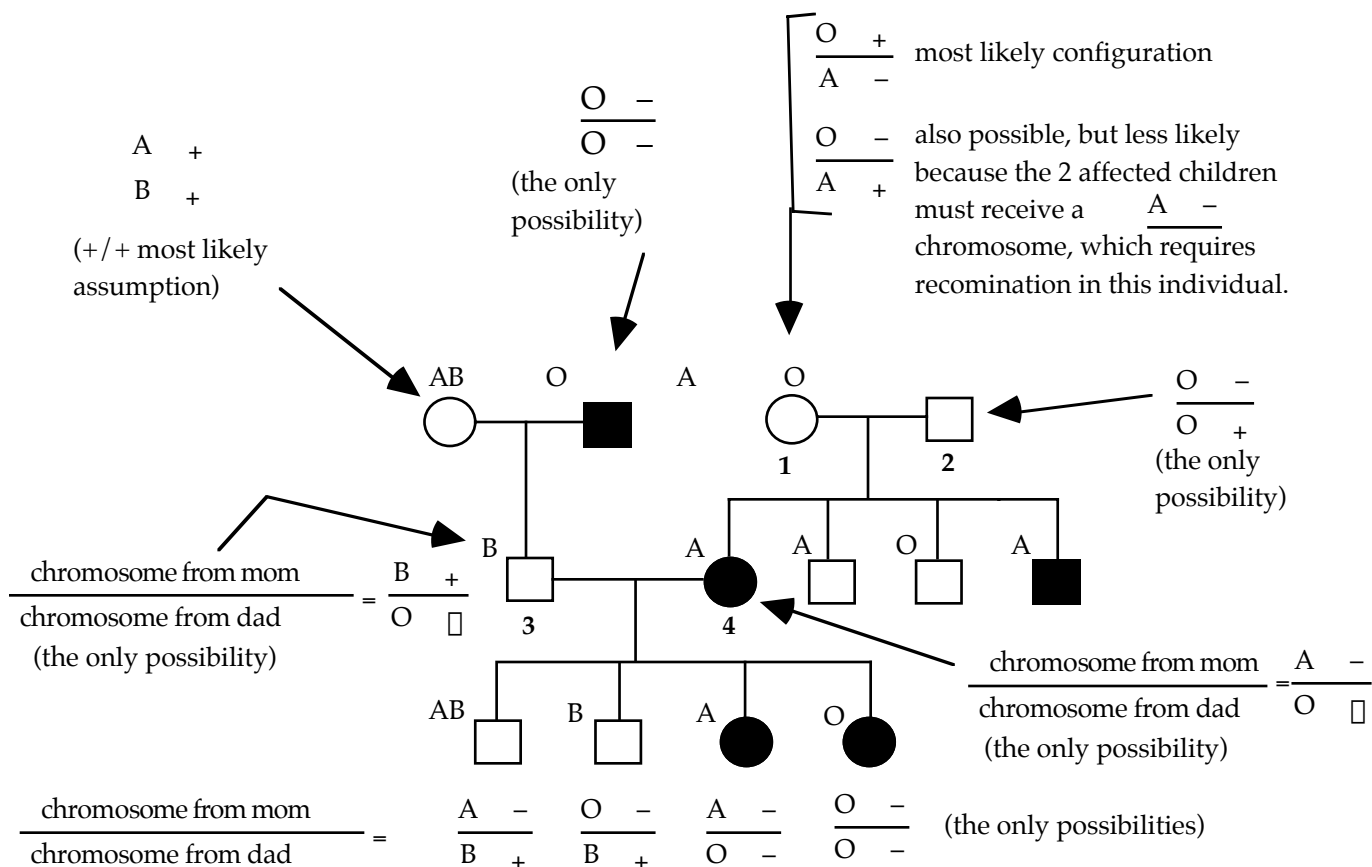


# 7.012 Solutions to Linkage & Pedigrees Problem

## I.

a) & b) One way to solve this problem is to work out the genotypes of the individuals in the pedigree.



c) Individual 3 received an O - chromosome from dad and the B + chromosome from mom.

d) To have type B blood, the child must have gotten an O - chromosome from mom and a B ? chromosome from dad.

The recombination frequency (RF) gives the probability of crossover (genetic exchange) between two genes. In the case of individual (3), he can produce 4 types of gametes:

- B - recombinant
- O + recombinant
- B + parental
- O - parental

In order to be diseased **and** B, recombination must have occurred and since the recombination frequency is 11% (see first paragraph), the chance of being B and diseased is 11%.

## II.

a) What are the genotypes of Phil and Ryan with respect to these two genes. Use the letter E for ear wiggling and the letter R for tongue rolling.

<u>Phil</u>	<u>Ryan</u>
<u>E +</u>	<u>+ +</u>
+ R	+ +

b) How do you account for the fact that Ryan is unable to roll his tongue or wiggle his ears?

*During meiosis in Phil, there was recombination between the chromosome carrying the ability to wiggle gene and the one carrying the ability to roll gene.*

$$\frac{E +}{+ R} \quad \rightarrow \quad \underline{E R} \text{ and } \underline{+ +}$$

*Ryan received the wildtype chromosome from his mother and the recombined completely wildtype chromosome from his father.*