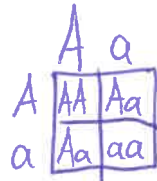


KEY

SCIENCE 10 GENETIC QUESTIONS

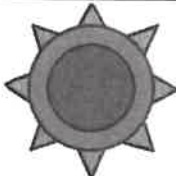
1. Draw a Punnett square to show how two parents with normal skin colour could have an albino baby. Use *a* for the recessive allele that results in very pale skin and hair colour, and *A* for the dominant allele that results in normal skin and hair colour.



2. If the parents shown in your Punnett square have one albino baby, what is the probability that their second baby will also be albino? How do you know?

25% - parents genotype does not change with any number of pregnancies or offspring.

The table below shows the genotypes and phenotypes for the ABO blood system. Use it to answer questions 4 to 8.

Genotype	Phenotype		
$I^A I^A$ or $I^A i$	Type A blood	Has Type A carbohydrate molecules on red blood cells	
$I^B I^B$ or $I^B i$	Type B blood	Has Type B carbohydrate molecules on red blood cells	
$I^A I^B$	Type AB blood	Has Type A and B carbohydrate molecules on red blood cells	
ii	Type O blood	Has neither Type A or B carbohydrate molecules on red blood cells	

3. In a heterozygous $I^A i$ person, which allele is dominant, I^A or i ? Explain your reasoning.

I^A is dominant because the A antigen is observably expressed on the red blood cell. Since it is present in a heterozygous dom/rec. genotype, it must be dominant, as the phenotype is Type A.

4. Codominance refers to inheritance in which two alleles of a gene each have a different observable effect on the phenotype of a heterozygous individual. Thus, in codominance, neither allele is recessive – both alleles are dominant. Which of the genotypes results in a phenotype that provides clear evidence of codominance?

Type AB blood with the genotype $I^A I^B$

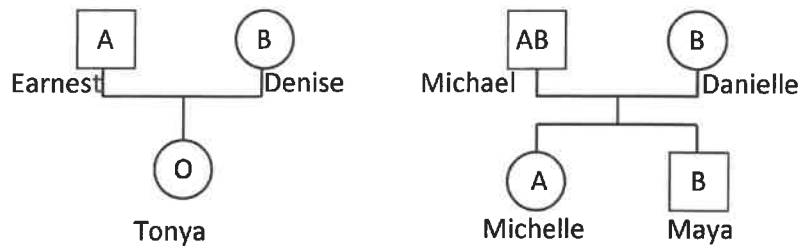
5. The Punnett square below shows the possible genotypes for the children of a type AB father and type O mother. Write in the blood type for each genotype to show the possible blood types for the children of these parents.

		Mother Eggs (Type O)	
		i	i
Father (Type AB) Sperm	I^A A	Type A $I^A i$	Type A $I^A i$
	I^B B	Type B $I^B i$	Type B $I^B i$

6. Now suppose that a mother has blood Type A and genotype $I^A i$ and the father has blood Type B and genotype $I^B i$. Draw a Punnett square to show the possible genotypes for their children. Write in the blood type for each genotype.

		I^A	i
I^B		Type AB $I^A I^B$	Type B $I^B i$
	i	Type A $I^A i$	Type O $i i$

7. The following family tree shows the blood types for two families whose babies were born at the same time in the same hospital.



Is it possible that Tonya and Michelle were switched at birth, so that Tonya is really Michael and Danielle's baby? In other words, could Michael and Danielle have a child with Type O blood? How do you know this? (Hint: use a Punnett square to help you answer this question.)



No it is not possible. Michael would need to be a carrier of the recessive allele (i) to have a Type O offspring.

8. Identical twins come from the same zygote when a developing embryo splits in two, so identical twins have the same genes. In contrast, fraternal twins result when two different sperm fertilize two different eggs, so fraternal twins have different alleles for many genes.

Are Michelle and Maya identical twins or fraternal twins? How do you know?

Fraternal — they would have identical genetics, and thus, identical blood types if identical twins. ($A \neq B$).

9. Suppose hair colour in a type of mice is a result of incomplete dominance as shown in the table below.

Genotype	Phenotype (skin colour)
BB	dark brown
Bb	light brown
bb	tan

Notice that a heterozygous individual has an intermediate phenotype, halfway between the two homozygous individuals. This is called incomplete dominance. Explain how incomplete dominance differs from a dominant-recessive pair of alleles.

With incomplete dominance, the dominant allele is expressed, but not so strongly that the recessive allele is eliminated from the phenotype — both are expressed and basically mix. Light brown is in between (a mix of) dark brown and tan.

Adapted from *Genetics Questions from Soap Opera Genetics* by Ingrid Waldron

Explain how incomplete dominance differs from co-dominance.

Incomplete dominance is a blending of traits expressed by the dom + rec. allele of a heterozygous genotype and the trait appears inhomogeneous. Co-dominance is when two alleles of the same gene express on different areas of the organism (black and white dairy cow or a cat with coloured spots for ex)

10. Two mice, male and female, both have light brown hair. What are their genotypes?

Draw a Punnett square to show how these parents could have two babies with very different hair colour – one dark brown and the other tan.

	B	b
B	BB dark brown	Bb light brown
b	Bb light brown	bb tan