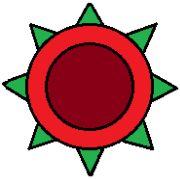
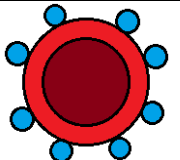
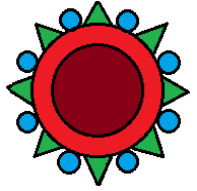
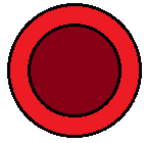


## GENETIC QUESTIONS

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?

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

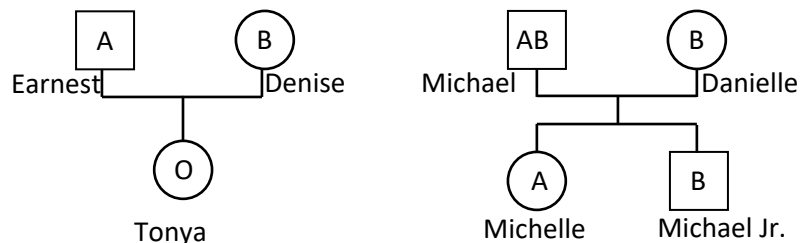
| Genotype                                            | Phenotype     |                                                                   |                                                                                       |
|-----------------------------------------------------|---------------|-------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <b>I<sup>A</sup>I<sup>A</sup> or I<sup>A</sup>i</b> | Type A blood  | Has Type A carbohydrate molecules on red blood cells              |  |
| <b>I<sup>B</sup>I<sup>B</sup> or I<sup>B</sup>i</b> | Type B blood  | Has Type B carbohydrate molecules on red blood cells              |  |
| <b>I<sup>A</sup>I<sup>B</sup></b>                   | Type AB blood | Has Type A and B carbohydrate molecules on red blood cells        |  |
| <b>ii</b>                                           | 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.
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?
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<br>(Type O) |         |
|------------------------------|-------|-------------------------|---------|
|                              |       | $i$                     | $i$     |
| Father<br>(Type AB)<br>Sperm | $I^A$ | $I^A i$                 | $I^A i$ |
|                              | $I^B$ | $I^B i$                 | $I^B i$ |

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.

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.)

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 Michael Jr. identical twins or fraternal twins? How do you know?

9. Suppose one of the twins has light skin and the other one has dark skin. To understand how this could happen, we will consider two alleles of one of the genes for skin colour.

| 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.

Explain how incomplete dominance differs from co-dominance.

10. The parents, Michael and Danielle, both have light brown skin. What is their genetic makeup (i.e., their genotype)?

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