**Who Gets the Money?**

Mr. And Mrs. John Jones died in a tragic farm accident when the tractor they were riding on rolled over in a ditch. Authorities found one million dollars hidden in a feed bin in the chicken coop. The couple is known to have a son, from whom they are estranged. This man is the sole heir to the Jones’ fortune.

Five men show up, each claiming to be the couples long lost son who had run away to become a sheep-herder. You are called in as a genetics expert to decide who is the rightful heir. The phenotypes of all involved are shown below.

Table 1: Family Phenotypes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Vision** | **Eye Color** | **Earlobes** | **Hair Texture** | **ABO Type** |
| **Mr. Jones** | Color-blind | Brown-eyes (homozygous) | Free earlobes (heterozygous) | Wavy | A type (homozygous) |
| **Mrs. Jones** | Normal vision (homozygous) | Brown-eyes (heterozygous) | Free earlobes (heterozygous) | Straight | B type (heterozygous) |
| **Carl** | Color-blind | Blue-eyed | Attached earlobes | Curly | A type (heterozygous) |
| **Ray** | Normal vision | Blue-eyed | Free earlobes  (homozygous) | Wavy | AB type |
| **Dale** | Normal vision | Brown-eyed | Free earlobes (heterozygous) | Straight | A type (heterozygous) |
| **Earl** | Color-blind | Brown-eyed | Free earlobes (heterozygous) | Wavy | O type |
| **Robert** | Normal vision | Brown-eyed | Free earlobes (homozygous) | Curly | AB type |

**Vision**: Color blindness is sex-linked recessive (XN is normal vision and Xn is colorblindness).

**Eye color**: Brown eyes (B) are dominant over blue eyes (b).

**Earlobes**: Free earlobes (F) are dominant over attached earlobes (f).

**Hair texture**: Hair texture is incompletely dominant, curly hair (H) is dominant, wavy hair is heterozygous, straight hair (h) is recessive.

**Blood types**: Use the table below. Blood types are co-dominant and multiple alleles.

**Blood Typing**

|  |  |
| --- | --- |
| **Phenotype** | **Genotype** |
| **A** | **IAIA or IAi** |
| **B** | **IBIB or IBi** |
| **AB** | **IAIB** |
| **O** | **ii** |

**Directions:**

1. **For each member of the family fill out the chart below with the correct genotypes (you must do all of them and use appropriate symbols! (10 points)**

Table 2: Family Genotypes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Vision** | **Eye Color** | **Earlobes** | **Hair Texture** | **ABO Type** |
| **Mr. Jones** |  |  |  |  |  |
| **Mrs. Jones** |  |  |  |  |  |
| **Carl** |  |  |  |  |  |
| **Ray** |  |  |  |  |  |
| **Dale** |  |  |  |  |  |
| **Earl** |  |  |  |  |  |
| **Robert** |  |  |  |  |  |

1. **Cross Mr. and Mrs. Jones for each trait (10 points)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Vision**   |  |  |  | | --- | --- | --- | |  |  |  | |  |  |  | |  |  |  |   Phenotypic Ratios: \_\_\_\_\_\_ Normal Vision  \_\_\_\_\_\_ Colorblind | **Eye Color**   |  |  |  | | --- | --- | --- | |  |  |  | |  |  |  | |  |  |  |   Phenotypic Ratios: \_\_\_\_\_\_ Brown  \_\_\_\_\_\_ Blue |
| **Earlobes**   |  |  |  | | --- | --- | --- | |  |  |  | |  |  |  | |  |  |  |   Phenotypic Ratios: \_\_\_\_\_\_ Free  \_\_\_\_\_\_ Attached | **Hair Texture**   |  |  |  | | --- | --- | --- | |  |  |  | |  |  |  | |  |  |  |   Phenotypic Ratios: \_\_\_\_\_\_ Curly  \_\_\_\_\_\_ Wavy  \_\_\_\_\_\_ Straight |
| **ABO type**   |  |  |  | | --- | --- | --- | |  |  |  | |  |  |  | |  |  |  |   Phenotypic Ratios: \_\_\_\_\_\_ A \_\_\_\_\_\_ B  \_\_\_\_\_\_ AB \_\_\_\_\_\_ O |  |

1. Using the information from your table and punnett squares determine which man is entitled to the inheritance. Please write at least 5 sentences justifying your answer. (10 points)

**RUBRIC**

|  |  |
| --- | --- |
| *Standard: Describe how genetic information is inherited and expressed.* | |
| **Determining Genotypes (10)** | |
| * Students correctly determined the genotypes of all the traits in Table 2. |  |
| **Setting up and solving Punnett Squares (10)** | |
| * Students correctly set up and solved the Punnett Square for each trait. (5) |  |
| * Students correctly identified the phenotypic ratios. (5) |  |
| **Clearly communicates their findings (10)** | |
| * Students described how they eliminated potential heirs by citing their data. (5) |  |
| * Student correctly determined who gets the money. (3) |  |
| * Students wrote clear and focused text to convey a well defined perspective and appropriate content. (2) |  |
| /30 | |