Create Your Own Creature

Objectives:

1. Model the offspring of a potential cross of **monohybrid**, **dihybrid** and **sex-linked genes** that may display **dominance, recessiveness, incomplete dominance** or **codominance**
2. Become familiar with terminology related to genetic processes such as **genotype, phenotype, homozygous, heterozygous, dominant, recessive, codominant** etc.

Activity Summary: Apply your knowledge of Mendelian genetics to **breed your very own organism** using the resources given

Materials:

* Playdough
* Pipe cleaners
* Two strips of PTC paper (one for each group member)

Instructions:

1. Using the chart below, work in **groups of** **two** to complete Chart A with the **genotypes** for each of the traits listed.

If you display the dominant phenotype write the **homozygous genotype**

|  |  |  |
| --- | --- | --- |
| Trait | Dominant | Recessive |
| Eye colour- **E/e** | brown, black or green | blue or grey |
| Hair Texture- **L/l** | curly | straight |
| Hair line- **H/h** | pointed on forehead | straight across forehead |
| Hair colour-**M/m** | brown or black | blonde or red |
| Folded hands-**N/n** | left thumb over right | right thumb over left |
| Tongue rolling-**A/a** | can roll into U shape | cannot role into U shape |
| Ability to taste PTC paper-**T/t** | can taste | cannot taste |

**Chart A:**

|  |  |  |
| --- | --- | --- |
| Trait | Genotype of Partner A | Genotype of Partner B |
| Eye colour- **E/e** |  |  |
| Hair Texture- **L/l** |  |  |
| Hair line- **H/h** |  |  |
| Hair colour-**M/m** |  |  |
| Folded hands-**N/n** |  |  |
| Tongue rolling-**A/a** |  |  |
| Ability to taste PTC paper-**T/t** |  |  |

1. Conduct a **monohybrid cross** of the genotypes displayed by you and your partner and fill out the resulting **genotype of your offspring** in Chart B. Randomly choose a sex for your offspring.

**Chart B:**

|  |  |
| --- | --- |
| Trait | Genotype of Offspring (F1) |
| Eye colour- **E/e** |  |
| Hair Texture- **L/l** |  |
| Hair line- **H/h** |  |
| Hair colour-**M/m** |  |
| Folded hands-**N/n** |  |
| Tongue rolling-**A/a** |  |
| Ability to taste PTC paper-**T/t** |  |
| Sex-**X/Y** |  |

1. Use the table below to determine the **phenotype** of your offspring and **model the creature using the playdough and pipe cleaners** provided. (Eg. genotype of offspring for eye colour is EE, this is a dominant genotype so the phenotype will be green eyes)

|  |  |  |
| --- | --- | --- |
| Trait | Dominant Genotype | Recessive Genotype |
| Eye colour | Green eyes | Blue eyes |
| Hair Texture | Curly pipe cleaners | Straight pipe cleaners |
| Hair line | Spherical body | Cube shaped body |
| Hair colour | Blue or white pipe cleaner | Yellow or red pipe cleaner |
| Folded hands | Smiling mouth | Frowning mouth |
| Tongue rolling | Triangular nose | Round nose |
| Ability to taste PTC paper | Three fingers and toes | Two fingers and toes |

1. Conduct a **dihybrid cross** (using any two of your 2 single allele traits on your offspring—ex: EeLl x EeLl). Write the gametes in the circles provided and list the **phenotypic ratios**.

|  |  |  |  |
| --- | --- | --- | --- |
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When **two alleles are equally dominant** they produce an intermediate phenotype, this is known as **incomplete dominance**. An example of this can be exhibited in the offspring of red (CRCR) and white (CWCW) snapdragon flowers which are pink (CRCW). This intermediate phenotype must always have a **heterozygous genotype**.

1. Conduct a **monohybrid cross** below and attach wings that are the colour of the heterozygous genotype to your creature.

CRCR=red wings

CYCY=yellow wings

|  |  |
| --- | --- |
|  |  |
|  |  |

**Codominance** is a **type of incomplete dominance** where **both of the allelic phenotypes are expressed** at the same time. An example of this can be seen in shorthorn cattle where a red bull (HrHr) and white cow (HwHw) produce a roan calf (HrHw) with **white and red hair**.

1. If the Punnett square cross above was an example of **codominance**, what would the wings on your creature look like?

Genes that are found on either of the sex chromosomes are called **sex-linked genes**. Colourblindness is an example of a **recessive** sex-linked gene found on the X chromosome. If your creature is a female she has the genotype **XAXa** and is a **carrier** of this trait, if your creature is a male his genotype is **XaY** and he displays this trait.

1. Mate your creature with another group’s creature, what **percentage** of the offspring will be colourblind? Explain why colourblindness is more common in males than females?