TOPIC 1: Introduction to the Cell & Cell Theory

* The Cell Theory
	+ All things are of one or more .
	+ Cells are the of and in an organism.
	+ Cells come only cells.
* Cells are Diverse
	+ in , , and organization.
* Why Are Cells So Small?
	+ Transport
		- Cell to surface ratios favor size.
	+ Control
		- Nucleus to consideration.
* How small can a cell be?
	+ Mycoplasmas
		- bacteria that are to mm (1/10 the size of bacteria).
		- Note: 1.0 mm = one of a meter
* All cells have
	+ (cell) Membrane
	+ (eukaryotes only)
	+ (an area)
	+ (structures with specialized functions)
* Cell Types
	+ Prokaryotes- cells that have membranes
		- example =
	+ Eukaryotes- cells that do have , -bound structures
		- examples = and
* Timeline
	+ Prokaryotic Organisms:
		- First appeared OF YEARS AGO
		- include and
	+ Eukaryotic Organisms:
		- First appeared of years ago
		- include , , and
* Key Differences:
	+ Prokaryotes
		- Lack a and other bounded structures.
		- Have small
		- DNA is not organized into
		- are not made of and does not have a 9+2 structure
		- Cell walls are made of , not
	+ Eukaryotes
		- Have a and other bounded structures.
		- Have large
		- DNA is organized into
		- Flagella are made of and have a 9+2 structure
		- Cell are made of

TOPIC 2: The Organization of Living Things

* As organisms develop, their cells (change & separate) and form of organization
* Why it Matters
	+ Humans (we are ) can have kinds of , , , and
* Unicellular Organisms
	+ “uni-” =
	+ are unicellular organisms
		- Some , some , and some , are unicellular
	+ Can still do they need to stay alive
	+ Benefits over multicellular organisms:
		- Need resources
		- Can live in conditions
* Multicellular Organisms
	+ multi-” =
	+ , , some , and fungi are multicellular
		- Start as a cell 🡪 cells 🡪 cells differentiate (change) into of cells 🡪 cells together
	+ Characteristics
		- Larger size
			* have predators and have more options of
		- Longer life
			* organism will to live even if cell dies
		- Specialization
			* each type of cell has a job, making the organism more
* Levels of Organization
	+ 1st Level:
	+ 2nd Level:
	+ 3rd Level:
	+ 4th Level:
	+ 🡪 🡪 🡪
* Level 1 : Cells
	+ Cells can be (have a certain function)
		- Function =
	+ Function is related to the
		- Structure = how are put
			*
			* it’s made from
		- Structure of a cell is different from cell
* Level 2: Tissues
	+ Tissue = of cells that work together to do a job
		- Ex: Heart muscle is made of heart muscle
	+ Animals have 4 types of tissue
		-
		-
		-
		-
	+ Plants have 3 types of tissue
		-
		-
		-
* Level 3: Organs
	+ Organ = structure that is made up tissues working together to get a job done
		- Ex: Stomach – tissue moves food, tissues make to digest food, tissue holds stomach together, tissue sends messages back and forth between the stomach and brain
* Level 4: Organ Systems
	+ Organ system = group of organs working to perform a specific
	+ Each organ system has a
		- Ex: Digestive system is made of including the stomach and intestines
* Structure of Animals
	+ Cells
		- of an animal’s structure
		- become
	+ Tissues
		- made of cells that to perform a function
	+ Organs
		- made of different of tissues that work to perform a function
	+ Organ Systems
		- made of that work to perform a function
	+ Organisms

TOPIC 3: Genetics Using Punnett Squares

* Early Genetics
	+ The study of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ began with observations made by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Mendel.
	+ After noticing that the flowers his pea plants were either violet or white, Mendel began to study the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ traits.
		- Between 1856 and 1863 he \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_and tested at least 28,000 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
		- Remember that Mendel worked \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_years ago when nobody knew about \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_or even the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that carry genes.
	+ Let’s consider a single gene…
		- A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ carries information that determines your \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Traits are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ you \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from your \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
		- Genes are located in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
		- Chromosomes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_and there are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_of genes in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
		- In humans, a cell’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ contains \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ individual chromosomes or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ pairs of chromosomes.
		- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the chromosomes come from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and half come from the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
		- This is a human \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ representing the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_of chromosomes in a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Definitions
	+ Allele- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Genotype- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Phenotype- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Dominant trait refers to a
	+ The term "recessive” describes
	+ Homozygous= \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Heterozygous= \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Genetics
	+ study of are passed from to
* Traits
	+ are by the on the .
* A gene
	+ a segment of that determines a .
* Chromosomes
	+ come in pairs, thus come in pairs.
* Homologous pairs –
	+ matching genes – one from parent and one from parent
		- Example:
			* Humans have chromosomes or pairs.
				+ One set from dad – 23 in
				+ One set from mom – 23 in
* Alleles
	+ different (possibilities) for the same –
		- ex: blue eyes or brown eyes
* Dominant and Recessive Genes
	+ dominant
		- Gene that the other gene from
	+ recessive
		- Gene that does “show” even though it is
	+ Symbol –
		- Dominant gene – case letter – T
		- Recessive gene – case letter – t
		- Both genes of a pair are the –
			* homozygous or purebred
				+ TT – dominant
				+ tt – recessive
			* One and one gene – or hybrid
				+ Tt – heterozygous
* Genotype and Phenotype
	+ of genes an organism has ( ) – genotype
		- Ex: TT, Tt, tt
	+ Physical resulting from gene make-up –
		- Ex: hitchhiker’s thumb or straight thumb
* Punnett Square and Probability
	+ Used to the possible gene of offspring
	+ Punnett Square
		- Example: Black fur (B) is dominant to white fur (b) in mice
* Practice
	+ We use \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_to represent the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ letter represents the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_form of a gene (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) and a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_letter is the abbreviation for the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_form of the gene (allele).
	+ Example below: P=dominant purple and p= recessive white
	+ The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for this flower is violet/shaded while its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (if homozygous) is PP.
	+ The phenotype for this flower is white while its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is pp (to be white the flower \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_of the recessive copies of the allele).
* Punnett Squares
	+ The Punnett square is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_way of working out what the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of two parents will be.
		- It is a helpful tool to show allelic combinations and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ offspring ratios.
	+ 
	+ How to set up a Punnett Square
		- We begin by constructing a grid of two \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ lines.

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|  |  |

* + - Next, put the genotype of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_across the top and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ along the left side.
			* For this example lets consider a genotype of BB crossed with bb.

|  |  |  |
| --- | --- | --- |
|  | B | B |
| b |  |  |
| b |  |  |

* + - * Notice \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_letter goes above each box
				+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_matter which parent’s genotype goes on either side.
		- Next, fill in the boxes by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and row head-letters down and across into the empty spaces.

|  |  |  |
| --- | --- | --- |
|  | B | B |
| b | Bb | Bb |
| b | Bb | Bb |



* Now that we have learned the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of genetics lets walk through some examples using \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Squares.

|  |  |  |
| --- | --- | --- |
|  | W | w |
| W | WW | Ww |
| w | Ww | ww |

* + Usually \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_the capital letter first
		- Lets say:
			* W- dominant white
			* w- recessive violet
	+ Parents in this cross are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (Ww).
		- Note: Make sure I can tell your capital letters from lowercase letters.
	+ What percentage of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ will have violet flowers?
		- ANSWER: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ recessive)
* Red hair (R) is dominant over blond hair (r). Make a cross between a heterozygous red head and a blond.

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* + What percentage of the offspring will have red hair?
		- \_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Let’s try some more…
	+ In pea plants, tall pea plants (T) are dominant over short pea plants (t). Construct a Punnett

Square for a heterozygous tall pea plant and a short pea plant.

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* + What are the percentage of phenotypes?
		- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ tall
		- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ short
* Black eyes (R) is dominant over red eyes (r) in rats. Make a cross between a homozygous rat with black eyes and a rat with red eyes.

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

* + What is the possibility of a red eye off springs?
		- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_