

Genetics Review

MULTIPLE CHOICE: Circle the answer that best completes the sentence.

The Austrian monk whose experiments with pea plants were the beginning of our understanding of genetics was _____.

- A. Albert Einstein
- B. Albus Dumbledore
- C. Alfred Nobel
- D. Gregor Mendel

The different alternatives or choices for a gene are called _____.

- A. generations
- B. traits
- C. tetrads
- D. alleles

Crossing organisms from the F_1 generation produces the _____ generation.

- A. P_2
- B. F_2
- C. P_1
- D. None of these—you can't cross F_1 organisms with each other!

Crossing organisms from the P_1 generation produces the _____ generation.

- E. P_2
- F. F_1
- G. F_2
- H. None of these—you can't cross P_1 organisms with each other!

Mendel's "factors" or "particles" are now called _____.

- A. gametes
- B. genes
- C. cells
- D. zygotes

Self-pollination produces seeds with genetic information from _____ parent plant(s).

- A. ONE
- B. TWO
- C. THREE

What pattern did Mendel see when crossing pure TALL with pure SHORT pea plants?

- A. ALL the F_1 offspring were short, but the F_2 generation were all tall.
- B. ALL the F_1 offspring were tall, but the F_2 generation were all short.
- C. ALL the F_1 offspring were short, but 50% the F_2 generation were all tall and 50% were short.
- D. ALL the F_1 offspring were tall, but 25% the F_2 generation were short and 75% were tall.

WHICH OF THE FOLLOWING IS TRUE of MENDELIAN INHERITANCE?

- A. If a dominant allele is present, the recessive allele won't be seen.
- B. If a recessive allele is present, the dominant allele won't be seen.
- C. Both recessive and dominant alleles show if present

Pollen is produced by the _____ part of the flower.

- A. female
- B. male

* * * * *

TRUE OR FALSE

Circle T if the statement is TRUE. Circle F if the statement is FALSE.

If false, make corrections to the underlined words to make the statement true.

T F Dominant alleles are represented by a lower case letter.

T F Mendel's Law of Fertilization explains why alleles end up in different gametes following meiosis.

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MATCH THE WORD FROM THE WORD BANK WITH ITS DEFINITION:

GENETICS	HEREDITY	TRAIT	PURE-BREEDING
DOMINANT	RECESSIVE	ALLELE	FERTILIZATION

_____ A characteristic that can be observed such as hair color, seed shape, flower color, etc

_____ The joining of a sperm and egg to make a zygote

_____ A gene choice that MASKS ANOTHER choice for a trait

_____ A gene choice that IS MASKED BY ANOTHER choice for a trait

_____ the branch of biology that studies how characteristics are transmitted from parent to offspring

_____ the passing of characteristics from parent to offspring

_____ An alternative choice for a gene

_____ An organism that always produces offspring identical to itself if self
pollinated

* * * * *

PUNNETT SQUARE PRACTICE

Use a Punnett Square to show the possible offspring from the crosses given and answer the questions:

IN PEAS:	R = round	T = tall	Y = yellow peas	P = purple flowers
	r = wrinkled	t = short	y = green peas	p = white flowers

MAKING MONOHYBRID CROSSES:

What is the genotype of a HOMOZYGOUS YELLOW SEED plant? _____

What is the genotype of A HOMOZYGOUS GREEN SEED plant? _____

What is the genotype of a HETEROZYGOUS YELLOW plant? _____

Make a cross between a PURE YELLOW SEED parent and a PURE GREEN SEED parent.

Genotypes of Parents: _____ X _____

POSSIBLE OFFSPRING GENOTYPES _____

POSSIBLE OFFSPRING PHENOTYPES _____

What is the probability an offspring will show the DOMINANT TRAIT (YELLOW SEEDS)? _____%

What is the probability an offspring will show the RECESSIVE TRAIT (GREEN SEEDS)? _____%

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What is the genotype of a PURE PURPLE FLOWERED plant ? = _____

What is the genotype of a PURE WHITE FLOWERED plant? = _____

What is the genotype of a HYBRID PURPLE FLOWERED plant? = _____

Make a cross between a HOMOZYGOUS PURPLE FLOWERED plant and a HOMOZYGOUS WHITE FLOWERED plant.

Genotypes of Parents: _____ X _____

POSSIBLE OFFSPRING GENOTYPES _____

POSSIBLE OFFSPRING PHENOTYPES _____

What is the probability an offspring will show the DOMINANT TRAIT (PURPLE FLOWERS)?
_____ %

What is the probability an offspring will show the RECESSIVE TRAIT (WHITE FLOWERS)?
_____ %

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WHAT IS THE GENOTYPE OF A HOMOZYGOUS TALL plant? _____

WHAT IS THE GENOTYPE OF A PURE SHORT plant? _____

Make a cross between a HOMOZYGOUS TALL plant and a PURE SHORT plant.

Genotypes of Parents: _____ X _____

POSSIBLE OFFSPRING GENOTYPES _____

POSSIBLE OFFSPRING PHENOTYPES _____

What is the probability an offspring will show the DOMINANT TRAIT (TALLNESS)?
_____ %

What is the probability an offspring will show the RECESSIVE TRAIT (SHORTNESS)?
_____ %

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SEE A PATTERN FOR HOMOZYGOUS (P₁) MONOHYBRID CROSSES:

If you cross plants that are PURE DOMINANT for a trait with plants that are PURE RECESSIVE for that trait, _____ % of the offspring will show the DOMINANT trait and the _____ trait will not show at all.

USE THE PATTERN ABOVE TO MAKE PREDICTION ABOUT A CROSS

If you cross a HOMOZYGOUS ROUND SEED plant with a PURE WRINKLED SEED plant
100% will look _____
0% will look _____

The offspring will have a 100% probability of having the _____ genotype.

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MAKE SOME HETEROZYGOUS MONOHYBRID CROSSES

A black coat (B) is DOMINANT in guinea pigs. A brown coat (b) is RECESSIVE.

What is the genotype of a HOMOZYGOUS BLACK guinea pig? = _____

What is the GENOTYPE of a HETEROZYGOUS BLACK guinea pig? = _____

What is the GENOTYPE of a brown guinea pig? = _____



Make a cross between TWO HETEROZYGOUS BLACK guinea pigs.

Genotypes of Parents: _____ X _____

POSSIBLE OFFSPRING GENOTYPES _____

POSSIBLE OFFSPRING PHENOTYPES _____

What is the probability that a baby will be black? _____ %

What is the probability that a baby will be brown? _____ %

What is the probability the baby will be a HYBRID? _____ %

What is the probability the baby will be HOMOZYGOUS DOMINANT? _____ %

What is the probability the baby will be HOMOZYGOUS RECESSIVE? _____ %

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Purple fur (P) is DOMINANT in monsters. Yellow fur (p) is RECESSIVE.



What is the genotype of a PURE PURPLE monster? _____

What is the GENOTYPE of a HETEROZYGOUS purple monster? _____

What is the GENOTYPE of a YELLOW monster? _____

Make a cross between TWO HETEROZYGOUS PURPLE MONSTERS.

Genotypes of Parents: _____ X _____

POSSIBLE OFFSPRING GENOTYPES _____

POSSIBLE OFFSPRING PHENOTYPES _____

What is the probability that a baby will be purple? _____%

What is the probability that a baby will be yellow? _____%

What is the probability the baby will be a heterozygous? _____%

What is the probability the baby will be HOMOZYGOUS DOMINANT? _____%

What is the probability the baby will be HOMOZYGOUS RECESSIVE? _____%

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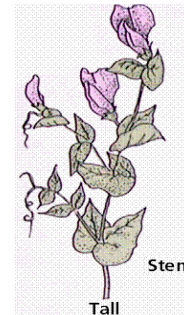
Tallness (T) is DOMINANT in pea plants. Shortness (t) is RECESSIVE.

What is the GENOTYPE of a HYBRID TALL pea plant? _____

What is the GENOTYPE of a SHORT pea plant? _____

Make a cross between two HYBRID TALL pea plants.

Genotypes of Parents: _____ X _____



POSSIBLE OFFSPRING GENOTYPES _____

POSSIBLE OFFSPRING PHENOTYPES _____

What is the probability that an offspring plant will be tall? _____%

What is the probability that an offspring plant will be short? _____%

What is the probability that an offspring plant will be a HYBRID? _____%

What is the probability that an offspring plant will be HOMOZYGOUS DOMINANT? _____%

What is the probability that an offspring plant will be HOMOZYGOUS RECESSIVE? _____%

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SEE A PATTERN FOR HETEROZYGOUS (F₁) MONOHYBRID CROSSES:

If you cross 2 parent plants that are BOTH HETEROZYGOUS for a trait the offspring will show a _____ : _____ phenotypic ratio.

_____ % of the offspring will show the DOMINANT trait and

_____ % of the offspring will show the RECESSIVE trait.

USE DOMINANT OR RECESSIVE TO FILL IN THE BLANKS BELOW:

$\frac{1}{4}$ of the offspring will have two _____ alleles, $\frac{1}{2}$ will be

hybrids with one _____ and one _____ allele, and

$\frac{1}{4}$ will have two _____ alleles.

USE THE PATTERN ABOVE TO MAKE PREDICTION ABOUT A CROSS

If you cross two HETEROZYGOUS ROUND SEED plants

75% will look _____

25% will look _____

The probability is:

$\frac{1}{4}$ will have the genotype _____ $\frac{1}{2}$ will have the genotype _____ $\frac{1}{4}$ will have the genotype _____

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Scientists have been investigating the genetic make up of the residents in Bikini Bottom. Complete the following questions about these inhabitants.

For each genotype below, indicate whether it is HETEROZYGOUS (HE) or HOMOZYGOUS (HO).

TT _____ Bb _____ DD _____ tt _____ Ff _____

Dd _____ ff _____ bb _____ BB _____ FF _____



Determine the ***PHENOTYPE*** for each genotype given. IN SPONGE PEOPLE the allele for YELLOW BODY COLOR (Y) is DOMINANT to BLUE (y).

YY = _____ Yy = _____ yy = _____

IN SPONGEPEOPLE the allele for SQUARE SHAPE (S) is dominant to ROUND (s).

SS = _____ Ss = _____ ss = _____

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SpongeBob SquarePants recently met SpongeSuzie RoundPants at a dance. SpongeBob is HETEROZYGOUS for his square pants, but Suzie is ROUND. Create a Punnett square to show the possibilities that could result if SpongeBob and SpongeSuzie had children.

Genotypes of Parents: _____ X _____

What is SpongBob's genotype? _____

What is SpongeSuzie's genotype? _____

What are the chances a child will have a square shape?
_____ out of 4 OR _____%

What are the chances a child will have a round shape?
_____ out of 4 OR _____%

* * * * *



In SQUID PEOPLE the allele for LIGHT BLUE SKIN (B) is DOMINANT over the GREEN (b) allele. Everyone in SquidWard's family has light blue skin. His family brags that they are a "purebred" line. He recently married a nice girl with light green skin, which is recessive. Create a Punnett square to show the possible offspring from this match.

Genotypes of Parents: _____ X _____

POSSIBLE OFFSPRING GENOTYPES _____

POSSIBLE OFFSPRING PHENOTYPES _____

What are the chances of a child with green skin? _____%

Would SquidWard's children still be considered "purebreds"? YES NO

EXPLAIN WHY or WHY NOT.

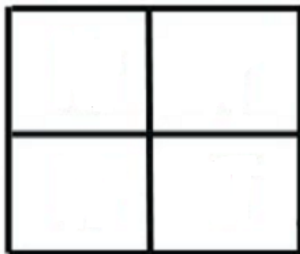
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INCOMPLETE DOMINANCE:

In Four O'clock plants RED FLOWERS (R) are INCOMPLETELY dominant over white (r) flowers. Heterozygous plants show a blended intermediate phenotype of PINK flowers.

MAKE A CROSS WITH 2 HETEROZYGOUS FOUR O'CLOCK PLANTS.

Genotypes of Parents: _____ X _____



Genotypes _____
Genotypic Ratio _____
Phenotypes _____
Phenotypic Ratios _____

IF the red allele in Four-o'clocks WAS COMPLETELY DOMINANT over the white allele, what would the phenotype be for a plant with Rr genotype? _____

* * * * *

You are exploring the jungle and find a new species of plant. Some of the plants have red flowers and some have yellow flowers. You cross a red flowering plant with a yellow flowering plant and all the offspring have orange flowers. You might assume that the alleles for flower color in this plant show _____.

- A. complete dominance
- B. incomplete dominance
- C. codominance

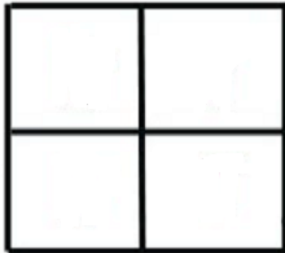
If the red and yellow alleles in the mystery jungle plant above showed CODOMINANCE instead, what might you expect a plant with one red allele and one yellow allele to look like?

- A. It would have all red flowers
- B. It would have all blue flowers
- C. It would have red and yellow flowers together on one plant
- D. It wouldn't make any flowers because it is a mutant.

BLOOD TYPES:

In the ABO blood type system the A and B alleles are dominant to O allele, and A and B are codominant to each other.

Make a cross between an AO mom and an BO dad.



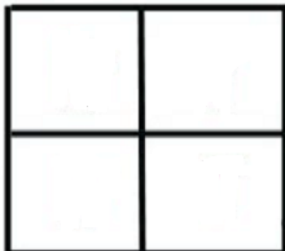
What are the possible genotypes of the offspring?

What is the probability the offspring will have:

A type blood _____% B type blood _____% O type blood _____% AB type blood _____%

* * * * *

Make a cross between an AO mom and an BB dad.



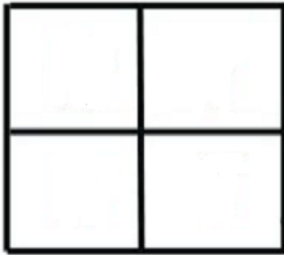
What are the possible genotypes of the offspring?

What is the probability the offspring will have:

A type blood _____% B type blood _____% O type blood _____% AB type blood _____%

* * * * * * * * * * * * * * *

Make a cross between an AA mom and an OO dad.



What are the possible genotypes of the offspring?

What is the probability the offspring will have:

A type blood _____% B type blood _____% O type blood _____% AB type blood _____%

* * * * * * * * * * * * * * *

You are working in the Emergency room and a bleeding patient with type B blood is brought in. You need to give him blood, but the hospital is all out of type B. Circle ALL the types of blood could you safely give him instead.

A AB O

EXPLAIN your choices.

What if the bleeding patient had type AB blood and the hospital was out of AB blood. Circle ALL the types of blood could you safely give him.

A B O

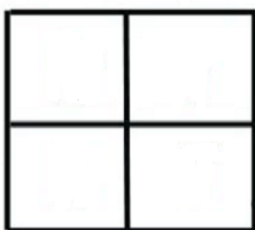
EXPLAIN your choices.

JERRY SPRINGER GENETICS:

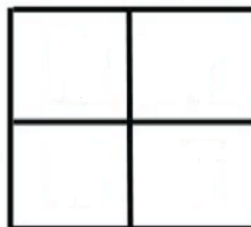
Wanda tells Jerry Springer that she thinks either Ralph or Fred could be the father of her baby. Wanda's genotype is AO. Wanda's baby has type O blood. Ralph's genotype is AB. Fred's genotype is BO.

Make two crosses to show who could be the father of Wanda's baby.

Ralph X Wanda



Fred X Wanda



Is it possible for Ralph to be the baby's father? YES NO

Is it possible for Fred to be the baby's father? YES NO

Does this absolutely PROVE that Fred IS the baby's father? YES NO

EXPLAIN YOUR ANSWER.

IF Wanda's baby has type O blood, what are the possible genotypes for men who COULD BE the father of Wanda's baby?

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IN PEAS:

R = round T= tall Y = yellow peas P = purple flowers
r = wrinkled t = short y = green peas p = white flowers

MAKING HOMOZYGOUS DIHYBRID CROSSES:

Cross a HOMOZYGOUS TALL, HOMOZYGOUS ROUND pea with a SHORT, WRINKLED pea.

Parent's genotypes _____ X _____

Possible gametes _____

How many out of 16 will be:

- _____ TALL & ROUND
- _____ TALL & WRINKLED
- _____ SHORT & ROUND
- _____ SHORT & WRINKLED

* * * * *

Cross a HOMOZYGOUS TALL, HOMOZYGOUS YELLOW pea with a PURE SHORT, GREEN pea.

Parent's genotypes _____ X _____

Possible gametes _____

How many out of 16 will be:

- _____ TALL w/ YELLOW PEAS
- _____ TALL w/GREEN PEAS
- _____ SHORT w/ YELLOW PEAS
- _____ SHORT w/ GREEN PEAS

* * * * *

SEE A PATTERN FOR HOMOZYGOUS (P₁) DIHYBRID CROSSES:

If you cross plants that are **PURE DOMINANT** for **TWO TRAITS** with plants that are **PURE RECESSIVE** for **TWO TRAITS**, _____ % of the offspring will look **DOMINANT** for **BOTH** traits and the _____ traits will not show at all.

* * * * *

Cross a **HETEROZGOUS TALL, HETEROZYGOUS ROUND** pea with a **PURE SHORT, WRINKLED** pea.

Parent's genotypes _____ X _____

Possible gametes _____

How many out of 16 will be:

- _____ TALL ROUND
- _____ TALL WRINKLED
- _____ SHORT ROUND
- _____ SHORT WRINKLED

* * * * *

Cross a HYBRID TALL, HYBRID YELLOW pea with a HETEROZYGOUS TALL, HETEROZYGOUS YELLOW pea.

Parent's genotypes _____ X _____

Possible gametes _____

How many out of 16 will be:

_____ TALL w/ YELLOW PEAS

_____ TALL w/ GREEN PEAS

_____ SHORT w/ YELLOW PEAS

_____ SHORT w/ GREEN PEAS

* * * * *

FIND THE PATTERN FOR HETEROZYGOUS (F₁) DIHYBRID CROSSES:

If you cross 2 parent plants that are **BOTH HETEROZYGOUS** for **TWO TRAITS**, the offspring will show a _____ : _____ : _____ : _____ phenotypic pattern.

Fill in the blanks below with: **DOMINANT** or **RECESSIVE**

9/16 of the offspring will show both _____ traits.

3/16 will look _____ for trait 1 and _____ for trait 2.

3/16 will look _____ for trait 1 and _____ for trait 2.

1/16 will look _____ for both traits.

USE THIS PATTERN TO TELL THE POSSIBLE OFFSPRING OF A HETEROZYGOUS DIHYBRID CROSS WITHOUT USING A PUNNETT SQUARE:

R = round		T = tall
r = wrinkled		t = short
RrTt	X	RrTt

9/16 will look _____ and _____
 3/16 will look _____ and _____
 3/16 will look _____ and _____
 1/16 will look _____ and _____

P = purple		T = tall
p = white		t = short
PpTt	X	PpTt

9/16 will look _____ and _____
 3/16 will look _____ and _____
 3/16 will look _____ and _____
 1/16 will look _____ and _____

Rhett and Scarlett are expecting a baby. Rhett's rich uncle has promised them \$1 million if their baby is a blue eyed boy that can carry on the family name. Brown eyes (B) are dominant over blue eyes (b). Rhett has brown eyes, while Scarlett has blue eyes. Fill in the Punnett square with Rhett and Scarlett's possible gametes.

Rhett's Genotype: BbXy Scarlett's Genotype: bbXX

Possible gametes: _____

What genotype does a baby need to be a blue eyed boy and get the \$1 million?

Use a Punnett square to show the possible genotypes for their baby.

_____ Brown eyed boys

_____ Brown eyed girls

_____ Blue eyed girls

_____ Blue eyed boys

What is the probability they will have a BLUE-EYED BOY and get the \$1 million? _____%

Why does this cross not follow the 9:3:3:1 pattern for DIHYBRID (2 gene) crosses?

Modified from: <http://brookings.k12.sd.us/biology>