

Monster Genetics Challenge Punnett Squares & Heredity Halloween STEM Lab

- ✓ Students use Punnett squares to predict monster offspring traits, then draw and label the resulting creature.
- ✓ Full Answer Key with Examples and Fully Editable

A/a – Skin Color	A = Slime-Green (dominant) • Bright green tone with a glowing hue a = Moon-Pale (recessive) • Faded, pale white or gray tone
B/b – Horns	B = Horns present (dominant) • Sharp black or purple horns curve upward b = No horns (recessive) • Smooth head with faint bumps
C/c – Eye Count	C = Three eyes (dominant) • Three glowing eyes arranged horizontally c = Two eyes (recessive) • Two regular monster eyes
D/d – Fangs	D = Saber fangs (dominant) • Long, sharp teeth visible even when mouth closed d = Small teeth (recessive) • Rounder, duller teeth
E/e – Tail	E = Spiked tail (dominant) • Long tail with three or more spikes e = No tail (recessive) • Flat back, no tail visible
F/f – Fur Color (Incomplete Dominance)	FF = Midnight Black – darkest coat Ff = Smoky Gray – medium shade, blended ff = Snow White – bright, pale fur



Monster Genetics: Punnett Squares & Traits

Teacher Guide (Setup • Timing • Materials)
Duration: 1–2 class periods (45–90 min). Group Size: pairs

Materials per group:

- Trait Cards set (printed & cut)
- Allele tiles or slips (A/a, B/b, C/c, D/d, E/e) — or
- Student packet (Punnett squares + phenotype sheet)
- Colored pencils/markers for monster sketch
- Scissors, tape/glue

Learning Goals: Use Punnett squares to predict offspring genotypes; calculate simple genotype ratios and phenotype ratios.
Safety: Paper & scissors only; standard classroom procedure.

Monster Trait Set (Dominant / Recessive)

Use 4–5 traits for an intro lesson (monohybrid and dihybrid crosses).
A/a – Skin Color: A = Slime-Green (dominant), a = Moon-Pale (recessive)
B/b – Horns: B = Horns present (dominant), b = No horns (recessive)
C/c – Eye Count: C = Three eyes (dominant), c = Two eyes (recessive)
D/d – Fangs: D = Saber fangs (dominant), d = Small teeth (recessive)
E/e – Tail: E = Spiked tail (dominant), e = No tail (recessive)
Optional twist: Use one incomplete-dominance trait (F/f – Fur Color).

Parent Genotype Cards (Print & Cut)

Make two identical decks; students draw one card from each deck.

A/a	B/b	C/c
AA	BB	CC
Aa	Bb	Cc
aa	bb	cc
AA	Bb	Cc
Aa	BB	cc
aa	Bb	CC
Aa	bb	Cc

Monster Genetics – Color Trait Cards (6 Traits)

Optional - Use these printable cards for your Monster Genetics simulation. Each shows the gene, alleles, and phenotype visuals.

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B/b – Horns	B = Horns present (dominant) • Sharp black or purple horns curve upward b = No horns (recessive) • Smooth head with faint bumps
C/c – Eye Count	C = Three eyes (dominant) • Three glowing eyes arranged horizontally c = Two eyes (recessive) • Two regular monster eyes
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Monster Genetics: Punnett Squares & Traits

From Genes to Traits – Introduction

Every living thing has instructions called genes. Different genes code for different traits. Each trait has a dominant allele (shows up with just one copy) and a recessive allele (needs two copies to show up). When two parents pass alleles to an offspring, you can observe—green skin, horns, or fangs—is the phenotype.

Punnett squares are a simple way to predict the chance of different allele combinations that could happen. Probabilities are like a coin flip: if you have four children in a family, one will have the trait—it means there's a 1 in 4 chance. Punnett squares help you see all the possibilities in real life (incomplete dominance, codominance, etc.) and are a powerful first step for understanding heredity.

Answer the Following Comprehension Questions

- 1) What is the difference between genotype and phenotype?
- 2) In this model, what does “dominant” mean?
- 3) If Parent 1 is Aa and Parent 2 is aa, what phenotype do you expect for the offspring?
- 4) Why doesn't a 75% probability guarantee 3 out of 4 offspring have the trait?
- 5) Name one real-world pattern of inheritance that is more complex than simple dominance.

Monster Genetics: Punnett Squares & Traits

Student Procedure

- 1) Receive two Parent Genotype Cards to determine Parent 1 and Parent 2 genotypes for one trait (i.e. A/a).
- 2) For each selected trait, write parent genotypes (e.g., Aa × aa).
- 3) Build a Punnett square for each trait; fill in offspring genotypes.
- 4) Determine the phenotype for each genotype using the trait descriptions.
- 5) Calculate expected ratios (genotype and phenotype).
- 6) Repeat for remaining traits.
- 7) Design & draw your ‘Monster Offspring’ using your predicted phenotype combo; label each trait.
- 8) Reflection: Compare model probabilities to your one offspring—why might appearance differ from exact ratios?

Punnett Square Practice (Monohybrid)

A – Skin (A/a): Parent Cross	—	×	
P1		P2	

Genotype ratio: _____ Phenotype ratio: _____

B – Horns (B/b): Parent Cross	—	×	
P1		P2	

Genotype ratio: _____ Phenotype ratio: _____

C – Eyes (C/c): Parent Cross	—	×	
P1		P2	

Genotype ratio: _____ Phenotype ratio: _____

D – Fangs (D/d): Parent Cross	—	×	
P1		P2	

Genotype ratio: _____ Phenotype ratio: _____

Monster Offspring – Example Illustration

Phenotype shown: slime-green skin, horns, three eyes, saber fangs, spiked tail.



Monster Genetics: Punnett Squares & Traits — Sample Student Sheet

Below is a completed example using these parent crosses: A: Aa × aa; B: Bb × Bb; C: Cc × cc; D: Dd × dd; E: Ee × ee. Selected offspring (example): Aa Bb Cc Dd Ee → slime-green skin, horns, three eyes, saber fangs, spiked tail.

A – Skin (A/a): Parent Cross — Aa × aa

	a	a
A	Aa	Aa
a	aa	aa

Genotype ratio: 1 Aa : 1 aa Phenotype ratio: 1 slime-green (A_) : 1 pale (aa)

B – Horns (B/b): Parent Cross — Bb × Bb

	B	b
B	BB	Bb
b	Bb	bb

Genotype ratio: 1 BB : 2 Bb : 1 bb Phenotype ratio: 3 horns (B_) : 1 no horns (bb)

C – Eyes (C/c): Parent Cross — Cc × cc

	c	c
C	Cc	Cc
c	cc	cc

Genotype ratio: 1 Cc : 1 cc Phenotype ratio: 1 three-eyes (C_) : 1 two-eyes (cc)

D – Fangs (D/d): Parent Cross — Dd × dd

	d	d
D	Dd	Dd
d	dd	dd

Genotype ratio: 1 Dd : 1 dd Phenotype ratio: 1 saber (D_) : 1 small (dd)

E – Tail (E/e): Parent Cross — Ee × ee

	e	e
E	Ee	Ee
e	ee	ee

Genotype ratio: 1 Ee : 2 Ee : 1 ee Phenotype ratio: 3 spiked (E_) : 1 no tail (ee)

Dihybrid Challenge (A & B): Answer Key

This key includes the completed 4x4 Punnett square for AaBb × AaBb and the resulting phenotype ratios.

Completed Punnett Square

	AB	Ab	aB	ab
AB	AABB	AABb	AaBB	AaBb
Ab	AABb	AAbb	AaBb	Aabb
aB	AaBB	AaBb	aaBB	aaBb
ab	AaBb	Aabb	aaBb	aabb

Phenotype Summary

Phenotype (A & B)	Count (out of 16)	Percent
A_ B_ (Both dominant)	9	56.25%
A_ bb (A dominant only)	3	18.75%
aa B_ (B dominant only)	3	18.75%
aa bb (Both recessive)	1	6.25%

Phenotype ratio: 9 : 3 : 3 : 1

Teacher Notes

Each parent produces four gametes (AB, Ab, aB, ab). Independent assortment produces 16 possible genotypes. When grouped by dominant and recessive phenotypes, the 9:3:3:1 ratio appears — dihybrid crosses.

From Genes to Traits – Introduction - Answer Key

- 1) What is the difference between genotype and phenotype?
The genotype is the set of alleles (gene versions) an organism carries—like AA, Aa, or aa.
The phenotype is the observable trait that results, such as green skin or pale skin.
- 2) In this model, what does “dominant” mean?
A dominant allele shows its effect even if only one copy is present. It “masks” the recessive allele, so organisms with AA or Aa both display the dominant trait.
- 3) If Parent 1 is Aa and Parent 2 is aa, what phenotype ratio do you expect for skin color? Explain.
Half the offspring (50%) are predicted to be Aa and show the dominant trait (slime-green skin), and half (50%) are aa with the recessive trait (pale skin). The ratio is 1:1 because each parent passes one allele at random.
- 4) Why doesn't a 75% probability guarantee 3 out of 4 offspring have the trait?
Probability describes chance per offspring, not a fixed count. Each offspring is an independent event—like flipping a coin. Even with a 75% chance, random variation can produce any outcome in a small sample.
- 5) Name one real-world pattern of inheritance that is more complex than simple dominance.
Examples include incomplete dominance (a blended phenotype, like pink flowers from red and white parents), codominance (both alleles expressed, like AB blood type), or polygenic inheritance (traits controlled by many genes, such as height or skin color).

What You Get

- **Special Halloween-Themed Lab Activity with fun connections**
- **Teacher Guide:** Quick setup, parent genotype cards & trait cards (6 traits incl. incomplete dominance).
- **Student Handout:** Introduction reading and questions, parents/alleles setup, step-by-step Punnett-square procedure (mono → dihybrid), phenotype summary table, monster sketch/planning page.
- **Data Tables:** Punnett squares for traits A–F, genotype & phenotype ratio lines.
- **Analysis + Model Answers:** Introduction reading answer key, sample answer for genotype and phenotype data as well as monster image with resulting traits.

