Biology A

Your Name _____ Period_____
Partner's Name _____ Date _____

DRAGON GENETICS LAB

INTRODUCTION

Students will work in pairs in the lab to produce a dragon from the random mixing of genetic traits. Each student will be a dragon parent. They will use a complete set of dragon chromosomes. The homologous chromosomes will be separated according to Mendel's law of Independent Assortment. The inheritance of the traits may be simple dominance, codominance, sex-linked, sex influenced, or sex-limited. **Read the entire lab packet before answering the prelab**.

PRE-LAB:

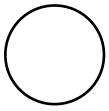
1. What does each popsicle stick represent:

2. Why does each popsicle stick chromosome have two sides with alleles:

3. If a chromosome has a letter on one side but the letter is missing on the other, what happened to the missing letter?

4. What trait is coded for by the gene with the symbol:
   W?_____
   X? _____
   Y? _____

Teacher stamps or initials here when you're finished with the Pre-lab:



METHOD

Materials:

Chromosomes (represented by popsicle sticks)
One packet of Mom chromosomes, one packet of Dad chromosomes, colored pencils

Procedure:

1. After the teacher stamps the space above, have one partner gather the appropriate chromosomes packets from the supply table. Each partner will have five popsicle sticks (unless your parent dragon has a chromosomal mutation) -- one of each color of the autosomes, and one sex chromosome (either pink or blue). Each side of a stick represents a chromosome, and the two sides together represent a pair of homologous chromosomes.
2. Examine your dragon chromosomes, looking on both sides to see each of the alleles that make up the genotype for each gene locus. Note whether you are the mom (pink sex chromosome) or the dad (blue).
3. Read through page 2's description of the genome.
4. Each parent's genotype consists of the alleles on both chromosomes (i.e. both sides of the stick). Usually each parent will have two alleles for each gene. Write your genotypes in the appropriate table on page 3. Copy your partner's genotype. Notice that your parents may have chromosomal mutations (deletions, inversions, duplications, etc). See #5 if you don't know how to write your alleles.
5. For each color autosome, and then for the sex chromosomes, each parent will randomly drop his or her stick on the table. The side of the stick that is up represents the chromosome that is passed on to the baby. Record your alleles in the appropriate tables on page 3. Copy your partner's alleles as well.
   - If alleles are out of order pair up homologous alleles (e.g. A & a), even if the chromosome gene sequences were altered (e.g. inverted)
   - Leave blank spaces in the table if an allele was deleted.
   - Add duplicated alleles to gametes (ex: "QQ" in sperm would indicated a duplicated Q allele in the father's yellow autosome).
6. The decoding chart on page 2 indicates the phenotypic effect of each gene on the baby. The trait produced by each pair of alleles should be recorded in the data chart. Remember that a CAPITAL letter is dominant over a small letter [recessive] unless the decoding chart indicates those traits are codominant, sex-influenced, or sex-limited. The expression of a duplicated allele may be amplified (use your judgement about what makes sense). If a parent gamete was missing an allele, the baby will express a single gamete inherited from the other parent.
7. Draw and color your dragon to produce a picture of the baby that accurately shows its characteristics. Be creative! (You may use the back of the packet or add a separate page.)
8. Answer the Discussion Questions. No further lab report or analysis is necessary.

Your Name _____ Period_____
Partner's Name _____ Date _____

DECODING THE DRAGON GENOME

Chromosome	Dominant genes	Recessive genes
Green Autosome	A. no chin spike	a. chin spike
	B. nose spike	b. no nose spike
	C. three head flaps	c. four head flaps
	D. no visible ear hole	d. visible ear hole
	E. [see ✻ below]	
Red Autosome	F. long neck	f. short neck
	G. no back hump	g. back hump
	H. no back spikes	h. back spikes
	I. long tail	i. short tail
	J. flat feet	j. arched feet
Orange Autosome	K. red eyes	k. yellow eyes
	L. spots on neck	l. no spots on neck
	M. [see ✢ below]	
	N. no fangs	n. fangs
	O. spots on back	o. no spots on back
Yellow Autosome	P. no spots on thigh	p. spots on thigh
	Q. green body	q. purple body
	R small comb on head [see 🏯 below]	r. large comb on head [see 🏯 below]
	S. [See ☞ below]	
	T. [See ► below]	
Sex Chromosomes	U. regular thigh	u. pointed thigh
	V. four toes	v. three toes
	W. no chest plate	w. chest plate
X Chromosome Only	X. no. tail spike	x. tail spike
	Z. long arms	z. short arms
	+ non-fire breather	- fire breather
Y chromosome only	Y. male sex	

Codominant traits

✻ E. eye pointed at each end	e. round eye	Ee. eye round at front only
☞ S. Red spots	s. yellow spots	Ss. orange spots

Sex-influenced traits

✢ M. wings	m. no wings [dominant in presence of male hormone]
► T. no elbow spike	t. elbow spike [dominant in presence of male hormone]

Sex-limited traits

🏯 R or r Only males have the comb on the head.

modified from: http://serendip.brynmawr.edu/sci_edu/waldron/#dragon2 Ver 131107.2.7

Dragon Family Genome

Our Baby (Named _____)

Green Autosomes

	Genotypes		Alleles in		Trait:
	Mom	Dad	Egg	Sperm →	Determines: Phenotype of the baby
A					
B					
C					
D					
E					

Red Autosomes

	Genotypes		Alleles in		Trait:
	Mom	Dad	Egg	Sperm →	Determines: Phenotype of the baby
F					
G					
H					
I					
J					

Orange Autosomes

	Genotypes		Alleles in		Trait:
	Mom	Dad	Egg	Sperm →	Determines: Phenotype of the baby
K					
L					
M					
N					
O					

Yellow Autosomes

	Genotypes		Alleles in		Trait:
	Mom	Dad	Egg	Sperm →	Determines: Phenotype of the baby
P					
Q					
R					
S					
T					

Sex Chromosomes

	Genotypes		Alleles in		Trait:
	Mom	Dad	Egg	Sperm →	Determines: Phenotype of the baby
U					
V					
W					
X					
Z					
+					
Y					

modified from: http://serendip.brynmawr.edu/sci_edu/waldron/#dragon2

For Lab Quiz: be able to answer the following questions. You may use this lab handout on the Lab Quiz.

1. What is Mendel's Law of Segregation?

2. How does dropping the sticks and transcribing only 1 side of the stick model this law?

3. What is Mendel's Principle of Independent Assortment?

4. How does dropping the green, orange and red sticks illustrate this principle?

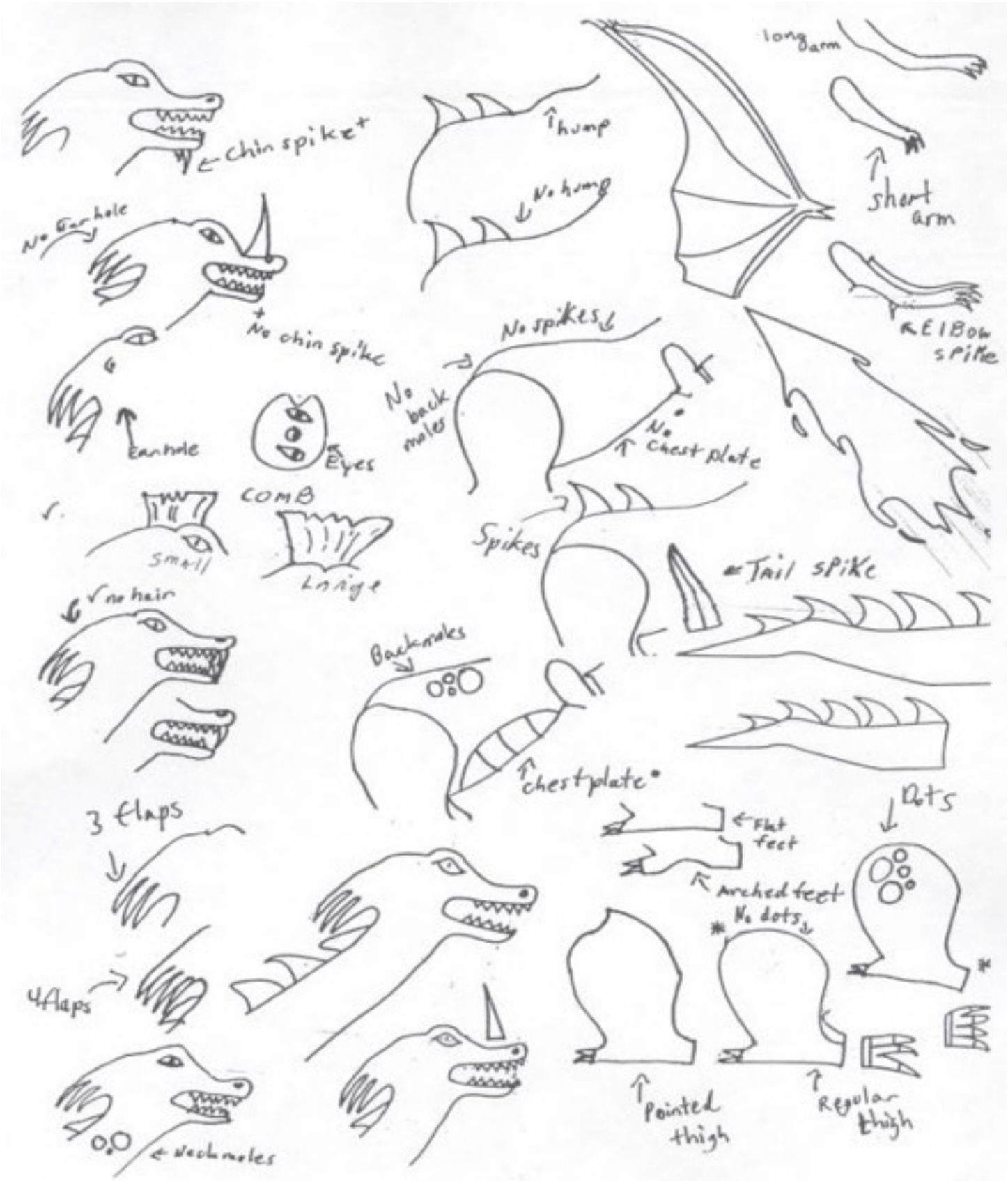
5. The gene for fangs is recessive, yet most of the dragons have fangs. How can a recessive trait be so common?

5. What is a "sex-linked trait"?

6. Which traits are sex-linked? Refer to "Decoding the Dragon Genome."

7 a. What traits are *more likely* to be found in males? [Consider sex-linked, sex-influenced and sex-limited traits.]

8 a. What traits are *more likely* to be found in females?



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