Genetics Review Questions

Scientists have been investigating the genetic makeup of the organisms in this community. Use the information provided and your knowledge of genetics to answer each question.

1. For each genotype below, indicate whether it is a heterozygous (He) OR homozygous (Ho).

TT _Ho_ Bb _He_ DD _Ho_ Ff _He_ tt _Ho_ dd _Ho_
Dd _He_ ff _Ho_ Tt _He_ bb _Ho_ BB _Ho_ FF _Ho_

Which of the genotypes in #1 would be considered purebred?
_TT, DD, tt, dd, ff, bb, BB, FF_

Which of the genotypes in #1 would be hybrids?
_Bb, Ff, Dd, Tt_

2. Determine the phenotype for each genotype using the information provided
Yellow body color is dominant to blue.
YY _yellow_ Yy _yellow_ yy _blue_

Square shape is dominant to round.
SS _square_ Ss _square_ ss _round_

3. For each phenotype, give the genotypes that are possible.
A tall head (T) is dominant to short (t).
Tall = _TT, Tt_ Short = _tt_

Pink body color (P) is dominant to yellow (p).
Pink body = _PP, Pp_ Yellow body = _pp_

4. Bob is heterozygous for his square shape, but Susie is round. Square shape is dominant to round. Create a Punnett square to show the possibilities that would result if Bob and Susie had children.

	S	s
s	Ss	ss
s	Ss	ss

A. List the possible genotypes and phenotypes for their children.
   Genotypes: _Sq_ , _sq_ _____

   Phenotypes: _Square , round_ _____

B. What are the chances of a child with a square shape? _2_ out of _4_ or _50_ %
C. What are the chances of a child with a round shape? _2_ out of _4_ or _50_ %

5. Patrick and Patti are both heterozygous for their pink body color (Pp), which is dominant over a yellow body color. Create a Punnett square to show the possibilities that would result if Patrick and Patti had children.

	P	p
P	PP	Pp
p	Pp	pp

A. List the possible genotypes and phenotypes for their children.
   Genotypes: _PP, Pp, pp_ _____

   Phenotypes: _Pink, yellow_ _____

B. What are the chances of a child with a pink body? _3_ out of _4_ or _75_ %

C. What are the chances of a child with a yellow body? _1_ out of _4_ or _25_ %

6. Everyone in Squidward's family has light blue skin, which is the dominant trait for body color in his hometown of Squid Valley. His family brags that they are a "purebred" line. He recently married a nice girl who has light green skin, which is a recessive trait. Create a Punnett square to show the possibilities that would result if Squidward and his new bride had children. Use B to represent the dominant gene and b to represent the recessive gene.

	B	B
b	Bb	Bb
b	Bb	Bb

A. List the possible genotypes and phenotypes for their children. All Bb, All light Blue.
B. What are the chances of a child with light blue skin? _100_ %
C. What are the chances of a child with light green skin? _0_ %
D. Would Squidward's children still be considered purebreds? Explain!
   No, all hybrids.

7. Assume that one of Squidward's sons, who is heterozygous for the light blue body color, married a girl that was also heterozygous. Create a Punnett square to show the possibilities that would result if they had children.

	B	b
B	BB	Bb
b	Bb	bb

A. List the possible genotypes and phenotypes for their children.

Genotypes: _BB, Bb, bb_

Phenotypes: _Light blue and light green_

B. What are the chances of a child with light blue skin? _75_%
C. What are the chances of a child with light green skin?_25_%

Incomplete Dominance

With **incomplete dominance**, a cross between organisms with two different phenotypes produces offspring with a third phenotype that is a blending of the parental traits.
It's like mixing paints, red + white will make pink. Red doesn't totally block (dominate) the white, instead there is *incomplete* dominance, and we end up with something in-between.

8. A mouse with black fur (BB) is crossed with a mouse with white fur (bb). All of the offspring in the F1 generation are grey (Bb). Use a Punnett square to show a cross between two grey mice.

	B	b
B	BB	Bb
b	Bb	bb

A. How many of their offspring will be black? _25%_
B. How many of their offspring will be white? _25%_
C. How many of their offspring will be grey? _50%_

Codominance

With **codominance**, a cross between organisms with two different phenotypes produces offspring with a third phenotype in which both of the parental traits appear together.

9. A purebred red flower (RR) is crossed with a purebred white flower (rr). All of the offspring have red flowers with white spots on them (Rr). Create a Punnett square showing a cross between a white flower and a red flower with white spots.

	r	r
R	Rr	Rr
r	rr	rr

A. What is the probability of the offspring being completely red? _0_
B. What is the probability of the offspring being completely red with white spots? _50%_
C. What is the probability of the offspring being completely white? _50%_

10. Draw a Punnett square showing a cross between a father with genotype Ao and a mother with genotype AB.

	A	o
A	AA	Ao
B	AB	Bo

A. What is the probablility that the child will have blood type O? 0%

B. What is the probablility that the child will be homozygous type O? 0%

C. What is the probablility that the child will have blood type A? 50%

Sex Linkage

Sex linkage is a pattern of inheritance in which traits are controlled by genes located on sex chromosomes. For example, the gene for colour blindness is a recessive allele and is located on the X chromosome. This means that females (XX) have two copies of the gene and males (XY) have only one copy.

11. The eye colour of fruit flies is the result of a sex-linked pattern of inheritance. In this pattern, the eye-colour gene is carried only on the X chromosome. Use the symbols below to answer questions (a) to (e).

Female = ♀   Male = ♂
X^R = red eye (dominant) X^r = white eye (recessive) Y = no eye-colour gene

a) Write the genotype for a female that is homozygous for red eye colour. $X^R X^R$

b) Write the genotype for a male whose eye colour is white. $X^r Y$

c) What is the sex and eye colour of a fly with the following genotype: $X_r X_r$?

Female with white eyes.

d) Fill in the Punnett square to show the cross between a female fruit fly that is heterozygous for eye colour and a male fruit fly that has red eyes.

	♂	
	X^R	Y
♀ X^R	$X^R X^R$	$X^R Y$
X^r	$X^R X^r$	$X^r Y$

e) What percentage of female offspring are likely to have red eyes and also be carriers of the white eye trait?

50% of female offspring have red eyes and are carriers for the white eye trait ($X^R X^r$)