Genetics problem set 3. Solution

1.

A) The appearance of 4 different colors and a classic dihybrid ratio of offspring make me suspect 2 genes control color in these bean plants.

B) Perhaps 2 genes control pigment:
The genotype A__ gives a yellow pigment: The genotype aa gives no yellow pigment
The genotype B__gives blue pigment: The genotype bb gives no blue pigment

If both yellow and blue are produced in the same bean plant, the beans appear green.

In the theoretical dihybrid cross:
AaBb X AaBb (both parents would appear green)

Theoretical offspring ratio:
9 : A__B__ (green due to yellow and blue pigment production)
3: A__bb (Yellow pigment only)
3: aaB__ (blue pigment only)
1: aabb (white)—due to lack of either yellow or blue pigment

C) If the strains were true breeding----Yellow X Blue (AAbb X aaBB)

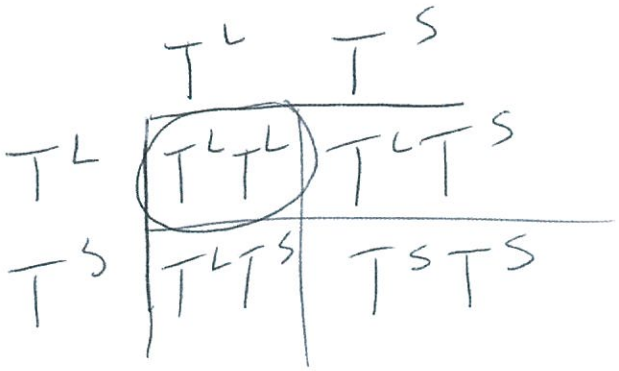
2. The ratio is similar to that seen in the example of lethal alleles.

T^L is dominant over T^s . When long tailed mice are bred, the offspring always include some short tailed mice, so the long tailed mice are not homozygous/true-breeding.

It appears that the T^L allele is a recessive lethal.

Long tailed mice are always heterozygotes.
$T^L T^S$ X $T^L T^S$ Should give 1: $T^L T^L$:2 $T^L T^S$: 1 $T^s T^S$

But $T^L T^L$ dies leaving 2 long tailed mice : 1 short tailed mouse for a theoretical ratio



(3) AaBb AaBb
Brown x Brown
↓

9 : 3 : 4 → 9 : 3 : 4
↓
indicates 2 genes and recessive epistasis

Brown : black : white

A_ → production of pigment
aa → no pigment (white)

B_ → pigment converted to brown
bb → pigment converted to black

9 ... A-B_ — brown
3 ... A_ bb — black
3 ... aa B_ — white
1 ... a a bb — white

* Parents of litter of brown mice found in March ≥

AABB x aabb
(brown) (white)

or

AABbb x aa BB
(Black (White)

4. The alleles for color of scales seem to show co-dominance.
Fish showing both colors of scales are assumed to be heterozygous and should produce a ratio of offspring. 1 all silver: 2 silver and gold : 1 all gold

5.

- Only son 1 with type B and daughter 2 with type A could be the biological children of this couple.
- Daughter 1 could be the father's child from a previous marriage. The mother of Daughter 2 would have had to have A, B, or AB blood type.
- Son 2 could be a child from the mother's previous marriage. The father of Son 2 could have been type A or B (if he is heterozygous), or O blood type.

White x White

↓

Pink x Pink

↓

9 : 7

Pink White

} resembles Complementary Gene action!

2 genes - A : B

- one dom allele of each results in Pink

A a B b = Pink bunnies

parents were AA bb (White) USA x aa BB (White) Canada

↓

Aa Bb (Pink)

↓

9 A - B - - Pink

3 A - b b

3 a a B -

1 a a b b } White

7

White ♀ × wt ♂

$X^{w}X^{w}$ × $X^{W}Y$

↓

(all females red eyed)

♀ Ww = red — 50 red-eyed females

(all males white eyed)

♂ wY = white — 50 white eyed males

8

♀ × ♂

? × $X^{w}Y$

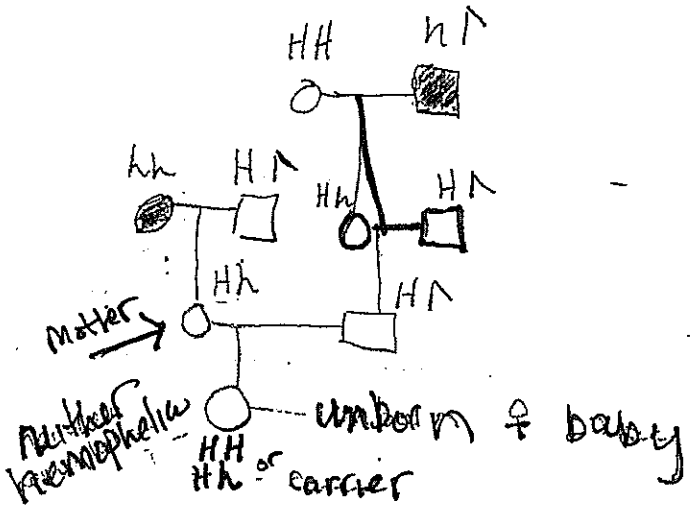
↓

♀	♂
1: WW	1: WY
1: Ww	1: wY

♀ = $X^{W}X^{w}$ → She had red eyes.

?

9



* Since the baby's father is not hemophiliac the baby has received an X chrom with the Hh allele from him. The baby could have received a mutant or a Hh allele from her mother → The baby WILL NOT have hemophelia but could be a carrier. Future ♂ children have 50% chance of having hemophelia.