GENETICS PROBLEM SET 1 KEY

1) Y = yellow body $\bar{Y}$ = ebony body

W = wt wings $\bar{w}$ = vestigial wings

P: $\bar{w}\bar{w}\bar{Y}\bar{Y}$ × $WWYY$

F_1: $W\bar{w}\,Y\bar{Y}$ × self

① To do a two-gene cross, first determine all possible allele combinations for each parent: $W\bar{w}\,Y\bar{Y}$

WY
$W\bar{Y}$
$\bar{w}Y$
$\bar{w}\bar{Y}$

② Set up a Punnet Square, & each allele combination getting its own row or column

F_2: (since you need to show genotypes, you must show punnet square)

	WY	$W\bar{Y}$	$\bar{w}Y$	$\bar{w}\bar{Y}$
WY	$WWYY$	$WW\bar{Y}Y$	$W\bar{w}YY$	$W\bar{w}Y\bar{Y}$
$W\bar{Y}$	$WWY\bar{Y}$	$WW\bar{Y}\bar{Y}$	$W\bar{w}Y\bar{Y}$	$W\bar{w}\bar{Y}\bar{Y}$
$\bar{w}Y$	$W\bar{w}YY$	$W\bar{w}Y\bar{Y}$	$\bar{w}\bar{w}YY$	$\bar{w}\bar{w}Y\bar{Y}$
$\bar{w}\bar{Y}$	$W\bar{w}Y\bar{Y}$	$W\bar{w}\bar{Y}\bar{Y}$	$\bar{w}\bar{w}Y\bar{Y}$	$\bar{w}\bar{w}\bar{Y}\bar{Y}$

③ Since it is a true dihybrid, the offspring will be in the 9:3:3:1 ratio.

9: wt wings, Yellow bod,
3: wt wings, ebony bod,
3: vestigial wings, Yellow bod,
1: vestigial wings, ebony bod,

2) R = red, $\bar{r}$ = yellow fruit
T = tall, t = short plant

P: $\underset{\text{pure red dwarf}}{RRtt}$ × $\underset{\text{yellow, pure tall}}{\bar{r}\bar{r}TT}$

F_1: $R\bar{r}Tt$

F_2: 9/16 Red, tall 3/16 Red, short
3/16 Yellow tall 3/16 Yellow, short

3) $\underset{\text{MOM}}{P\bar{p}Tt}$ × $\underset{\text{DAD}}{tt}$

$P\bar{p}tt$ × $\bar{p}\bar{p}Tt$

The grandparents tell you that mom and dad are heterozygous for the dominant trait.

	Pt	$\bar{p}t$
$\bar{p}T$	$P\bar{p}Tt$	$\bar{p}\bar{p}Tt$
$\bar{p}t$	$P\bar{p}tt$	$\bar{p}\bar{p}tt$

You would see children of all combinations.

4) Since the syndactyl mule-foot trait is dominant, mating only cloven-hoofed pigs will keep this trait pure-breeding.

Belted is dominant, so to ensure a pig is true-breeding you could mate your questionable belted pig with a solid pig. If any of the piglets are solid, the belted-pig must be heterozygous.

5) Black = FF C– = rose comb
Blue = Ff c̄c̄ = single comb
white = ff

ff Cc̄ (♂) × Ff c̄c̄ (♀)

	Fc̄	fc̄
C	FfCc̄	ffCc̄
c̄	Ffc̄c̄	ffc̄c̄

Blue, rose white, rose
Blue, single white, single

6) Because two deaf parents had a hearing daughter, this form of deafness is dominant.

Case I: deaf suitor

dd (♀) × D– (♂)

Best case scenario, D a heterozygous father (most statistically probable case) there is a 50% chance of having a deaf child

	D	d
d	Dd	dd

CASE II: hearing suitor

dd (♀) × DD (♂)

0% chance of deaf children.