GENETIC PROBLEMS II

SOLUTIONS

Genetic Problems

II

Solutions

B = BLACK L = SHORT
b = WHITE l = LONG

#1

a) BBLL x bbLL
↓
BbLL

GENO 1:0
BbLL

PHENO 1:0
ALL BLACK, SHORT

b) BbLL x bbLl
↓

	bL	bl
BL	BbLL	BbLl
bL	bbLL	bbLl

1:1:1:1

~~1:1~~
~~BLACK SHORT~~ 50%
white, short 50%

c) BbLL x BBLl
↓

	BL	Bl
BL	BBLL	BBLl
bL	BbLL	BbLl

1:1:1:1

1:0
ALL BLACK, SHORT

#2

B = Black L = Short
b = White l = Long

a) ot x o→

3B_ll
1 bbll
2 bbL_

→ B b L l x b b l l

Low Confidence

) ot x o→

39 B_ L_
19 B_ l l

B B L l x B b l l

Low Confidence

) ot x o→

19 bbll

b b l l x b b l l

High Confidence

#3 [illegible]

a) A [illegible]

Black Short ? x White Long

B... L... x bb ll

If White Short up in offspring Then Bb (Carrier) for Black Coated Pic. If Long Short up Then Short Hair (Carrier) Ll. The Most offspring produced The Most Information you can Get.

#4 (?) (bbll)

IF Black Short Hair x White Long Hair

a) And 47 offspring Black Short Then BBLL

) And 12 Black Short And 1 White Long. BbLl

) And 27 Black Short And 1 White Short Then BbLL

#5 B = Black L = Short
b = brown l = Long

Dihybrid Cross BbLl x BbLl

a) 1 Black, Short $(3/4)(3/4) = 9/16$

b.) BS BS LL LL

$(3/4)(3/4)(3/4)(3/4)(1/4)(1/4)(1/4)(1/4) =$

$(9/16)\ (9/16)\ (1/16)\ (1/16) = 81/65,536 = 0.1\%$

c) ~~You can have this one~~

3 Black Long Hair, 1 Hair, Mice

$(3/4)\ (3/4)\ (1/2) = 9/32$

$(9/32)(9/32)(1/32) = 729/32,768 = 2\%$

d.) BLF, WLM

$(3/4)(3/4)(1/2)(1/4)(3/4)(1/2) = \frac{27}{1024} = 2.6\%$

#6

B = Black L = Short
b = white l = Long

Cross Hybrids Bb × Bb Ll × Ll

a) BBL $(3/4)(3/4)(1/4) = 9/64$
BLB $= 9/64$
LBB $= 9/64$
$+$
$27/64 = 42\%$

b) BS BS w w = $(3/4)(3/4)(3/4)(3/4)(1/4)(1/4) = 81/4096$
w w BS BS $= 81/4096$
BS w w BS $= 81/4096$
w BS BS w $= 81/4096$
w BS w BS $= 81/4096$
BS w BS w $= 81/4096$
$+$
$486/4096 = 12\%$

c) MBS MBS FWL $(1/2)(3/4)(3/4)(1/2)(3/4)(3/4)(1/2)(1/4)(1/4) = 81/32,768$
MBS FWL MBS $81/32,768$
FWL MBS MBS $81/32,768$
$+$
$243/32,768$

#7 AA = B = Short

Aa = Cream b = Long

aa =

* Now that I know it is incomplete dominance I would use a symbol system C^Y C^W

Dihybrid Cross = $Aa\,Bb \times AaBb$

↓

(Yellow, Short)
(Cream, Short)
(White, Short)
OR
(Yellow, Long)
(Cream, Long)
(White, Long)

← Incomplete Dominance in Hair color

Complete Dominance in Hair Length

#8 L = Short C^YC^Y = Yellow

l = Long. C^YC^W = Cream

C^WC^W = White

a.) $C^YC^YLL \times C^WC^Wll$

Geno 1:0 C^YC^WLl

Pheno 1:0 All Cream, Short

b.) $C^YC^WLl \times C^WC^Wll$

	C^YL	C^Yl	C^WL	C^Wl
C^Wl	C^YC^WLl	C^YC^Wll	C^WC^WLl	C^WC^Wll

Geno 1:1:1:1

Pheno 1:1:1:1 CL CS WL WS

c.) $C^YC^WLl \times C^YC^YLl$

	C^YL	C^Yl	C^WL	C^Wl
C^YL	C^YC^YLL	C^YC^YLl	C^YC^WLL	C^YC^Wll

Geno 1:2:1:1:2:1

Pheno 3:1:3:1 YS : YL : CS : C

#9

DD = NORMAL (KORBY)
Dd = SHORT LEG. (DEXTER)
dd = LETHAL

P = NO HORNS
p = HORNS

a) DdPp x DdPp

	DP	Dp	dP	dp
DP	DDPP	DDPp	DdPP	DdPp
Dp	DDPp	DDpp	DdPp	Ddpp
dP	DdPP	DdPp	X	X
dp	DdPp	Ddpp	X	X

NORMAL HORNS 1
NORMAL NO HORNS III
SHORT LEG HORNS II
SHORT LEG NO HORNS IIII
I

1:3:2:6

b) DdPp x Ddpp

	DP	Dp	dP	dp
Dp	DDPp	DDpp	DdPp	Ddpp
dp	DdPp	Ddpp		

NORMAL NO HORNS I
NORMAL HORNS I
SHORT HORNS II
SHORT NO HORNS II

1:1:2:2

c) DDpp x DdPP

	DP	dP
Dp	DDPp	DdPp

NORMAL NO HORNS
DEXTER NO HORNS

1 : 1

1C

AA = Ripe CC = Deep Cut MM = 2 [illegible]
Aa = Ripe Cc = Deep Cut Mm = 2 [illegible]
aa = Green cc = Smooth mm = [illegible]

1) AAccMM x aaCCmm

↓

AaCcMm → All Ripe, Deep Cut, Browned

2) AaCCMM x Aaccmm

3 : 1

	Acm	acm
ACM	AACcMm	AaCcMm
aCM	AaCcMm	aaCcMm

3 Ripe, Deep Cut, Browned
1 Green, Deep Cut, Browned

3) AACCMm x AaCcmm

	ACM	ACm
ACm	AACCMm	AACCmm
Acm	AACcMm	AACcmm
aCm	AaCCMm	AaCCmm
acm	AaCcMm	AaCcmm

4 Ripe, Deep Cut, Browned
4 Ripe, Deep Cut, [illegible]

1 : 1

#11 Gray = e^+ Vestigial = vg

Ebony = e Normal = vg^+

a) $e^+e\ vg^+vg \times e^+e\ vg^+vg$

9:3:3:1 Ratio (*Memorized)

1/D $(9/16)\ 256 = 144$ Gray Normal

1/R $(3/16)\ 256 = 48$ Gray Vestigial

1/D $(3/16)\ 256 = 48$ Ebony Normal

1/R $(1/16)\ 256 = 16$ Ebony Vestigial

b) $e^+e\ vg^+vg \times ee\ vgvg$

1:1:1:1 Ratio (*Memorized)

1/D $(1/4)\ 312$

1/R $(1/4)\ 312$ 78 of Each

1/D $(1/4)\ 312$

1/R $(1/4)\ 312$

Gray Normal
Gray Vestigial
Ebony Normal
Ebony Vestigial

c) $vg^+e^+ \quad vg\ e^+$

e^+	$vg^+vge^+e^+$	$vgvge^+e^+$
e	vg^+vge^+e	$vgvge^+e$

Gray Normal
Gray Vestigial

1:1

#12

a.) ABC
ABc

b.) aBC
aBc
abC
abc

#13

a.) AaBbccDd
2·2·1·2 = 8 DIFF. GAMETES.

b.) AABbCcddEeFf = 16 " "
1·2·2·1·2·2

c.) AaBbCCddEeFfGgHh = 64 " "
2·2·1·1·2·2·2·2

#14

LL = LONG KK = RED
L'L' = ROUND R'R' = WHITE
L'L = OVAL RR = PURPLE

1.) L L' R' R x L L R' R

16 LLR'R' 15 LLRR
31 L'LR'R 17 L'LRR
16 L'LR'R' 32 LLR'R

) L' L' R' R x L' L' R' R

103 L'L'R'R
56 L'L' RR
47 L'L' R'R'

) L' L' R' R' x L L R R

212 L'LR'R

#15

i) AaBbCcDd x aabbccdd

2·2·2·2 = 16 phenotypes.

* Treat this as 4 individual crosses
ex) Aa x aa = 2 possible phenotypes.
So. . . .

) AaBbCc x AabbCc *

2·2·2 = 8 phenotypes.

) AaBbCcDD x AabbCCDd

2·2·1·1 = 4 phenotypes.

#16

i) AaBbCcDdEe x AaBbCcDdEe

3·3·3·3·3 = 243 possible genotypes.

.) AaBbCc x AabbCc

3·2·3 = 18 genotypes.

) AaBbCcDd x AabbCCDd

#17

a) $G^1G^2H^1H^2J^1J^2 \times G^1G^2H^1H^2J^1J^2$

$3 \cdot 3 \cdot 3 = 27$ phenotypes

b) $G^1G^2H^1H^2J^1J^2 \times G^1G^1H^1H^2J^1J^2$

$2 \cdot 3 \cdot 3 = 18$ phenotypes

c) $G^1G^2H^2H^2J^1J^2K^1K^2 \times G^1G^1H^1H^2J^1J^2K^1K^2$

$2 \cdot 1 \cdot 3 \cdot 3 = 18$ phenotypes

#18

a) $AaH^1H^2 \times aaH^1H^1$

$2 \cdot 2 = 4$ phenotypes.

b) $AaH^1H^2J^1J^2 \times AaH^1H^2J^1J^2$

$2 \cdot 3 \cdot 3 = 18$ phenotypes.

c) $aaH^2H^2J^1J^2Mm \times AaH^2H^2J^1J^2Mm$

#19

Alexandria White Eye

A^A
$A a^n$
$A a$

Normal Yellow Eye

$a^n a^n$
$a^n a$

Akee yellow Eye

aa

#20 Where $M^r > M > m$

a)

	M^r	M^r
M^r	$M^r M^r$	$M^r M^r$
M	$M^r M$	$M M$

Geno 1:1

Pheno 1:0
All Restricted Maroons

)

	M^r	M
M^r	$M^r M^r$	$M^r M$
m	$M^r m$	$M m$

Geno 1:1:1:1

Pheno 3:1
Restricted Maroons : Maroons

)

	M^r	m
M	$M^r M$	$M m$
m	$M^r m$	$m m$

Geno 1:1:1:1

Pheno 2:1:1