Learning Genetics Can Be Fun - Solutions

1. a) tG (b) TG, tG (c) TG, Tg, tG, tg (d) TG, Tg

2. a) genotype (b) gamete (c) genotype (d) gamete

3. Two black dogs could be homozygous black (BB) or heterozygous black (Bb). Yellow must be homozygous, therefore cannot be the same genotype as black.

4. P Cc x Cc — Both parents are normal but carry the allele for CF.
   F_1 CC, Cc, Cc, cc — One in four children will inherit it.

5. a) P Rr x rr
   b) R, r and r, r
   c) F_1 Rr, Rr, rr, rr — 1 round:1 wrinkled
   d) F_2 RR, Rr, Rr, rr — 3 round:1 wrinkled

6. P Ll x ll
   F_1 Ll, Ll, ll, ll — 1 long:1 short

7. P T_ x tt — - almost 1:1 therefore unknown parent must be heterozygous.
   F_1 327 tall: 321 shortNote: homozygous (TT) would give ALL tall plants in F_1.

8. The presence of all smooth in the offspring means smooth is dominant.
   P SS x ss
   F_1 Ss
   F_2 3:1

9. a) P Ss x Ss
   F_1 SS, Ss, Ss, ss
   b) P S_ x _ _

The female must be heterozygous as she produced non-spotted pups. The unknown male must be homozygous recessive (ss). If he were homozygous dominant, all pups would be spotted. If he were heterozygous, you would expect a 3:1 ratio in pups.

10. (i) P T_ x tt
    F_1 tt
    (ii) P T_ x tt
    F_1 Tt
    (iii) P T_ x Tt
    F_1 tt

The male must be heterozygous (Tt) to be able to produce both trotters and pacers. If he were homozygous dominant he would produce only trotters.

11. Normal woman Pp (must be heterozygous because father was albino)
Husband pp
Husband's parents both Pp
Children Pp, Pp, pp

12. Perform a test cross. W_ x ww

13. a) P ggFf x G_Ff
F_1 Ggff
b) We would need a mermaid to be born with blue hair. This would tell us that the mother is heterozygous.

14. B - black; b - white; S - short; s - long
a) P BBSs x bbss
F_1 BbSs, Bbss 1 black, short:1 black, long

b) P BbSs x bbss
F_1 BbSs, Bbss, bbSs, bbss 1 black, short:1 black, long: 1 white, short:1 white, long

c) P BBss x BbSs
F_1 BBSs, BBss, BbSs, Bbss 1 black, short:1 black, long

d) i) (a) 1/2 (b) 1/4 (c) 1/2
ii) (a) 1/2 (b) 1/4 (c) 1/2
iii) (a) 0 (b) 1/4 (c) 0

15. B - black; b - white; S - solid; s- spotted

		male		female
a)	P	B_S_	x	bbS_
	F_1	2 BbS_ , 2 bbS_		

Some white pups so the male must be Bb. The absence of any non-spotted pups suggests that female A is SS but we can’t say for sure.

b) P BbSs x B_S_
F_1 bbss the presence of white, non-spotted pups means that female B must be BbSs

c) BbSs x bbss
F_1 bbSs , bbss , BbSs , Bbss
The genotype of female C can be determined from her phenotype.

16. P Pp x Pp
F_1 PP, Pp, Pp, pp chance of PKU is 1/4

17. P Bb x Bb
F_1 BB, Bb, Bb, bb
a) 1/4 (b) 1/4 (c) 1/2
d) 1 homozygous brown:2 heterozygous brown:1 homozygous blonde. Phenotype: 3 brown:1 blonde
e) not possible because blonde (b) is recessive
f) P Cc x cc
F_1 Cc, cc 1/2 of offspring will have curly hair.
g) 1/2
h) No. Straight is recessive.

18. Parents are AaBbCC x AabbCc
P (AAbbCc) = P(AA) x P(bb) x P(Cc)
P(AA) = 1/4

P(bb) = 1/2
P(Cc) = 1/2
P (AAbbCc) = 1/4 x 1/2 x 1/2 = 1/16

19. S^R - round; S^L – long
P S^RS^R x S^LS^L
F_1 S^RS^L, S^RS^L, S^RS^L, S^RS^L
P S^RS^L x S^RS^L
F_2 S^RS^R, S^RS^L, S^RS^L, S^LS^L (incomplete dominance)

20. P Aa x Aa
F_1 AA, Aa, Aa, aa - 1/4 unaffected, 1/2 affected with sickle cell trait, 1/4 affected with sickle cell disease

21. C^RC^R - chestnut; C^MC^M - cremello; C^MC^R - palomino
P C^MC^R x C^MC^M
F_1 C^MC^M, C^RC^M 1 cremello:1 palomino

22. P F^RF^W x F^RF^W
F_1 F^RF^R, F^RF^W, F^RF^W, F^WF^W
a) 1/2 pink
b) 1/4 red
c) 1/4 white
d) 1:2:1

23. woman $I^B\_$ x man $I^A\_$
F_1 ii is possible if mother and father were both heterozygous. The facts are inconclusive.

24. P ii x I^AI^B
F_1 I^Ai, I^Bi

AB female could produce AB offspring if the male were type A, B, or AB; she could never produce type O in F_1 because she always donates either A or B.

25. Parents 1
$I^A\_$ x $I^B\_$
F_1 only parents capable of producing type AB (Baby 3)

Parents 2
ii x ii
F_1 only type O (Baby 4)

Parents 3
I^AI^B x ii
F_1 these parents can produce babies of type A or B but only one baby remains (Baby 1)

Parents 4
$I^B\_$ x $I^B\_$
F_1 these parents cannot produce a type A baby (Baby 2)

26. a) P C^hC^a x C^aC^a
F$_1$ C^hC^a, C^aC^a 1 himalayan:1 albino

b) P CC^a x $C^{ch}C^a$
F$_1$ 2 $C\_$, $C^{ch}\_$, C^aC^a

c) P $C^{ch}C^{ch}$ x $C^{ch}C^a$
F$_1$ $C^{ch}C^{ch}$, $C^{ch}C^a$ 1 chinchilla:1 light gray

d) P $C^{ch}\underline{C^h}$ x C^aC^a test cross
F$_1$ 5 $C^h\underline{C^a}$, 5 $C^{ch}\underline{C^a}$

27. a) 4 children
b) A is Dd, B is Dd
c) M is dd, N is dd

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