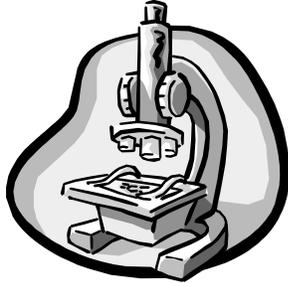


Science 10-Biology
Activity 17
Worksheet on More Complex Genetics



10

Name _____

Due Date _____

Show Me Hand In

Correct and Hand In Again By _____

NOTE: This worksheet is based on material from pages 398-404 in Science Probe.

1. Explain why Mendel was either very careful or very lucky in his research.

2. Are most human genes as simple as the ones Mendel studied on peas? _____

3. In *incomplete dominance*, individuals that are *heterozygous* are _____ than each homozygous parent, instead of being like one of them.

4. In incomplete dominance, neither allele is completely _____.

5. If a purebred red carnation is crossed with a purebred white carnation, what are the offspring like? _____

6. A gene with more than two alleles is said to have _____ alleles.

7. Even if a gene has more than two possible alleles, an individual can only possess _____ of these alleles -- one on each chromosome of a homologous pair.

8. List the four human blood types: _____

9. What is meant by an *antigen*? (Use glossary or index.) _____

10. Your blood type depends on which antigen is present on the surface of your _____ blood cells.

11. Fill in the following table:

Blood Type	Antigens

12. The gene that controls blood type is assigned the letter _____.

13. The three different alleles of the “I” gene are _____

14. Which of the alleles in question 13 are *recessive*? _____

15. Fill in the following chart, thinking about it as you do so!

Genotype	A antigen (+ or -)	B antigen (+ or -)	Phenotype

16. Does the I^A allele dominate over the i allele? _____

17. Does the I^B allele dominate over the i allele? _____

18. What happens when an individual has both the I^A and the I^B allele? _____

19. What happens when an individual has neither the I^A nor the I^B, but only two i's?

20. Explain what happens to alleles which have *codominance*. _____

21. The gene for coat colour in rabbits (C), has _____ different alleles.

22. Labrador retrievers have two genes that control coat colour, _____ and _____.

23. The E allele is dominant over the e, the B and the b. The E allele causes a _____ colour coat. For this reason, all genotypes which contain the E allele will result in a phenotype with a _____ coat colour. (See table 17.5 on page 401.)

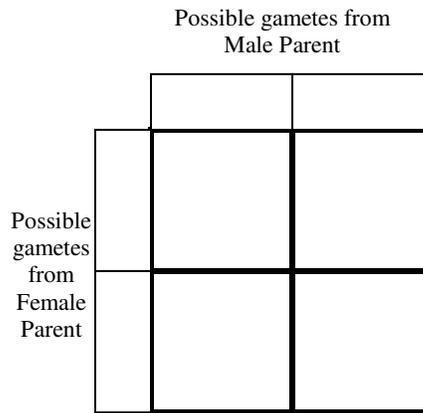
24. For the Labrador retriever, what two genotypes result in a black coat? _____ or _____. This is because the _____ allele is dominant over the _____ allele and the _____ allele. The only genotype which results in a brown coat is _____. This is because this genotype does not contain the _____ (*gold*) or the _____ (*black*) allele. Looking at the table, just by chance, you could say that most Labrador retrievers are probably _____, a few are _____ and very few are _____ in colour.

25. Do genes usually act on their own, or do they usually interact with other genes?

26. Is human height controlled by a simple gene, or many genes? _____

Is it possible to accurately predict the adult height of a child if the heights of both parents are known? _____ Explain your answer. _____

27. Human females have _____ X chromosomes, while human males have an _____ and a _____ chromosome.
28. Since the phenotype of a female is XX, during meiosis, all gametes produced by the female contain an _____ chromosome.
29. Since the phenotype of a male is XY, _____ the male gametes will receive an _____ chromosome and _____ will receive a _____ chromosome.
30. Draw a Punnett square showing the X and Y chromosomes of a cross between a female (XX) and male (XY) human.



What fraction of the offspring will be female? _____. What fraction are male? _____

31. Which contains more genes, the X chromosome or the Y chromosome? _____
32. The gene for colour-blindness is carried on the _____ chromosome. There is no matching allele on the _____ chromosome. People with the *dominant* allele for colour vision will have _____ colour vision, while people with only the recessive allele will be _____
33. In order to be colour-blind, a female (with two X chromosomes) must have the _____ allele on both chromosomes. If she have the dominant allele on just one chromosome, she will _____ be colour-blind.

34. Males only have one X chromosome, so if they inherit the recessive allele, they _____ be colour-blind. (They do not have another X chromosome which could carry the dominant (normal colour vision) allele).
35. Males have _____ times the chance of being colour-blind as females.
36. Characteristics which are controlled by genes on the sex (X & Y) chromosomes are called _____ traits. Since most of these traits are found on the X chromosome, they are usually exhibited by _____, who do not have another X chromosome which could carry a dominant allele to cancel the effects of a recessive one. Females are usually _____ of these traits because they have the recessive allele (which they could pass on to an offspring) on one X chromosome, but also the dominant allele on the other _____ chromosome, which cancels the effects of the recessive one. If the recessive allele is passed onto a male offspring, the male will exhibit the recessive trait.
37. What is the major symptom of *hemophilia*? _____

38. Why did the Royal Family have such a high incidence of hemophilia? _____

39. Hemophiliacs have a greater incidence of AIDS and Hepatitis C than the normal population. Suggest why. _____

40. About how many different genes do humans have in all their chromosomes? _____
 See <http://www.exn.ca/Stories/2000/06/26/53.asp>
41. What is one way that identifying human genes may help people with ailing organs in the future? See: <http://www.cbsnews.com/stories/2002/10/21/tech/main526411.shtml>

42. Coat color in cats is a codominant trait and is also located on the X chromosome. Cats can be black, yellow or calico. A calico cat has black and yellow splotches. In order to be calico, the cat must have an allele for the black color (X^B) and an allele for the yellow color (X^Y).

- a) A black male's genotype is _____ b) A yellow male's genotype is _____
- c) A black female's genotype is _____ d) A calico female's genotype is _____
- e) Is a calico male possible? _____

f) A yellow male is crossed with a black female. Use a punnett square to determine the possible genotypes of the offspring.

g) About what fraction of the offspring will be black? _____

h) About what fraction of the offspring will be yellow? _____

i) All of the females will be (black, yellow, calico?) _____

j) A calico female is crossed with a black male. Use a punnett square to determine the possible genotypes of the offspring.

k) Half the females would be _____ and half would be _____

l) Half of the males would be _____ and half would be _____

43. A female who is a carrier for hemophilia would have the genotype ($X^H X$). A male without hemophilia (normal) would have the genotype (XY). Use punnett squares to fill in the blanks on the following table:

Mother	Father	Child's Chance of Hemophilia
Carrier (possesses hemophilia gene)	Normal clotting factor genes	____ percent chance son will have hemophilia. ____percent chance daughter will be a "carrier."
Normal clotting factor genes	Hemophilia	Son has a _____ percent chance of hemophilia Daughter has a _____percent chance of being a carrier
Carrier	Hemophilia	Son has a _____percent chance of hemophilia Daughter may develop hemophilia (Rare)

Use the next page for Punnett squares.