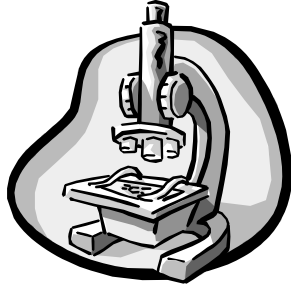


Science 10-Biology

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.

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

- Are most human genes as simple as the ones Mendel studied on peas? _____
- In *incomplete dominance*, individuals that are *heterozygous* are _____ than each homozygous parent, instead of being like one of them.
- In incomplete dominance, neither allele is completely _____.
- If a purebred red carnation is crossed with a purebred white carnation, what are the offspring like? _____
- A gene with more than two alleles is said to have _____ alleles.
- 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.
- List the four human blood types: _____
- 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.)

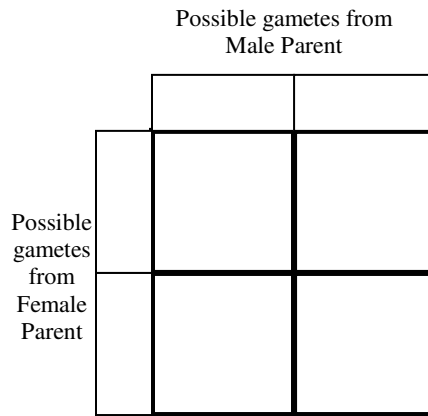
24. For the Labrador retriever, what two genotypes result in a black coat?
 _____ or _____. This is because the _____ allele is
 dominant over the _____ allele and the _____ allele. The only genotype which
 results in a brown coat is _____. This is because this genotype does not
 contain the _____ (*gold*) 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.