Name: Key

Study Guide

Chapter 7: Tracking Traits

Vocab: Provide a definition for each of the following terms **and** include the term in a sentence that demonstrates your understanding of that term.

Dominant
Recessive
Alleles
Genotype
phenotype (expressed trait)
Homozygous
Heterozygous
Hybrids
DNA
Chromosomes
Autosomes
Sex chromosomes
Gametes
Meiosis
Diploid
Haploid
Zygote
Mitosis
Law of independent assortment
Karyotype
Punnett square
Sex linked
Heredity
Monohybrid cross
Dihybrid cross
P generation
F_1 generation
F_2 generation
Incomplete dominance
Codominance
Sexual reproduction
Asexual reproduction
Sister chromatid,
Homologous chromosomes
Crossing over
Law of segregation of alleles
Carrier
Pedigree chart

Review Questions:

Lesson 1: It Runs in the Family:

1. What is the difference between "acquired characteristics" and traits that are inherited?

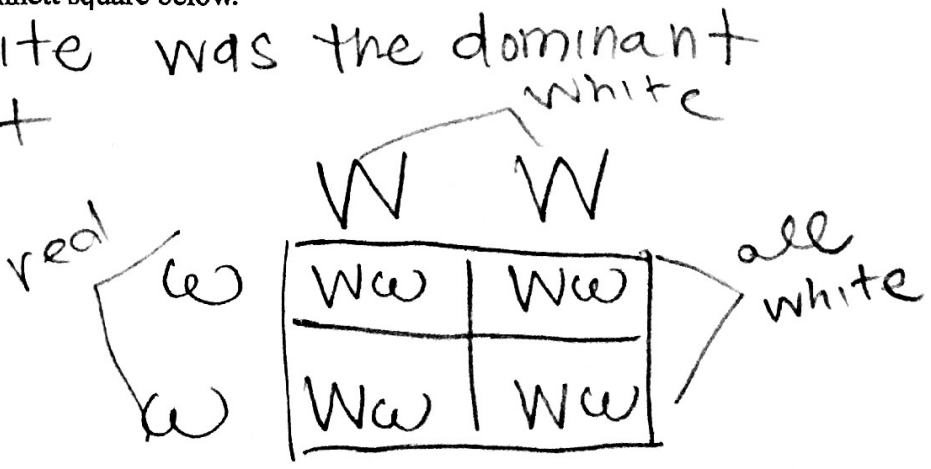
Traits that are inherited are passed on chromosomes from parents to offspring. Acquired traits are not coded for in genes and not passed on. Ex: learned skill

Lesson 2: What Shows Up?

2. Explain why when we crossed the red yeast with the white yeast the offspring were only white. Demonstrate your answer with a Punnett square below.

W = White
w = red

White was the dominant trait



Lesson 3: How do we get our traits?

3. Who was Gregor Mendel and why is he considered the founder of modern genetics?
He was a Monk that studied heredity in pea plants. He is responsible for laws of heredity. He coined the terms "dominant" and recessive". Described "factors" of inheritance, now called genes

4. Circle the genotypes below that would be considered heterozygous:

(Aa) BB cc DD (Ee) ff (Gg) HH

5. In pea plants, having a smooth pod shape is dominant to a constricted pod. What are the possible genotypes for having a smooth pod? SS, Ss What about constricted? ss
S = smooth
s = constrict

6. What is the difference between genotype and phenotype?
Genotype is the two alleles that an organism has for a trait. Ex: GG, Gg, gg. Phenotype is the physical feature resulting from a genotype. Ex: tall, short

Lesson 4: All About Alleles

7. In Flowers, long Anthers (L) is dominant to short anthers (l). Cross a homozygous recessive and a heterozygous flower to give offspring. Show your work in a Punnett Square. Also, indicate the genotypic and phenotypic ratios for this cross. L = long l = short

Ll ll

	l	l
L	Ll	Ll
l	ll	ll

2 Ll : 2 ll
2 Long : 2 short

8. In most mammals, brown/dark eyes are dominant over blue eyes. Is it possible for 2 brown eyed parents to produce blue-eyed offspring? Is it possible for 2 blue-eyed parents to produce brown-eyed offspring? Show your work to make your point. D = dark/brown d = blue

yes!

	D	d ← brown eyed parents
D	Dd	Dd
d	Dd	dd ← blue eyed child

9. In chupacabras, wide stripes are dominant to narrow stripes. If two wide-striped chupacabras mate and they have both wide AND narrow striped offspring, what is the genotype of the parents? Show your work to prove your point.

parents: both Ww

	W	w
W	WW	Ww
w	Ww	ww

← wide striped offspring

← narrow striped offspring

Can't be WW. This would result in all wide striped offspring.

10. If you have a wide striped chupacabra and want to know if it is homozygous or heterozygous-what could you cross it with to be sure? (Show your work)

cross it with a narrow striped chupacabra (ww)

	W	w
w	Ww	ww
w	Ww	ww

if some narrow stripes, then parent is heterozygous

	W	W
w	Ww	Ww
w	Ww	Ww

if all wide stripe, parent is homozygous Dominant

11. Set up a Punnett square using the following information:

- Dominate allele for purple corn kernels = R
- Recessive allele for yellow corn kernels = r
- Dominate allele for starchy kernels = T
- Recessive allele for sweet kernels = t

What would the phenotype(s) of the F1 generation be if a cross was made between a pure breeding purple starchy kernel corn plant and a yellow sweet kernel corn plant? Show your work below.

RRTT → gametes → RT

rrtt → gametes → rt

	rt
RT	RrTt

offspring phenotype: Purple Starchy

Next cross the offspring of the F1 generation (determined above) with itself. Show your work for this dihybrid cross below

Male genotype: RrTt Possible gametes: RT Rt rT rt

Female genotype: RrTt Possible gametes: RT Rt rT rt

	Rt	Rt	rT	rt
RT	RRTT	RRTt	RrTT	RrTt
Rt	RRTt	RRtt	RrTt	Rrtt
rT	RrTT	RrTt	rrTT	rrTt
rt	RrTt	Rrtt	rrTt	rrtt

a. What is the probability of producing purple, starchy corn kernels? 9/16

Possible genotype(s)? RRTT, RRTt, RrTT, RrTt,

b. What is the probability of producing yellow, starchy corn kernels? 3/16

Possible genotype(s)? rrTT, rrTt,

c. What is the probability of producing purple, sweet corn kernels? 3/16

Possible genotype(s)? RRtt, Rrtt

d. What is the probability of producing yellow, sweet corn kernels? 1/16

Possible genotype(s)? rr tt

e. Whenever you have a dihybrid cross (a cross involving two different traits that are not linked) between two individuals that are heterozygous for both traits (such as in problems 19a-d) what **phenotypic** ratio do you end up with? 9:3:3:1

How do we get our traits? Continued

12. What is meant by diploid and haploid? What is our (humans) diploid and haploid chromosome number?

Diploid cells have 2 sets of every chromosome. Haploid cells have only one copy of each chromosome.

human haploid number = 23 chromosomes

human diploid number = 46 chromosomes

13. Why is meiosis an important/necessary process? (2 reasons)

- creates genetic variation
- It creates cells w/ half the number of chromosomes (so that when 2 sex cells fuse, they have 46 chromosomes).
- It creates sex cells that can combine randomly with other sex cell, creating genetic variation

14. How many cells are created at the end of meiosis? How many chromosomes are in each cell? Are the cell haploid or diploid?

4 cells w/ 23 chromosomes (in humans).
cells are haploid

15. Describe 2 ways that meiosis creates genetic variation.

- crossing over creates genetic variation through recombination of genes on chromosomes
- independent assortment creates genetic variation by creating gametes w/ different combinations of chromosomes

16. Compare and contrast mitosis and meiosis in the table below.

	Chromosome number of parent cells	Number of divisions	Number of daughter cells produced	Chromosome number of daughter cells	Purpose/function
Mitosis	2n = 46	1	2	2n = 46	produces somatic cells for growth, repair, & replacement. asexual reproduction
Meiosis	2n = 46	2	4	n = 23	creates sex cells that are haploid → genetic variation

17. How do males and females differ in their sex chromosomes? XX XY
female male

18. Why do members of the same family have different traits?

-random fertilization
-genetic recombination in meiosis through crossing over & independent assortment

19. How can chromosomes be matched to aid in producing a karyotype?

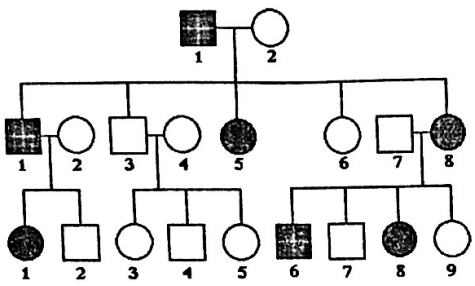
Size, shape

20. How can we determine the sex of an individual by looking at a karyotype?

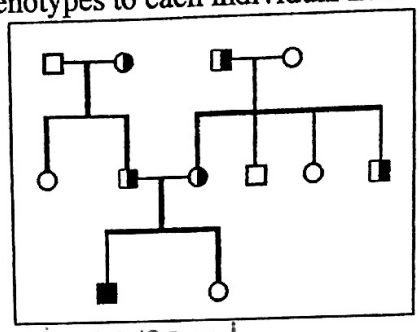
Look at their sex chromosomes. If they have two X chromosomes they are female, if they have one X and one Y, they are male.

Lesson 5: Inheritance Patterns

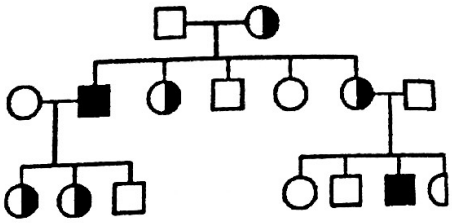
21. Identify the pedigrees below as illustrating a trait that is either autosomal dominant, autosomal recessive, or X-linked recessive. Assign genotypes to each individual in the pedigrees.



autosomal Dominant



autosomal recessive



Sex linked recessive

22. Explain why males can never pass on a sex-linked trait such as color blindness to their sons.

Males pass their Y chromosome to their son. Sex linked traits are on the X chromosome and that is not the chromosome males pass to sons.

23. For a sex-linked trait, how can you determine whether a woman is a carrier or not?

Look at her male sons or father. If either of them have the trait she is a carrier.

24. The bison herd on Konza Prairie has begun to show a genetic defect. Some of the males have a condition known as "rabbit hock" in which the knee of the back leg is malformed slightly. We do not yet know the genes controlling this trait but for the sake of our question, we shall assume it is a sex-linked gene and that it is recessive. Now, suppose that the herd bull (the dominant one which does most of the breeding) who is normal (X^N) mates with a cow that is a carrier for rabbit hock. What are his chances of producing a normal calf?

N = normal n = rabbit hock

	X^N	Y
X^N	X^NX^N	X^NY
X^n	X^NX^n	X^nY

25% of offspring are expected to have rabbit hock

(50% of male offspring)

Important information: Codominant traits are different from simple dominant traits because heterozygous individuals can have multiple dominant alleles. This results in both traits being expressed simultaneously. There is also a recessive trait that can be present.

EXAMPLE:
Blood type:
Type A: I^AI^A or heterozygous A: I^Ai
Type B: I^BI^B or heterozygous B: I^Bi
Type AB: I^AI^B
Type O: ii

25. Type O crosses with Type AB. Show the cross below and determine both the percent and ratio of each type of blood.
TOTALS: (percent and ratio)
A: 50% 1/2
B: 50% 1/2
AB: 0% 0/2
O: 0% 0/2

	i	i
I^A	I^Ai	I^Ai
I^B	I^Bi	I^Bi

26. Woman has type B (exact genotype unknown). Man has type O. What are the possible blood types of their kids? Set up a Punnett square to find out and determine which type(s) are possible.

Is this type possible:
A: yes/ no?
B: yes/ no
AB: yes/ no
O: yes/ no? if she has genotype I^Bi

	i	i
I^B	I^Bi	I^Bi
I^B	I^Bi	I^Bi

	i	i
I^B	I^Bi	I^Bi
i	ii	ii

B.) If the woman has a baby with type AB blood, could the man above be the father? Explain your answer. No. he could only pass on a recessive allele (i) for type O. For the baby to be AB, the dad would need to be either A or AB

27. From the "make a face " simulation what is a polygenic trait? Give an example.
Trait controlled by more than one gene EX: skin color

28. From the "make a face " simulation what is epistasis? Give an example of a trait that is related to this process.
The control of one set of genes by another EX: control of cleft chin gene by chin shape gene

29. Make a concept map that shows the relationship between the following terms: chromosomes, genes, alleles, and traits. Label your concept map to show how the terms are related.