LECTURES 23 - 28 – Mendelian Genetics

QUESTIONS TO TRY FOR PRACTICE

1) Mendel crossed yellow-seeded and green-seeded pea plants and then allowed the offspring to self-pollinate to produce an F_2 generation. The results were as follows: 6022 yellow and 2001 green (8023 total). The allele for green seeds has what relationship to the allele for yellow seeds?
A) dominant
B) incompletely dominant
C) recessive
D) semidominant

2) A man and woman are both of normal pigmentation, but both have one parent who is albino (without melanin pigmentation). Albinism is an autosomal (not sex-linked) recessive trait. What is the probability that their first child will be an albino?
A) 0%
B) 1/8
C) 1/2
D) 1/4
E) 100%

3) A man and woman are both of normal pigmentation, but both have one parent who is albino (without melanin pigmentation). Albinism is an autosomal (not sex-linked) recessive trait. What is the probability that their first female child will have albinism?
A) 0%
B) 1/8
C) 1/2
D) 1/4
E) 100%

4) A man and woman are both of normal pigmentation and have a child who is albino (without melanin pigmentation). Albinism is an autosomal (not sex-linked) recessive trait. What are the genotypes of the albino's parents?
A) One parent must be homozygous for the recessive allele, the other parent can be homozygous dominant, homozygous recessive, or heterozygous.
B) One parent must be heterozygous, the other parent can be homozygous dominant, homozygous recessive, or heterozygous.
C) Both parents must be heterozygous.
D) One parent must be homozygous dominant; the other parent must be heterozygous.
E) Both parents must be homozygous dominant.

5) In tigers, a recessive allele causes a white tiger (absence of fur pigmentation). If two phenotypically normal tigers that are heterozygous at this locus are mated, what percentage of their offspring is expected to be white?
A) 50%
B) 75%
C) about 66%
D) about 90%
E) 25%

6) A man has extra digits (six fingers on each hand and six toes on each foot). His wife and their daughter have a normal number of digits. Having extra digits is a dominant trait. The couple's second child has extra digits. What is the probability that their next (third) child will have extra digits?
A) 1/2
B) 1/16
C) 1/8
D) 3/4
E) 9/16

7) Different ratios occur in crosses with single gene pairs or two gene pairs. What types of ratios are likely to occur in crosses dealing with a single gene pair?
A) 9:3:3:1, 1:2:1
B) 1:1:1:1, 1:4:6:4:1
C) 3:1, 1:1, 1:2:1
D) 9:7, 12:3:1
E) 15:1, 1:2

8) A black guinea pig crossed with an albino guinea pig produced 12 black offspring. When the albino was crossed with a second black animal, 6 blacks and 6 albinos were obtained. What is the best explanation for this genetic situation?
A) Albino is recessive; black is dominant.
B) Albino is dominant; black is incompletely dominant.
C) Albino and black are codominant.
D) Albino is recessive; black is recessive.
E) None of the above applies.

9) Phenylketonuria is an inherited disease caused by a recessive autosomal allele. If a woman and her husband are both carriers, what is the probability that their first child will be a phenotypically normal girl?
A) 1/4
B) 1/16
C) 1.0
D) 3/16
E) 3/8

10) Assuming independent assortment for all gene pairs, what is the probability that the following parents, *AABbCc* × *AaBbCc*, will produce an *AaBbCc* offspring?
A) 1/2
B) 1/16
C) 1/8
D) 3/4
E) 9/16

11) Suppose two *AaBbCc* individuals are mated. Assuming that the genes are not linked, what fraction of the offspring are expected to be homozygous recessive for the three traits?
A) 1/4
B) 1/8
C) 1/16
D) 1/64
E) 1/256

12) When Mendel crossed yellow-seeded and green-seeded pea plants, all the offspring were yellow seeded. When he took these F_1 yellow-seeded plants and crossed them to green-seeded plants, what genotypic ratio is expected?
A) 1:2:1
B) 3:1
C) 9:3:3:1
D) 1:1
E) 1:1:1:1

13) In rabbits, the homozygous *CC* is normal, *Cc* results in deformed legs, and *cc* results in very short legs. The genotype *BB* produces black fur, *Bb* brown fur, and *bb* white fur. If a cross is made between brown rabbits with deformed legs and white rabbits with deformed legs, what percentage of the offspring would be expected to have deformed legs and white fur?
A) 25%
B) 33%
C) 0%
D) 100%
E) 50%

14) A sexually reproducing animal has two unlinked genes, one for head shape (*H*) and one for tail length (*T*). Its genotype is *HhTt*. Which of the following genotypes is possible in a gamete from this organism?
A) *tt*
B) *Hh*
C) *HhTt*
D) *T*
E) *HT*

15) A recessive allele on the X chromosome is responsible for red-green colour blindness in humans. A woman with normal vision whose father is colour blind marries a colour-blind male. What is the probability that this couple's first son will be colour blind?
A) 25%
B) 50%
C) 100%
D) 75%
E) 0%

16) Hemophilia is caused by several genetic factors; one, a recessive allele of an X-linked gene, is the subject of this problem. Assume that a man with hemophilia marries a normal woman whose father had hemophilia. What is the probability that they will have a daughter with hemophilia?
A) 1/16
B) 1/8
C) 1/4
D) 1/2
E) 3/4

17) Hemophilia is caused by several genetic factors; one, a recessive allele of an X-linked gene, is the subject of this problem. Assume that a man with hemophilia marries a normal woman whose father had hemophilia. What is the probability that their first son will have hemophilia?
A) 1/16
B) 1/8
C) 1/4
D) 1/2
E) 3/4

18) A man who carries an allele of an X-linked gene will pass it on to
A) all of his daughters.
B) half of his daughters.
C) all of his sons.
D) half of his sons.
E) all of his children.

19) There are 40 different alleles for a gene involved in immune function. What is the maximum number of alleles that a human can have?
A) 1
B) 2
C) 20
D) 40
E) 80

20) A couple has a child with Harman's ataxia (a recessive disorder). If this couple has second child, what is the probability that child will have ataxia?
A) 0
B) 2/3
C) 1/2
D) 1/4
E) 1/16

21) The second child of the couple above is unaffected (does not display the condition). What is the probability this child is a carrier for the ataxia condition?
A) 0
B) 2/3
C) 1/2
D) 1/4
E) 1/16

22) Regarding an allelic pair for flower colour in snapdragons, heterozygotes have pink flowers, whereas the two homozygotes have red flowers or white flowers. When plants with red flowers are crossed with plants with white flowers, what proportion of the offspring is expected to have pink flowers?
A) 50%
B) 0%
C) 100%
D) 25%
E) 75%

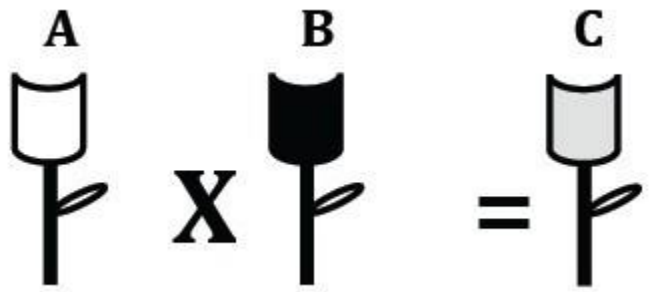
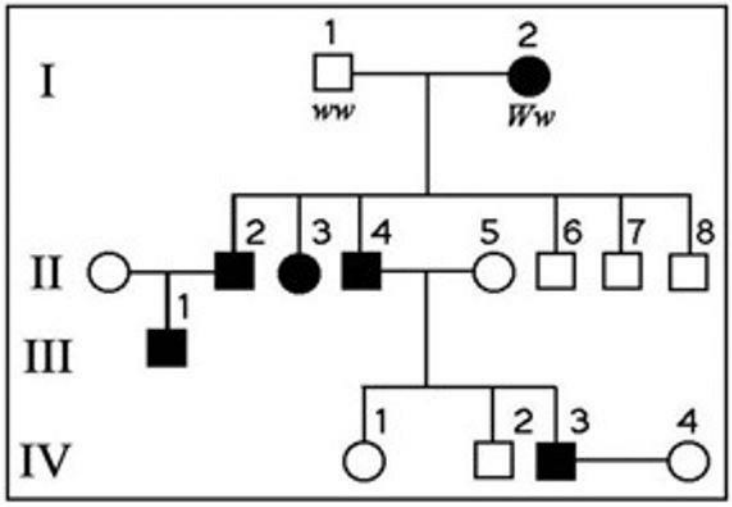


Figure 14.2

23) In the figure above, flower A was crossed with flower B to produce flower C. The phenotype of flower C is the result of
A) incomplete dominance.
B) codominance.
C) the passing on of a sex-linked trait.
D) aneuploidy.

The following question(s) refer to the pedigree chart in the figure provided for a family, some of whose members exhibit the dominant trait, *W*. Affected individuals are indicated by a dark square or circle.



24) What is the genotype of individual II-5?
A) *WW*
B) *Ww*
C) *ww*
D) *WW* or *ww*
E) *ww* or *Ww*

25) What is the likelihood that the progeny of IV-3 and IV-4 will have the trait?
A) 0 percent
B) 25 percent
C) 50 percent
D) 75 percent
E) 100 percent