Name: KEY Class: _____ Date: _____ ID: A

AP Biology Ch 12 Faux Test

Multiple Choice
Identify the choice that best completes the statement or answers the question.

B 1. When Thomas Hunt Morgan crossed his red-eyed F_1 generation flies to each other, the F_2 generation included both red- and white-eyed flies. Remarkably, all the white-eyed flies were male. What was the explanation for this result?
   a. The gene involved is on the Y chromosome.
   b. The gene involved is on the X chromosome.
   c. The gene involved is on an autosome, but only in males.
   d. Other male-specific factors influence eye color in flies.
   e. Other female-specific factors influence eye color in flies.

B 2. Which of the following is the meaning of the chromosome theory of inheritance as expressed in the early 20th century?
   a. Individuals inherit particular chromosomes attached to genes.
   b. Mendelian genes are at specific loci on the chromosome and in turn segregate during meiosis.
   c. Homologous chromosomes give rise to some genes and crossover chromosomes to other genes.
   d. No more than a single pair of chromosomes can be found in a healthy normal cell.
   e. Natural selection acts on certain chromosome arrays rather than on genes.

D 3. Males are more often affected by sex-linked traits than females because
   a. male hormones such as testerone often alter the affects of mutations on the X chromosome.
   b. female hormones such as estrogen often compensate for the effects of mutations on the X chromosome.
   c. X chromosomes in males generally have more mutations than X chromosomes in females.
   d. males are hemizygous for the X chromosome.
   e. mutations on the Y chromosome often worsen the effects of X-linked mutations.

C 4. SRY is best described in which of the following ways?
   a. a gene present on the X chromosome that triggers female development
   b. an autosomal gene that is required for the expression of genes on the Y chromosome
   c. a gene region present on the Y chromosome that triggers male development
   d. an autosomal gene that is required for the expression of genes on the X chromosome
   e. a gene required for development, and males or females lacking the gene do not survive past early childhood

D 5. In cats, black fur color is caused by an X-linked allele; the other allele at this locus causes orange color. The heterozygote is tortoiseshell. What kinds of offspring would you expect from the cross of a black female and an orange male?
   a. tortoiseshell females; tortoiseshell males
   b. black females; orange males
   c. orange females; orange males
   d. tortoiseshell females; black males
   e. orange females; black males

E 6. Red-green color blindness is a sex-linked recessive trait in humans. Two people with normal color vision have a color-blind son. What are the genotypes of the parents?
   a. X^{nXn} and X^{nY}
   b. X^{nXn} and X^{NY}
   c. X^{NXN} and X^{nY}
   d. X^{NXN} and X^{NY}
   e. X^{NXn} and X^{NY}

E 7. Cinnabar eyes is a sex-linked recessive characteristic in fruit flies. If a female having cinnabar eyes is crossed with a wild-type male, what percentage of the F_1 males will have cinnabar eyes?
   a. 0%
   b. 25%
   c. 50%
   d. 75%
   e. 100%

B 8. Normally, only female cats have the tortoiseshell phenotype because
   a. the males die during embryonic development.
   b. a male inherits only one allele of the X-linked gene controlling hair color.
   c. the Y chromosome has a gene blocking orange coloration.
   d. only males can have Barr bodies.
   e. multiple crossovers on the Y chromosome prevent orange pigment production.

B 9. Sex determination in mammals is due to the SRY region of the Y chromosome. An abnormality of this region could allow which of the following to have a male phenotype?
   a. Turner syndrome, 45, X
   b. translocation of SRY to an autosome of a 46, XX individual
   c. a person with an extra X chromosome
   d. a person with one normal and one shortened (deleted) X
   e. Down syndrome, 46, XX

D 10. In humans, clear gender differentiation occurs not at fertilization, but after the second month of gestation. What is the first event of this differentiation?
a. formation of testosterone in male embryos
b. formation of estrogens in female embryos
c. anatomical differentiation of a penis in male embryos
d. activation of SRY in male embryos and masculinization of the gonads
e. activation of SRY in females and feminization of the gonads

D 11. Duchenne muscular dystrophy is a serious condition caused by a recessive allele of a gene on the human X chromosome. The patients have muscles that weaken over time because they have absent or decreased dystrophin, a muscle protein. They rarely live past their 20s. How likely is it for a woman to have this condition?
a. Women can never have this condition.
b. One-half of the daughters of an affected man would have this condition.
c. One-fourth of the daughters of an affected father and a carrier mother could have this condition.
d. Very rarely: it is rare that an affected male would mate with a carrier female.
e. Only if a woman is XXX could she have this condition.

A 12. All female mammals have one active X chromosome per cell instead of two. What causes this?
a. activation of the *XIST* gene on the X chromosome that will become the Barr body
b. activation of the *BARR* gene on one X chromosome, which then becomes inactive
c. crossing over between the *XIST* gene on one X chromosome and a related gene on an autosome
d. inactivation of the *XIST* gene on the X chromosome derived from the male parent
e. attachment of methyl (CH_3) groups to the X chromosome that will remain active

A 13. Which of the following statements is true of linkage?
a. The closer two genes are on a chromosome, the lower the probability that a crossover will occur between them.
b. The observed frequency of recombination of two genes that are far apart from each other has a maximum value of 100%.
c. All of the traits that Mendel studied–seed color, pod shape, flower color, and others–are due to genes linked on the same chromosome.
d. Linked genes are found on different chromosomes.
e. Crossing over occurs during prophase II of meiosis.

A 14. How would one explain a testcross involving F_1 dihybrid flies in which more parental-type offspring than recombinant-type offspring are produced?
a. The two genes are closely linked on the same chromosome.
b. The two genes are linked but on different chromosomes.
c. Recombination did not occur in the cell during meiosis.
d. The testcross was improperly performed.
e. Both of the characters are controlled by more than one gene.

A 15. What does a frequency of recombination of 50% indicate?
a. The two genes are likely to be located on different chromosomes.
b. All of the offspring have combinations of traits that match one of the two parents.
c. The genes are located on sex chromosomes.
d. Abnormal meiosis has occurred.
e. Independent assortment is hindered.

D 16. Three genes (*A*, *B*, and *C*) at three loci are being mapped in a particular species. Each gene has two alleles, one of which results in a phenotype that is markedly different from the wild type. The unusual allele of gene *A* is inherited with the unusual allele of gene *B* or *C* about 50% of the time. However, the unusual alleles of genes *B* and *C* are inherited together 14.4% of the time. Which of the following describes what is happening?
a. The three genes are showing independent assortment.
b. The three genes are linked.
c. Gene *A* is linked but genes *B* and *C* are not.
d. Gene *A* is assorting independently of genes *B* and *C*, which are linked.
e. Gene *A* is located 14.4 map units from genes *B* and *C*.

B 17. What is one map unit equivalent to?
a. the physical distance between two linked genes
b. 1% frequency of recombination between two genes
c. 1 nanometer of distance between two genes
d. the distance between a pair of homologous chromosomes
e. the recombination frequency between two genes assorting independently

D 18. Recombination between linked genes comes about for what reason?
a. Mutation on one homolog is different from that on the other homolog.
b. Independent assortment sometimes fails because Mendel had not calculated appropriately.
c. When genes are linked they always "travel" together at anaphase.
d. Crossovers between these genes result in chromosomal exchange.
e. Nonrecombinant chromosomes break and then re-join with one another.

C 19. Why does recombination between linked genes continue to occur?
a. Recombination is a requirement for independent assortment.
b. Recombination must occur or genes will not assort independently.
c. New allele combinations are acted upon by natural selection.
d. The forces on the cell during meiosis II always result in recombination.
e. Without recombination there would be an insufficient number of gametes.

A 20. Map units on a linkage map cannot be relied upon to calculate physical distances on a chromosome for which of the following reasons?
a. The frequency of crossing over varies along the length of the chromosome.
b. The relationship between recombination frequency and map units is different in every individual.
c. Physical distances between genes change during the course of the cell cycle.
d. The gene order on the chromosomes is slightly different in every individual.
e. Linkage map distances are identical between males and females.

A 21. What is the reason that closely linked genes are typically inherited together?
a. The likelihood of a crossover event between these two genes is low.
b. The number of genes in a cell is greater than the number of chromosomes.
c. Chromosomes are unbreakable.
d. Alleles are paired together during meiosis.
e. Genes align that way during metaphase I of meiosis.

B 22. Sturtevant provided genetic evidence for the existence of four pairs of chromosomes in *Drosophila* in which of these ways?
a. There are four major functional classes of genes in *Drosophila*.
b. *Drosophila* genes cluster into four distinct groups of linked genes.
c. The overall number of genes in *Drosophila* is a multiple of four.
d. The entire *Drosophila* genome has approximately 400 map units.
e. *Drosophila* genes have, on average, four different alleles.

C 23. If cell X enters meiosis, and nondisjunction of one chromosome occurs in one of its daughter cells during meiosis II, what will be the result at the completion of meiosis?
a. All the gametes descended from cell X will be diploid.
b. Half of the gametes descended from cell X will be $n + 1$, and half will be $n - 1$.
c. One-fourth of the gametes descended from cell X will be $n + 1$, 1/4 will be $n - 1$, and 1/2 will be n.
d. There will be three extra gametes.
e. Two of the four gametes descended from cell X will be haploid, and two will be diploid.

D 24. One possible result of chromosomal breakage is for a fragment to join a nonhomologous chromosome. What is this alteration called?
a. deletion
b. transversion
c. inversion
d. translocation
e. duplication

D 25. A nonreciprocal crossover causes which of the following products?
a. deletion only
b. duplication only
c. nondisjunction
d. deletion and duplication
e. duplication and nondisjunction

A 26. Of the following human aneuploidies, which is the one that generally has the most severe impact on the health of the individual?
a. 47, +21
b. 47, XXY
c. 47, XXX
d. 47, XYY
e. 45, X

A 27. A phenotypically normal prospective couple seeks genetic counseling because the man knows that he has a translocation of a portion of his chromosome 4 that has been exchanged with a portion of his chromosome 12. Although he is normal because his translocation is balanced, he and his wife want to know the probability that his sperm will be abnormal. What is your prognosis regarding his sperm?
a. One-fourth will be normal, 1/4 will have the translocation, and 1/2 will have duplications and deletions.
b. All will carry the same translocation as the father.
c. None will carry the translocation because abnormal sperm will die.
d. His sperm will be sterile and the couple might consider adoption.
e. One-half will be normal and the rest will have the father's translocation.

B 28. Abnormal chromosomes are frequently found in malignant tumors. Errors such as translocations may place a gene in close proximity to different control regions. Which of the following might then occur to make the cancer worse?
a. an increase in nondisjunction
b. expression of inappropriate gene products
c. a decrease in mitotic frequency
d. death of the cancer cells in the tumor
e. sensitivity of the immune system

B 29. An inversion in a human chromosome often results in no demonstrable phenotypic effect in the individual. What else may occur?
a. There may be deletions later in life.
b. Some abnormal gametes may be formed.
c. There is an increased frequency of mutation.
d. All inverted chromosomes are deleted.
e. The individual is more likely to get cancer.

D 30. What is the source of the extra chromosome 21 in an individual with Down syndrome?
a. nondisjunction in the mother only
b. nondisjunction in the father only
c. duplication of the chromosome
d. nondisjunction or translocation in either parent
e. It is impossible to detect with current technology.

E 31. Down syndrome has a frequency in the U.S. population of ~1/700 live births. In which of the following groups would you expect this frequency to be significantly higher?
a. people in Latin or South America
b. the Inuit and other peoples in very cold habitats
c. people living in equatorial areas of the world
d. very small population groups
e. No groups have such higher frequency.

D 32. A couple has a child with Down syndrome. The mother is 39 years old at the time of delivery. Which of the following is the most probable cause of the child's condition?
a. The woman inherited this tendency from her parents.
b. One member of the couple carried a translocation.
c. One member of the couple underwent nondisjunction in somatic cell production.
d. One member of the couple underwent nondisjunction in gamete production.
e. The mother had a chromosomal duplication.

C 33. What is a syndrome?
a. a characteristic facial appearance
b. a group of traits, all of which must be present if an aneuploidy is to be diagnosed
c. a group of traits typically found in conjunction with a particular chromosomal aberration or gene mutation
d. a characteristic trait usually given the discoverer's name
e. a characteristic that only appears in conjunction with one specific aneuploidy

A 34. Which of the following is known as a Philadelphia chromosome?
a. a human chromosome 22 that has had a specific translocation
b. a human chromosome 9 that is found only in one type of cancer
c. an animal chromosome found primarily in the mid-Atlantic area of the United States
d. an imprinted chromosome that always comes from the mother
e. a chromosome found not in the nucleus but in mitochondria

E 35. At what point in cell division is a chromosome lost so that, after fertilization with a normal gamete, the result is an embryo with 45, X?

I. an error in anaphase I
II. an error in anaphase II
III. an error of the first postfertilization mitosis
IV. an error in pairing

a. I or II only
b. II or IV only
c. III or IV only
d. I, II, or III only
e. I, II, III, or IV

B 36. Which of the following is true of aneuploidies in general?

a. A monosomy is more frequent than a trisomy.
b. 45, X is the only known human live-born monosomy.
c. Some human aneuploidies have selective advantage in some environments.
d. Of all human aneuploidies, only Down syndrome is associated with mental retardation.
e. An aneuploidy resulting in the deletion of a chromosome segment is less serious than a duplication.

D 37. A woman is found to have 47 chromosomes, including three X chromosomes. Which of the following describes her expected phenotype?

a. masculine characteristics such as facial hair
b. enlarged genital structures
c. excessive emotional instability
d. healthy female of slightly above-average height
e. sterile female

Figure 12.1 shows a map of four genes on a chromosome.

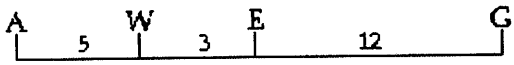
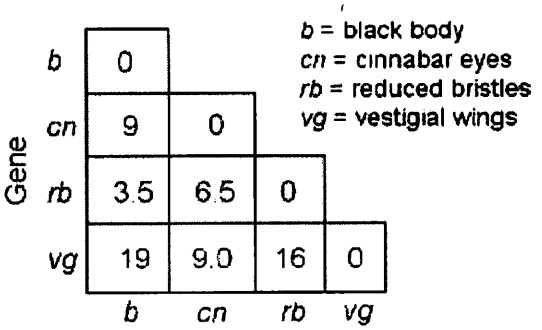


Figure 12.1

E 38. Between which two genes would you expect the highest frequency of recombination?

a. *A* and *W*
b. *W* and *E*
c. *E* and *G*
d. *A* and *E*
e. *A* and *G*



The numbers in the boxes are the recombination frequencies in between the genes (in percent).

Figure 12.2

D 39. In a series of mapping experiments, the recombination frequencies for four different linked genes of *Drosophila* were determined as shown in Figure 12.2. What is the order of these genes on a chromosome map?

a. *rb-cn-vg-b*
b. *vg-b-rb-cn*
c. *cn-rb-b-vg*
d. *b-rb-cn-vg*
e. *vg-cn-b-rb*

Use the following information to answer the questions below.
A plantlike organism on the planet Pandora can have three recessive genetic traits: bluish leaves, due to an allele (*a*) of gene *A*; a feathered stem, due to an allele (*b*) of gene *B*; and hollow roots due to an allele (*c*) of gene *C*. The three genes are linked and recombine as follows:

A geneticist did a testcross with an organism that had been found to be heterozygous for the three recessive traits and she was able to identify progeny of the following phenotypic distribution (+ = wild type):

Phenotypes	Leaves	Stems	Roots	Number
1	*a*	+	+	14
2	*a*	+	*c*	0
3	*a*	*b*	+	32
4	*a*	*b*	*c*	440
5	+	*b*	+	0
6	+	*b*	*c*	16
7	+	+	*c*	28
8	+	+	+	470
			Total	1,000

Figure 12.3

C 40. Which of the following are the phenotypes of the parents in this cross?
a. 2 and 5
b. 1 and 6
c. 4 and 8
d. 3 and 7
e. 1 and 2

A 41. In which progeny phenotypes has there been recombination between genes *A* and *B*?
a. 1, 2, 5, and 6
b. 1, 3, 6, and 7
c. 2, 4, 5, and 8
d. 2, 3, 5, and 7
e. in all 8 of them

B 42. If recombination frequency is equal to distance in map units, what is the approximate distance between genes *A* and *B*?
a. 1.5 map units
b. 3 map units
c. 6 map units
d. 15 map units
e. 30 map units

C 43. What is the greatest benefit of having used a testcross for this experiment?
a. The homozygous recessive parents are obvious to the naked eye.
b. The homozygous parents are the only ones whose crossovers make a difference.
c. Progeny can be scored by their phenotypes alone.
d. All of the progeny will be heterozygous.
e. The homozygous recessive parents will be unable to cross over.

B 44. The greatest distance among the three genes is between *a* and *c*. What does this mean?
a. Gene *c* is between *a* and *b*.
b. Genes are in the order: *a–b–c*.
c. Gene *a* is not recombining with *c*.
d. Gene *a* is between *b* and *c*.
e. Distance *a–b* is equal to distance *a–c*.

Refer to the following information to answer the questions below.

A man who is an achondroplastic dwarf with normal vision marries a color-blind woman of normal height. The man's father was 6 feet tall, and both the woman's parents were of average height. Achondroplastic dwarfism is autosomal dominant, and red-green color blindness is X-linked recessive.

B 45. How many of their daughters might be expected to be color-blind dwarfs?
a. all
b. none
c. half
d. one out of four
e. three out of four

B 46. What proportion of their sons would be color-blind and of normal height?
a. none
b. half
c. one out of four
d. three out of four
e. all

E 47. They have a daughter who is a dwarf with normal color vision. What is the probability that she is heterozygous for both genes?
a. 0%
b. 25%
c. 50%
d. 75%
e. 100%