

## AP Bio Heredity Practice Test 2016

### Multiple Choice

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

- \_\_\_ 1. Mendel called those traits that were not expressed in the F1 generation:
- a. recessive
  - b. heterozygous
  - c. incompletely dominant
  - d. hybrids
  - e. null alleles
- \_\_\_ 2. Expressions of a trait such as yellow versus green seeds are referred to as:
- a. varieties
  - b. phenotypes
  - c. genotypes
  - d. factors
  - e. alleles
- \_\_\_ 3. Alternate forms of the same gene are known as:
- a. gametes
  - b. heterozygous
  - c. alleles
  - d. homozygous
  - e. genotypes
- \_\_\_ 4. The information in the squares within a Punnett square are:
- a. offspring genotypes.
  - b. parental phenotypes.
  - c. gamete phenotypes.
  - d. parental genotypes.
  - e. gamete genotypes.
- \_\_\_ 5. You have a garden in which you would like to have only pea plants that have green seeds. (Green seed color is recessive to yellow). You only have available yellow F1 seeds that were obtained by crossing green and yellow varieties. If you allow plants that arise from these seeds to self-pollinate, what proportion of the offspring could be used to initiate your pure-breeding pea garden?
- a. all
  - b. 3/4
  - c. 1/2
  - d. 1/4
  - e. none
- \_\_\_ 6. If a red-eyed *Drosophila* female, heterozygous for white eyes, is mated to a red-eyed male, what will be the phenotypic ratios for sex and eye color in their offspring?
- a. All flies will have red eyes.
  - b. All the females have red eyes and all the males have white eyes.
  - c. All the males have red eyes; all the females have white eyes.
  - d. All the males have red eyes; half the females have white eyes and half have red eyes.
  - e. All the females have red eyes; half the males have red eyes and half the males have white eyes.
- \_\_\_ 7. When a trait, such as height in humans, is continuously variable over a wide phenotypic range, it is reasonable to suspect that it is exhibiting:
- a. epistasis
  - b. polygenic inheritance
  - c. the effects of environmental interaction.
  - d. variable expressivity
  - e. variable penetrance
- \_\_\_ 8. Genes that occur on the same chromosome are said to be:
- a. epistatic
  - b. polygenic
  - c. the effects of environmental interaction.
  - d. linked

- b. autosomal
- c. homologous
- e. alleles

\_\_\_ 9. According to the chromosome map below, the pair of genes exhibiting the highest recombination rate is \_\_\_\_\_, and the pair with the lowest recombination rate is \_\_\_\_\_.



- a. A-C;B-C
- b. A-B;B-C
- c. A-C;A-B
- d. A-B;A-C
- e. B-C;A-B

- \_\_\_ 10. What is the difference between a monohybrid cross and a dihybrid cross?
- a. A monohybrid cross involves a single parent, whereas a dihybrid cross involves two parents.
  - b. A monohybrid cross produces a single progeny, whereas a dihybrid cross produces two progeny.
  - c. A dihybrid cross involves organisms that are heterozygous for two characters and a monohybrid only one.
  - d. A monohybrid cross is performed for one generation, whereas a dihybrid cross is performed for two generations.
  - e. A monohybrid cross results in a 9:3:3:1 ratio whereas a dihybrid cross gives a 3:1 ratio.
- \_\_\_ 11. A cross between homozygous purple-flowered and homozygous white-flowered pea plants results in offspring with purple flowers. This demonstrates
- a. the blending model of genetics.
  - b. true-breeding.
  - c. dominance.
  - d. a dihybrid cross.
  - e. the mistakes made by Mendel.
- \_\_\_ 12. The  $F_1$  offspring of Mendel's classic pea cross always looked like one of the two parental varieties because
- a. one phenotype was completely dominant over another.
  - b. each allele affected phenotypic expression.
  - c. the traits blended together during fertilization.
  - d. no genes interacted to produce the parental phenotype.
  - e. different genes interacted to produce the parental phenotype.
- \_\_\_ 13. What was the most significant conclusion that Gregor Mendel drew from his experiments with pea plants?
- a. There is considerable genetic variation in garden peas.
  - b. Traits are inherited in discrete units, and are not the results of "blending."
  - c. Recessive genes occur more frequently in the  $F_1$  than do dominant ones.
  - d. Genes are composed of DNA.
  - e. An organism that is homozygous for many recessive traits is at a disadvantage.

- \_\_\_ 14. How many unique gametes could be produced through independent assortment by an individual with the genotype  $AaBbCCDdEE$ ?
- 4
  - 8
  - 16
  - 32
  - 64
- \_\_\_ 15. Two plants are crossed, resulting in offspring with a 3:1 ratio for a particular trait. This suggests
- that the parents were true-breeding for contrasting traits.
  - incomplete dominance.
  - that a blending of traits has occurred.
  - that the parents were both heterozygous.
  - that each offspring has the same alleles.
- \_\_\_ 16. Two characters that appear in a 9:3:3:1 ratio in the  $F_2$  generation should have which of the following properties?
- Each of the traits is controlled by single genes.
  - The genes controlling the characters obey the law of independent assortment.
  - Each of the genes controlling the characters has two alleles.
  - Four genes are involved.
  - Sixteen different phenotypes are possible.
- \_\_\_ 17. 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?
- $HT$
  - $Hh$
  - $HhTt$
  - $T$
  - $tt$
- \_\_\_ 18. It was important that Mendel examined not just the  $F_1$  generation in his breeding experiments, but the  $F_2$  generation as well, because
- he obtained very few  $F_1$  progeny, making statistical analysis difficult.
  - parental traits that were not observed in the  $F_1$  reappeared in the  $F_2$ .
  - analysis of the  $F_1$  progeny would have allowed him to discover the law of segregation, but not the law of independent assortment.
  - the dominant phenotypes were visible in the  $F_2$  generation, but not in the  $F_1$ .
  - many of the  $F_1$  progeny died.
- \_\_\_ 19. When crossing an organism that is homozygous recessive for a single trait with a heterozygote, what is the chance of producing an offspring with the homozygous recessive phenotype?
- 0%
  - 25%
  - 50%

- d. 75%
- e. 100%

Use Figure 14.1 and the following description to answer the questions below.

In a particular plant, leaf color is controlled by gene locus *D*. Plants with at least one allele *D* have dark green leaves, and plants with the homozygous recessive *dd* genotype have light green leaves. A true-breeding dark-leaved plant is crossed with a light-leaved one, and the  $F_1$  offspring is allowed to self-pollinate. The predicted outcome of the  $F_2$  is diagrammed in the Punnett square shown in Figure 14.1, where 1, 2, 3, and 4 represent the genotypes corresponding to each box within the square.

	<i>D</i>	<i>d</i>
<i>D</i>	1	2
<i>d</i>	3	4

**Figure 14.1**

- \_\_\_ 20. Which of the boxes marked 1-4 correspond to plants with dark leaves?
  - a. 1 only
  - b. 1 and 2
  - c. 2 and 3
  - d. 4 only
  - e. 1, 2, and 3
  
- \_\_\_ 21. Which of the boxes correspond to plants with a heterozygous genotype?
  - a. 1
  - b. 1 and 2
  - c. 1, 2, and 3
  - d. 2 and 3
  - e. 2, 3, and 4
  
- \_\_\_ 22. Which of the plants will be true-breeding?
  - a. 1 and 4
  - b. 2 and 3
  - c. 1—4
  - d. 1 only
  - e. None
  
- \_\_\_ 23. Mendel accounted for the observation that traits which had disappeared in the  $F_1$  generation reappeared in the  $F_2$  generation by proposing that

- a. new mutations were frequently generated in the  $F_2$  progeny, "reinventing" traits that had been lost in the  $F_1$ .
- b. the mechanism controlling the appearance of traits was different between the  $F_1$  and the  $F_2$  plants.
- c. traits can be dominant or recessive, and the recessive traits were obscured by the dominant ones in the  $F_1$ .
- d. the traits were lost in the  $F_1$  due to blending of the parental traits.
- e. members of the  $F_1$  generation had only one allele for each character, but members of the  $F_2$  had two alleles for each character.

- \_\_\_\_\_ 24. Which of the following about the law of segregation is *false*?
- a. It states that each of two alleles for a given trait segregate into different gametes.
  - b. It can be explained by the segregation of homologous chromosomes during meiosis.
  - c. It can account for the 3:1 ratio seen in the  $F_2$  generation of Mendel's crosses.
  - d. It can be used to predict the likelihood of transmission of certain genetic diseases within families.
  - e. It is a method that can be used to determine the number of chromosomes in a plant.
- \_\_\_\_\_ 25. The fact that all seven of the pea plant traits studied by Mendel obeyed the principle of independent assortment most probably indicates which of the following?
- a. None of the traits obeyed the law of segregation.
  - b. The diploid number of chromosomes in the pea plants was 7.
  - c. All of the genes controlling the traits were located on the same chromosome.
  - d. All of the genes controlling the traits behaved as if they were on different chromosomes.
  - e. The formation of gametes in plants occurs by mitosis only.
- \_\_\_\_\_ 26. Mendel was able to draw his ideas of segregation and independent assortment because of the influence of which of the following?
- a. His reading and discussion of Darwin's *Origin of Species*
  - b. The understanding of particulate inheritance he learned from renowned scientists of his time
  - c. His discussions of heredity with his colleagues at major universities
  - d. His reading of the scientific literature current in the field
  - e. His experiments with the breeding of plants such as peas
- \_\_\_\_\_ 27. Mendel's observation of the segregation of alleles in gamete formation has its basis in which of the following phases of cell division?
- a. Prophase I of meiosis
  - b. Prophase II of meiosis
  - c. Metaphase I of meiosis
  - d. Anaphase I of meiosis
  - e. Anaphase of mitosis

- \_\_\_ 28. Mendel's second law of independent assortment has its basis in which of the following events of meiosis I?
- Synapsis of homologous chromosomes
  - Crossing over
  - Alignment of tetrads at the equator
  - Separation of homologs at anaphase
  - Separation of cells at telophase
- \_\_\_ 29. Black fur in mice ( $B$ ) is dominant to brown fur ( $b$ ). Short tails ( $T$ ) are dominant to long tails ( $t$ ). What fraction of the progeny of the cross  $BbTt \times BBtt$  will have black fur and long tails?
- 1/16
  - 3/16
  - 3/8
  - 1/2
  - 9/16
- \_\_\_ 30. In certain plants, tall is dominant to short. If a heterozygous plant is crossed with a homozygous tall plant, what is the probability that the offspring will be short?
- 1
  - 1/2
  - 1/4
  - 1/6
  - 0
- \_\_\_ 31. Two true-breeding stocks of pea plants are crossed. One parent has red, axial flowers and the other has white, terminal flowers; all  $F_1$  individuals have red, axial flowers. The genes for flower color and location assort independently. If 1,000  $F_2$  offspring resulted from the cross, approximately how many of them would you expect to have red, terminal flowers?
- 65
  - 190
  - 250
  - 565
  - 750
- \_\_\_ 32. In a cross  $AaBbCc \times AaBbCc$ , what is the probability of producing the genotype  $AABBCC$ ?
- 1/4
  - 1/8
  - 1/16
  - 1/32
  - 1/64
- \_\_\_ 33. Given the parents  $AABBcc \times AabbCc$ , assume simple dominance and independent assortment. What proportion of the progeny will be expected to phenotypically resemble the first parent?
- 1/4
  - 1/8
  - 3/4
  - 3/8

e. 1

*Use the following information to answer the questions below.*

Labrador retrievers are black, brown, or yellow. In a cross of a black female with a brown male, results can be either all black puppies, 1/2 black to 1/2 brown puppies, or 3/4 black to 1/4 yellow puppies.

- \_\_\_ 34. These results indicate which of the following?
- Brown is dominant to black.
  - Black is dominant to brown and to yellow.
  - Yellow is dominant to black.
  - There is incomplete dominance.
  - Epistasis is involved.
- \_\_\_ 35. How many genes must be responsible for these coat colors in Labrador retrievers?
- 1
  - 2
  - 3
  - 4
- \_\_\_ 36. In one type cross of black  $\times$  black, the results were as follows:
- 9/16 black
  - 4/16 yellow
  - 3/16 brown
- The genotype *aabb* must result in which of the following?
- Black
  - Brown
  - Yellow
  - A lethal result

*Use the following information to answer the questions below.*

Radish flowers may be red, purple, or white. A cross between a red-flowered plant and a white-flowered plant yields all-purple offspring. The part of the radish we eat may be oval or long, with long being the dominant characteristic.

- \_\_\_ 37. In the  $F_2$  generation of the above cross, which of the following phenotypic ratios would be expected?
- 9:3:3:1
  - 9:4:3
  - 1:1:1:1
  - 1:1:1:1:1:1
  - 6:3:3:2:1:1

- \_\_\_ 38. *Drosophila* (fruit flies) usually have long wings (+) but mutations in two different genes can result in bent wings (bt) or vestigial wings (vg). If a homozygous bent wing fly is mated with a homozygous vestigial wing fly, which of the following offspring would you expect?
- All +bt +vg heterozygotes
  - 1/2 bent and 1/2 vestigial flies
  - All homozygous + flies
  - 3/4 bent to 1/4 vestigial ratio
  - 1/2 bent and vestigial to 1/2 normal
- \_\_\_ 39. The flower color trait in radishes is an example of which of the following?
- A multiple allelic system
  - Sex linkage
  - Codominance
  - Incomplete dominance
  - Epistasis
- \_\_\_ 40. A 1:2:1 phenotypic ratio in the  $F_2$  generation of a monohybrid cross is a sign of
- complete dominance.
  - multiple alleles.
  - incomplete dominance.
  - polygenic inheritance.
  - pleiotropy.
- \_\_\_ 41. In snapdragons, heterozygotes for one of the genes have pink flowers, whereas homozygotes have red or white flowers. When plants with red flowers are crossed with plants with white flowers, what proportion of the offspring will have pink flowers?
- 0%
  - 25%
  - 50%
  - 75%
  - 100%
- \_\_\_ 42. Tallness (*T*) in snapdragons is dominant to dwarfness (*t*), while red (*R*) flower color is dominant to white (*r*). The heterozygous condition results in pink (*Rr*) flower color. A dwarf, red snapdragon is crossed with a plant homozygous for tallness and white flowers. What are the genotype and phenotype of the  $F_1$  individuals?
- ttRr*—dwarf and pink
  - ttrr*—dwarf and white
  - TtRr*—tall and red
  - TtRr*—tall and pink
  - TTRR*—tall and red
- \_\_\_ 43. Skin color in a certain species of fish is inherited via a single gene with four different alleles. How many different types of gametes would be possible in this system?
- 1
  - 2
  - 4
  - 8



e. 16

- \_\_\_ 44. In cattle, roan coat color (mixed red and white hairs) occurs in the heterozygous ( $Rr$ ) offspring of red ( $RR$ ) and white ( $rr$ ) homozygotes. Which of the following crosses would produce offspring in the ratio of 1 red : 2 roan : 1 white?
- red  $\times$  white
  - roan  $\times$  roan
  - white  $\times$  roan
  - red  $\times$  roan
  - The answer cannot be determined from the information provided.

*Refer to the following to answer the questions below.*

Gene  $S$  controls the sharpness of spines in a type of cactus. Cactuses with the dominant allele,  $S$ , have sharp spines, whereas homozygous recessive  $ss$  cactuses have dull spines. At the same time, a second gene,  $N$ , determines whether cactuses have spines. Homozygous recessive  $nn$  cactuses have no spines at all.

- \_\_\_ 45. The relationship between genes  $S$  and  $N$  is an example of
- incomplete dominance.
  - epistasis.
  - complete dominance.
  - pleiotropy.
  - codominance.

*Use the information given here to answer the following questions.*

Feather color in budgies is determined by two different genes  $Y$  and  $B$ , one for pigment on the outside and one for the inside of the feather.  $YYBB$ ,  $YyBB$ , or  $YYBb$  is green;  $yyBB$  or  $yyBb$  is blue;  $YYbb$  or  $Yybb$  is yellow; and  $yybb$  is white.

- \_\_\_ 46. Two blue budgies were crossed. Over the years, they produced 22 offspring, 5 of which were white. What are the most likely genotypes for the two blue budgies?
- $yyBB$  and  $yyBB$
  - $yyBB$  and  $yyBb$
  - $yyBb$  and  $yyBb$
  - $yyBB$  and  $yybb$
  - $yyBb$  and  $yybb$

*Use the following information to answer the questions below.*

A woman who has blood type A positive has a daughter who is type O positive and a son who is type B negative. Rh positive is a trait that shows simple dominance over Rh negative and is designated by the alleles  $R$  and  $r$ , respectively. A third gene for the MN blood group has codominant alleles  $M$  and  $N$ .

- \_\_\_ 47. Which of the following is a possible partial genotype for the son?

- a.  $I^B I^B$
- b.  $I^B I_A$
- c.  $ii$
- d.  $I^B i$
- e.  $I^A I^A$

\_\_\_ 48. Which of the following is a possible genotype for the mother?

- a.  $I^A I^A$
- b.  $I^B I^B$
- c.  $ii$
- d.  $I^A i$
- e.  $I^A I^B$

\_\_\_ 49. Which of the following is a possible phenotype for the father?

- a. A negative
- b. O negative
- c. B positive
- d. AB negative
- e. Impossible to determine

\_\_\_ 50. Which of the following is the probable genotype for the mother?

- a.  $I^A I^A RR$
- b.  $I^A I^A Rr$
- c.  $I^A i rr$
- d.  $I^A i Rr$
- e.  $I^A i RR$

\_\_\_ 51. If both children are of blood group MM, which of the following is possible?

- a. Each parent is either M or MN.
- b. Each parent must be type M.
- c. Both children are heterozygous for this gene.
- d. Neither parent can have the N allele.
- e. The MN blood group is recessive to the ABO blood group.

\_\_\_ 52. Which describes the ability of a single gene to have multiple phenotypic effects?

- a. Incomplete dominance
- b. Multiple alleles
- c. Pleiotropy
- d. Epistasis

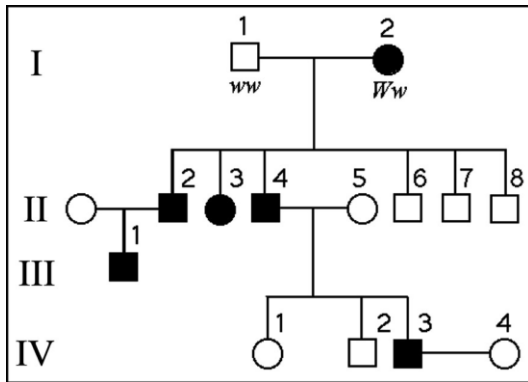
\_\_\_ 53. Which describes the ABO blood group system?

- a. Incomplete dominance
- b. Multiple alleles
- c. Pleiotropy

- d. Epistasis
- \_\_\_ 54. Which of the following terms best describes when the phenotype of the heterozygote differs from the phenotypes of both homozygotes?
- Incomplete dominance
  - Multiple alleles
  - Pleiotropy
  - Epistasis
- \_\_\_ 55. Cystic fibrosis affects the lungs, the pancreas, the digestive system, and other organs, resulting in symptoms ranging from breathing difficulties to recurrent infections. Which of the following terms best describes this?
- Incomplete dominance
  - Multiple alleles
  - Pleiotropy
  - Epistasis
- \_\_\_ 56. Which of the following is an example of polygenic inheritance?
- Pink flowers in snapdragons
  - The ABO blood groups in humans
  - Huntington's disease in humans
  - White and purple flower color in peas
  - Skin pigmentation in humans
- \_\_\_ 57. Which of the following provides an example of epistasis?
- Recessive genotypes for each of two genes (*aabb*) results in an albino corn snake.
  - The allele *b17* produces a dominant phenotype, although *b1* through *b16* do not.
  - In rabbits and many other mammals, one genotype (*cc*) prevents any fur color from developing.
  - In *Drosophila* (fruit flies), white eyes can be due to an X-linked gene or to a combination of other genes.
- \_\_\_ 58. Most genes have many more than two alleles. However, which of the following is also true?
- At least one allele for a gene always produces a dominant phenotype.
  - Most of the alleles will never be found in a live-born organism.
  - All of the alleles but one will produce harmful effects if homozygous.
  - There may still be only two phenotypes for the trait.
  - More than two alleles in a genotype is lethal.
- \_\_\_ 59. Huntington's disease is a dominant condition with late age of onset in humans. If one parent has the disease, what is the probability that his or her child will have the disease?
- 1
  - 3/4
  - 1/2
  - 1/4
  - 0
- \_\_\_ 60. A woman has six sons. The chance that her next child will be a daughter is
- 1.

- b. 0.
- c. 1/2.
- d. 1/6.
- e. 5/6.

The following questions refer to the pedigree chart in Figure 14.2 for a family, some of whose members exhibit the dominant trait, wooly hair. Affected individuals are indicated by an open square or circle.



**Figure 14.2**

- \_\_\_ 61. What is the genotype of individual II-5?
  - a.  $WW$
  - b.  $Ww$
  - c.  $ww$
  - d.  $WW$  or  $ww$
  - e.  $ww$  or  $Ww$
  
- \_\_\_ 62. What is the probability that individual III-1 is  $Ww$ ?
  - a. 3/4
  - b. 1/4
  - c. 2/4
  - d. 2/3
  - e. 1
  
- \_\_\_ 63. People with sickle-cell trait
  - a. are heterozygous for the sickle-cell allele.
  - b. are usually healthy.
  - c. have increased resistance to malaria.
  - d. produce normal and abnormal hemoglobin.
  - e. All of the above
  
- \_\_\_ 64. When a disease is said to have a multifactorial basis, it means that
  - a. both genetic and environmental factors contribute to the disease.
  - b. it is caused by a gene with a large number of alleles.
  - c. it affects a large number of people.

- d. it has many different symptoms.
  - e. it tends to skip a generation.
- \_\_\_ 65. An ideal procedure for fetal testing in humans would have which of the following features?
- a. Lowest risk procedure that would provide the most reliable information
  - b. The procedure that can test for the greatest number of traits at once
  - c. A procedure that provides a 3D image of the fetus
  - d. The procedure that can be performed at the earliest time in the pregnancy
  - e. A procedure that could test for the carrier status of the fetus
- \_\_\_ 66. A scientist discovers a DNA-based test for the allele of a particular gene. This and only this allele, if homozygous, produces an effect that results in death at or about the time of birth. Of the following, which is the best use of this discovery?
- a. To screen all newborns of an at-risk population
  - b. To design a test for identifying heterozygous carriers of the allele
  - c. To introduce a normal allele into deficient newborns
  - d. To follow the segregation of the allele during meiosis
  - e. To test school-age children for the disorder
- \_\_\_ 67. An obstetrician knows that one of her patients is a pregnant woman whose fetus is at risk for a serious disorder that is detectable biochemically in fetal cells. The obstetrician would most reasonably offer which of the following procedures to her patient?
- a. CVS
  - b. Ultrasound imaging
  - c. Amniocentesis
  - d. Fetoscopy
  - e. X-ray
- \_\_\_ 68. The frequency of heterozygosity for the sickle cell anemia allele is unusually high, presumably because this reduces the frequency of malaria. Such a relationship is related to which of the following?
- a. Mendel's law of independent assortment
  - b. Mendel's law of segregation
  - c. Darwin's explanation of natural selection
  - d. Darwin's observations of competition
  - e. The malarial parasite changing the allele
- \_\_\_ 69. Cystic fibrosis (CF) is a Mendelian disorder in the human population that is inherited as a recessive. Two normal parents have two children with CF. The probability of their next child being normal for this characteristic is which of the following?
- a. 0
  - b. 1/2
  - c. 1/4
  - d. 3/4
  - e. 1/8

- \_\_\_ 70. Phenylketonuria (PKU) is a recessive human disorder in which an individual cannot appropriately metabolize a particular amino acid. This amino acid is not otherwise produced by humans. Therefore the most efficient and effective treatment is which of the following?
- Feed them the substrate that can be metabolized into this amino acid.
  - Transfuse the patients with blood from unaffected donors.
  - Regulate the diet of the affected persons to severely limit the uptake of the amino acid.
  - Feed the patients the missing enzymes in a regular cycle, i.e., twice per week.
- \_\_\_ 71. Hutchinson-Gilford progeria is an exceedingly rare human genetic disorder in which there is very early senility, and death, usually of coronary artery disease, at an average age of approximately 13. Patients, who look very old even as children, do not live to reproduce. Which of the following represents the most likely assumption?
- All cases must occur in relatives; therefore, there must be only one mutant allele.
  - Successive generations of a family will continue to have more and more cases over time.
  - The disorder may be due to mutation in a single protein-coding gene.
  - Each patient will have had at least one affected family member in a previous generation.
  - The disease is autosomal dominant.
- \_\_\_ 72. A pedigree analysis for a given disorder's occurrence in a family shows that, although both parents of an affected child are normal, each of the parents has had affected relatives with the same condition. The disorder is then which of the following?
- Recessive
  - Dominant
  - Incompletely dominant
  - Maternally inherited
  - A new mutation
- \_\_\_ 73. One of two major forms of a human condition called neurofibromatosis (NF 1) is inherited as a dominant, although it may be either mildly to very severely expressed. If a young child is the first in her family to be diagnosed, which of the following is the best explanation?
- The mother carries the gene but does not express it at all.
  - One of the parents has very mild expression of the gene.
  - The condition skipped a generation in the family.
  - The child has a different allele of the gene than the parents.
- \_\_\_ 74. Why did the improvement of microscopy techniques in the late 1800s set the stage for the emergence of modern genetics?
- It revealed new and unanticipated features of Mendel's pea plant varieties.
  - It allowed the study of meiosis and mitosis, revealing parallels between behaviors of genes and chromosomes.
  - It allowed scientists to see the DNA present within chromosomes.
  - It led to the discovery of mitochondria.
  - It showed genes functioning to direct the formation of enzymes.

- \_\_\_ 75. 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?
- The gene involved is on the X chromosome.
  - The gene involved is on the Y chromosome.
  - The gene involved is on an autosome.
  - Other male-specific factors influence eye color in flies.
  - Other female-specific factors influence eye color in flies.
- \_\_\_ 76. Morgan and his colleagues worked out a set of symbols to represent fly genotypes. Which of the following are representative?
- $AaBb \times AaBb$
  - 46, XY or 46, XX
  - $vg+vgse+se \times vgvgsese$
  - $+2 \times +3$
- \_\_\_ 77. Sturtevant provided genetic evidence for the existence of four pairs of chromosomes in *Drosophila* in which of these ways?
- There are four major functional classes of genes in *Drosophila*.
  - Drosophila* genes cluster into four distinct groups of linked genes.
  - The overall number of genes in *Drosophila* is a multiple of four.
  - The entire *Drosophila* genome has approximately 400 map units.
  - Drosophila* genes have, on average, four different alleles.
- \_\_\_ 78. A man with Klinefelter syndrome (47, XXY) is expected to have any of the following EXCEPT
- lower sperm count.
  - possible breast enlargement.
  - increased testosterone.
  - long limbs.
  - female body characteristics.
- \_\_\_ 79. A woman is found to have 47 chromosomes, including 3 X chromosomes. Which of the following describes her expected phenotype?
- Masculine characteristics such as facial hair
  - Enlarged genital structures
  - Excessive emotional instability
  - Normal female
  - Sterile female
- \_\_\_ 80. Males are more often affected by sex-linked traits than females because
- males are hemizygous for the X chromosome.
  - male hormones such as testosterone often alter the effects of mutations on the X chromosome.
  - female hormones such as estrogen often compensate for the effects of mutations on the X.
  - X chromosomes in males generally have more mutations than X chromosomes in females.
  - mutations on the Y chromosome often worsen the effects of X-linked mutations.

- \_\_\_ 81. What is the chromosomal system for determining sex in mammals?
- Haploid-diploid
  - X-0
  - X-X
  - X-Y
  - Z-W
- \_\_\_ 82. What is the chromosomal system for sex determination in birds?
- Haploid-diploid
  - X-0
  - X-X
  - X-Y
  - Z-W
- \_\_\_ 83. What is the chromosomal system of sex determination in most species of ants and bees?
- Haploid-diploid
  - X-0
  - X-X
  - X-Y
  - Z-W
- \_\_\_ 84. SRY is best described in which of the following ways?
- A gene region present on the Y chromosome that triggers male development
  - A gene present on the X chromosome that triggers female development
  - An autosomal gene that is required for the expression of genes on the Y chromosome
  - An autosomal gene that is required for the expression of genes on the X chromosome
  - Required for development, and males or females lacking the gene do not survive past early childhood
- \_\_\_ 85. 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?
- Tortoiseshell females; tortoiseshell males
  - Black females; orange males
  - Orange females; orange males
  - Tortoiseshell females; black males
  - Orange females; black males
- \_\_\_ 86. 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?
- $X^C X^c$  and  $X^C Y$
  - $X^C X^C$  and  $X^C Y$
  - $X^C X^C$  and  $X^c Y$
  - $X^C X^c$  and  $X^C Y$



e.  $X^C X^c$  and  $X^C Y$

- \_\_\_ 87. Calico cats are female because
- a male inherits only one of the two X-linked genes controlling hair color.
  - the males die during embryonic development.
  - the Y chromosome has a gene blocking orange coloration.
  - only females can have Barr bodies.
  - multiple crossovers on the Y chromosome prevent orange pigment production.
- \_\_\_ 88. In birds, sex is determined by a ZW chromosome scheme. Males are ZZ and females are ZW. A recessive lethal allele that causes death of the embryo is sometimes present on the Z chromosome in pigeons. What would be the sex ratio in the offspring of a cross between a male that is heterozygous for the lethal allele and a normal female?
- 2:1 male to female
  - 1:2 male to female
  - 1:1 male to female
  - 4:3 male to female
  - 3:1 male to female

*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 six 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.

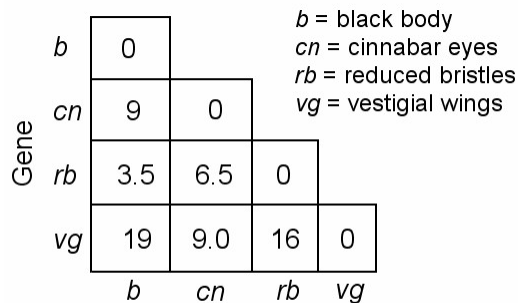
- \_\_\_ 89. How many of their daughters might be expected to be color-blind dwarfs?
- All
  - None
  - Half
  - One out of four
  - Three out of four
- \_\_\_ 90. What proportion of their sons would be color-blind and of normal height?
- All
  - None
  - Half
  - One out of four
  - Three out of four
- \_\_\_ 91. They have a daughter who is a dwarf with normal color vision. What is the probability that she is heterozygous for both genes?
- 0
  - 0.25
  - 0.50
  - 0.75
  - 1.00

- \_\_\_ 92. A Barr body is normally found in the nucleus of which kind of human cell?
- Unfertilized egg cells only
  - Sperm cells only
  - Somatic cells of a female only
  - Somatic cells of a male only
  - Both male and female somatic cells
- \_\_\_ 93. Sex determination in mammals is due to the SRY region of the Y chromosome. An abnormality could allow which of the following to have a male phenotype?
- Turner syndrome, 45, X
  - Translocation of SRY to an autosome of a 46, XX individual
  - A person with too many X chromosomes
  - A person with one normal and one shortened (deleted) X
  - Down syndrome, 46, XX
- \_\_\_ 94. Which of the following statements is true?
- The closer two genes are on a chromosome, the lower the probability that a crossover will occur between them.
  - The observed frequency of recombination of two genes that are far apart from each other has a maximum value of 100%.
  - All of the traits that Mendel studied—seed color, pod shape, flower color, and others—are due to genes linked on the same chromosome.
  - Linked genes are found on different chromosomes.
  - Crossing over occurs during prophase II of meiosis.
- \_\_\_ 95. How would one explain a testcross involving  $F_1$  dihybrid flies in which more parental-type offspring than recombinant-type offspring are produced?
- The two genes are linked.
  - The two genes are linked but on different chromosomes.
  - Recombination did not occur in the cell during meiosis.
  - The testcross was improperly performed.
  - Both of the characters are controlled by more than one gene.
- \_\_\_ 96. New combinations of linked genes are due to which of the following?
- Nondisjunction
  - Crossing over
  - Independent assortment
  - Mixing of sperm and egg
  - Deletions
- \_\_\_ 97. What does a frequency of recombination of 50% indicate?
- The two genes are likely to be located on different chromosomes.
  - All of the offspring have combinations of traits that match one of the two parents.
  - The genes are located on sex chromosomes.
  - Abnormal meiosis has occurred.
  - Independent assortment is hindered.
- \_\_\_ 98. A 0.1% frequency of recombination is observed

- a. only in sex chromosomes.
- b. only on genetic maps of viral chromosomes.
- c. on unlinked chromosomes.
- d. in any two genes on different chromosomes.
- e. in genes located very close to one another on the same chromosome.

- \_\_\_ 99. What is the reason that linked genes are inherited together?
- a. They are located close together on the same chromosome.
  - 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.
- \_\_\_ 100. What is the mechanism for the production of genetic recombinants?
- a. X inactivation
  - b. Methylation of cytosine
  - c. Crossing over and independent assortment
  - d. Nondisjunction
  - e. Deletions and duplications during meiosis

Refer to Figure 15.2 to answer the following questions.



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

**Figure 15.2**

- \_\_\_ 101. Which of the following two genes are closest on a genetic map of *Drosophila*?
- a. *b* and *vg*
  - b. *vg* and *cn*
  - c. *rb* and *cn*
  - d. *cn* and *b*
  - e. *b* and *rb*

*D*, *F*, and *J* are three genes in *Drosophila*. The recombination frequencies for two of the three genes are shown in Figure 15.3.

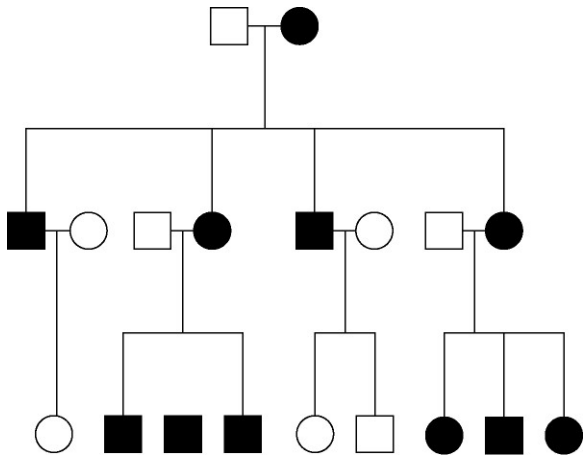
Gene Pair	Recombination Frequency
D-F	50%
D-J	25%
F-J	?

**Figure 15.3**

- \_\_\_ 102. Genes D and F could be
- located on different chromosomes.
  - located very near to each other on the same chromosome.
  - located far from each other on the same chromosome.
  - Both A and B
  - Both A and C
- \_\_\_ 103. The frequency of crossing over between any two linked genes will be which of the following?
- Higher if they are recessive
  - Dependent on how many alleles there are
  - Determined by their relative dominance
  - The same as if they were not linked
  - Proportional to the distance between them
- \_\_\_ 104. Map units on a linkage map cannot be relied upon to calculate physical distances on a chromosome for which of the following reasons?
- The frequency of crossing over varies along the length of the chromosome.
  - The relationship between recombination frequency and map units is different in every individual.
  - Physical distances between genes change during the course of the cell cycle.
  - The gene order on the chromosomes is slightly different in every individual.
  - Linkage map distances are identical between males and females.
- \_\_\_ 105. If a human interphase nucleus contains three Barr bodies, it can be assumed that the person
- has hemophilia.
  - is a male.
  - has four X chromosomes.
  - has Turner syndrome.
  - has Down syndrome.
- \_\_\_ 106. If a pair of homologous chromosomes fails to separate during anaphase of meiosis I, what will be the chromosome number of the four resulting gametes with respect to the normal haploid number ( $n$ )?
- $n + 1; n + 1; n - 1; n - 1$
  - $n + 1; n - 1; n; n$
  - $n + 1; n - 1; n - 1; n - 1$
  - $n + 1; n + 1; n; n$
  - $n - 1; n - 1; n; n$
- \_\_\_ 107. One possible result of chromosomal breakage is for a fragment to join a nonhomologous chromosome. What is this alteration called?
- Deletion

- b. Disjunction
- c. Inversion
- d. Translocation
- e. Duplication

- \_\_\_ 108. 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
- \_\_\_ 109. The frequency of Down syndrome in the human population is most closely correlated with which of the following?
- a. Frequency of new meiosis
  - b. Average of the ages of mother and father
  - c. Age of the mother
  - d. Age of the father
  - e. Exposure of pregnant women to environmental pollutants
- \_\_\_ 110. 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
- \_\_\_ 111. A couple has a child with Down syndrome when the mother is 39 years old at the time of delivery. Which is the most probable cause?
- 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.
- \_\_\_ 112. In order for chromosomes to undergo inversion or translocation, which of the following is required?
- a. Point mutation
  - b. Immunological insufficiency
  - c. Advanced maternal age
  - d. Chromosome breakage and rejoining
  - e. Meiosis
- \_\_\_ 113.



**Figure 15.4**

The pedigree in Figure 15.4 shows the transmission of a trait in a particular family. Based on this pattern of transmission, the trait is most likely

- mitochondrial.
- autosomal recessive.
- sex-linked dominant.
- sex-linked recessive.
- autosomal dominant.

- \_\_\_ 114. Correns described that the inheritance of variegated color on the leaves of certain plants was determined by the maternal parent only. What phenomenon does this describe?
- Mitochondrial inheritance
  - Chloroplast inheritance
  - Genomic imprinting
  - Infectious inheritance
  - Sex-linkage

**Short Answer**

- Imagine that a newly discovered, recessively inherited disease is expressed only in individuals with type O blood, although the disease and blood group are independently inherited. A normal man with type A blood and a normal woman with type B blood have already had one child with the disease. The woman is now pregnant for a second time. What is the probability that the second child will also have the disease? Assume that both parents are heterozygous for the gene that causes the disease.
- A man has six fingers on each hand and six toes on each foot. His wife and their daughter have the normal number of digits. Extra digits is a dominant trait. What fraction of this couple's children would be expected to have extra digits?

117. Imagine that you are a genetic counselor, and a couple planning to start a family comes to you for information. Charles was married once before, and he and his first wife had a child with cystic fibrosis. The brother of his current wife, Elaine, died of cystic fibrosis. What is the probability that Charles and Elaine will have a baby with cystic fibrosis? (Neither Charles nor Elaine has cystic fibrosis.)
118. Determine the sequence of genes along a chromosome based on the following recombination frequencies:  $A-B$ , 8 map units;  $A-C$ , 28 map units;  $A-D$ , 25 map units;  $B-C$ , 20 map units;  $B-D$ , 33 map units.

## AP Bio Heredity Practice Test 2016 Answer Section

### MULTIPLE CHOICE

- |            |        |                   |
|------------|--------|-------------------|
| 1. ANS: A  | PTS: 1 |                   |
| 2. ANS: B  | PTS: 1 |                   |
| 3. ANS: C  | PTS: 1 |                   |
| 4. ANS: A  | PTS: 1 |                   |
| 5. ANS: D  | PTS: 1 |                   |
| 6. ANS: E  | PTS: 1 |                   |
| 7. ANS: B  | PTS: 1 |                   |
| 8. ANS: D  | PTS: 1 |                   |
| 9. ANS: A  | PTS: 1 |                   |
| 10. ANS: C | PTS: 1 | TOP: Concept 14.1 |
| 11. ANS: C | PTS: 1 | TOP: Concept 14.1 |
| 12. ANS: A | PTS: 1 | TOP: Concept 14.1 |
| 13. ANS: B | PTS: 1 | TOP: Concept 14.1 |
| 14. ANS: B | PTS: 1 | TOP: Concept 14.1 |
| 15. ANS: D | PTS: 1 | TOP: Concept 14.1 |
| 16. ANS: B | PTS: 1 | TOP: Concept 14.1 |
| 17. ANS: A | PTS: 1 | TOP: Concept 14.1 |
| 18. ANS: B | PTS: 1 | TOP: Concept 14.1 |
| 19. ANS: C | PTS: 1 | TOP: Concept 14.1 |
| 20. ANS: E | PTS: 1 | TOP: Concept 14.1 |
| 21. ANS: D | PTS: 1 | TOP: Concept 14.1 |
| 22. ANS: A | PTS: 1 | TOP: Concept 14.1 |
| 23. ANS: C | PTS: 1 | TOP: Concept 14.1 |
| 24. ANS: E | PTS: 1 | TOP: Concept 14.1 |
| 25. ANS: D | PTS: 1 | TOP: Concept 14.1 |
| 26. ANS: E | PTS: 1 | TOP: Concept 14.1 |
| 27. ANS: D | PTS: 1 | TOP: Concept 14.1 |
| 28. ANS: C | PTS: 1 | TOP: Concept 14.1 |
| 29. ANS: D | PTS: 1 | TOP: Concept 14.2 |
| 30. ANS: E | PTS: 1 | TOP: Concept 14.2 |
| 31. ANS: B | PTS: 1 | TOP: Concept 14.2 |
| 32. ANS: E | PTS: 1 | TOP: Concept 14.2 |
| 33. ANS: C | PTS: 1 | TOP: Concept 14.2 |
| 34. ANS: E | PTS: 1 | TOP: Concept 14.2 |
| 35. ANS: B | PTS: 1 | TOP: Concept 14.2 |
| 36. ANS: C | PTS: 1 | TOP: Concept 14.2 |
| 37. ANS: E | PTS: 1 | TOP: Concept 14.2 |
| 38. ANS: A | PTS: 1 | TOP: Concept 14.2 |
| 39. ANS: D | PTS: 1 | TOP: Concept 14.3 |
| 40. ANS: C | PTS: 1 | TOP: Concept 14.3 |



41.	ANS: E	PTS: 1	TOP: Concept 14.3
42.	ANS: D	PTS: 1	TOP: Concept 14.3
43.	ANS: C	PTS: 1	TOP: Concept 14.3
44.	ANS: B	PTS: 1	TOP: Concept 14.3
45.	ANS: B	PTS: 1	TOP: Concept 14.3
46.	ANS: C	PTS: 1	TOP: Concept 14.3
47.	ANS: D	PTS: 1	TOP: Concept 14.3
48.	ANS: D	PTS: 1	TOP: Concept 14.3
49.	ANS: C	PTS: 1	TOP: Concept 14.3
50.	ANS: D	PTS: 1	TOP: Concept 14.3-14.4
51.	ANS: A	PTS: 1	TOP: Concept 14.3
52.	ANS: C	PTS: 1	TOP: Concept 14.3
53.	ANS: B	PTS: 1	TOP: Concept 14.3
54.	ANS: A	PTS: 1	TOP: Concept 14.3
55.	ANS: C	PTS: 1	TOP: Concept 14.3
56.	ANS: E	PTS: 1	TOP: Concept 14.3
57.	ANS: C	PTS: 1	TOP: Concept 14.3
58.	ANS: D	PTS: 1	TOP: Concept 14.3
59.	ANS: C	PTS: 1	TOP: Concept 14.4
60.	ANS: C	PTS: 1	TOP: Concept 14.4
61.	ANS: C	PTS: 1	TOP: Concept 14.4
62.	ANS: E	PTS: 1	TOP: Concept 14.4
63.	ANS: E	PTS: 1	TOP: Concept 14.4
64.	ANS: A	PTS: 1	TOP: Concept 14.4
65.	ANS: A	PTS: 1	TOP: Concept 14.4
66.	ANS: B	PTS: 1	TOP: Concept 14.4
67.	ANS: C	PTS: 1	TOP: Concept 14.4
68.	ANS: C	PTS: 1	TOP: Concept 14.4
69.	ANS: C	PTS: 1	TOP: Concept 14.4
70.	ANS: C	PTS: 1	TOP: Concept 14.4
71.	ANS: C	PTS: 1	TOP: Concept 14.4
72.	ANS: A	PTS: 1	TOP: Concept 14.4
73.	ANS: B	PTS: 1	TOP: Concept 14.4
74.	ANS: B	PTS: 1	TOP: Concept 15.1
	SKL: Knowledge/Comprehension		
75.	ANS: A	PTS: 1	TOP: Concept 15.1
	SKL: Knowledge/Comprehension		
76.	ANS: C	PTS: 1	TOP: Concept 15.1
	SKL: Knowledge/Comprehension		
77.	ANS: B	PTS: 1	TOP: Concept 15.1
	SKL: Knowledge/Comprehension		
78.	ANS: C	PTS: 1	TOP: Concept 15.2
	SKL: Knowledge/Comprehension		
79.	ANS: D	PTS: 1	TOP: Concept 15.2
	SKL: Application/Analysis		
80.	ANS: A	PTS: 1	TOP: Concept 15.2
	SKL: Knowledge/Comprehension		

81. ANS: D                   PTS: 1                   TOP: Concept 15.2  
SKL: Knowledge/Comprehension
82. ANS: E                   PTS: 1                   TOP: Concept 15.2  
SKL: Knowledge/Comprehension
83. ANS: A                   PTS: 1                   TOP: Concept 15.2  
SKL: Knowledge/Comprehension
84. ANS: A                   PTS: 1                   TOP: Concept 15.2  
SKL: Knowledge/Comprehension
85. ANS: D                   PTS: 1                   TOP: Concept 15.2  
SKL: Application/Analysis
86. ANS: E                   PTS: 1                   TOP: Concept 15.2  
SKL: Application/Analysis
87. ANS: A                   PTS: 1                   TOP: Concept 15.2  
SKL: Application/Analysis
88. ANS: A                   PTS: 1                   TOP: Concept 15.2  
SKL: Application/Analysis
89. ANS: B                   PTS: 1                   TOP: Concept 15.2  
SKL: Application/Analysis
90. ANS: C                   PTS: 1                   TOP: Concept 15.2  
SKL: Application/Analysis
91. ANS: E                   PTS: 1                   TOP: Concept 15.2  
SKL: Application/Analysis
92. ANS: C                   PTS: 1                   TOP: Concept 15.2  
SKL: Knowledge/Comprehension
93. ANS: B                   PTS: 1                   TOP: Concept 15.2  
SKL: Application/Analysis
94. ANS: A                   PTS: 1                   TOP: Concept 15.3  
SKL: Knowledge/Comprehension
95. ANS: A                   PTS: 1                   TOP: Concept 15.3  
SKL: Knowledge/Comprehension
96. ANS: B                   PTS: 1                   TOP: Concept 15.3  
SKL: Knowledge/Comprehension
97. ANS: A                   PTS: 1                   TOP: Concept 15.3  
SKL: Knowledge/Comprehension
98. ANS: E                   PTS: 1                   TOP: Concept 15.3  
SKL: Application/Analysis
99. ANS: A                   PTS: 1                   TOP: Concept 15.3  
SKL: Knowledge/Comprehension
100. ANS: C                   PTS: 1                   TOP: Concept 15.3  
SKL: Knowledge/Comprehension
101. ANS: E                   PTS: 1                   TOP: Concept 15.3  
SKL: Application/Analysis
102. ANS: E                   PTS: 1                   TOP: Concept 15.3  
SKL: Application/Analysis
103. ANS: E                   PTS: 1                   TOP: Concept 15.3  
SKL: Knowledge/Comprehension
104. ANS: A                   PTS: 1                   TOP: Concept 15.3  
SKL: Knowledge/Comprehension
105. ANS: C                   PTS: 1                   TOP: Concept 15.4

- SKL: Knowledge/Comprehension
106. ANS: A           PTS: 1           TOP: Concept 15.4  
SKL: Application/Analysis
107. ANS: D           PTS: 1           TOP: Concept 15.4  
SKL: Knowledge/Comprehension
108. ANS: D           PTS: 1           TOP: Concept 15.4  
SKL: Knowledge/Comprehension
109. ANS: C           PTS: 1           TOP: Concept 15.4  
SKL: Knowledge/Comprehension
110. ANS: D           PTS: 1           TOP: Concept 15.4  
SKL: Knowledge/Comprehension
111. ANS: D           PTS: 1           TOP: Concept 15.4  
SKL: Application/Analysis
112. ANS: D           PTS: 1           TOP: Concept 15.4  
SKL: Application/Analysis
113. ANS: A           PTS: 1           TOP: Concept 15.5  
SKL: Application/Analysis
114. ANS: B           PTS: 1           TOP: Concept 15.5  
SKL: Knowledge/Comprehension

#### SHORT ANSWER

115. ANS:  
1/16
- PTS: 1           TOP: Self-Quiz Questions
116. ANS:  
1/2
- PTS: 1           TOP: Self-Quiz Questions
117. ANS:  
1/6
- PTS: 1           TOP: Self-Quiz Questions
118. ANS:  
*D—A—B—C*
- PTS: 1           TOP: Self-Quiz Questions