AP Biology Genetics Practice 2014 2015

Name _____

1. A genetic counselor is consulted by a young man who is worried about developing Huntington's disease, an inherited disorder caused by a dominant allele of a single gene. The young man explains that his cousin was recently diagnosed with Huntington's disease, and the news has caused him to consider his own risk of developing the disorder. Which of the following questions will best help the genetic counselor to evaluate the risk of the young man developing Huntington's disease and transmitting it to his children?

   (A) Were you and your cousin born in the same geographical area?
   (B) Were your parents or grandparents ever diagnosed with Huntington's disease?
   (C) Were you in physical contact with a person diagnosed with Huntington's disease?
   (D) Were you ever exposed to substances that are suspected of being mutagens?

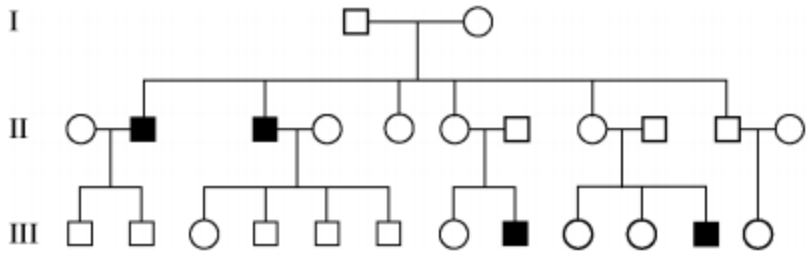
124. Phenylketonuria (PKU) is an inherited disease caused by an autosomal recessive allele.

   If two individuals who are carriers of PKU have two children, what is the probability that neither child will have PKU? Give your answer as a fraction or decimal.

12. Individuals with an inherited autosomal recessive disorder called primary ciliary dyskinesia (PCD) often have severe respiratory problems due to defective cilia. Males with PCD are often sterile because they produce sperm with defective flagella. Which of the following most likely explains the effect of the recessive allele?

   (A) The mitochondria are defective and do not produce sufficient protein to synthesize microtubules in the cilia and flagella.
   (B) The plasma membrane of the alveoli is not permeable to carbon dioxide during respiration because it is too hydrophobic.
   (C) The Golgi bodies secrete an enzyme that destroys the proteins in the flagella and cilia.
   (D) The cells do not produce functional motor proteins in flagella and cilia.

24. In the following human pedigree, squares represent males, circles represent females, and shaded symbols indicate individuals affected with a disorder.



One of the affected males from the third generation has a child with a female who is a carrier. For the pedigree shown above, which of the following best expresses the probability that the couple's first son will be affected with the disorder?

(A) 25%
(B) 50%
(C) 75%
(D) 100%

Questions 29-32

Table I shows the results of breeding experiments to examine the inheritance of flower color (purple versus white) and pod shape (inflated versus constricted). For the crosses recorded in Table I, true-breeding parents were crossed to produce F_1 offspring, which were then testcrossed to homozygous recessive individuals. Table II shows the results of computer-simulated crosses to model the inheritance of leaf shape (broad versus narrow) and flower color (purple versus white).

TABLE I: RESULTS FROM CROSSES WITH PEA PLANTS

Parental Cross	Phenotypes of F_1 Offspring	Phenotypes of Testcross Offspring (numbers of individuals)			
Purple × White	Purple	Purple (461)		White (468)	
Inflated × Constricted	Inflated	Inflated (593)		Constricted (588)	
Purple, Inflated × White, Constricted	Purple, Inflated	Purple, Inflated (315)	Purple, Constricted (312)	White, Inflated (320)	White, Constricted (317)

TABLE II: RESULTS OF COMPUTER-SIMULATED CROSSES

Parental Cross	Phenotypes of F_1 Offspring	Phenotypes of Testcross Offspring (numbers of individuals)			
Broad × Narrow	Broad	Broad (4870)		Narrow (4862)	
Purple × White	Purple	Purple (4253)		White (4259)	
Broad, White × Narrow, Purple	Broad, Purple	Broad, White (672)	Broad, Purple (75)	Narrow, White (61)	Narrow, Purple (664)

29. Based on the data in Table I, which of the following best explains why there are no individuals with constricted pods in the F_1 generation?

(A) Inflated pod shape is dominant to constricted pod shape.
(B) The inflated-pod offspring in the F_1 generation are homozygous.
(C) Constricted pod shape typically arises from a new mutation in the F_1 generation.
(D) The constricted-pod offspring are carriers for the inflated pod shape allele.

30. In Table I, the ratio of phenotypes in the offspring from the testcross with F_1 plants that had purple flowers and inflated pods suggests that the genes for flower color and pod shape are located

(A) close together on the same autosome
(B) on the X chromosome
(C) on different chromosomes
(D) on a mitochondrial chromosome

31. Which of the following provides the best justification for an assumption that might have been used in the computer simulation (Table II) ?

(A) The broad allele is recessive to the narrow allele because broad leaves appear in every generation.
(B) The purple allele is dominant to the white allele because all the offspring from the cross of purple-flowered and white-flowered plants had purple flowers.
(C) The narrow allele is codominant with the purple allele because the purple-flower trait and the narrow-leaf trait segregate together.
(D) The white allele is dominant to both the broad and narrow alleles because plants with either type of leaf shape can have white flowers.

32. In Table II, the F_1 offspring of the cross between broad-leaved, white-flowered plants with narrow-leaved, purple-flowered plants have a phenotype that differs from that of either parent. However, many testcross offspring have the same phenotype as one of the two plants in the parental cross, but relatively few testcross offspring have the same phenotype as the F_1 offspring. Which of the following best explains the observation?

(A) Recombination between the leaf-shape and flower-color genes resulted in chromosomes carrying a dominant allele of both genes.
(B) Recombination between the broad and narrow alleles of the leaf-shape gene resulted in chromosomes carrying three different alleles at the same genetic locus.
(C) Independent assortment of homologous chromosomes resulted in the combinations of alleles present in the parental generation.
(D) The computer model cannot capture the possible assortments of gametes when multiple genes are considered.