

Directions: Read each question carefully and completely. Select the **ONE BEST** answer and record your choice by **CAREFULLY** blackening the proper space on your answer sheet with a #2 pencil. If you make a mistake, erase your old answer completely.

- The branch of genetics concerned with analyzing how genes are passed from generation to generation is
A. molecular genetics B. plant genetics C. transmission genetics
D. population genetics
- Which of the following eukaryotic organisms has been studied extensively by geneticists?
A. yeast B. fruit flies C. maize (corn) D. all of the above
- Which of the following is a prokaryotic organism studied extensively by genetics researchers?
A. E. coli B. Zea mays C. Drosophila D. homo sapiens
- From the experiments with pea plants Gregor Mendel discerned that
A. traits observed in parent plants are independent of the traits seen in the offspring
B. traits are inherited through the physical transmission of hereditary factors
C. hereditary factors are made of DNA
D. hereditary factors are inherited as a complete set from one parent only
- If a diploid cell contains 6 chromosomes (i. e. three per set) how many possible random arrangements of homologues could occur during metaphase I?
A. 8 B. 10 C. 16 D. 6 E. 20
- Skin cells and gametes of the same animal contain the same number of chromosomes
A. yes B. no
- Any chromosome may pair with any other chromosome in the same cell in meiosis
A. yes B. no
- The gametes of an animal may contain more maternal chromosomes than its body cells contain
A. yes B. no
- In dogs, black fur color is dominant to white. Two heterozygous black dogs are mated. What would be the probability of the pups four with black fur and two with white fur?
A. 0.297 B. 0.321 C. 0.545 D. 0.012 E. 0.789

10. Summer squash comes in three shapes: disk, spherical and elongate. In one experiment researcher crossed two squash plants with disk-shaped fruits. The first 160 seeds planted from this cross, produced plants with fruit shapes as follows: 89 disk, 61 sphere and 10 elongate. What is the mode of inheritance of fruit shape in summer squash?
A. autosomal dominant B. epistatic C. autosomal recessive D. X-linked
11. If two black mice were crossed, ten black and three white mice result. What are the genotypes of the parents?
A. Bb and Bb B. BB and bb C. Bb and BB D. BB and BB
12. An ideal organism for a geneticist to study would possess which of the following characteristics?
A. a relatively a short life cycle
B. a large degree of genetic variation among individuals in the population
C. each mating produces a large number of offspring
D. genetic background is well known
E. all of these are desirable characteristics
13. Crossing over occurs most frequently during which stage of cell division?
A. prophase I of meiosis B. metaphase II of meiosis
C. prophase of mitosis D. telophase of mitosis
E. prophase II of meiosis
14. At the conclusion of meiosis, there are ----- cells.
A. two diploid B. four diploid C. two haploid D. four haploid
15. In his breeding experiments, Mendel noted the appearance of which of the following traits?
A. flower color B. seed shape C. stem height D. all of the above
16. The first filial generation is produced by mating the
A. F1 offspring B. F2 offspring C. true breeding offspring
D. parental generation
17. Mendel observed that some traits present in the parental generation disappear in the F1, only to reappear in the F2. He concluded that
A. only dominant factors are expressed in the F2 generation
B. dominant factors masked the expression of recessive factors in the F1 generation
C. recessive factors could only be detected in the parental generation
D. recessive factors were lost from the genotype during successive breeding
18. True breeding individuals with two identical alleles of a particular gene are
A. heterozygous B. hemizygous C. homozygous D. heterogenous

19. In pea plants, the smooth seed allele is dominant to the wrinkled seed allele. The F1 generation resulting from a mating between a true-breeding pea plant bearing smooth seeds and one bearing wrinkled seeds would show which phenotype
- A. $\frac{1}{2}$ smooth seeds and $\frac{1}{2}$ wrinkled seeds B. all smooth seeds
 C. all wrinkled seeds D. $\frac{3}{4}$ wrinkled and $\frac{1}{4}$ smooth
20. In lilies, white flowers (W) are dominant to purple flowers (w). If two plants that are heterozygous for flower color are mated, the offspring might have which genotype?
- A. WW B. Ww C. ww D. all of the above E. none
21. In the above example (question # 20), the offspring would be expected to show which phenotypic ratio?
- A. 3:1 B. 1:2:1 C. 9:3:3:1 D. 1:1 E. none of the above
22. In the above example (question # 20), an offspring could have which phenotype?
- A. white flowers B. purple flowers C. white flowers with purple spots
 D. both A and B
23. In a pea plant that is heterozygous for seed color, what proportion of gametes will carry a recessive allele?
- A. $\frac{1}{4}$ B. $\frac{1}{2}$ C. $\frac{3}{4}$ D. all of the gametes E. none
24. In a test cross between an individual with an unknown genotype that exhibits the dominant phenotype, and a known homozygous recessive individual, the progeny showed a 1:1 ratio of dominant to recessive phenotypes. The individual of unknown genotype is therefore -----
- A. hemizygous B. homogeneous C. homozygous D. heterozygous
25. What proportion of pea plants will produce smooth, yellow seeds (S- Y-) in the F2 generation when two F1 plants and the both the genotypes Ss Yy, are crossed?
- A. $\frac{3}{4}$ B. $\frac{9}{16}$ C. $\frac{3}{16}$ D. $\frac{1}{4}$ E. $\frac{1}{16}$
26. In the F2 generation, how many phenotypic classes are possible from a trihybrid cross of heterozygotes in which the genes involved show complete dominance?
- A. 2 B. 8 C. 16 D. 27 E. 61
27. In the F2 generation, how many genotype classes are possible from a dihybrid cross of two heterozygotes in which genes involved show complete dominance?
- A. 3 B. 4 C. 8 D. 9 E. 12
28. The statistical test used to determine if an observed set of data differs significantly from the expected results is the ----- test.
- A. student t B. best fit C. product rule D. chi-square

29. The inheritance of traits in humans is best studied by
 A. performing carefully controlled mating experiments
 B. construction and evaluating family pedigrees
 C. performing and evaluating chi-square tests
 D. all of the above
30. If the results of a chi-square test on a particular set of data show a P value greater than 0.05, then the hypothesis is
 A. must be rejected B. must be accepted C. cannot be rejected
31. In human recessive traits are expressed in
 A. females only B. every generation C. a person with one recessive allele
 D. a person with two recessive alleles E. both A and C
32. The offspring of two phenotypically normal people who are heterozygotes for albinism would be expected to exhibit which phenotypic ratio of normal to affected individuals?
 A. 3:1 B. 1:1 C. 1:2:1 D. 1:3 E. 4:0
33. The probability that two parents will have first three girls and next one boy in their family may be determined using the
 A. product rule B. sum rule C. student t test D. chi-square
34. The probability that two parents will have first three girls and next one boy in their family is
 A. $\frac{1}{2}$ B. $\frac{1}{4}$ C. $\frac{1}{8}$ D. $\frac{1}{16}$ E. $\frac{1}{32}$
35. In humans, brown eye color (B) is dominant to blue eyes (b). Two parents with brown eyes have a large family of 24 children. 18 of the children have brown eyes and 6 of them have blue eyes. Then parents genotypes are
 A. BB and bb B. Bb and bb C. BB and Bb D. Bb and Bb
36. In humans, albinism is a recessive trait characterized by a lack of pigment in the skin and eyes. An albino woman marries a man with normal skin pigmentation whose mother was an albino. What percentage of their offspring is expected to be albino?
 A. 0% B. 25% C. 50% D. 75% E. 100%
37. Coat color in rodents is determined by a gene interaction between two genes. If a true-breeding black rat is crossed to a true-breeding albino rat, the result is a rat with agouti (brownish/dark gray) coat color. If two agouti animals of the F1 generation are crossed to each other, they produce agouti, black, and albino animals in a 9:3:4 ratio. What is the pattern of inheritance for this trait?
 A. autosomal recessive B. autosomal dominant C. epistatic

38. A couple has four children. Neither the father nor the mother is bald; one of the two sons is bald, but neither of the daughters is bald. If one of the daughters marries a nonbald man and they have a son, what is the chance that the son will become bald as an adult?
A. $\frac{1}{4}$ B. $\frac{1}{2}$ C. $\frac{1}{8}$ D. $\frac{1}{16}$ E. $\frac{1}{18}$
39. For traits that show incomplete dominance, the phenotype of a heterozygote is
A. the same as the homozygous dominant phenotype
B. the same as the homozygous recessive phenotype
C. intermediate between the homozygous dominant and homozygous recessive
D. completely different from either the homozygous dominant or recessive
40. In a certain type of plant, the gene for flower color has two alleles, blue and yellow. Heterozygous plants produce green flowers. This is an example of
A. incomplete dominance B. co-dominance C. complete dominance
D. epistasis
41. The expressivity of a gene depends on the organism's
A. genotype B. environment C. age D. all of the above
42. A (n) ----- gene masks the expression of a different, non-allelic gene
A. incomplete dominance B. epistatic C. recessive D. co-dominant
43. A person who is known to have a particular genotype does not show the phenotype specified by the gene. This is an example of
A. incomplete dominance B. epistasis C. incomplete penetrance
D. phenotype switching E. sex reversal
44. The autosomal dominant trait brachydactyly is a condition characterized by short, stumpy fingers and toes; however, the symptoms are not always expressed in individuals that carry the dominant allele. The brachydactyly allele is
A. co-dominant B. incompletely dominant C. incompletely penetrant
D. epistatic E. completely dominant
45. Members of a family have a condition in which the second toe is longer than the big toe. The trait is found in every generation, but it does not always appear in family members with the associated genotype. In some people, the second toe is longer on both feet; in others only one foot has the affected toe. This gene is
A. dominant B. incompletely penetrant C. variably expressed
D. all of the above E. none of the above
46. Some fruit flies that are homozygous for the recessive eyeless gene have no eyes, while others have eyes that are smaller than normal. Still others have completely normal eyes. This indicates that the eyeless gene is
A. epistatic B. completely penetrant C. co-dominant
D. incompletely dominant E. variably expressed

47. Autosomal traits that appear in only one gender are
A. sex-linked B. sex influenced C. sex limited D. sex inhibited
48. Pattern baldness, a trait which is caused by an allele that acts as a dominant allele in men but as a recessive allele in women, is a ----- trait.
A. sex influenced B. sex limited C. sex linked D. incompletely dominant
49. Autosomal traits that appear in both genders but differ between males and females either in frequency of occurrence or in phenotypes are
A. sex-linked B. sex influenced C. sex inhibited D. sex limited
50. The sedative thalidomide induces the condition that resembles the genetic disorder phocomelia. This induced condition is a ----- of the genetic disease.
A. phenocopy B. genotype C. phenotype D. prototype