

Select the letter of the alphabet indicating the most appropriate answer.

1. A polymorphic species
 - A. must breed true.
 - B. is just like a purebred variety of domestic stocks.
 - C. exhibits reasonably frequent individual variation for one or more characters.
 - D. has "like begetting like" only.
 - E. always has "like begetting unlike".

2. An alternative form of a gene is
 - A. an allele.
 - B. a gamete.
 - C. a phenocopy.
 - D. a sibling.
 - E. variable expressivity.

3. Purebred does not imply
 - A. absence of mutants.
 - B. homozygosity.
 - C. of a lineage established by registration records.
 - D. of a recognized breed free of genetic contributions from outside stock for many generations.
 - E. producing the same phenotype and only that phenotype generation after generation.

4. Scientific method includes
 - A. selective use of criteria for "truth".
 - B. replication of experimental results.
 - C. observing, hypothesizing, and testing results.
 - D. a search for more inclusive theories.
 - E. all of the above.

5. Among others, Kölreuter and Von Gärtner established that
 - A. progeny are always intermediate between the parents.
 - B. chromosomes are the only constant predictable structures in the cell nucleus.
 - C. reciprocal crosses are generally equal.
 - D. pangenes develop an organ like the one from which the gemmule came.
 - E. acquired character result from a blending of blood of the parents.

6. The seed endosperm of higher plants is
 - A. monoploid
 - B. haploid
 - C. diploid.
 - D. triploid.
 - E. bereft of genetic material.

7. In both mitosis and meiosis
 - A. synapsis of homologous chromosomes occurs in the prophase.
 - B. chromosomes revert to the reticulum in telophase.
 - C. chiasma terminalized in diakinesis.
 - D. centromeres first show their duplicated state in metaphase.
 - E. the chromosomes line up in a single plane in the center of the cell in leptonema.

8. Five cell divisions in producing the gamete is most characteristic of
- gametogenesis.
 - spermatogenesis.
 - oögenesis.
 - microsporogenesis.
 - megasporogenesis.
9. Tetrads are found in
- centromeres.
 - pachynema, diplonema, and diakinesis.
 - mendelian F2 results.
 - the G1 phase of the cell cycle.
 - telophase II.
10. One variety of the lime, Citrus aurantifolia, has 9 pairs of chromosomes and a variety of kumquat, Fortunella hindsii, has 36 chromosomes. The hybrid between them has how many chromosomes?
- 9
 - 18
 - 27
 - 36
 - 54
11. Globe-eyed goldfish, Carassius auratus, crossed with normal yielded an F2 of 3/4 normal and 1/4 globe-eyed. The inheritance of the mutant fits a
- dominant.
 - codominant
 - recessive.
 - dominant with reduced penetrance.
 - recessive with variable expressivity.
12. The catnip response to the essential oil nepetalactone is normal. A recessive mutant in cats, Felis catus, fails to respond to nepetalactone. If purebred normals are crossed with non-responders, about how many of 120 F2 progeny would be expected to be normal?
- 30.
 - 40.
 - 60.
 - 90.
 - 120.
13. Silky plumage in chickens is recessive to normal. From pure-breeding stocks of each kind, what fraction of the normal F2 would be expected to breed true?
- none.
 - 1/4.
 - 1/3.
 - 1/2.
 - all.

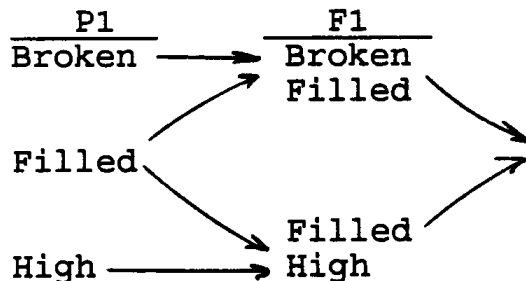
14. A lavender hen mated to a wild type cock laid 11 eggs of which 3 hatched. Two were lavender chicks and one normal. The actual $2/3$ to $1/3$ frequency is best explained by
- a codominant lethal.
 - a recessive lethal in both parents.
 - chance combinations from heterozygous cock carrying a recessive lavender mutant.
 - chance combinations of a dominant mutant heterozygous in the hen.
 - C or D or partial dominance, since the data are insufficient to distinguish.
15. The wild type Red Jungle Fowl has a striped chick down pattern. The Golden Sebright has a non-striped pattern. The F1 in a cross of these types were all non-striped. From a cross of the F1 back to Jungle fowl there were 67 striped and 61 non-striped offspring. This last family represents a(n)
- P1.
 - F1.
 - F2.
 - backcross.
 - testcross.
16. There were 89 normal progeny and 28 albinos hatched from ten clutches of eggs from selected normal appearing corn snakes, Elaphe guttata. The parents probably were
- homozygous.
 - purebred.
 - equivalent to F1 types.
 - in a testcross.
 - mutants.
17. Dominance is
- relative to the technique used to detect the phenotype.
 - an attribute of the normal condition.
 - unaffected by environment.
 - rare for normal genes.
 - not important in establishing the phenotype.
18. The "skin" color of watermelons, Citrullus vulgaris, may be the normal solid green or striped (green and light green). From a cross of pure-breeding parents of each type, the F1 were all solid green. Assuming monohybrid control, how many striped melon plants would be expected to occur in the F2, if 104 plants were raised in the F2?
- 13.
 - 26.
 - 52.
 - 78.
 - 104.

19. In the watermelon problem above, the most appropriate pair of gene symbols is
- A. G and g.
 - B. G+ and g.
 - C. G+ and s.
 - D. S+ and s.
 - E. S and s+.
20. The Huntington elm in England is considered a hybrid of Ulmus glabra (opposite leaved) with U. montana (alternate leaved). The F₂ from the Huntington elm consisted of 732 opposite leaved: 239 alternate leaved seedlings. (J. Linn. Soc. Bot 39:290-300) Therefore,
- A. The F₂ should have had a 3rd phenotype.
 - B. a testcross would be to the glabra type.
 - C. all the F₂ should have been opposite leaved.
 - D. the Huntington elm was opposite leaved.
 - E. a 1:3 ratio of opposite leaved to alternate leaved should have occurred, if it is a monohybrid.
21. In chickens, Gallus gallus domesticus, the gene controlling blue egg shell is dominant to the normal buff. P₁ stocks of each type were crossed. However, the F₂ had only 3/8 (not 3/4) of all the progeny laying blue eggs. Probably,
- A. the mutant is recessive.
 - B. there are two mutants controlling blue eggs.
 - C. roosters don't lay eggs.
 - D. reduced penetrance is involved.
 - E. homozygous mutants die.
22. The sunlight sneeze gene in humans controls a photic double sneeze reflex (Sci. '84). At least one parent of an affected individual always shows this phenotype as well. The most likely type of inheritance is
- A. concordant.
 - B. dominant.
 - C. genocopy.
 - D. pleiotrophic.
 - E. recessive.
23. In Society finches a "fawn" colored bird crossed with a normal chocolate (dark) type yielded the F₁ all chocolate. What fraction of the F₂ would be expected to breed true?
- A. none
 - B. all
 - C. 1/2
 - D. 1/3
 - E. 1/4

24. In Texas Longhorn cattle, three phenotypes occur among progeny from dilute x dilute parents: normal, dilute, and extreme dilute (Olsen, 1975, MS thesis, ISU). Among the progeny one would expect
- A. equal numbers among the three phenotypes.
 - B. about 1/4 to be extreme dilute.
 - C. partial dominant inheritance.
 - D. 3/4 to be normal.
 - E. both B and C.
25. In 1898 Luther Burbank published what he called segregation results of crossing the Persian walnut with the California black walnut to produce the "Paradox" hybrid. He said the hybrid selfed produced about 1/3 broad-leaved Persian type, 1/3 black walnut leaf type, and 1/3 Paradox type. He did not keep accurate count of the second generation hybrids because he operated on such a "large scale ... making this scarcely practicable". In light of Mendelian genetics how would you change the ratio of Persian: black: Paradox type respectively?
- A. 1:3:1
 - B. 1:2:1
 - C. 2:1:1
 - D. 1:1:2
 - E. None of these is likely.
26. Heggedal mink, Mustela vison, have dark eyes with white fur. Heggedals never breed true, their progeny always consist of 2/3 Heggedal and 1/3 normal. How many of the Heggedals are heterozygous?
- A. none.
 - B. 1/4.
 - C. 1/2.
 - D. 2/3.
 - E. all.
27. Monozygotic twins have 67% concordance for epilepsy, while dizygotic twins have 3% concordance. Therefore, within the variation noted:
- A. both genotypes and environment are important.
 - B. environment is clearly responsible for practically all of the variation.
 - C. genotype is clearly responsible for nearly all of the variation.
 - D. the data are inadequate for saying anything about the relative importance of genetics and environment.
 - E. identical twins have a higher frequency of epilepsy than the rest of the population.
28. When one gene controls or affects more than one character, the concept is known as
- A. codominance.
 - B. penetrance.
 - C. phenocopy.
 - D. pleiotrophism.
 - E. variable expressivity.

29. The sailfin molly, Poecilia latipinna, may have melanistic spotting controlled by a semi-dominant gene. Maximum spotting occurs at 20 degrees C and minimal at 28 degrees C. This is an example of
- A. variable expressivity.
 - B. pleiotrophy.
 - C. reduced penetrance.
 - D. phenocopy.
 - E. genocopy.
30. In raspberries, Rubus idaeus, the separate mutants spineless and waxless are both recessive to the normal (presence of spines and bloom or wax). A horticulturist wishes to obtain the combined spineless and waxless type. What fraction of the F2 progeny would be expected to be his desired type?
- A. 9/16.
 - B. 7/16.
 - C. 6/16.
 - D. 3/16.
 - E. 1/16.
31. Oval radishes, Raphanus sativus, never breed true; half their progeny include round and the normal long root types. Corky root is dominant to non-corky. How many F2 from a cross of purebred round non-corky by long corky stocks would be expected to be oval, corky?
- A. 9/16.
 - B. 7/16.
 - C. 6/16.
 - D. 3/16.
 - E. 1/16.
32. If all the mutants are recessive in a trihybrid, then in the F2 each phenotypic single mutant class is indicated in the
- A. 27/64 classes.
 - B. 9/64 classes.
 - C. 3/64 classes.
 - D. 1/64 classes.
 - E. none of these classes.
33. In cats, Felis catus, three recessive mutants are long hair, black color, and lack of the catnip response to the essential oil nepetalactone. Two dominant mutants are polydactyly and piebald. From parents heterozygous for each of the 5 gene pairs indicated, what is the expected frequency of normal progeny?
- A. 3/4.
 - B. 243/1024.
 - C. 27/1024.
 - D. 3/231.
 - E. none of these.

34. In the petunia, Petunia hybrida, the standard flower color is magenta. Purebred mutant blue stock crossed with magenta yielded an F1 all magenta and the F2 contained 3/8 lilac. The explanation probably does not include
- magenta is epistatic to lilac and blue.
 - blue is a dihybrid recessive.
 - mimic recessive mutants control lilac.
 - separate lilac mutants interact to yield blue.
 - the P1 types represent 5/8 of the F2.
35. The pigeon, Columba livia, is normally a blue color. Two genetically independent recessive mutant types are red and epistatic albino. The F2 would be expected to have.
- 3 phenotypes and 9 genotypes.
 - 3 phenotypes and 16 genotypes.
 - 4 phenotypes and 8 genotypes.
 - 4 phenotypes and 9 genotypes.
 - none of these.
36. In canaries, Serinus canarius, blue color is a "codominant" lethal (mutant homozygotes never hatch). Crested canaries never breed true, yielding 1/3 normal progeny of those hatched from crested parents. The double mutant, crested blue in both parents will have hatched progeny with the phenotypic ratio
- 9:3:3:1.
 - 6:2:3:1.
 - 4:2:2:1.
 - 1:1:1:1.
 - none of these.
37. Three of 10 alleles for white leaf marking in white clover, Trifolium refens are called broken, filled, and high. All are fully codominant with each other. From the following pedigree how many of the phenotypic classes in the last (third) generation would be purebred (homozygous)?



- none
- all
- one
- two
- three

38. The dictum that "genetic characters allelic to the same thing are allelic to each other" is correct for comparison of
- A. all genes.
 - B. interaction mutant phenotypes.
 - C. recessive mutants.
 - D. single mutants.
 - E. wild type genes.
39. Pick the false conclusion.
Wild type or normal may fail to appear in the phenotypic assortment
- A. in the F2, if both P1 strains are homozygous for some mutant held in common.
 - B. in the F1, if both P1 strains are homozygous for some mutant held in common.
 - C. in the F2, if both P1 mutant stocks are controlled by alleles.
 - D. in the F1, if both P1 mutant stocks are controlled ;by alleles.
 - E. in the F2 or F1, if the mutants are mimics, genetically independent.
40. Allelism is excluded for single mutant forms when
- A. the F2 are all mutant.
 - B. the F2 exhibits a monohybrid ratio.
 - C. the F2 includes recovery of wild type.
 - D. the F2 exhibits a dihybrid ratio.
 - E. (C and D answers are correct).