

1. Dentinogenesis imperfecta is a rare, autosomal, dominantly inherited disease of the teeth which occurs about one in 8000. The teeth are somewhat brown in color and the crowns wear down rapidly. Assume that a male with dentinogenesis imperfecta (assume he is heterozygous), marries a woman with normal teeth. What is the probability that their first child will have dentinogenesis imperfecta?

- 1.0
- *0.5
- 0.25
- 0.125
- 0
- none of the above

2. What is the probability that, in the family described above, their first two children will have dentinogenesis imperfecta?

- 1.0
- 0.5
- *0.25
- 0.125
- 0
- none of the above

3. What is the probability that, in the family described above, their first child will be a girl with dentinogenesis imperfecta?

- 1.0
- 0.5
- *0.25
- 0.125
- 0
- none of the above

	Cross		Progeny	
			solid	striped
(a)	solid	x striped	55	60
(b)	solid	x solid	36	0
(c)	striped	x striped	0	65
(d)	solid	x solid	92	30
(e)	solid	x striped	44	0

4. You are growing pea plants in your a garden and some pea plants have solid leaves, while others have striped leaves. You conduct five different crosses (a

through e, above) and obtain the results given in the table. Define gene symbols and give the possible genotypes of the parents of each cross. Using upper case letters for dominant alleles and lower case letters for recessive alleles, the parental genotypes in cross a are most likely to be:

AA x AA

AA x Aa

AA x aa

Aa x Aa

*Aa x aa

aa x aa

None of the above

5. The parental genotypes in cross d (above) are most likely to be:

AA x AA

AA x Aa

AA x aa

*Aa x Aa

Aa x aa

aa x aa

None of the above

6. In *Drosophila melanogaster*, vestigial (short) wings (vg) are caused by a recessive gene which independently assorts with a gene pair which influences body hair. Homozygotes for the hairy allele (hh) have hairy bodies. A cross is made between a fly with normal wings and a hairy body and a fly with vestigial wings and a normal body. The phenotypically normal F1 flies were crossed among each other and 1024 F2 flies were reared. What phenotypes would you expect in the F2 and in what actual numbers (not ratio) would you expect to find them?

1728 wild type: 256 vestigial and hairy

512 wild type: 512 vestigial and hairy

256 wild type : 256 hairy : 256 vestigial : 256 vestigial and hairy

320 wild type : 320 hairy : 320 vestigial : 64 vestigial and hairy

*576 wild type : 192 hairy : 192 vestigial : 64 vestigial and hairy

none of the above

7. With incomplete dominance, a likely ratio resulting from a monohybrid cross would be

9:3:3:1

3:1

1:2:2:4

*1:2:1

3:3

none of the above

8. A condition in which one gene can mask the expression of a different gene is called

additive alleles

dominance

recessiveness

*epistasis

codominance

none of the above

9. Typical phenotypic ratios resulting from epistatic interactions in dihybrid crosses would be

*9:3:4, 9:7

3:1, 1:1

1:1:1:1, 1:4:6:4:1

9:3:3:1, 1:2:1

1:2:2:4:1:2:1:2:1

none of the above

10. A mutant gene which produces brown eyes (*bw*) is located on chromosome #2 of *Drosophila melanogaster* whereas a mutant gene producing bright red eyes, scarlet (*st*), is located on chromosome #3. Phenotypically wild type flies (with dull red eyes), whose mothers had brown eyes and whose fathers had scarlet eyes were mated. The 800 offspring possessed the following phenotypes: wild type (dull red), white, scarlet (bright red), and brown. Most of the 800 offspring had wild type eyes while those with white eyes were the least frequent. How many white-eyed flies would you expect in the F2 generation?

*50

60

75

200

400

none of the above

11. The actual numbers in each phenotypic class in the above cross were: 445 wild type : 155 scarlet : 140 brown : 60 white. Use a chi-square test to test the assumption that the F2 phenotypic ratio is due to an epistatic interaction between the brown and scarlet loci. What values do you get for chi-square, the degrees of freedom, and the P value of the test. Hint: use a chi-square table from your lecture notes, slides or text book.

Chi-square=0.004; df=1; P is greater than 0.90

Chi-square=0.16; df=1, P is greater than 0.5 and less than 0.9
Chi-square=2.89; df=1; P is greater than 0.05 and less than 0.20
Chi-square=0.004; df=3; P is greater than 0.90
Chi-square=0.16; df=3; P is greater than 0.90
*Chi-square=2.89; df=3; P is greater than 0.2 and less than 0.5
None of the above

12. Many of the color varieties of summer squash are determined by interacting loci: and genotype with AA or Aa produces white fruit, aaBB or aaBb produce yellow fruit, and aabb produces green fruit. Assume that two fully heterozygous plants are crossed. Give the phenotypic ratio of their offspring

9 white: 4 yellow: 3 green
9 white: 3 yellow: 4 green
9 white : 6 yellow : 1 green
10 white : 3 yellow : 3 green
*12 white : 3 yellow : 1 green
none of the above

13. A form of hemophilia are determined by genes on the X chromosome in humans. Assume that a phenotypically normal woman whose father had hemophilia is married to a normal man. What is the probability that their first daughter will have hemophilia?

*0
0.125
0.25
0.5
0.75
1.0
none of the above

14. In a Drosophila experiment a cross was made between homozygous wild type females and yellow-bodied males. All of the resulting F1's were phenotypically wild type. However, adult flies of the F2 generation (resulting from matings of the F1's) had the following characteristics: all females were wild type, half the males were wild type and half the males were yellow. Is the yellow locus autosomal or X-linked or Y-linked?

Autosomal
*X-linked
Y-linked

15. Is the mutant gene for yellow body in Drosophila recessive or dominant?

*Recessive
Dominant
Neither

16. Glucose-6-phosphate dehydrogenase deficiency (G6PD) is inherited as an X-linked recessive gene in humans. A woman who does not have the disease, but whose father suffered from G6PD, marries a normal man. What proportion of their sons is expected to be G6PD?

- 0
- 0.125
- 0.25
- *0.5
- 0.75
- 1.0
- none of the above

17. If the husband in the above question was not normal but was also G6PD deficient, what proportion of their sons is expected to be G6PD

- 0
- 0.125
- 0.25
- *0.5
- 0.75
- 1.0
- none of the above

18. The pattern of inheritance of both Fragile-X Syndrome and Huntington Disease can be characterized by the term

- Sex-linked
- X-linked
- Y-linked
- Maternally inherited
- *Genetic anticipation
- None of the above

19. A tortoiseshell female cat (with patches black and patches of orange fur) mates with a black male cat. The kittens are expected in what phenotypic ratio?

- Females 100% black; males 50% black and 50% orange
- Females 100% orange; males 50% black and 50% orange
- Females 100% black; males 50% black and 50% orange

Females 50% black and 50% orange; males 50% black and 50% orange
*Females 50% black and 50% tortoiseshell; males 50% black and 50% orange
Females 50% black and 50% tortoiseshell; males 50% black and 50% tortoiseshell
None of the above

20. How many Barr bodies would one expect to see in cells of Turner syndrome females (karyotypically 45,X0) and Klinefelter syndrome males (karyotypically 47,XXY)?

0,0
*0,1
0,2
1,0
1,1
0,2
none of the above

21. In humans, the genetic basis for determining the sex "male" is accomplished by the presence of _____.

a balance between the number of X chromosomes and the number of haploid sets of autosomes
multiple alleles scattered throughout the autosomes
one X chromosome
one Y chromosome
*a particular portion of the Y chromosome
none of the above

22. Assuming a normal number of autosomes, what would be the sexes of an XXY mouse and an XXY Drosophila, ZW butterfly

Female, female, female
Female, male, male
*Male, female, female
Male, female, male
Male, male, male
None of the above