

**Part 1. Matching. In the following numbered questions (on the left), chose from the possible answers given by the letters (on the right). Not all answers are used, and some answers might be used more than once. 3 points each. Total 30 points.**

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| <p>1. When the expression of one gene pair masks or modifies the expression of another, the genes are said to exhibit _____.</p> <p>2. Male pattern baldness is thought to be a _____ trait.</p> <p>3. Hairy ears in humans is a _____ trait.</p> <p>4. Chromosomes that are not sex chromosomes are _____.</p> <p>5. Expansion of a _____ into the “full mutation” range is the cause of the most common type of inherited mental retardation.</p> <p>6. The most common type of inherited mental retardation is _____.</p> <p>7. Male mammals are the _____ sex.</p> <p>8. An XXY fruit fly with a normal set of autosomes is what gender?<br/>_____.</p> <p>9. An XO human suffers from what condition?<br/>_____.</p> <p>10. An ZW chicken is what gender? _____</p> <p>t)</p> | <p>a) autosomes</p> <p>b) dominance</p> <p>c) epistasis</p> <p>d) female</p> <p>e) Fragile-X syndrome</p> <p>f) heterogametic</p> <p>g) homogametic</p> <p>h) Huntington disease</p> <p>i) intersex</p> <p>j) Klinefelter Syndrome</p> <p>k) male</p> <p>l) recessive mutation</p> <p>m) recessiveness</p> <p>n) sex limited</p> <p>o) sex-linked</p> <p>p) 3-base (triplet) repeat</p> <p>q) Turner Syndrome</p> <p>r) X-linked</p> <p>s) Y-linked</p> |
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**Part 2. Multiple Choice Questions. Pick the best answer among the choices given.**

1. A cross is made between two individuals of genotypes Aa bb Cc Dd Ee Ff and aa BB cc Dd ee ff. What is the probability of producing the genotype aa bb cc dd ee ff?
- a) 0
  - b) 1/32
  - c) 1/64
  - d) 1/128
  - e) 1/256
  - f) none of the above

2. You find phenotypic variation in body color in a species of earthworm. You cross a pure-breeding red worm with a pure-breeding yellow worm. The F1 offspring from this cross are all red. You self-fertilize one of these F1 offspring, and you see the following phenotypic ratios in the offspring: 207 red: 68 brown: 93 yellow. Which of the following mechanisms do you think controls skin color in this species?

- a) two genes, complete dominance
- b) one gene, normal dominance
- c) one gene, epistasis
- d) two genes, incomplete dominance
- e) two genes, epistasis

3. In humans, there is a dominant allele that causes vitiligo, where small-unpigmented spots appear on the body. Also, there is a recessive allele for another gene that causes albinism, which causes the entire body to be unpigmented. Vitiligo cannot be seen in albinos. A man with vitiligo had an albino mother and normal father. If the man has a child by a phenotypically normal skinned woman who had an albino father, what is the probability of having a phenotypically normal child?

- a) 0
- b) 1/8
- c) 1/4
- d) 3/8
- e) 1/2
- f) 5/8
- g) None above are correct.

4. In some plants, a red pigment (cyanidine) is synthesized from a colorless precursor. The addition of a hydroxyl group to the cyanidine molecule causes it to become purple. In a cross between two purple plants, the following results are obtained: 94 purple; 31 red; 43 colorless. Of the following list, what were the most likely genotypes of the parental purple plants?

- a) Aa and Aa
- b) AA and aa
- c) Aa and aa
- d) AABB and aabb
- e) AAbb and aaBB
- f) AaBb and AaBb

5. Two Manx cats are mated. In a large litter, two-thirds of the kittens are Manx and one-third have normal tails. Which symbols below most accurately describe the genotypes of the parental cats?

- a) M/+ and +/+
- b) M/M and +/+
- c) M/+ and M/+
- d) M/- and +/+
- e) M/M and M/+

6. Male and female yellow mice are crossed. Over several litters, a 2:1 ratio of yellow to wild-type (agouti) pups were produced. If the symbol “Y” represents the allele associated with yellow body color, which symbols below most accurately describe the genotypes of the offspring?

- a) Yy and yy
- b) YY and yy
- c) Yy and Yy
- d) YY and Yy
- e) yy and yy
- f) None of the above

7. The fourth (ring) finger of humans may be longer or shorter than the second (index) finger. The short index finger is produced by an autosomal allele that is dominant in men and recessive in women. What kinds of children and in what proportions would the following marriage be likely to produce: heterozygous long-fingered woman x homozygous short-fingered man. Give sex and finger length of children.

- a) All long-fingered girls; all long-fingered boys
- b) all short-fingered girls; all short-fingered boys
- c) All long-fingered girls; ½ long-fingered and ½ short fingered boys
- d) ½ long-fingered and ½ short-fingered girls; ½ long-fingered and ½ short fingered boys
- e) ½ long-fingered and ½ short-fingered girls; all long-fingered boys
- f) none of the above

8. Black and orange pigments in the coats of cats are determined by an X-linked pair of alleles,  $c^b$  (black) and  $c^o$  (orange). Females are either black ( $c^b c^b$ ), orange ( $c^o c^o$ ) or tortoiseshell with patches of black and patches of orange ( $c^b c^o$ ). Males are either black ( $c^b Y$ ) or orange ( $c^o Y$ ). What genotypes and phenotypes would be expected among the offspring of a cross between a black female and an orange male?

- a) all orange males; all black females
- b) all black males; all orange females
- c) all orange males; all tortoiseshell females
- d) all black males; all tortoiseshell females
- e) all tortoiseshell males; all black females
- f) none of the above

9. The barred pigmentation pattern of the Barred Plymouth Rock breed of chickens consists of white wing bars on black feathers. This pattern is determined by a dominant Z-linked gene ( $B$ ). The recessive allele of this gene ( $b$ ) produces a nonbarred (plain) wing coloration. What phenotypic ratio is expected among the progeny of a cross between a barred female and a nonbarred male? (Include sex and phenotype information.)

- a) barred females and barred males
- b) barred females and non-barred males
- c) non-barred females and non-barred males
- d) non-barred females and barred males
- e) none of the above

10. Fragile X syndrome is caused by expansion of the number of CGG repeats in a region immediately adjacent to the FMR-1 gene. Expansion occurs from the normal range (~6 to ~50 repeats) to the permutation range (~55 to ~230 repeats) to the full mutation range (>230 repeats). Expansion to the full mutation tends to occur in the offspring of individuals with permutations, but not in the offspring of individuals within the normal range. This condition is an example of a kind of inheritance called:

- a) incomplete penetrance
- b) genotype-environment interaction
- c) genetic anticipation
- d) recessive X-linked inheritance
- e) dominant X-linked inheritance

### Formulae, etc.

$\chi^2$  Test: 
$$\chi^2 = \sum \frac{(O-E)^2}{E}$$

### $\chi^2$ Table

df	Probabilities					
	0.90	0.50	0.20	0.05	0.01	0.001
1	0.02	0.46	1.64	3.84	6.64	10.83
2	0.21	1.39	3.22	5.99	9.21	13.82
3	0.58	2.37	4.64	7.82	11.35	16.27
4	1.06	3.36	5.99	9.49	13.28	18.47