

## 102-2 遺傳學 第一次期中考試題

- Please write the definition of the following important genetic terms (50 points):  
(1) allele (2) locus (3) character (4) phenotype (5) homologous chromosome  
(6) reduction division (7) dominance (8) incomplete dominance (9) codominance  
(10) penetrance
- Please describe how Mendel's monohybrid crosses revealed the principle of segregation? (10 points)
- Calvin Bridges found primary exceptions of progenies arose from the cross of a white eye female fly and a red eye male fly, and secondary exceptions arose from the cross between the female from the primary exception and a normal red eye male. The phenotypes and number of sex chromosomes of these exceptions were:  
White eye female: XXY (primary & secondary exception)  
Red eye male: X (primary exception); XY (secondary exception)  
Please explain how Calvin Bridges formulated "the Chromosome Theory" from aforementioned observations. (10 points)
- In rice, two pure-breeding lines without awns were intercrossed, and all F1 progenies had no awn. However, by self-pollinating an F1 progeny, 131 F2 progenies had no awn, while 29 F2 progenies showed awns. Please deduce the genotypes of these phenotypes (including two parental lines, F1 and F2 progenies) with clearly defined gene symbols and use Chi-square goodness-of-fit test to validate your answer. (10 points)
- In *Drosophila melanogaster*, cut wings (*ct*) is recessive to normal wings (*ct<sup>+</sup>*), forked bristle (*f*) is recessive to normal bristle (*f<sup>+</sup>*), and garnet eye (*g*) is recessive to red eyes (*g<sup>+</sup>*), sable body (*s*) is recessive to gray body (*s<sup>+</sup>*). A female fly with normal wings, normal bristle, red eye and gray body is crossed to a male with cut wings, forked bristle, garnet eyes and sable body. The following are the progenies resulting from this cross.

Phenotypic classes	number
cut wings, forked bristle, red eyes, sable body	135
cut wings, normal bristle, red eyes, sable body	310
normal wings, normal bristle, red eyes, sable body	36
normal wings, normal bristle, garnet eyes, gray body	150
cut wings, normal bristle, garnet eyes, gray body	9
cut wings, forked bristle, garnet eyes, gray body	49
normal wings, forked bristle, red eyes, sable body	6
normal wings, forked bristle, garnet eyes, gray body	305

- Please use Chi-square independence test to determine how many genes are not in a linkage group. (10 points)
- Please draw genetic map(s) for linkage loci, and calculate genetic distance between all pairs of two adjacent loci. (10 points)

Critical values of the $\chi^2$ distribution				
<i>df</i>	1	2	3	4
<i>P</i> =0.05	3.841	5.991	7.815	9.488