請依序作答：

一、 (a). What is the heritability of a trait? (6%) (b). Discuss a method of estimating heritability of a trait. (6%)

二、 (a).What is the genetic advance (genetic gain due to selection)? (6%) (b).Discuss factors affecting the genetic advance due to selection. (6%)

三、 (a).What is the synthetic cultivar? (6%) (b).Discuss the implications(暗喻) of Sewall Wright's proposed formula for predicting the F_2 yield of a group of inbred lines. (8%)

四、 (a). What is the mass selection? (6%) (b).Discuss the steps involved in the mass selection method of breeding. (6%)

五、 Diagrammed here is DNA from a wildtype gene (top) and a mutant allele (bottom) that has an insertion of a transposable element that inactivates the genes. The symbols B and E represent the positions of restriction sites for *BamHI* and *EcoRI*, respectively, and the rectangles show sites of hybridization with each of three probes (A, B, and C) that are available. The dots at the left indicated that the nearest site of either *BamHI* or *EcoRI* cleavage is very far to the left of the region shown. Explain which probe and which single restriction enzyme you would use for RFLP analysis to
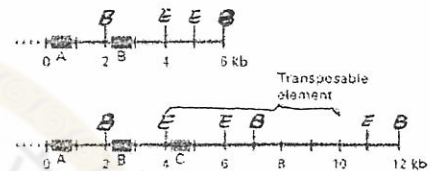
identify both alleles. Also explain why any other choices would be unsuitable. (10%)

六、 Assume that the trihybrid cross *AABBrr* X *aabbRR* is made in a plant species in which *A* and *B* are dominant but there is no dominance between *R* and *r*. Consider the F2 progeny from this cross, and assume independent assortment. (10%)

　　a.　How many phenotypic classes are expected?

　　b.　What is the probability of the parental *aabbRR* genotype?

　　c.　What proportion would be expected to be homozygous for all three genes?

七、 某養雞場 walnut-comb 雞冠的雜交配後得到的後裔表現型及其分離比記載於附表

　　a. 請完成附表。(4%)

　　b. 分析此試驗設計之錯誤，並出該如何修正。(6%)

	Comb Type				
	Walnut	Rose	Pea	Single	Total
Observed Numbers(O)	31	13	10	2	56
Expected ratio	9	3	3	1	
Expected Numbers(E)					
O-E					
$(O-E)^2$					
$(O-E)^2/E$					
$\chi^2=?$					

八、 An organism has six pairs of chromosomes.

　　a. In the absence of crossing over, how many different chromosomal combinations are possible in the gametes? (5%)

　　b. Considering crossing over, how many different chromosomal combinations are possible in the gametes? (5%)

九、 The largest chromosome in a particular eukaryote contains 4×10^7 bp. The rate of DNA synthesis is 4000 bpi min at each replication fork.

　　a. How long does it take to replicate the entire chromosome from a single origin of replication located exactly in the middle of the chromosome. Assume no pauses. (5%)

　　b. Research reveals that it takes only 8 min for an actively growing cell to replicate this chromosome. What is the minimum number of replicons present on this chromosome? (5%)

試題隨卷繳回