

I. Questions:

1. The following two genotypes are crossed: $Aa Bb Cc dd Ee \times Aa bb Cc Dd Ee$.
What will the proportion of the following genotypes be among the progeny of this cross? (8%)
(A) $Aa Bb Cc Dd Ee$
(B) $Aa bb Cc dd ee$
(C) $aa bb cc dd ee$
(D) $AA BB CC DD EE$
2. In guinea pigs, the allele for black fur (B) is dominant over the allele for brown fur (b). A black guinea pig is crossed with a brown guinea pig, producing five F_1 black guinea pigs and six F_1 brown guinea pigs. How many copies of the black allele (B) will be present in each cell from an F_1 black guinea pig at the following stages: G_1 , G_2 , metaphase of mitosis, metaphase I of meiosis, metaphase II of meiosis, and after the second cytokinesis following meiosis? Assume that no crossing over takes place. (12%)
3. In *Drosophila melanogaster*, cherub wings (ch), black body (b), and cinnabar eyes (cn) result from recessive alleles that are all located on chromosome 2. A homozygous wild-type fly was mated with a cherub, black, and cinnabar fly, and the resulting F_1 females were test-crossed with cherub, black, and cinnabar males. The following progeny were produced from the testcross:

ch	b^+	cn	105
ch^+	b^+	cn^+	750
ch^+	b	cn	40
ch^+	b^+	cn	4
ch	b	cn	753
ch	b^+	cn^+	41
ch^+	b	cn^+	102
ch	b	cn^+	5

- (A) Determine the order of these genes on the chromosome. (2%)
(B) Calculate the map distances between the genes. (4%)
(C) Determine the coefficient of coincidence and the interference among these genes. (4%)
4. What is the SMC protein? (2%) Give two examples and describe their functions. (6%)

見背面

5. An individual heterozygous for a reciprocal translocation possesses the following chromosomes ("•" represents the centromere):

A	B	•	C	D	E	F	G
A	B	•	C	D	V	W	X
R	S	•	T	U	E	F	G
R	S	•	T	U	V	W	X

Give the products that result from alternate, adjacent-1, and adjacent-2 segregation. (6%)

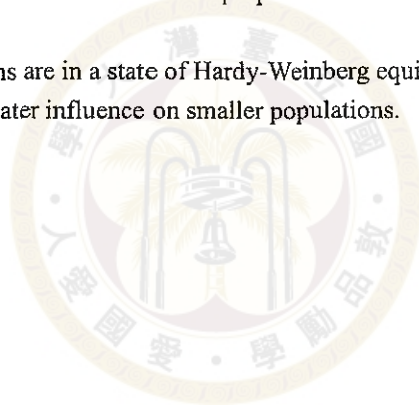
6. What is the genomic imprinting? (2%) How is the process of X inactivation in mammals different to genomic imprinting? (4%)
7. A graduate student isolated a gene from the rice genomic library, inserted it to a plasmid, and transformed the plasmid into a bacterium. The bacteria expressed the inserted rice gene, but the new protein made by the bacteria is somewhat different from the protein normally produced in rice. What is your explanation for why a different protein was produced in the bacteria? (10 %)
8. What is the term describing genetic variation within a population in the length of DNA fragments that are produced when chromosomes are digested with particular restriction enzymes? Both full term and abbreviation are inquired. (10%)
9. A contig containing four genomic DNA clones (A~D) was tested for the presence of six sequence-tagged sites: STS1~STS6. The results are given in the following table; "+" indicates the presence of the STS, and "-" indicates the absence of the STS.

		STS					
		1	2	3	4	5	6
clone	A	-	+	-	-	+	-
	B	+	-	-	-	+	-
	C	-	-	-	+	-	+
	D	+	-	+	+	-	-

- (A) What is the order of STS sites on the chromosome? (5%)
(B) Draw the contig map (overlapping relationship of A~D). (5%)

II. True (O) or False (X) questions: (2 points each)

1. 61 different tRNAs are required for translation *in vivo*.
2. The genetic code is basically universal from bacteria to human.
3. At the termination stage of translation, the stop codon is recognized by a tRNA molecule called release factor.
4. The leucine zipper motif can recognize and bind to DNA sequence within the major groove.
5. The Shine-Dalgarno sequence is found in prokaryotic cells, but not in eukaryotic cells.
6. Crossovers ensure proper chromosome segregation during meiosis I.
7. Sister chromatid exchanges are important to the increase of genetic diversity.
8. Barbara McClintok was the first scientist to propose the existence of transposable elements.
9. Most natural populations are in a state of Hardy-Weinberg equilibrium.
10. Genetic drift has a greater influence on smaller populations.



試題隨卷繳回