

系所組別：生命科學系乙組

考試科目：遺傳學

考試日期：0223，節次：3

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

一. 解釋名詞 25% (每題5分)

1. SNP
2. Linkage disequilibrium
3. nonsense mutation
4. wobble hypothesis
5. Shine-Dalgarno sequence

二. 單選題 26% (每題2分)

1. When a wild-type fly is crossed to a fly homozygous for an autosomal recessive gene, all of the progeny express the recessive phenotype, what type of chromosomal change probably accounts for this result?
 - A) inversion
 - B) deletion
 - C) duplication.
 - D) translocation
 - E) trisomy
2. Which of the following statements regarding sex chromosomes is *not* true?
 - A) An individual with a Y chromosome lacking SRY will be phenotypically female.
 - B) The calico cat supports the Lyon hypothesis that X inactivation is random.
 - C) In *Drosophila*, the ratio of X chromosomes to sets of autosomes determines sex.
 - D) In some reptilian species sex is determined by incubation temperature of eggs.
 - E) The XIST gene is not expressed on the inactivated X.
3. After telophase I of meiosis, the chromosomal makeup of each daughter cell is
 - A) tetraploid, and the chromosomes are composed of two chromatids.
 - B) haploid, and the chromosomes are composed of two chromatids.
 - C) diploid, and the chromosomes are composed of two chromatids.
 - D) haploid, and the chromosomes are composed of a single chromatid.
 - E) diploid, and the chromosomes are composed of a single chromatid.
4. Which of the following is an example of polygenic inheritance?
 - A) Huntington's disease in humans.
 - B) Skin pigmentation in humans.
 - C) Pink flowers in snapdragons.
 - D) White and purple flower color in peas.
 - E) The ABO blood groups in humans.

(背面仍有題目,請繼續作答)

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5. If a plant of genotype $A/a; B/b; C/c; D/d$ is selfed and the genes assort independently, how many different genotypes will be found among the progeny?
- A) 16
 - B) 24
 - C) 64
 - D) 81
 - E) 96
6. A process that occurs in *meiosis* but usually *not* mitosis is
- A) pairing of homologs
 - B) chromatid formation
 - C) cell division
 - D) separation of homologous centromeres to opposite poles
 - E) chromosome condensation
7. Let P = purple flowers and p = white, and T = tall plants and t = dwarf. Of the 16 possible gamete combinations in the dihybrid cross between 2 double heterozygotes, how many would produce the phenotype *white, tall*?
- A) 1
 - B) 2
 - C) 3
 - D) 9
 - E) 16
8. If you needed to determine the order of genes on a chromosome, you should perform
- A) a test cross.
 - B) a SNP test.
 - C) a one-point cross.
 - D) a two-point cross.
 - E) a three-point cross.
9. The chromosome constitution of an allotetraploid can be represented by
- A) $n_1 + n_2$
 - B) $2n_1 + 2n_2$
 - C) $2n_1$
 - D) $2n_2$
 - E) $2n_1 + n_2$

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10. In a cross made with variegated Four O' Clock plants, pollen is provided from flowers on a green sector, and ovules from a white sector. The progeny are expected to be
- A) all variegated
 - B) all green
 - C) all white
 - D) some variegated, some green, some white
 - E) some variegated, some white
11. Which statement best describes the F plasmid?
- A) F plasmids contain genes for formation of a specialized pilus that forms a conjugation bridge between two cells for the purpose of transferring genetic material
 - B) The F plasmids does not have an origin of replication and can therefore not replicate itself
 - C) The primary host for the F plasmids is *Saccharomyces cerevisiae*
 - D) The F plasmids is not important for genetic research
 - E) All of the above statements describe the F plasmids
12. The mouse autosomal genes *B* and *S* are linked and 38 map units apart. Genotypes *B S/B S* and *b s/b s* are intercrossed and the F_1 is testcrossed to *b s/b s*. The proportion of *B-S* progeny will be
- A) 0.38
 - B) 0.76
 - C) 0.50
 - D) 0.31
 - E) 0.19
13. The *lac* operon is normally expressed
- A) in the absence of both lactose and glucose.
 - B) in the absence of lactose and the presence of glucose.
 - C) in the presence of lactose and the absence of glucose.
 - D) in the presence of both lactose and glucose.
 - E) None of the above.

三.問答題 49%

1. What is a simple definition of an allele? (3%)
2. List at least two criteria that indicate a human disorder may be attributable to genetically altered mitochondria. (4%)
3. Why do you think it was much harder to determine linkage patterns in humans than in other species such as *Drosophila* or corn? (5%)

(背面仍有題目,請繼續作答)

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4. Woman born with an extra X chromosome (XXX) are generally healthy and indistinguishable in appearance from normal XX woman. What is a likely explanation for this finding? How could you test this explanation? (6%)
5. Discuss two different modes of regulation of transcription in prokaryotes. (6%)
6. How many clones do you need if you could like to construct a 5X coverage genomic library of an organism which genome size is 4Mb. Assuming the average DNA fragment cloned is 2kb. (5%)
7. What is metagenomics? (5%)
8. What are the current uses of **restriction fragment length polymorphism** technique? (5%)
9. What is **alternative splicing**? (5%)
10. What are the differences of translation between prokaryotes and eukaryotes? (5%)