

請分區作答：

遺傳(50%)

- 一、 In tomatoes, tall vine (D) is dominant over dwarf (d), and spherical fruit shape (P) is dominant over pear shape (p). The genes for vine height and fruit shape are linked with 30 percent recombination between them. One tall plant (I) with spherical fruit was crossed with a dwarf, pear-fruited plant. The cross produced the following results: tall, spherical 91; dwarf, pear 119; tall, pear 38; dwarf spherical 52. Another tall plant with spherical fruit (II) was crossed with the dwarf, pear-fruited plant, and the following results were obtained: tall, pear 23; dwarf, spherical 19; tall, spherical 7; dwarf, pear 11. Diagram these two crosses, showing the genetic markers on the chromosomes. (15%).
  - a、 What is the genotype of plant I? (3%)
  - b、 What is the genotype of plant II? (3%)
  - c、 If the two tall plants with spherical fruit were crossed with each other, that is, I × II, what phenotypic classes would you expect from the cross, and in what proportions? (9%)
- 二、 Genes on different chromosomes recombine with a frequency of 50 percent. Is it possible for two genes on the same chromosome to recombine with this frequency? (5%)
- 三、 Remember that experiment of mixing live IIIIR cells with heat killed IIIS cells obtained live IIIS cells. Please describe how Avery, MacLeod, and McCarty proved that DNA is the genetic transforming material. (10%)
- 四、 Indicate whether each of the following statements about the structure of DNA is true or false. (Each letter is used to refer to the concentration of that base in DNA.) (T or F, 是非題) (1% each)(10%)
  - a、  $A + T = G + C$
  - b、  $G/C = 1$
  - c、  $A/T = C/G$
  - d、  $T/A = C/G$
  - e、  $A + G = C + T$
  - f、  $A = G; C = T$
  - g、  $A = T$  within each single strand
  - h、 When separated, the two strands of a double helix are identical
  - i、 The structure of a DNA double helix is invariant
  - j、 Once the base sequence of one strand of a DNA double helix is known, the base sequence of the second strand can be deduced
- 五、 解釋名詞：
  - a、 amphidiploid, b、 epistasis, c、 robertsonian translocation, d、 RT-PCR, e、 selection marker (2% each)

育種(50%)

- 六、 依下列項目，比較混合選種法(Mass selection)與純系選種法(Pure line selection)：
  - a、 兩種選種法，何者較能應用於遺傳力較低的性狀(3%)?
  - b、 兩種選種法，何者所需的人力與人員訓練通常較低(2%)
  - c、 兩種選種法，何者較能選出適應當地的後代(1%)? 為什麼(2%)?
  - d、 兩種選種法，何者會使用到 progeny test (2%)?
  - e、 異交作物是否能應用於純系選種法(1%)? 如可以，要如何操作? 如不可，為何不可行? (3%)
- 七、 試詳述遠(親)緣雜交的目的(4%)、不親和的隔離障礙(6%)和克服方法(6%)
- 八、 何謂分子標誌輔助選種 (marker-assisted selection, MAS) (5%)? 試論其優缺點(5%)。
- 九、 請解釋何為 Single Nucleotide Polymorphism (SNP) (4%)。請說明 SNP 可用何種方法偵測 (3%)。請說明或舉例，在何種情況下，SNP 可做為育種上使用之分子標誌 (3%)。