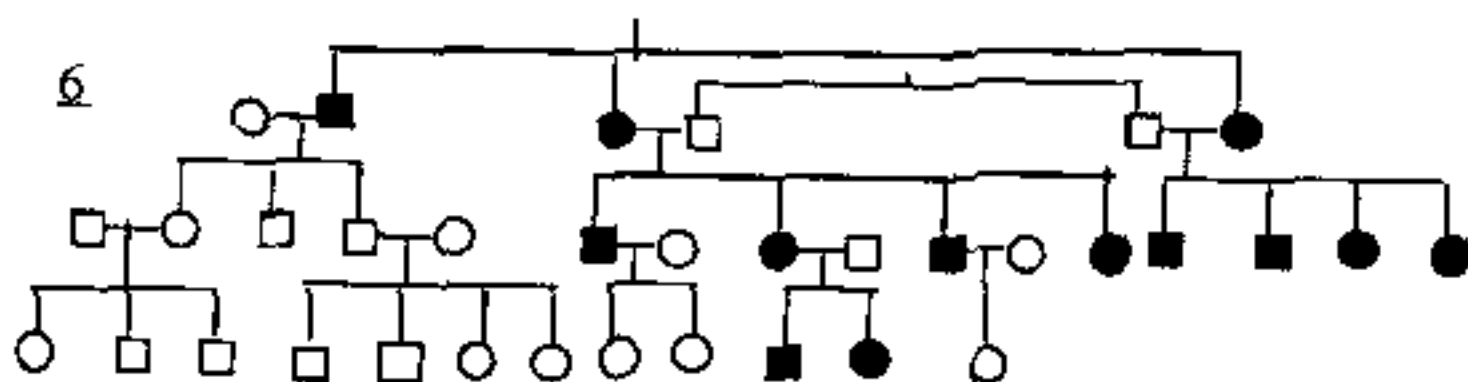
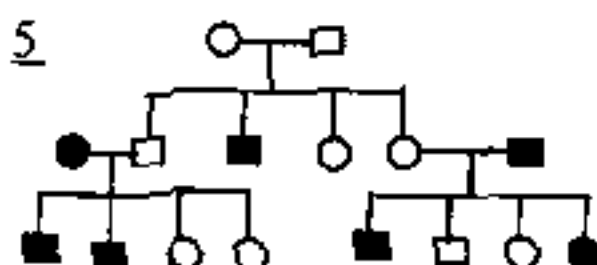
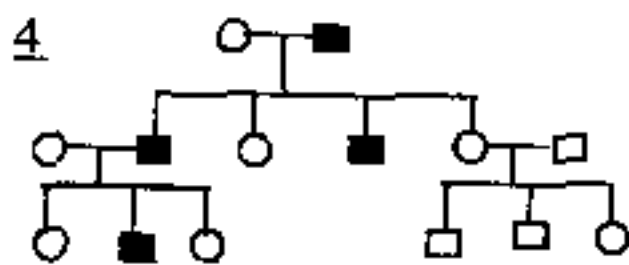
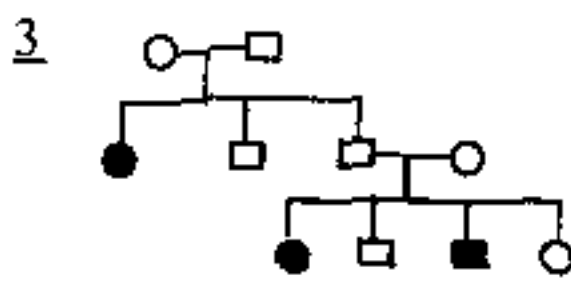
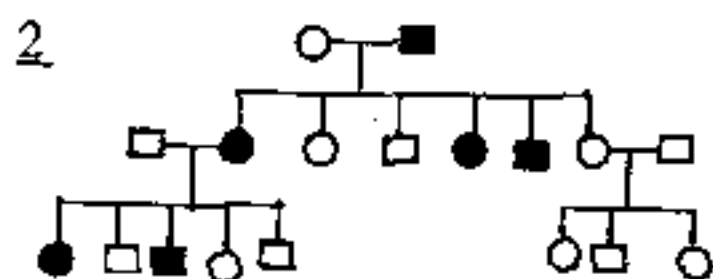
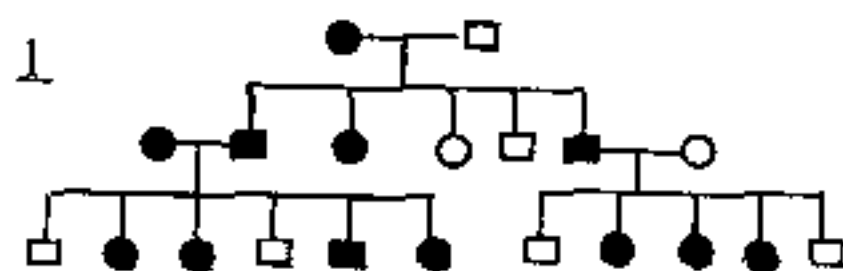


請依題目標示之阿拉伯數字作答

I. Filling blank (3 % each, total 60%)

Indicate the inheritance pattern of the following pedigree (1-6). Choose the best answer from: autosomal recessive, autosomal dominant, sex-linked recessive, sex-linked dominant, Y-linked, cytoplasmic (maternal) inheritance, maternal effect



2. A cell-free extract is prepared from Type IIS pneumococcal cells. Treatments of this extract with protease and RNase have no effect on its subsequent capacity to transform recipient Type IIR cells to Type IIS, however, a treatment with DNase prevents the transformation from Type IIR to Type IIS cells. What conclusion can you draw from this experiment?

八十七學年度 輻射生物研究所系(所) \_\_\_\_\_ 組碩士班研究生入學考試

科目 遺傳學 科號 1403 共 3 頁第 2 頁 \*請在試卷【答案卷】內作答

For each of the following partial diploids indicate whether  $\beta$ -galactosidase formation is inducible or constitutive.

8  $i^+ o^+ z^+$   
 $i^+ o^c z^+$

9  $i^s o^+ z^+$   
 $i^+ o^+ z^+$

10  $i^+ o^+ z^+$   
 $i^- o^+ z^+$

11  $i^- o^+ z^+$   
 $i^- o^+ z^+$

12  $i^+ o^c z^-$   
 $i^+ o^+ z^+$

Hint:  $i$ ,  $o$ , and  $z$  represent  $lacI$ , operator, and  $lacZ$ , respectively.  
+ and - indicate the wild-type and loss of function alleles.  
 $s$  is a negative dominant allele.

- 13 What is the probability of producing an offspring recessive for all four traits by the  $Aa Bb Cc Dd$  parents. Assuming that  $A$ ,  $B$ ,  $C$ , and  $D$  genes are not linked.
- 14 In a series of 94075 babies born in a particular hospital, 10 were achondroplastic dwarfs (an autosomal dominant condition). Two of these ten had an achondroplastic parent. The other 8 babies each had two normal parents. What is the apparent mutation rate at the achondroplasia locus?
- 15 Assuming wobble can occur, what two codons could be recognized by the anticodon 3'-GAG-5'? Write the codon in the 5'-3' direction.
- 16 What is the result of mutation caused by tautomerization of thymine of an  $A \cdot T$  pair?
- 17 Identify the end product of an abortive transposition carried out in a  $recA^-$  deficient host by a transposon with mutations in the resolvase gene.
- 18 Which repair system cleaves thymine dimers?
- 19 A mutant is isolated that cannot be reverted. What type of chromosome aberration might it carry?
- 20 Retinoblastoma is caused by inactivation of a regulatory gene that normally holds cell division in check, what would be the likely phenotype (normal or malignant) of a hybrid between a retinoblastoma cell and a normal cell?

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科目 遺傳學 科號 1403 共 3 頁第 3 頁 \*請在試卷【答案卷】內作答

II. Short Essay (8% each, total 40%)

- 21 Assume the following sequence of events: Eukaryotic DNA replication begins; DNA is pulse-labelled with low specific activity thymidine; DNA is then pulsed with high specific activity thymidine. Show what the resulting autoradiograph will actually look like if the two daughter duplexes twist around each other (i.e., the "bubbles" collapse into straight lines)
- 22 Antitermination and attenuation are both concerned with termination of transcription. How do they differ? (*Hint: consider the roles of ribosome and RNA polymerase*)
- 23 Are all proteins translated from a single polycistronic mRNA necessarily made in the same quantity? Why?
- 24 Under the electron microscope, the DNA of a mutant  $\lambda$  phage is measured to be  $15 \mu\text{m}$  ( $10^{-6} \text{ m}$ ) and that of a wild-type  $\lambda$  is  $17 \mu\text{m}$ . (a) How many base pairs were deleted from the mutant phage. Please show your calculation. (b) Give one method, other than the electron microscopy, that can be used to estimate the size of DNA.
- 25 A mutant *E. coli* cell has an aminoacyl-tRNA synthetase that should attach the amino acid phenylalanine to its tRNA ( $\text{tRNA}^{\text{Phe}}$ ). At the elevated temperature of  $42^{\circ}\text{C}$  the amino acid arginine was attached to  $\text{tRNA}^{\text{Phe}}$ . What consequence would this have for the proteins that cell makes at the elevated temperature? Would this affect the function of these proteins? Why, or why not?