請使用學校所提供之試紙作答，並註明題號，不得使用其他紙張作答。

I.   Match the following terms with the descriptions below [*Note: 2 points each for a correctly answer, but 3 points will be subtracted for each of a wrong match!*](*20 points in total*)

A. gene pool.
B. gene frequencies
C. population
D. Hardy-Weinberg principle
E. mutation
F. chromosomal mutations
G. gene mutations
H. migration
I. Recombination
J. founder effect
K. heterosis
L. balanced polymorphism
M. random rating
N. genetic drift
O. operon

(   ) 1. individuals of the same species who interbreed with each other
(   ) 2. adaptive advantage of heterozygote over homozygote
(   ) 3. mating with any other available mate in the population, determined by chance
(   ) 4. method of distributing alleles after they have entered a population
(   ) 5. rearrangements of chromosomal sequences
(   ) 6. effects of chance fluctuation on a population
(   ) 7. tool for determining allelic frequencies in populations
(   ) 8. heritable gene change
(   ) 9. transfer of variations from one population
(   ) 10. maintenance of equilibrium between to or more phenotypes in the population

II.   Read the following statement; then answer questions 11 through 17 (*2 points each, 14 points in total*):

In guinea pigs, black coat color (B) is dominant over white (b). A hybrid male (Bb) was bred to a homozygous recessive female.

(   ) 11. The symbols Bb represent the: (A). genotype of the female (B). genotype of the male (C). phenotype of the male (D). phenotype of the female
(   ) 12. The phenotype of the female is: (A). white. (B). black (C). Bb (D). bb
(   ) 13. The number of kinds of sperm that the male could form with respect to coat color is: (A). 1 (B). 2 (C). 3 (D). 4
(   ) 14. Suppose a student had tossed a coin 25 times and had gotten heads every time. What is the probability that on the next toss he will get heads? (A). 1/2 (B). 1/4 (C). less than the probability of getting tails (D). more than the probability of getting tails
(   ) 15. The probability of the male's producing a sperm with the dominant gene (B) is: (A). 1/2 (B). 1/4 (C). 1 (D). 0
(   ) 16. In the F1 generation in a cross between these two animals, the ratio of expected offspring with respect to coat color would be:
        (A). 3 black to 1 white (B). all black females (C). all white males (D). 1/2 black, 1/2 white
(   ) 17. This cross, in which a heterozygous individual is crossed with a homozygous recessive, is termed a: (A). dihybrid cross (B). linkage cross (C). testcross (D). multiple alleles

III. Multiple Choice (*2 points each, 10 points in total*)

(   ) 18. Color-blindness is a sex-linked, recessive trait. The trait for normal vision is dominant. Suppose a woman heterozygous for normal vision (XCXc) marries a color-blind man. How would the genotype for the man be represented? (A). XcY (B). XcXc (C). color-blind (D). XCXc.
(   ) 19. What are the chances that this couple will have a color-blind son? (A). 1/4 (B). 1/2 (C). all sons will be color-blind (D). no son will be color-blind
(   ) 20. The genetic information is coded in the DNA by (A). the regular alternation of deoxyribose (sugar) and phosphate molecules. (B). the sequential arrangement of the four base molecules (the T, C, T, and G molecules) (C). the order of the genes (D). all of the above. (E). none of the above
(   ) 21. A standard F2 phenotypic ratio resulting from a dihybrid cross where dominance is complete would be (A). 3:1 (B). 1:2:1 (C). 3:3:1 (D). 1:1 (E) none of the above
(   ) 22. That DNA is thought to be the genetic material is based upon (A). the phenomenon of bacterial transformation (B). the correlation of the chromosme content of cells (C). the study of virus multiplication within bacteria. (D). all of the above (E). none of the above

注意：背面有試題

## V. Short answer of the following questions *BREIFLY*:

In mice the genotype y/y is gray, Y/y is yellow, and Y/Y dies as a small embryo. What offspring would be expected from a cross between a yellow and a gray? Between two yellows? In which cross would you expect the largest size of litter? *(9 points)*

In man the gene D is necessary for a normal ear cochlea and gene E is necessary for a normal auditory nerve. In the absence of either of these factors the individual is deaf. Show a) how two normal parents could produce a deaf child and, b) how two deaf parents could produce a normal child. *(8 points)*

Fill in the missing letters in the following: *(13 points)*
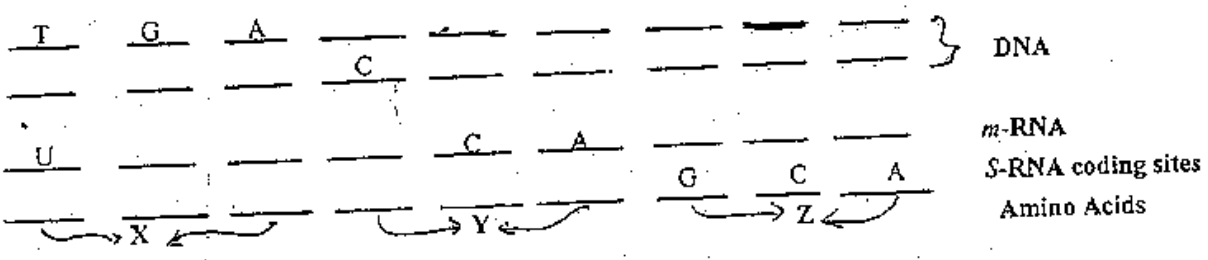
) If TTCGCTTA is the sequence of bases in one strand of a section of a DNA molecule, *(2 points each, 6 points in total)*

   a) What will be the sequence of bases in a complementary strand of DNA formed from this?
   b) In a strand of messenger RNA formed from the original molecule?
   c) For how many amino acids does this sequence code?

5) How many different kinds of gametes can the following individuals produce? *(2 points each, 6 points in total)*
   a) AABBFF   b) AAWwCCFf   c) AaBbGgHh

6) When a strain of genotype "A C N R X", where the gene order is unknown, was used as a source of DNA used to transform a strain of genotype " a c n r x ", the following types were found: "A c n R x ", " a c N r X ", "A C n R x ", & "A c n r X " in addition to those such as ' C n r x " where only a single gene was transformed. What is the gene order? *(4 points)*

7) Assuming a 1:1 sex ratio, what is the probability that a family of 6 children will consist of *(2 points each, 10 points in total)*
   a) 3 boys and 3 girls? b) A boy, a girl, a boy, a girl, a boy, and a girl in this order? c) All girls?