

Questions:

1. In questions A to C refer to data in chart below

(6 marks)

Phenotype	Number of progeny
AB	320
Ab	55
aB	45
ab	345

A. \_\_\_ We can determine that the genes (a) are linked. (b) are not linked. (c) are partially linked. (d) aren't possible.

B. \_\_\_ What are the genotypes of the original homozygous strains?

C. \_\_\_ If linked, the percent recombination that has occurred is (a) 10% (b) 13% (c) 30% (d) 50%

2. Determine whether the following statements are "True" or "False" (12 Marks)

A. \_\_\_ Phenotype determines whether an organism is heterozygous or homozygous

B. \_\_\_ Ten percent crossing over is equal to one map.

C. \_\_\_ Bacteria contain extrachromosomal molecules of DNA called **plasmids** which are circular.

D. \_\_\_ The ratio of progeny to parents with genes that are not linked is exactly the same as that of parent showing 50 percent crossing over.

E. \_\_\_ Thymine and cytosine are two examples of pyrimidines.

F. \_\_\_ The number of chromosomes can be the same in gamete cells and somatic cells

G. \_\_\_ DNA and RNA are polymers composed of monomers called phosphate group

H. \_\_\_ They show **aneuploidy**, meaning that 1 or more chromosomes of a normal set are missing or present in unusual number

I. \_\_\_ Sex chromosome composition in some fish is opposite that of mammals

J. \_\_\_ genetics, a polymeric molecule consisting of deoxyribonucleotide building blocks that in a double-stranded, double-helical form is the genetic material of all living organisms.

ملاحظة



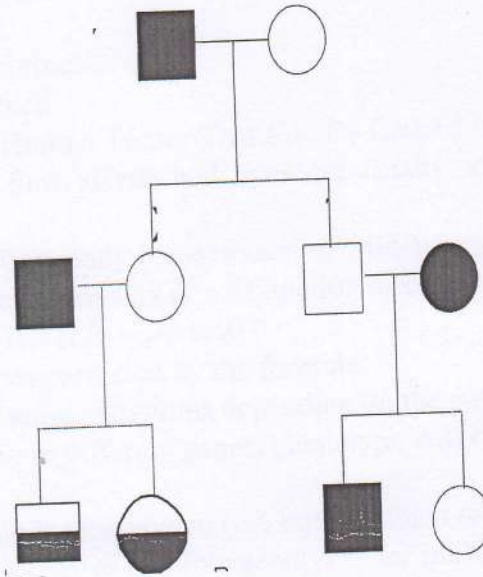
**3. Fill in the blanks.**

**(10 Marks)**

- A. Forty- five percent of crossing over is equal to \_\_\_\_ map units.
- B. When a homozygous white snapdragon is crossed with homozygous red snapdragon of the same species, all the progeny are pink. The mode of inheritance exhibited here is hybrid \_\_\_\_.
- C. The ratio 7: 9 expresses a \_\_\_\_\_ epistatic interaction.
- D. The two separate strands of a replicated chromosome are called \_\_\_\_\_.
- E. A cross between a homozygous dominant male and a heterozygous dominant female would have \_\_\_\_\_ percent homozygous.
- F. The complete expression of an individual's genotype is the \_\_\_\_.
- G. Recombination produces new combination of genes not present in the \_\_\_\_\_.
- H. Restriction Enzymes are primarily found in bacteria and are given abbreviations based on \_\_\_\_\_ and \_\_\_\_\_ of the bacteria.
- I. Chromosomes differ in size and morphology. Each has a constriction called a \_\_\_\_\_.
- J. The sex of many animals is determined by genes but on chromosomes called sex \_\_\_\_\_.



4. A sex-linked recessive,  $r$ , is largely responsible for the development of disease in humans. The normal phenotype  $R$  allele is dominant. The pedigree below represents the pattern in which disease is inherited. Answer questions A to D based on this pedigree chart. (7 Marks)



Key: ■ affect male

● affect female

1. \_\_\_\_\_ What is the children's genotype of a marriage between II-1 and II-2?
2. \_\_\_\_\_ What is the probability genotype parents?
3. \_\_\_\_\_ The genotype of the mother, individual II-2 is (a)  $X^rY$  (b)  $X^RY$  (c)  $Rr$  (d)  $X^rX^r$  (e) cannot be determined (f)  $X^RX^r$

5. Encircle the correct answer for the followings: (8 marks)

A. Prometaphase:

1. The centromeres divide, separating the sister chromatids.
2. The nuclear envelope fragments
3. Microtubules, from the spindle interact with the chromosomes.

B. Crosses between organisms heterozygous for genes exhibiting independent assortment

1. Gametes= $3^2$ , Genotype= $2^3$  and phenotype= $2^4$
2. Gametes= $2^2$ , Genotype= $3^3$  and phenotype= $2^4$
3. Gametes= $3^n$ , Genotype= $2^n$  and phenotype= $2^n$
4. Gametes= $2^n$ , Genotype= $3^n$  and phenotype= $2^n$

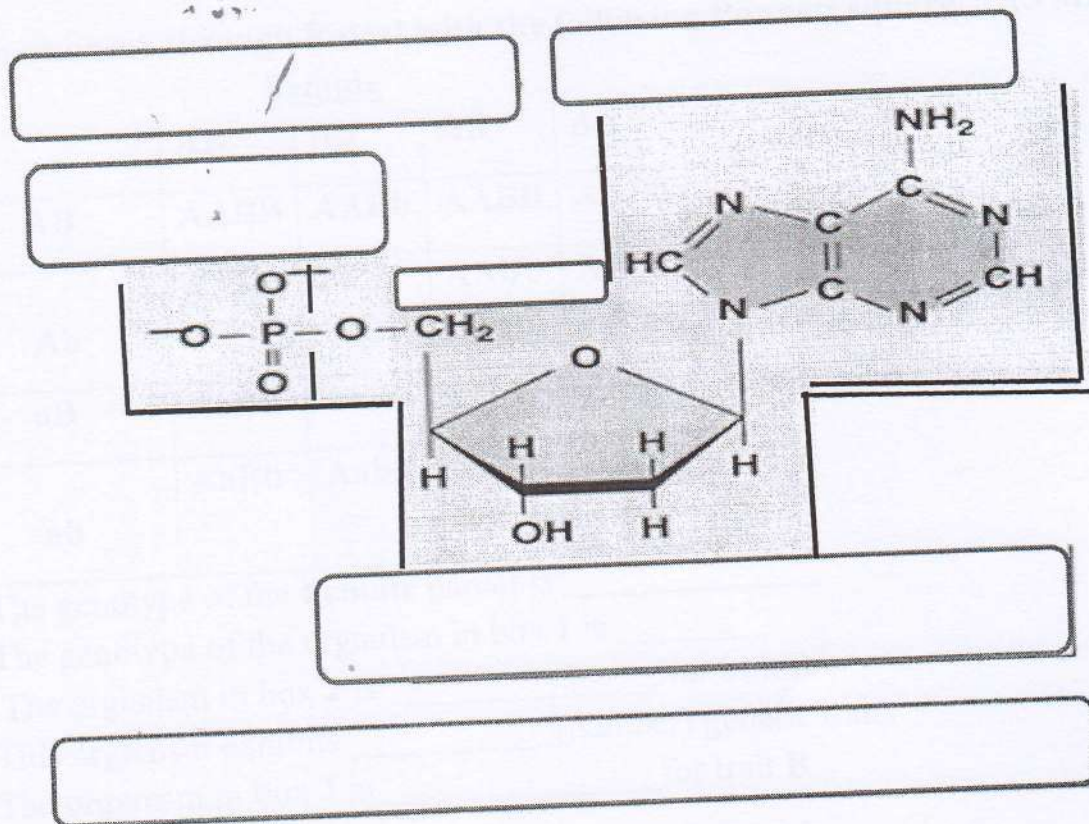


- C. Genetic recombination: A process by which parents with different alleles give rise to progeny with genotypes that:
1. differ from either parent
  2. like either parent
  3. differ only from one parent
- D. There are two classes of nitrogenous bases
1. Adenine and thymine
  2. RNA and DNA
  3. Purines and pyridines
  4. Guanine and uracil
- E. Retinoblastoma, a Human Tumor That Can Be Caused by Mitotic Recombination
1. The hereditary form affects both eyes and usually occurs at an earlier age than sporadic.
  2. y produces yellow body color instead of wild-type grey.
  3. This could be explained by nondisjunction or chromosomal loss.
- F. Complementation test (*cis-trans* test)
1. Of the genotypes predicted by the formula
  2. Variation in disease symptoms depending on the patient's allele(s).
  3. If mutations are in different genes, phenotype will be wild type
- G.  $n(n+1)/2$
1. The *eosin* allele is recessive to *red*, but dominant to *white*.
  2. The formula calculates possible genotypes for multiple alleles.
  3. In incomplete dominance, the recessive allele is not expressed



6. Well-label pieces of the following figure:

(5 Marks)



7. Draw the genetic map, when you have following information: (4 Marks)

- I. w gives white eyes
- II. m gives miniature wings
- III. y gives yellow body

The crosses gave the following recombination frequencies:

- I. w x m was 32.7%
- II. w x y was 1.0%
- III. m x y was 33.7%



8. Questions A through E deal with the following Punnett square. (5 Marks)

		Female			
		AB	Ab	AB	Ab
Male	AB	AABB	AABb	AABB	AABb
	Ab	AABb	1	AABb	AAbb
	aB	AaBB	AaBb	2	AaBb
	ab	AaBb	Aabb	AaBb	3

- A. The genotype of the Female parent is \_\_\_\_\_
- B. The genotype of the organism in box 1 is \_\_\_\_\_
- C. The organism in box 2 is \_\_\_\_\_ for trait A
- D. This organism exhibits \_\_\_\_\_ (number) genetic traits
- E. The organism in box 3 is \_\_\_\_\_ for trait B



Good Luck

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