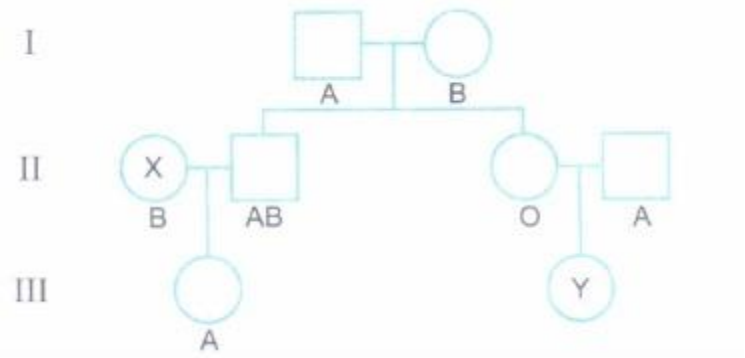
INDIAN SCHOOL AL WADI AL KABIR

Class: XII	**Department: SCIENCE 2023 – 24** **SUBJECT: BIOLOGY**	**Date of submission:** **MAY 15, 2023**
Worksheet No: 04 **WITH ANSWERS**	**UNIT: GENETICS & EVOLUTION** **Chapter: PRINCIPLES OF INHERITANCE AND VARIATIONS**	**Note:** **A4 FILE FORMAT**
NAME OF THE STUDENT	**CLASS & SEC:**	**ROLL NO.**

Case study.

1. Study the pedigree chart showing the pattern of inheritance of blood group character in a family.



(a) Give the genotypes of the parents in generation I.
(b) State the possible genotypes of the individuals.
(i) X in generation II.
(ii) Y in generation III.
(c) How does the inheritance of this blood group explain codominance?

2.Turner's syndrome is an example of monosomy. It is formed by the union of an allosome free egg and a normal 'X' containing sperm or a normal egg and an allosome free sperm. The individual has 2n = 45 chromosomes (44 + X0) instead of 46. Such individuals are sterile females who have rudimentary ovaries, underdeveloped breasts, small uterus, short stature, webbed neck and abnormal intelligence. They may not menstruate or ovulate. This disorder can be treated by giving female sex hormone to women from the age of puberty to make them develop breasts and have menstruation. This makes them feel more normal

(i) Turner's syndrome is an example of
(a) aneuploidy (b) euploidy (c) polyploidy (d) autosomal abnormality
(ii) Turner's syndrome is a/an
(a) autosomal recessive Mendelian disorder (b) autosomal dominant Mendelian disorder
(c) sex-linked Mendelian disorder (d) chromosomal disorder

(iii) Which of the following statements regarding Turner's syndrome is incorrect?
(a) It is a case of monosomy of chromosomes
(b) The suffering individual is a sterile female having one 'X' chromosome missing in the cells
(c) The problem is due to an extra chromosome
(d) The individual is of short stature

(iv) **Assertion:** Turner's syndrome is caused due to absence of any one of the X and Y sex chromosome.
Reason: Individuals suffering from Turner's syndrome show masculine as well as feminine development
(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion
(c) Assertion is true but reason is false
(d) Both assertion and reason are false

MULTIPLE CHOICE QUESTIONS

1. Identify the genetic makeup of Klinefelter's syndrome
    (a) 45 AA + XX/XY
    (b) 44 AA + XXY
    (c) 44 AA + XO
    (d) 45 AA + XO
2. Crossing with a recessive parent which helps to analyse the genotype of an organism is known as -----
    (a) Monohybrid cross
    (b) Dihybrid cross
    (c) Test cross
    (d) Back cross
3. Linkage groups are formed by
    (a) Genes present on homologous chromosomes
    (b) Genes present on non-homologous chromosomes
    (c) Genes present on autosomes
    (d) Genes present on same chromosome
4. If a genetic disease is transferred from a phenotypically normal but carrier female to some of the male progeny, the disease is --------
    (a) Sex linked
    (b) Autosome Linked
    (c) Y – linked
    (d) Both (a) and (c)
5. Select the law which Mendel proposed after his experiments on two gene inheritance
    (a) Law of dominance
    (b) Law of segregation
    (c) Law of independent assortment
    (d) All of these

TWO MARK QUESTIONS

1. Explain the following terms:
   (a) Alleles (b) Pedigree analysis
2. Mendel published his work on inheritance in 1865 but it remained unrecognized till 1900. Give the reasons for this.
3. Human skin colour exhibits a special pattern of inheritance. Comment on it and how it varies from other Mendelian characters?
4. Why is the pedigree analysis done in the study of human genetics? State the conclusion that can be drawn from it.
5. Linkage and crossing over of genes are alternatives to each other. Justify with the help of an example

THREE MARK QUESTIONS

1. ABO blood group in humans is an example of dominance, co-dominance and multiple alleles. Justify.
2. Differentiate between:
   (a) Deletion and Insertion
   (b) XXY disorder and XO disorder
   (c) Aneuploidy and Polyploidy
3. Write a brief note on the sex determination in honey bees.
4. Haemophilia is an example of a Mendelian disorder which is due to sex linked recessive gene. Give a brief description of any other two Mendelian disorders.
5. During his studies on genes in *Drosophila* that were sex-linked, T.H. Morgan found F_2 population phenotypic ratios deviated from the expected 9:3:3:1. Explain the conclusion, he arrived at.

FIVE MARK QUESTIONS

1. With the help of one example each explains male and female heterogamety.
2. (a) State the law of independent assortment.
   (b)Using Punnett Square demonstrate the law of independent assortment in a dihybrid cross involving two heterozygous parents.

3. Name the respective pattern of inheritance where F_1 phenotype,

   (a) Does not resemble either of the two parents and is in between the two.
   (b) Resembles only one of the two parents.

4. Explain briefly the deviations from the Mendelian pattern of inheritance

PREVIOUS BOARD QUESTIONS

1. In a typical monohybrid cross the F_2 population ratio is written as 3:1 for phenotype but expressed as 1:2:1 for genotype. Explain with the help of an example.

2. Recently a girl baby has been reported to suffer from haemophilia. How is it possible? Explain with the help of a cross.
3. Pea seeds with BB alleles have round seeds and large starch grains, while seeds with bb alleles have wrinkled seeds with small starch grains. Work out the cross between these two parents. Explain the phenotypic ratio of the progeny with respect to seed shape and the starch grain size of the progeny produced.

4. (a) Work out a cross up to F_2 generation between two pure breeding pea plants, one bearing violet flowers and the other white flowers.

(b) (i) Name this type of cross.

(ii) State the different laws of Mendel that can be derived from such a cross.

5. (a) Do you agree to the perception in our society that the woman is responsible for the gender of the offspring? Substantiate your answer scientifically.

(b) How did Morgan explain linkage of genes?

ANSWER KEY (Hints)

ONE MARK QUESTIONS

1. **(b) 44AA + XXY**
2. **(c) Test cross**
3. **(d) Genes located on same chromosome forms the linkage group**
4. **(a) Sex-linked**
5. **(c) Law of Independent Assortment**

TWO MARK QUESTIONS

1. **(Hints: (a) alternative forms of a gene, (b) study of a genetic disorder by analyzing the family history)**
2. **(Hints: lack of communication, use of mathematics, concept of factor)**
3. **(Hints: Polygenic inheritance, more than one gene but in Mendelian inheritance only one gene controls one character)**
4. **(Hints: experiments cannot be conducted in humans, it explains the pattern of inheritance of genes through the family tree)**
5. **(Hints: Definition of linkage and crossing over, explanation with the help of Morgan's experiment)**

THREE MARK QUESTIONS

1. **(Hints: dominance – between alleles I^A and i & between alleles I^B and i, Co-dominance – between alleles I^A and I^B, Multiple alleles – presence of more than two alleles)**

2. **(Hints: (a) – removal of one or two base pairs and insertion is addition of one or two base pairs; (b) – Klinefelter's and Turner's syndrome; (c)- change in one or two chromosomes – aneuploidy, change in one or more haploid set - polyploidy)**
3. **(Hints: explanation of haplo-diploidy, representation of cross, males – haploids and by parthenogenesis & females – diploids and by fusion)**
4. **(Hints: sickle cell anemia/ colourblindness/Phenylketonuria – any two, explanation – type of disease, genotypes, reason, symptoms)**
5. **(Hints: reasons for deviation – linkage and crossing over, explanation of the terms, relationship between both with distance between genes, mention the crosses conducted by Morgan)**

FIVE MARK QUESTIONS

1. **(Hints: Male heterogamety – definition, example – XX – XY or XX – XO type – represent the cross, Female heterogamety – definition, example – ZW – ZZ type – represent the cross)**
2. **(Hints: (a) – state the law, (b) – representation of complete dihybrid cross with Punnett square)**
3. **(Hints: (a) – incomplete dominance, example and representation of cross; (b) – complete dominance, example, representation of monohybrid cross)**
4. **(Hints: explanation and representation of any two deviations in detail – multiple alleles, co-dominance, polygenic inheritance, pleiotropy)**

PREVIOUS BOARD QUESTIONS

1. **(Hints: representation of a typical monohybrid cross and mention the phenotypic and genotypic ratio)**
2. **(Hints: haemophilia – sex linked recessive disorder, rarely found in females, two conditions for females being haemophilic – haemophilic father and carrier mother, both parents haemophilic, representation of both conditions with the help of cross)**
3. **(Hints: (a) – Representation of cross – monohybrid, mention phenotypic and genotypic ratio; (b) (i) monohybrid cross; (ii) state law of dominance and law of segregation)**
4. **(Hints: It is an example of pleiotropy, seed shape shows typical dominance and starch grain exhibits incomplete dominance, representation of the cross, mention genotypic and phenotypic ratio for both characters)**
5. **(Hints: (a) – No, explanation of sex determination mechanism in humans, male heterogamety, justification; (b) linkage – definition, relationship between linkage and distance between genes, result of linkage)**

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