BIOLOGY

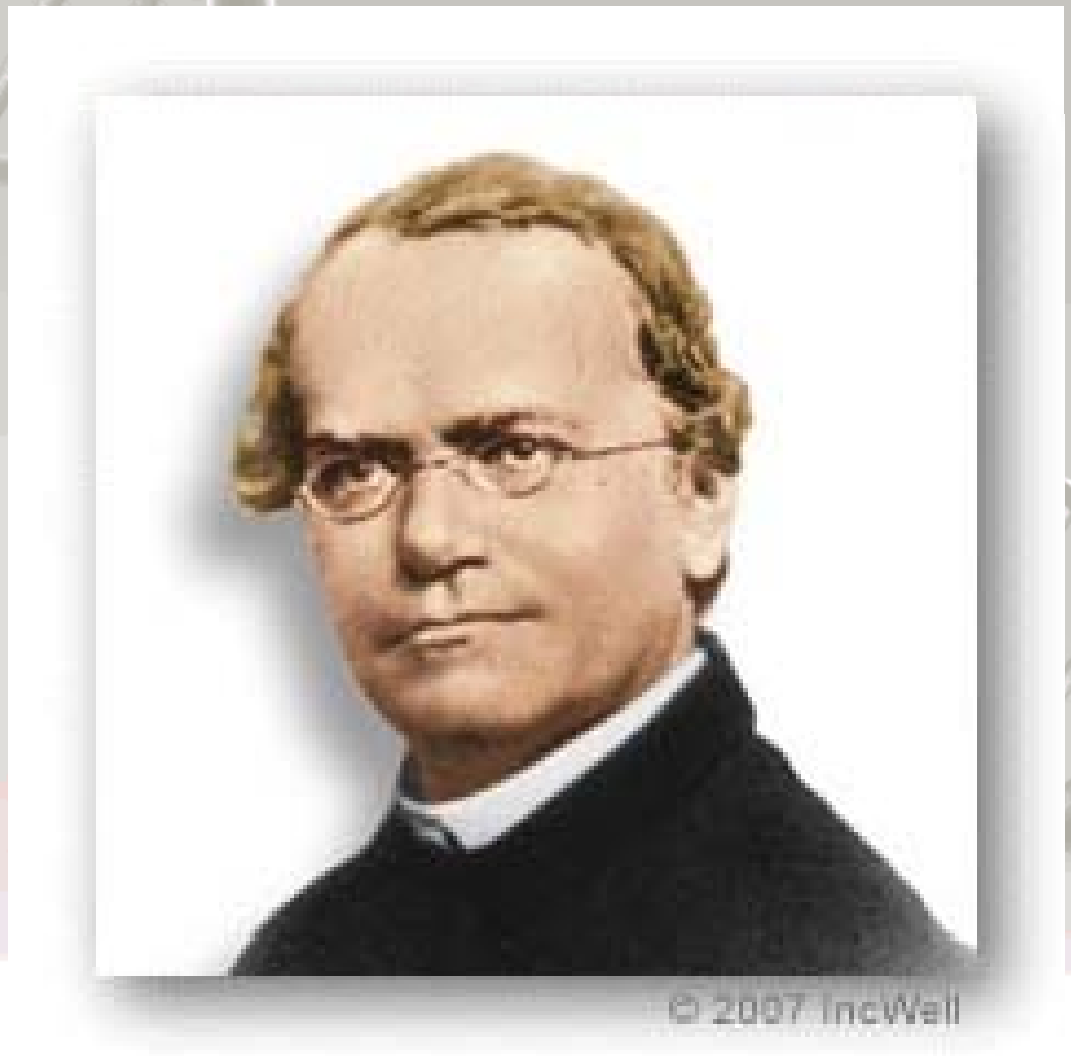
GENETICS

Genetics is study of heredity and variation.

Gregor Johann Mendel, father of genetics conducted hybridisation experiments on *Pisum sativum* to formulate the principles of inheritance .

BIOLOGY

GREGOR JOHANN MENDEL



BIOLOGY

PRINCIPLES OF INHERITANCE

1. Principle of unit characters
2. Principle of dominance
3. Law of segregation
4. Law of independent assortment

Principle of unit characters

In every organism a character is determined and transmitted by a definite gene or factor.

Principle of dominance

In a cross between two pure breeding plants for a contrasting character, the progeny obtained in heterozygous condition expresses any one of the parental characters as dominant.

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Law of segregation

Mendel's 1st law

When a pair of factors for a contrasting pair of characters is brought in a hybrid, they separate during gamete formation.

Law of segregation

Mendel's 1st law

Monohybrid phenotypic ratio – 3:1

Monohybrid genotypic ratio – 1:2:1

Monohybrid test cross ratio – 1:1

BIOLOGY

Law of Independent assortment

Mendel's 2nd law

When more than a pair of factors for different contrasting characters are brought together in a hybrid, they assort independently during gamete formation.

Law of Independent assortment

Mendel's 2nd law

Phenotypic ratio – 9:3:3:1

Genotypic ratio – 1:2:2:4:1:2:1:2:1

Test cross ratio – 1:1:1:1

BIOLOGY

Incomplete dominance

In a cross between two pure breeding plants for a contrasting character the progeny obtained in F_1 generation shows an intermediate character of either parents.

E.g.., Flower colour in *Mirabilis jalapa*

Multiple allele

A gene which expresses in more than two forms for a character in a population is multiple allele. It is observed in the expression of human blood groups.

Human blood groups

- Karl Landsteiner - A, B, O groups
- de Castella and Steni - AB group
- The group ‘AB’ is universal acceptor
- The group ‘O’is universal donor.

Human blood groups

Landsteiner and Weiner – Rh-factor in Rhesus monkey and later in human.

The incompatibility of Rh-factor between mother and her foetus results in erythroblastosis foetalis .

Sex-linked inheritance

Criss-cross inheritance

The inheritance of X-linked gene from parental male to F_2 male through F_1 carrier female.

Sex-linked inheritance

Colour blindness

Inability of a person to differentiate red and green colours due to recessive gene on X-chromosome.

Sex-linked inheritance

Hypertrichosis

A tuft of hair on the external ear pinna due to a gene on Y-chromosome.

Genetic disorders

Chromosomal disorders

Downs' syndrome –

45A + XY / XX = 47

Cri-do-chat syndrome –

5th partial monosomy

BIOLOGY

Chromosomal disorders

Klinefelters' syndrome -

XXY-syndrome- **44A + XXY = 47**

Turners' syndrome –

XO-syndrome- **44A + XO = 45**

Gene disorders

Sickle cell anaemia

Anaemia due to the formation of sickle celled RBC's by a defective gene Hb^s. It may result in haemorrhage, coma and death due to rupture of blood capillaries.

Gene disorders

Haemophilia (Bleeder's disease)

Inability of blood to clot due to lack of clotting factors by a defective recessive gene on X-chromosome.

BIOLOGY

Q. How many types of gametes are produced by Homozygote?

1. One
2. Two
3. Four
4. Many

Q. Assortment or segregation of genes takes place during

1. Fertilization
2. Separation of gametes
3. Formation of gametes
4. Death of gametes

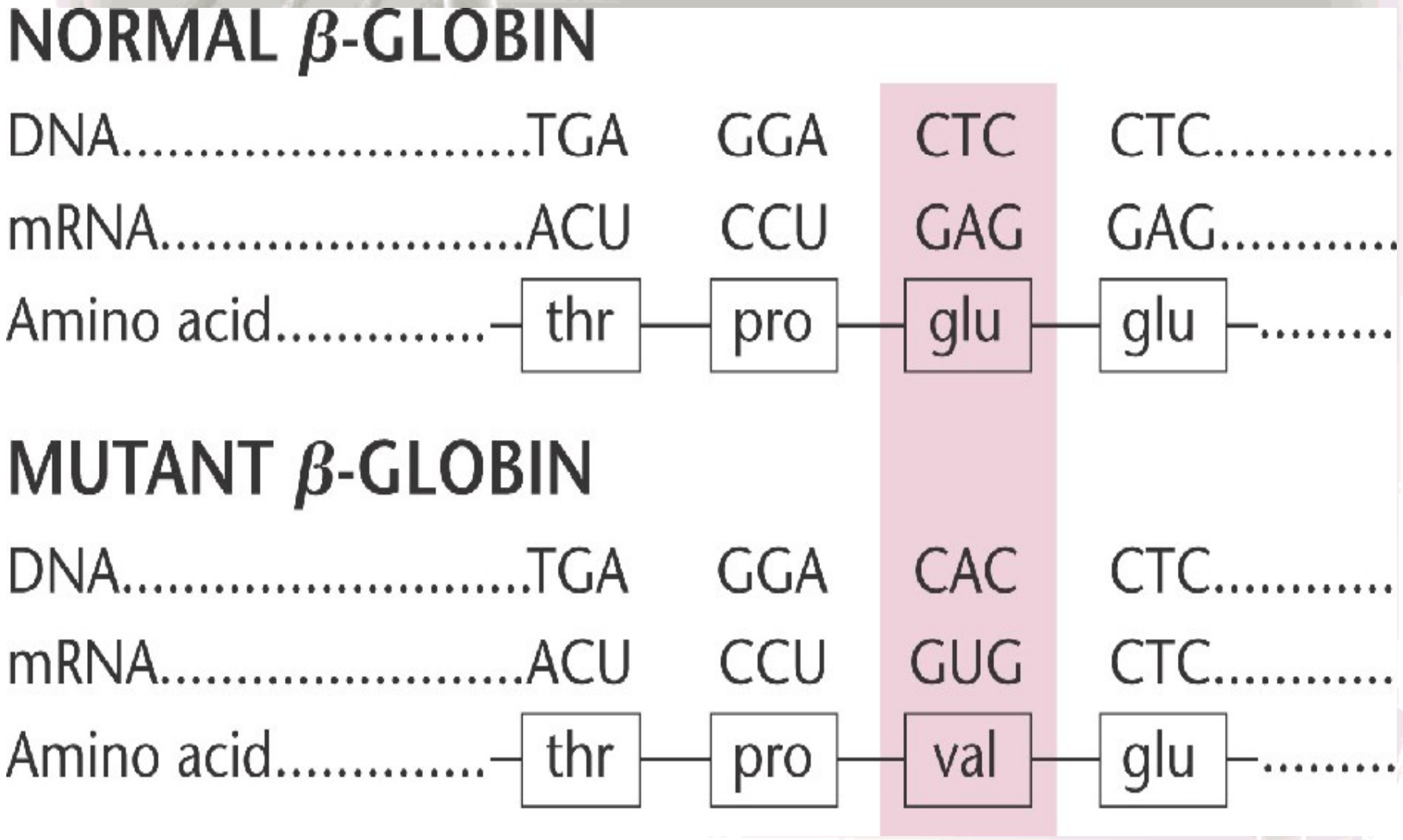
Q. If there is no agglutination on adding antiserum A and antiserum B to a blood drop, then the blood group is

1. A
2. B
3. AB
4. O

BIOLOGY

Q. In persons with sickle cell anaemia , the sixth aminoacid, glutamic acid in β-chain of haemoglobin molecule is replaced by

1. Serine
2. Valine
3. Methionine
4. Phenylalanine


NORMAL β-GLOBIN
DNA.....TGA GGA CTC CTC.....
mRNA.....ACU CCU GAG GAG.....
Amino acid.....thr pro glu glu.....
MUTANT β-GLOBIN
DNA.....TGA GGA CAC CTC.....
mRNA.....ACU CCU GUG CTC.....
Amino acid.....thr pro val glu.....

BIOLOGY

SICKLED RBC

KEA

BIOLOGY

Q. A woman with B blood group marries a man with AB blood group, which of the following blood group of children indicate that woman is heterozygous ?

1. A

2. B

3. AB

4. O

BIOLOGY

Q. Which of the following is the chromosomal complement (genotype) of a person suffering from Klinefelter's syndrome?

1. 44A+XXY
2. 45A+XX
3. 44A+XY
4. 44A+XO

BIOLOGY

Q. A type of protein-antigen present on the surface of RBC is also called

1. Agglutinogen
2. Agglutinin
3. Albumin
4. Globulin

KEA

BIOLOGY

Q. In a medico-legal problem of a family having four children with blood group A,B,O & AB respectively. Father is accepting first three children as his and rejecting last child by suspecting his wife, applied for divorce. The claim made by father is

1. Not valid
2. Valid
3. Can't claim unless he knows the blood group Of his wife
4. Data insuficient

BIOLOGY

Q. Which of the following phenotypic character is exhibited by Holandric genes ?

1. Red-green colour blindness
2. Profuse bleeding
3. Cat-cry syndrome
4. Hypertrichosis

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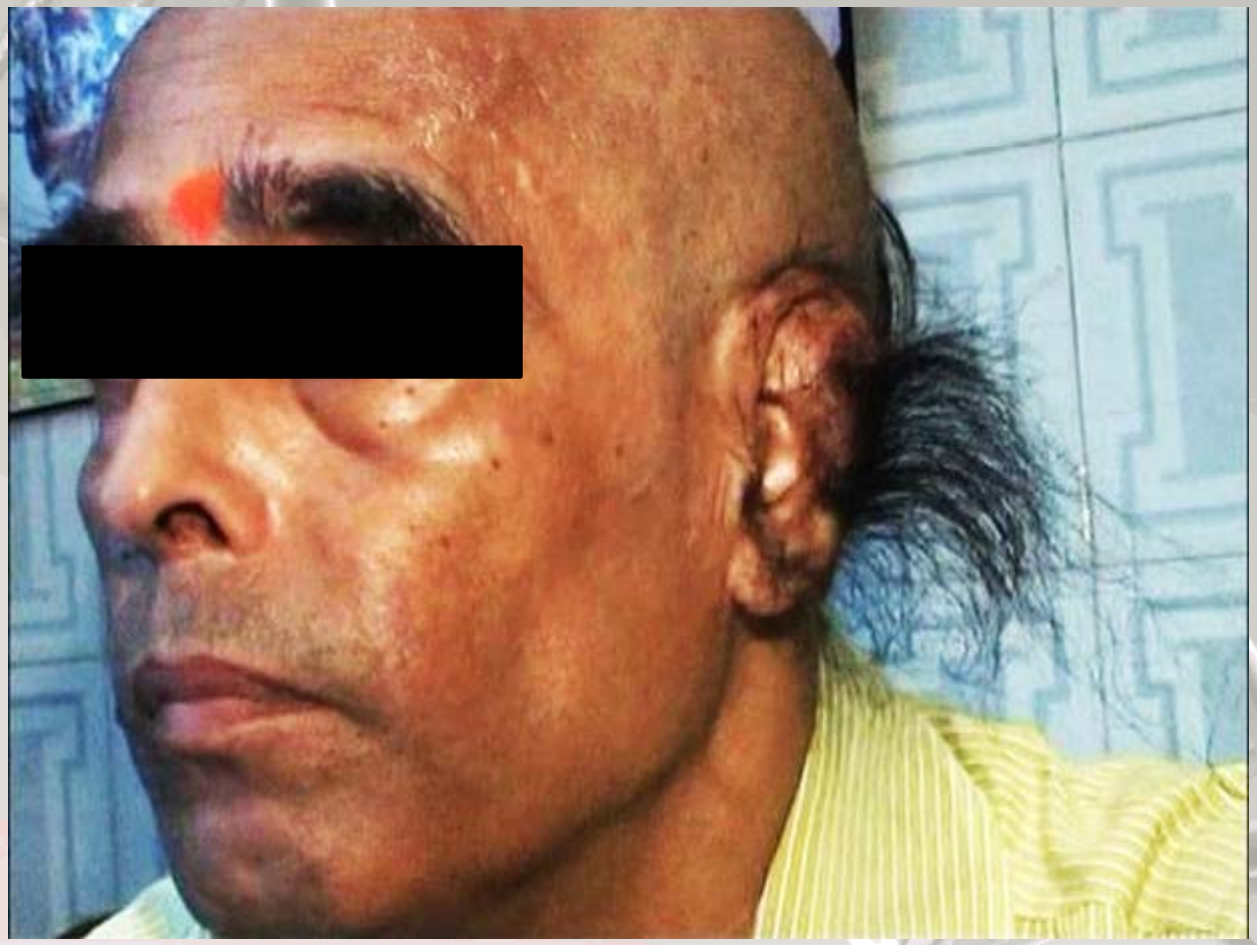
BIOLOGY



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BIOLOGY

Q. Which of the following is correct combination?

1. Sickle cell anaemia - bleeder's disease
2. Haemophilia - recessive X linked
3. Colour blindness - Y linked
4. Hypertrichosis - X linked

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BIOLOGY

Q. Suppose if you marry a good looking person with blood group O, what is the possibility of homozygous blood group, Of your child?

1. AB

2. O

3. A

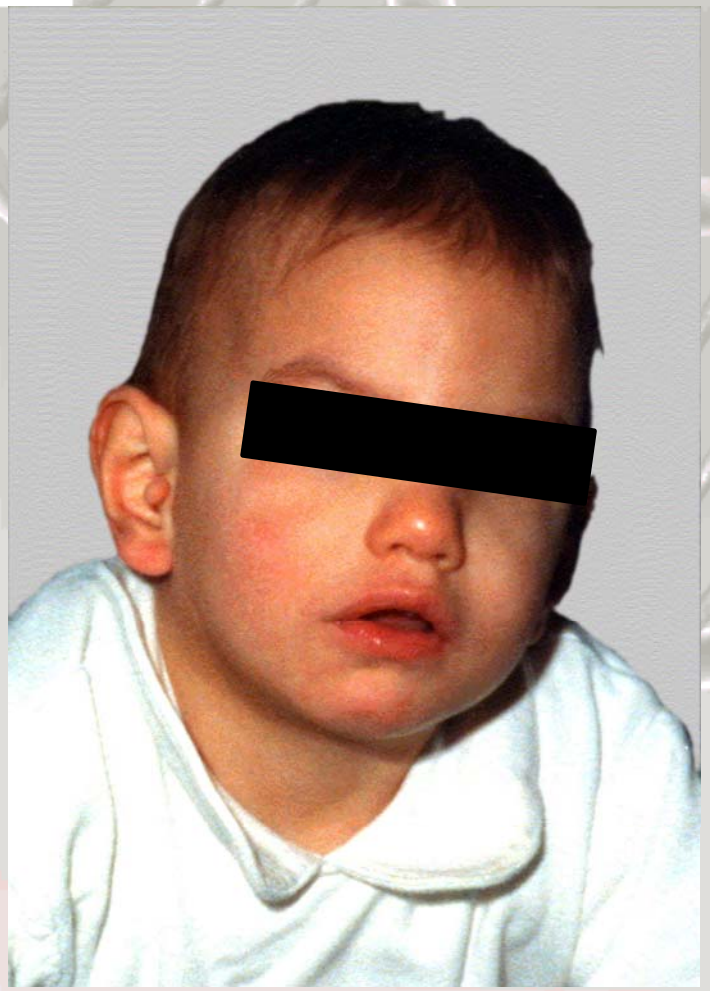
4. B

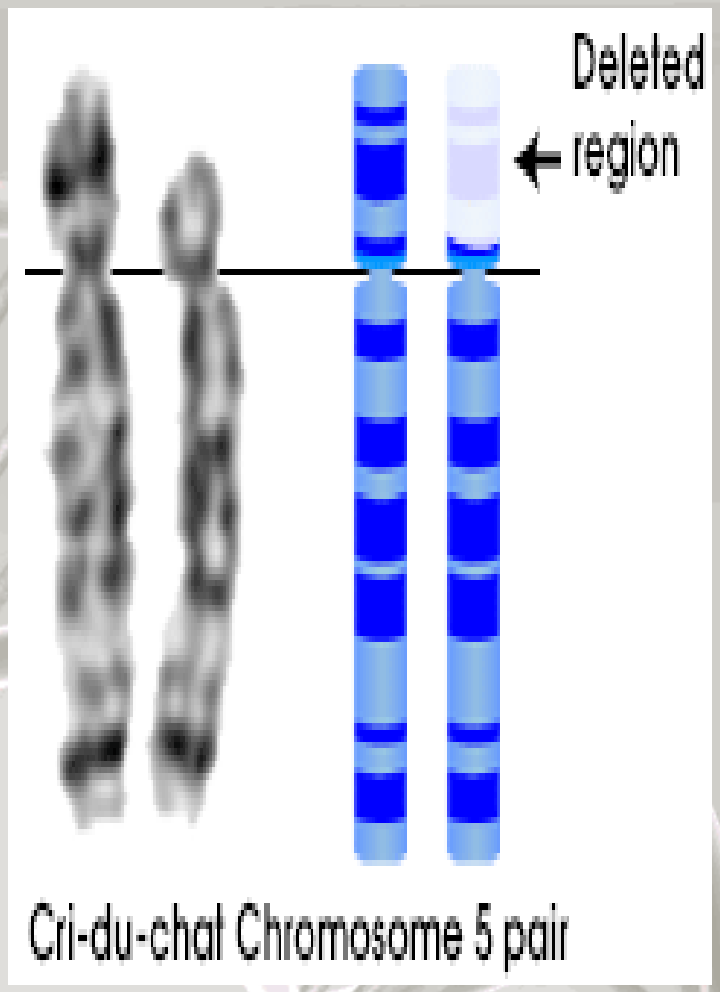
BIOLOGY

Q. Cry-du-chat exhibits which of the following karyotypic chromosomal abnormality?

1. Monosomy
2. Loss of segment of 21st autosome
3. Trisomy
4. Loss of short arm of one of the 5th autosome

BIOLOGY





BIOLOGY

Q. In a breeding experiment F_2 generation has 200 offsprings, 50 of them are with genotype TT. The genotype of parental generation must be

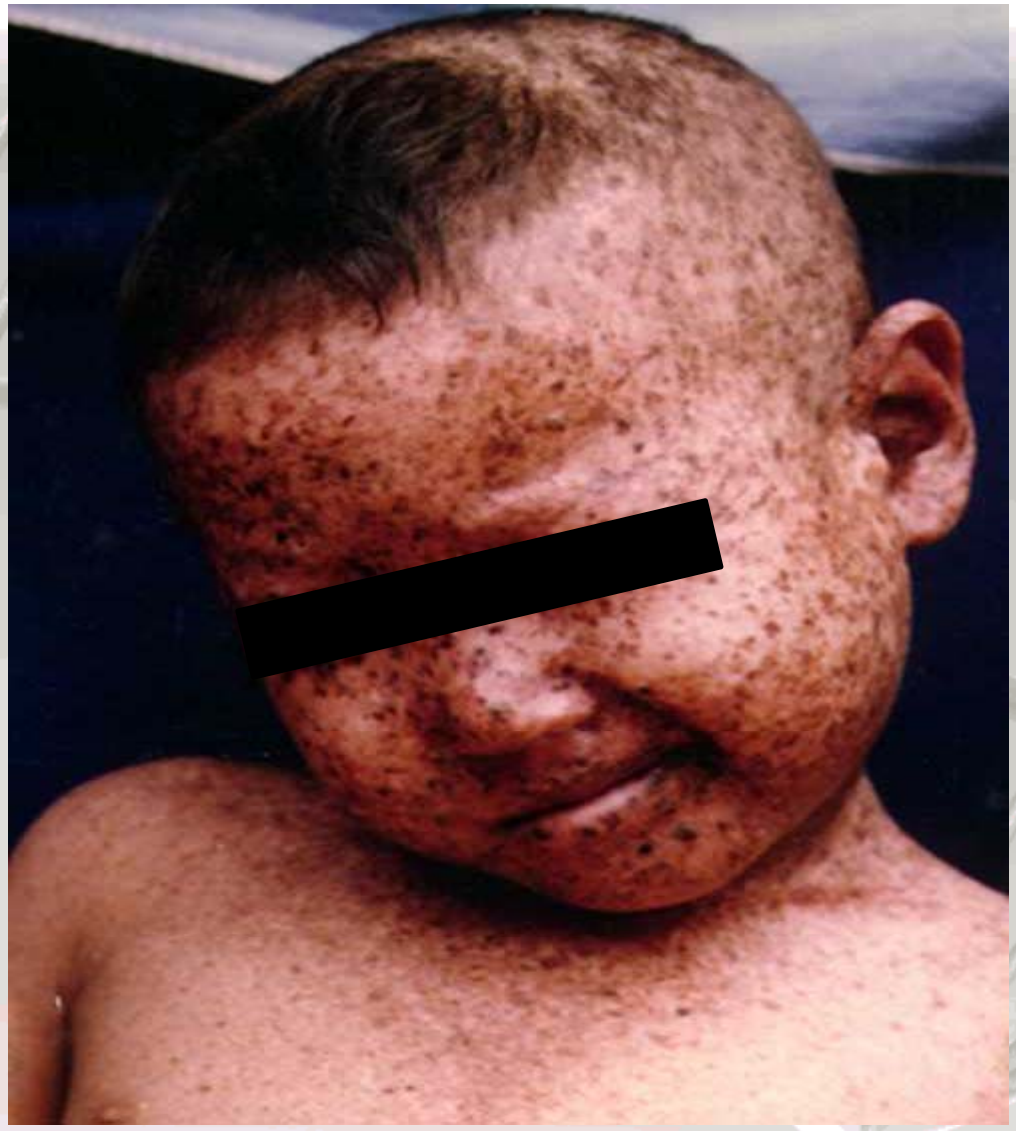
1. TT and tt
2. Tt and tt
3. Tt and Tt
4. tt and tt

Q. Which one of these statements is not associated with Rh-factor?

1. Rh- stands for rhesus factor
2. Rhesus monkey is *Macaca mulata*
3. Protein associated with RBC membrane
4. Antibody on RBC membrane

Q. Example for XY - linked inheritance is

1. Haemophilia
2. Colour blindness
3. Xeroderma
4. Hypertrichosis



Q. The significance of test cross is to test

1. Heterozygocity of F_1 progeny
2. Heterozygocity of recessive parent
3. Homozygocity of recessive parent
4. Heterozygocity of F_2 parent

BIOLOGY

Q. Which of this blood transfusion can be made without risk?

1. Group A to B
2. Group AB to O
3. Group A to O
4. Group B to AB

Q. Green blindness is

1. Protonopia
2. Deuteronopia
3. Daltonism
4. Tritanopia

BIOLOGY

Q. Which of the following is gene disorder?

1. Klinefelter's syndrome
2. Down's syndrome
3. Turner's syndrome
4. Sickle cell anaemia

Q. Erythroblastosis foetalis will occur when

1. Father is Rh+ve and mother is Rh-ve
2. Father is Rh-ve and mother is Rh+ve
3. Both father and mother are Rh-ve
4. Both father and mother are Rh+ve

BIOLOGY

Q. What is an offspring of two homozygous parents differing from one another by alleles at only one gene locus called?

1. Trihybrid
2. Dihybrid
3. Monohybrid
4. Back cross

Q. The genetic concept of segregation and recombination are most likely to be associated with

1. Meiosis and cleavage
2. Meiosis and mitosis
3. Meiosis and fertilization
4. Meiosis and amitosis

BIOLOGY

Q. Which of the following is not true?

1. Boys are haemophilic
2. Girls are carrier
3. Boys are carrier
4. Girls are haemophilic

KEA

BIOLOGY

Q. Which Mendelian law is applied when factor for each character segregate and pass on to each gamete uncontaminated?

1. Law of purity of gametes
2. Law of Independent assortment
3. Law of Unit characters
4. Law of Dominance

Q. If a tall plant is crossed with a dwarf one, about one half of the off spring produced are tall and the other half dwarf in F_1 generation. The genotype of parents is.

1. Tt x tt
2. Tt x Tt
3. TT x tt
4. tt x tt

BIOLOGY

Q. In a cross TT x tt , what percentage of off spring will have the same genotype as their parents in F_1 generation?

1. 0 %

2. 25 %

3. 50 %

4. 100 %

Q. The genotype of blood group AB is

1. Homozygous and codominant
2. Heterozygous and codominant
3. Codominant only
4. Heterozygous and dominant

Q. What is the cause for a child born with an extra chromosome in each of its cells?

1. Segregation
2. Non-disjunction
3. Crossing over
4. Multiple sex

KEA

BIOLOGY

Q. The gene for haemophilia is located on X - chromosome. Hence it is normally impossible for a

1. Haemophilic father to pass the gene to his daughter
2. Carrier mother to pass the gene to her daughter
3. Carrier mother to pass the gene to her son
4. Haemophilic father to pass gene to his son

Q. What is the probability of daughter born to a haemophilic mother and a colour blind father?

1. She is colour blind
2. She is haemophilic
3. She is heamophilic and colourblind
4. She is carrier for both

Q. If a man of blood group A^+ in heterozygous marries a woman of blood gp B^+ in heterozygous, their children can be of the blood group

1. A^+ , B^+ , AB^+ , O^+
2. A^+ , B^+ , AB^+ , O^+ A^- , B^- , AB^- , O^-
3. A^- , B^- , AB^- , O^-
4. A^+ , B^+ , A^- , B^-

KEA

BIOLOGY

Q. If the father is haemophiliac and mother is a carrier of the gene for haemophilia. What are the chance that their son will inherit the disease?

1. 0 %

2. 50 %

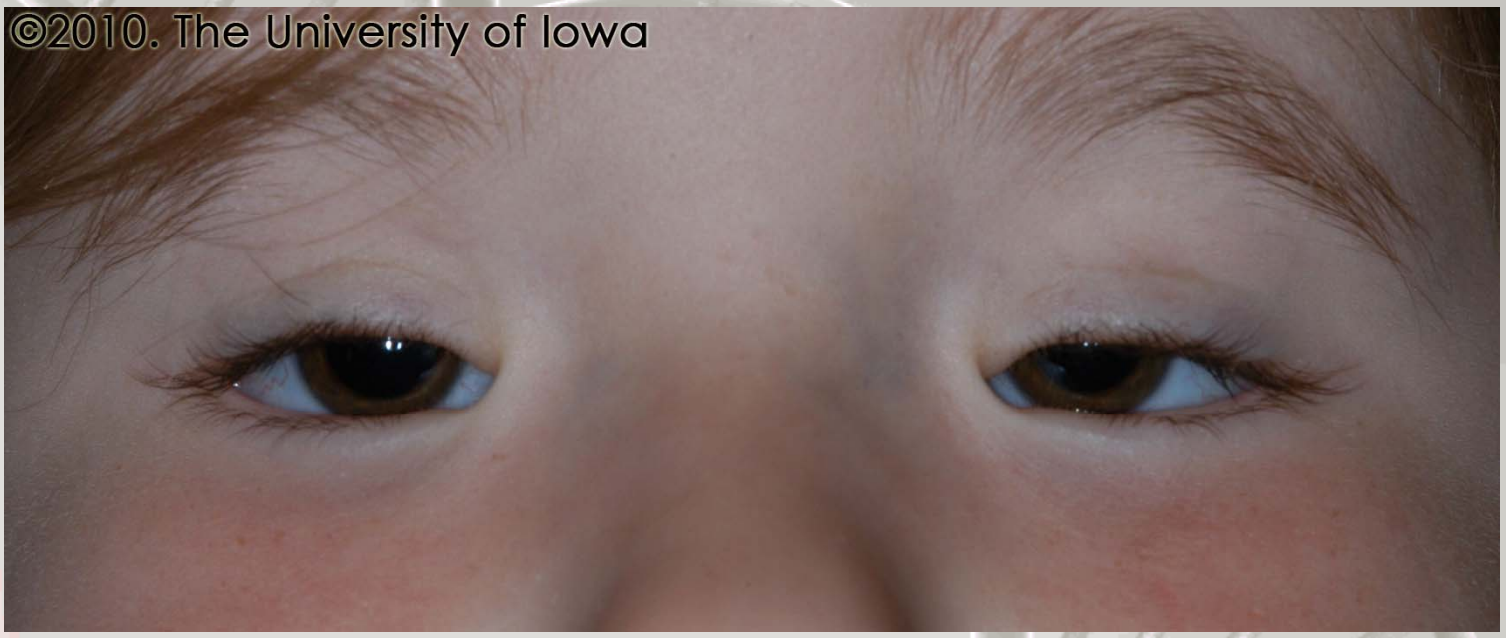
3. 75 %

4. 100 %

Q. Epicanthus condition is found in

1. Down's syndrome
2. Klinefelter's syndrome
3. Turner's syndrome
4. Criminal syndrome

BIOLOGY



Q. The disease reported in queen Victoria is

1. Heamophilia-A
2. Christmas
3. Daltonism
4. Hepatitis-B

BIOLOGY

Q. Sickle-cell anaemia is due to the mutated gene Hb^s present on the chromosome

1. 11
2. 16
3. 21
4. 5

Q. Y-linked inheritance is from

1. Female to male
2. Male to female
3. Father to son
4. Female to female

Q. Barr-body is

1. Highly heterochromatinised X-chromosome in male
2. Highly heterochromatinised X-chromosome in female
3. Barbels in cats
4. Y-chromosome in female

Q. Children born to colour blind woman and normal vision man are

1. All are colour blind
2. Daughters are colour blind and sons are normal
3. Sons are colour blind and daughters are normal
4. Sons are colour blind and daughters are carriers

Q. Criss-cross inheritance is between

1. Male to male
2. Female to female
3. Opposite sex
4. Father to mother

Q. The blood group AB was reported by

1. Carl Landsteiner
2. Steiner and Weiner
3. de Castella and Steini
4. Burnstein

Q. Which of the following are phenocopies with respect to length of pea plant?

1. TT, Tt, tt
2. TT, tt
3. TT,Tt
4. Tt, Tt

Q. Holandric characters are

1. Albinism
2. Icthyocis
3. Porcupine disorder
4. Icthyocis & Porcupine disorder

Q. Heamophilia was reported by

1. Allec Jeffrey
2. John Cotto
3. Carl Correns
4. Elizabeth

Q. Hemizygous condition is applicable to

1. XX
2. XY
3. XXY
4. XO

BIOLOGY

Q. The principle of blood transfusion is

1. The antigen of donor reacts with antibody of recipient
2. The antibody of donor reacts with antigen of recipient
3. The antigen of donor reacts with antigen of recipient
4. Blood should be HIV negative

BIOLOGY

Q. The rarest blood group is

1. A
2. B
3. AB
4. O

Q. The rediscoverers of mendelian principles are

1. de Vries
2. Correns and Mendel
3. Tschermak
4. de Vries, Correns, Tschermak

Q. Phenotypic ratio of dihybrid test cross is

1. 1 : 1
2. 1 : 1 : 1 : 1
3. 9 : 3 : 3 : 1
4. 1 : 2 : 2 : 4 : 1 : 2 : 1 : 2 : 1

Q. Which of the following is more likely to be heterozygous?

1. Pure lines
2. Self-pollinated crops
3. Autopolyploids
4. Cross-pollinated crops

BIOLOGY

Q. If the cell of an organism heterozygous for alleles Xx, Yy undergoes meiosis, then the possible genotype of gametes will be

1. XY, xY, Xy, xy
2. XY, xy
3. Xx, Yy
4. XxYy

BIOLOGY

Q. If two heterozygous dihybrids are crossed, the percentage of recessive is

1. 25%
2. 06%
3. 75%
4. 50%

Q. The significance in using a Punnet square is to know

1. gametic combinations
2. genotypic ratios
3. phenotypic ratios
4. all genotypic & phenotypic ratios

Q. If heterozygous round seeded pea plants are self-pollinated, the offsprings will be

1. 75% round
2. 50% heterozygous
3. 25% recessive
4. Phenotypically 3 : 1 ratios

BIOLOGY

THANK  YOU