Principle of Inheritance & Variation

1. The production of gametes by parents, formation of zygote, the f1 and f2 plants can be understood from a diagram called: **(2021)**
   (a) Punnett square
   (b) Net square
   (c) Bullet square
   (d) Punch square
2. Identify the wrong statement with reference to the gene 'I' that controls ABO blood groups. **(2020)**
   (a) A person will have only two of the three alleles.
   (b) When IA and IB are present together, they express same type of sugar.
   (c) Allele 'i' does not produce any sugar
   (d) The gene (I) has three alleles.
3. Experimental verification of the chromosomal theory of inheritance was done by: **(2020)**
   (a) Sutton
   (b) Boveri
   (c) Morgan
   (d) Mendel
4. Select the correct match **(2020)**

	Column - I		**Column - II**
(a)	Phenylketonuria	-	Autosomal dominant trait
(b)	Sickle cell anaemia	-	Autosomal recessive trait, chromosome-11
(c)	Thalassemia	-	X linked
(d)	Haemophilia	-	Y linked

5. How many true breeding pea plant varieties did Mendel select as pairs, which were similar except in one character with contrasting traits? **(2020)**
   (a) 2
   (b) 14
   (c) 8
   (d) 4
6. Chromosomal theory of inheritance was proposed by: **(2020 Covid Re-NEET)**
   (a) Bateson and Punnet
   (b) T.H. Morgan
   (c) Watson and Crick
   (d) Sutton and Boveri
7. The number of contrasting characters studied by Mendel for his experiments was: **(2020 Covid Re-NEET)**
   (a) 4
   (b) 2
   (c) 7
   (d) 14
8. The best example for pleiotropy is: **(2020 Covid Re-NEET)**
   (a) Phenylketonuria
   (b) Colour Blindness
   (c) ABO Blood group
   (d) Skin colour
9. What map unit (Centimorgan) is adopted in the construction of genetic maps? (2019)
   (a) A unit of distance between two expressed genes representing 10% cross over.
   (b) A unit of distance between two expressed genes representing 100% cross over.
   (c) A unit of distance between genes on chromosomes, representing 1% cross over.
   (d) A unit of distance between genes on chromosomes, representing 50% cross over.
10. What is the genetic disorder in which an individual has an overall masculine development gynaecomastia, and is sterile? **(2019)**
    (a) Turner's syndrome
    (b) Klinefelter's syndrome
    (c) Edward syndrome
    (d) Down's syndrome
11. The frequency of recombination between gene pairs on the same chromosome as a measure of the distance between genes was explained by **(2019)**
    (a) T.H. Morgan
    (b) Gregor J. Mendel
    (c) Alfred Sturtevant
    (d) Sutton Boveri
12. In Antirrhinum (Snapdragon), a red flower was crossed with a white flower and in F_1 generation pink flowers were obtained. When pink flowers were selfed, the F_2

generation showed white, red and pink flowers. Choose the incorrect statement from the following : **(2019)**

(a) This experiment does not follow the principle of dominance.

(b) Pink colour in F1 is due to incomplete dominance.

(c) Ratio of F_2 is $\frac{1}{4}$ due to incomplete Dominanace.

(d) Law of segregation does not apply in this experiment

13. Select the incorrect statement. **(2019)**

(a) Male fruit fly is heterogametic

(b) In male grasshoppers 50% of sperms have no sex-chromosome

(c) In domesticated fowls, sex of progeny depends on the type of sperm rather than egg

(d) Human males have one of their sex-Chromosome much shorter than the other

14. Select the correct statement: **(2018)**

(a) Franklin Stahl coined the term "linkage".

(b) Punnett square was developed by a British scientist.

(c) Spliceosomes take part in translation.

(d) Transduction was discovered by S. Altman.

15. Which of the following pairs is wrongly matched? **(2018)**

(a) Starch synthesis in pea : Multiple alleles

(b) ABO blood grouping : Co-dominance

(c) XO type sex determination : Grasshopper

(d) T.H. Morgan : Linkag

16. Which of the following characteristics represent 'Inheritance of blood groups' in humans? **(2018)**

A. Dominance

B. Co-dominance

C. Multiple dominance

D. Incompete dominance

E. Polygenic inheritance

(a) B, C and E

(b) A, B and C

(c) B, D and E

(d) A, C and E

17. A woman has an X-linked condition on one of her X chromosomes. This chromosome can be inherited by: **(2018)**

(a) Only daughters

(b) Only sons

(c) Only grandchildren

(d) Both sons and daughters

18. Among the following characters, which one was not considered by Mendel in his experiments on pea? **(2017)**

(a) Stem – Tall or Dwarf

(b) Trichomes – Glandular or non-glandular

(c) Seed – Green or Yellow

(d) Pod – Inflated or Constricted

19. A disease caused by an autosomal primary non- disjunction is **(2017)**

(a) Down's syndrome

(b) Klinefelter's syndrome

(c) Turner's syndrome

(d) Sickle cell anemia

20. The genotypes of a Husband and Wife are I^AI^B and I^Ai. Among the blood types of their children, how many different genotypes and phenotypes are possible? **(2017)**

(a) 3 genotypes ; 3 phenotypes

(b) 3 genotypes ; 4 phenotypes

(c) 4 genotypes ; 3 phenotypes

(d) 4 genotypes ; 4 phenotypes

21. Which one from those given below is the period for Mendel's hybridisation experiments? **(2017)**

(a) 1856 - 1863

(b) 1840 - 1850

(c) 1857 - 1869

(d) 1870 – 1877

22. Thalassemia and sickle cell anemia are caused due to a problem in globin molecule synthesis. Select the correct statement. **(2017)**

(a) Both are due to a qualitative defect in globin chain synthesis

(b) Both are due to a quantitative defect in globin chain synthesis

(c) Thalassemia is due to less synthesis of globin molecules

(d) Sickle cell anemia is due to a quantitative problem of globin molecules

23. Select the wrong statement: **(2017)**

(a) Chromosomal Theory of inheritance was proposed by Sutton

(b) Law of Dominance and Law of independent Assortment were proposed by Mendel

(c) Linkage and recombination were discovered by Sutton

(d) Three scientists independently rediscovered the Mendel's laws in 1900

24. The recessive genes located on X-chromosome in humans are always: **(2017, 2004)**

(a) Sub-lethal
(b) Expressed in females
(c) Expressed in males
(d) Lethal

25. Which one of the following is not true for the experiment of Mendel on pea? **(2017)**
(a) His experiments had small sampling size
(b) He choose characters of two contrasting states
(c) He used true-breeding lines
(d) His observations were based on natural, Open pollination

26. Select the correct option: **(2017)**
(a) Klinefelters's syndrome is due to an extra X chromosome and results in sterile male
(b) Phenylketonuria is X linked disease and results in accumulation of phenylpyruvic acid
(c) Down's syndrome is due to triploidy and results in mental retardation
(d) Turner's syndrome is due to trisomy and results in sterile female

27. If a colour-blind man marries a woman who is homozygous for normal colour vision, the probability of their son being colour-blind is: **(2016 - II)**
(a) 0.75
(b) 1
(c) 0
(d) 0.5

28. A true breeding plant is: **(2016 - II)**
(a) Near homozygous and produces offspring of its own kind
(b) Always homozygous recessive in its genetic constitution
(c) One that is able to breed on its own
(d) Produced due to cross-pollination among Unrelated plants

29. A cell at telophase stage is observed by a student in a plant brought from the field. He tells his teacher that this cell is not like other cells at telophase stage. There is no formation of cell plate and thus the cell is containing more number of chromosomes as compared to other dividing cells. This would result in: **(2016 - I)**
(a) Aneuploidy
(b) Polyploidy
(c) Somaclonal variation
(d) Polyteny

30. In a test cross involving F1 dihybrid flies, more parental- type offspring were produced than the recombinant-type offspring. This indicates **(2016 - I)**
(a) The two genes are located on two different chromosomes
(b) Chromosomes failed to separate during meiosis
(c) The two genes are linked and present on the same chromosome
(d) Both of the characters are controlled by more than one gene

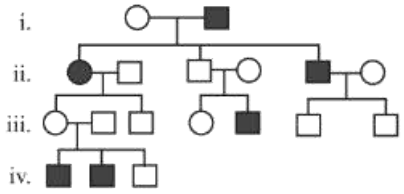
31. Pick out the correct statements: **(2016 - I)**
A. Haemophilia is a sex-linked recessive disease.
B. Down's syndrome is due to aneuploidy.
C. Phenylketonuria is an autosomal recessive gene disorder.
D. Sickle cell anaemia is an X-linked recessive gene disorder.
(a) A and D are correct
(b) B and D are correct
(c) A, C and D are correct
(d) A, B and C are correct

32. Match the terms in Column I with their description in Column II and choose the correct option **(2016 - I)**

A.	Dominance	(i)	Many genes govern a single character
B.	Co-dominance	(ii)	In a heterozygous organism only one allele expresses itself
C.	Pleiotropy	(iii)	In a heterozygous organism both alleles express themselves fully
D.	Polygenic inheritance	(iv)	A single gene influences many characters

(a) A–(ii), B–(i), C–(iv), D–(iii)
(b) A–(ii), B–(iii), C–(iv), D–(i)
(c) A–(iv), B–(i), C–(ii), D–(iii)
(d) A–(iv), B–(iii), C–(i), D–(ii)

33. A tall true breeding garden pea plant is crossed with a dwarf true breeding garden pea plant. When the F_1 plants were selfed the resulting genotypes were in the ratio of: **(2016 - I)**
    (a) 1 : 2 : 1 : Tall homozygous : Tall heterozygous : Dwarf
    (b) 1 : 2 : 1 : Tall heterozygous : Tall homozygous : Dwarf
    (c) 3 : 1 : Tall : Dwarf
    (d) 3 : 1 : Dwarf : Tall
34. Which of the following most appropriately describes haemophilia? **(2016 - I)**
    (a) Recessive gene disorder
    (b) X-linked recessive gene disorder
    (c) Chromosomal disorder
    (d) Dominant gene disorder
35. How many pairs of contrasting characters in pea plants were studied by Mendel in his experiments? **(2016 - I)**
    (a) Eight
    (b) Seven
    (c) Five
    (d) Six
36. A man with blood group 'A' marries a woman with blood group 'B'. What are all the possible blood groups of their offspring's? **(2016 - I)**
    (a) A, B, AB and O
    (b) O only
    (c) A and B only
    (d) A, B and AB only
37. Multiple alleles are present: **(2015)**
    (a) At the same locus of the chromosome
    (b) On non-sister chromatids
    (c) On different chromosomes
    (d) At different loci on the same Chromosome
38. The movement of a gene from one linkage group to another is called: **(2015)**
    (a) Translocation
    (b) Crossing over
    (c) Inversion
    (d) Duplication
39. Alleles are: **(2015)**
    (a) Different molecular forms of a gene
    (b) Heterozygote's
    (c) Different phenotype
    (d) True breeding homozygote's
40. An abnormal human baby with 'XXX' sex chromosomes was born due to: **(2015)**
    (a) Fusion of two ova and one sperm
    (b) Fusion of two sperms and one ovum
    (c) Formation of abnormal sperms in the father
    (d) Formation of abnormal ova in the mother
41. In the following human pedigree, the filled symbols represent the affected individuals. Identify the type of given pedigree. **(2015)**



    (a) X-linked recessive
    (b) Autosomal recessive
    (c) X-linked dominant
    (d) Autosomal dominant
42. A colour blind man marries a woman with normal sight who has no history of colour blindness in her family. What is the probability of their grandson being colour blind? **(2015 Re)**
    (a) 1
    (b) Nil
    (c) 0.25
    (d) 0.5
43. The term "linkage" was coined by: **(2015 Re)**
    (a) T. Boveri
    (b) G. Mendel
    (c) W. Sutton
    (d) T.H. Morgan
44. A gene showing co-dominance has: **(2015 Re)**
    (a) Alleles tightly linked on the same chromosome
    (b) Alleles that is recessive to each other
    (c) Both alleles independently expressed in the heterozygote
    (d) One allele dominant on the other
45. A pleiotropic gene: **(2015 Re)**
    (a) Is a gene evolved during Pliocene
    (b) Controls a trait only in combination with another gene
    (c) Controls multiple traits in an individual
    (d) Is expressed only in primitive plants
46. In his classic experiments on pea plants, Mendel did not use: **(2015 Re)**
    (a) Pod length
    (b) Seed shape
    (c) Flower position
    (d) Seed colour

47. Fruit colour in squash is an example of: **(2014)**
    (a) Inhibitory genes
    (b) Recessive epistasis
    (c) Dominant epistasis
    (d) Complementary genes
48. A human female with Turner's syndrome: **(2014)**
    (a) Is able to produce children with normal husband
    (b) Has 45 chromosomes with XO
    (c) Has one additional X chromosome
    (d) Exhibits male characters
49. A man whose father was colour blind marries a woman who had a colour blind mother and normal father. What percentage of male children of this couple will be colour blind?
    (a) 75%
    (b) 25%
    (c) 0%
    (d) 50%
50. The incorrect statement with regard to Haemophilia is: **(2013)**
    (a) A single protein involved in the clotting of blood is affected
    (b) It is a sex-linked disease
    (c) It is a recessive disease
    (d) It is a dominant disease
51. If two persons with 'AB' blood group marry and have sufficiently large number of children, these children could be classified as 'A' blood group : 'AB' blood group : 'B' blood group in 1 : 2 : 1 ratio. Modern technique of protein electrophoresis reveals presence of both 'A' and 'B' type proteins in 'AB' blood group individuals. This is an example of: **(2013)**
    (a) Complete dominance
    (b) Co-dominance
    (c) Incomplete dominance
    (d) Partial dominance
52. Which Mendelian idea is depicted by a cross in which the F_1 generation resembles both the parents? **(2013)**
    (a) Co-dominance
    (b) Incomplete dominance
    (c) Law of dominance
    (d) Inheritance of one gene
53. Which of the following statements is not true for two genes that show 50% recombination frequency? **(2013)**
    (a) If the genes are present on the same chromosome, they undergo more than one crossover in every meiosis
    (b) The genes may be on different chromosomes
    (c) The genes are tightly linked
    (d) The genes show independent assortment
54. If both parents are carriers for Thalassaemia, which is an autosomal recessive disorder, what are the chances of pregnancy resulting in an affected child? **(2013)**
    (a) 100%
    (b) No chance
    (c) 50%
    (d) 25%

Answer Key

S1. Ans. (a)

S2. Ans. (b)

S3. Ans. (c)

S4. Ans. (d)

S5. Ans. (b)

S6. Ans. (d)

S7. Ans. (c)

S8. Ans. (a)

S9. Ans. (c)

S10. Ans. (b)

S11. Ans. (c)

S12. Ans. (d)

S13. Ans. (c)

S14. Ans. (b)

S15. Ans. (a)

S16. Ans. (b)

S17. Ans. (d)

S18. Ans. (b)

S19. Ans. (a)

S20. Ans. (c)

S21. Ans. (a)

S22. Ans. (c)

S23. Ans. (c)

S24. Ans. (c)

S25. Ans. (a)

S26. Ans. (a)

S27. Ans. (c)

S28. Ans. (a)

S29. Ans. (b)

S30. Ans. (c)

S31. Ans. (d)

S32. Ans. (b)

S33. Ans. (a)

S34. Ans. (b)

S35. Ans. (b)

S36. Ans. (a)

S37. Ans. (a)

S38. Ans. (a)

S39. Ans. (a)

S40. Ans. (d)

S41. Ans. (b)

S42. Ans. (d)

S43. Ans. (d)

S44. Ans. (c)

S45. Ans. (c)

S46. Ans. (a)

S47. Ans. (c)

S48. Ans. (b)

S49. Ans. (d)

S50. Ans. (d)

S51. Ans. (b)

S52. Ans. (a)

S53. Ans. (c)

S54. Ans. (d)

Solutions

S1. Ans.(a)

Punnett square

S2. Ans.(b)

The gene (I) has three alleles in human blood grouping: I, I^A, and I^B.

Only two of the three alleles would be present in an individual.

On the surface of RBCs, Allele I does not create any sugar/antigen. It's a recessive trait. Sugar/antigen A antigen is produced on the surface of RBCs by allele I^A. It has a stronghold in nature. Sugar/antigen B antigen is produced on the surface of RBCs by allele I^B. It has a stronghold in nature. Both Allele I^A and Allele IB produce both A and B antigens on the surface of RBCs. Both of them

exhibit codominance. Because they express two different sugars/antigens

on the surface of the RBCs, the statement "When I^A and I^B. are present together, they express the same

type of sugar" is incorrect.

S3. Ans.(c)

Thomas Hunt Morgan and his colleagues performed experimental verification of the chromosomal

theory of heredity. Morgan's research with the microscopic fruit flies Drosophila melanogaster led

to the discovery of the genetic foundation for sexual reproduction's variety. Laws of inheritance were given by Mendel. Sutton and Boveri proposed the chromosomal theory of inheritance.

S4. Ans.(b)

Phenylketonuria, thalassemia and sickle cell anaemia are autosomal recessive disorder. Haemophilia is X-linked recessive disorder.

S5. Ans.(b)

Mendel selected 14 true breeding plant varieties.

S6. Ans.(d)

The chromosomal theory of inheritance was proposed by Sutton and Boveri in 1903. Sutton and Boveri argued that the pairing and separation of a pair of chromosomes would lead to the segregation of a pair of factors they carried. Sutton united the knowledge of chromosomal segregation with Mendelian principles and called it the chromosomal theory of inheritance.

S7. Ans.(c)

7 contrasting characters were studied by Mendel for his experiments. Some of the contrasting traits selected were smooth or wrinkled seeds, yellow or

green seeds, inflated (full) or constricted green or yellow pods and tall or dwarf plants.

S8. Ans.(a)

When a single gene can exhibit multiple phenotypic expression. Such a gene is called a pleiotropic gene. The disease phenylketonuria, which affects humans,

is an example of this. A mutation in the gene that codes for the enzyme phenyl alanine hydroxylase causes the condition (single gene mutation).

S9. Ans.(c)

1 map unit is equivalent to 1% cross over. Map unit is used to measure genetic distance. This genetic distance is based on average number of cross over frequency.

S10. Ans.(b)

Individuals with Klinefelter's syndrome have an additional copy of X-chromosome resulting into a karyotype of 44 + XXY (47). They show overall

masculine development, gynaecomastia and are sterile.

S11. Ans.(c)

The probability of recombination between gene pairs on the same chromosome was employed by

Alfred Sturtevant to calculate the distance between genes.

S12. Ans.(d)

Genes for flower colour in snapdragon shows incomplete dominance which is

an exception of Mendel's first principle, i.e., law of dominance. Here, the F1 had a phenotype that did not resemble

either of the two parents and was in between the two. Law of segregation is universally applicable.

S13. Ans.(c)

In bird females, heterogamety is found, i.e., a female bird has two sex chromosomes, Z and W and can

produce two different types of gametes. Thus sex of progeny depends on the types of egg rather than the type of sperm.

S14. Ans.(b)

Reignald C. Punnett, English geneticist, devised the Punnett square in early 1900s.

S15. Ans.(a)

Starch synthesis in pea plants is controlled by a single gene, which has two alleles- one dominant and other recessive.

S16. Ans.(b)

Blood group represent – dominance, co-dominance and multiple alleles. Three alleles (I^A, I^B, I^O) determine one characteristic, i.e., blood group I^A

and I^B are dominant

S17. Ans.(d)

Women has only X-chromosome with her which she can pass to any child-boy or girl. In contrast, a man can pass X-chromosome to only his daughter and

Y-chromosome to only his son.

S18. Ans.(a)

	Characters	**Dominant**	**Recessive**
1.	Stem height	Tall	Dwarf
2.	Flower colour	Violet	White
3.	Flower position	Axial	Terminal
4.	Pod shape	Inflated	Constricted
5.	Pod colour	Green	Yellow
6.	Seed shape	Round	Wrinkled
7.	Seed colour	Yellow	Green

S19. Ans.(a)

Down's syndrome (Mongolism): It is the presence of an additional copy of chromosome number 21 (trisomy of 21). Genetic constitution: 45 A + XX or

45 A + XY (i.e., 47 chromosomes).

Features:

- They are short statured with small round head.
- Broad flat face.
- Furrowed big tongue and partially open mouth.
- Many "loops" on finger tips.
- Palm is broad with characteristic palm crease.
- Retarded physical, psychomotor and Mental development.
- Congenital heart disease.

S20. Ans.(c)

Husband × Wife I^AI^B I^Ai

♀ \ ♂	I^A	I^B
I^A	I^AI^A	I^AI^B
I	I^A i	I^B i

Number of genotypes = 4 Number of phenotypes

= 3 I^AI^A and I^Ai = A

I^AI^B = A^B I^Bi = B

S21. Ans.(a)

Mendel experimented on pea plants for seven years, from 1856 to 1863, and his findings were published

in 1865. Thalassemia differs from sickle-cell anaemia in that the former is a quantitative problem involving insufficient globin molecules, whereas the latter is a qualitative one involving an incorrectly functioning globin.

S22. Ans.(c)

Thalassemia and sickle cell anemia are genetic disorders in which hemoglobin synthesis is affected. In thalassemia, there is a defect in the α or β globin

chain. This leads to the synthesis of abnormal red blood cells due to the decreased synthesis of globin

molecules. Whereas in sickle-cell anemia there is a mutation in β globin gene resulting in sickling of red

blood cells.

S23. Ans.(c)

Linkage was discovered by T.H. Morgan

S24. Ans.(c)

Females have a pair of X-chromosomes, whereas males have one X and one Y chromosome. Because of the presence of only one X chromosome, the recessive genes on X chromosome in males are

always expressed.

S25. Ans.(a)

His experiments had a large sampling size, which gave greater credibility to the data he collected.

S26. Ans.(d)

Turner's syndrome is caused due to the absence of one of the X chromosomes, i.e., 45 with XO.

S27. Ans.(c)

Because it is an X-linked recessive trait acquired by criss-cross inheritance, a color-blind man (X^cY)

and a normal woman (XX) cannot bear a color-blind kid. To bear a color-blind son, the other must be a carrier (X^cX) or affected (X^cX^c) such that the affected X chromosome is passed down to the son.

♀ / ♂	X^c	Y
X	XX^c	XY
X	XX^c	XY
	All carrier daughters	All normal son

S28. Ans.(a)

A true breeding line is one that have undergone continuous self-pollination, shows the stable trait inheritance and expression for several generations.

S29. Ans.(b)

Failure of cytokinesis after telophase stage of cell division results in an increase in a whole set of chromosomes in an organism and this phenomenon is known as polyploidy. This condition is often seen in plants.

S30. Ans.(c)

T.H. Morgan attributed the physical association or linkage of the two genes and coined the term linkage.

S31. Ans.(d)

Sickle cell anemia is an autosome linked recessive trait that can be transmitted from parents to the offspring when both the partners are carrier for the gene (or heterozygous).

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S32. Ans.(b)

1. Dominance ii. In a heterozygous organism only one allele expresses itself

2. Co-dominance iii. It is an inheritance in which heterozygous offspring show intermediate character between two parental characteristics.

3. Pleiotropy iv. A single gene produces more than one effect. E.g., starch synthesis in pea seeds, sickle cell anaemia, etc.

4. Polygenic inheritance i. Many genes effects one phenotype

S33. Ans.(a)

A phenotypic ratio of $3/4^{th}$ tall : (1/4 TT + 1/2 Tt) and $1/4^{th}$ tt, i.e., 3:1 ratio, but a genotypic ratio of 1:2:1.

S34. Ans.(b)

Hemophilia is X-linked sex linked recessive disease, which shows its transmission from unaffected

carrier female to some of the male progeny; has been widely studied. The family pedigree of Queen Victoria shows a number of hemophiliac descendent's as she was a carrier of the disease.

S35. Ans.(b)

Mendel conducted hybridisation experiments on garden pea. Mendel investigated seven pair of contrasting characters. These were Seed shape,

Seed colour, Flower colour, Pod Shape, Pod colour, Flower position and Stem height.

S36. Ans.(a)

Man I^Ai, woman I^Bi

	I^B	i
I^A	I^AI^B	I^A i
i	I^B i	i i

S37. Ans.(a)

Multiple alleles: More than two alternate forms of a gene present on the same locus are called multiple alleles. There is absence of crossing over in multiple alleles.

S38. Ans.(a)

When a portion of chromosomes breaks and attached to another is known as translocation.

S39. Ans.(a)

Term allele was given by W. Bateson. Alleles are different molecular forms of a gene.

S40. Ans.(d)

Abnormal ova is formed in mother's ovary due to non- disjunction of X-chromosome in the mother.

S41. Ans.(b)

Autosomal recessive trait can be transmitted from parents to the offspring when both the partners are carriers for the gene (or heterozygous).

In generation I, the female is a carrier of the disease and male is affected by the disease. In generation II, the female receives the affected genes from both mother and father. When II-1 marries a normal male, none of the offsprings are affected by the disease. However, the female of generation III is a carrier of the disease as she received the defective gene from the mother. As III-6 and III-7 are not affected by the disorder, the given pedigree is of X-linked recessive disorder.

S42. Ans.(c)

Colorblind man crosses with normal woman:

	X	X
X^C	X^CX	X^CX
Y	XY	XY

X^CX [daughter of colorblind man]

	X	X
X^C	X^CX	X^CX
X	XX	XY

XY [son of colorblind man]

	X	X
X	XX	XX
Y	XY	XXY

Out of four grandson (XCY, XY, XY, XXY), only one is colorblind.

Probability 1⁄4 = 0.25

S43. Ans.(d)

Chromosomal theory of linkage was put forward by T.H.Morgan

S44. Ans.(c)

The alleles which do not show dominance-recessive relationship and are able to express themselves independently and equally when present together.

S45. Ans.(c)

When a gene affects many aspects of phenotype or controls several phenotypes, it is said to be pleiotropic genes.

S46. Ans.(a)

Mendel conducted hybridisation experiments on garden pea. Mendel investigated seven characters that were manifested as two opposite traits. E.g., seed shape, seed colour, flower colour, pod shape, flower position and stem height.

S47. Ans.(c)

Fruit colour in squash is an example of dominant epistasis.

S48. Ans.(b)

Turner syndrome (45 chromosome) (44 + XO). It has 44 autosomes and 1 sex chromosome.

S49. Ans.(d)

Because it is present on the X-chromosome, colour blindness is an autosomal recessive genetic disease.

According to the first figure, a guy whose father was colorblind (will be, i.e. XY normal) marries a woman whose mother was colorblind and father was

normal (i.e. this woman will be a carrier) according to the situation stated in the question.

Thus, when a normal guy marries a carrier woman, the probability of a male offspring being colorblind is 25%.

S50. Ans.(d)

Haemophilla is an X - linked recessive disorder.

S51. Ans.(b)

Neither phenotype is totally dominant in

codominance. The heterozygous individual, on the other hand, manifests both characteristics. The ABO

blood group system is a good example. A, B, and I are the three alleles that make up the blood type gene. I causes O type and is recessive to both A and

B. The A and B alleles share a common ancestor.

Type AB blood is formed when a person has both A and B blood types. It makes no difference whether the alleles in the homologous chromosomes are dominant or recessive in codominance. If a homologous chromosome contains two alleles that may create proteins, both will be produced, resulting in a phenotype or set of features that is distinct from that of a homozygote.

S52. Ans.(a)

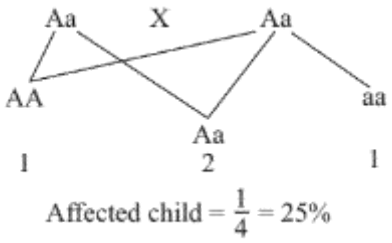
In case of co-dominance, F_1 generation resembles both parents. e.g., ABO blood grouping in humans.

S53. Ans.(c)

Tightly linked genes show 100% parental types and 0% recombinants.

S54. Ans.(d)

Autosomal recessive disorder - Thalassemia. AA: Normal; Aa: Carrier; aa: affected



Affected child = $\frac{1}{4} = 25\%$