HERIDITY

Class 10 - Science

Time Allowed: 30 minutes **Maximum Marks: 75**

1. Who is called the father of genetics? **[1]**

   a) Lamarck
   b) Darwin
   c) Stanley and miller
   d) Gregor Mendel

2. It a round green seeded pea plant (RRYY) is crossed with wrinkled yellow seeded pea plant (rr yy) the seeds to be produced in F_1 generation will be: **[1]**

   a) Wrinkled and yellow
   b) wrinkled and green
   c) round and yellow
   d) round and green

3. The two versions of a trait (character) which are brought in by the male and female gametes are situated on **[1]**

   a) sex chromosomes
   b) copies of the same chromosome
   c) two different chromosomes
   d) any chromosome

4. The number of pair (s) of sex chromosomes in the zygote of humans is **[1]**

   a) one
   b) three
   c) four
   d) two

5. Alternative forms of a gene are called **[1]**

   a) Multiples
   b) Chromosomes
   c) Loci
   d) Alleles

6. How many pairs of contrasting characters of pea were selected by Mendel for cross-fertilization? **[1]**

   a) Seven
   b) Five
   c) Twelve
   d) Six

7. Who was the first scientist to isolate DNA? **[1]**

   a) Watson and crick
   b) Weismann mishear
   c) Friedrich
   d) Darwin

8. The statement that correctly describes the characteristic(s) of a gene is: **[1]**

   a) Each chromosome has only one gene located all along its length.
   b) In individuals of a given species, a specific gene is located on a particular chromosome.
   c) All the inherited traits in human beings are not controlled by genes.
   d) A gene is not the information source for making proteins in the cell.

9. Select the correct statement among the following. **[1]**

i. Human female possesses homomorphic sex chromosomes.
ii. Males possess homogametic sex chromosomes in humans.
iii. Human females possess heterogametic sex chromosomes.
iv. Human male possesses homomorphic sex chromosomes.

a) Statement (iv) is correct.
b) Statement (i) is correct.
c) Statement (ii) is correct.
d) Statement (iii) is correct.

10. A cross between pea plant with white flowers (vv) and pea plant with violet flowers (VV) resulted in F_2 progeny in which ratio of violet (VV) and white (vv) flowers will be: **[1]**

a) 3 : 1
b) 1 : 1
c) 2 : 1
d) 1 : 3

11. Two pink colored flowers on crossing resulted in 1 red, 2 pink, and 1 white flower progeny. The nature of the cross will be **[1]**

a) double fertilisation
b) no fertilisation
c) cross fertilisation
d) self pollination

12. In human males, all the chromosomes are paired perfectly except one. This/these unpaired chromosome is/are **[1]**

i. large chromosome
ii. small chromosome
iii. Y-chromosome
iv. X-chromosome

a) (i) and (ii)
b) (iii) and (iv)
c) (iii) only
d) (ii) and (iv)

13. A zygote which has an X-chromosome inherited from the father will develop into a **[1]**

a) boy
b) either boy or girl
c) X- chromosome does not determine the sex of a child
d) girl

14. Humans inherit colour of their eyes from their parents. Brown-eyed couple has three blue-eyed children. Which of the following statements gives correct explanation of this situation? **[1]**

i. Each parent has an allele for brown eyes and an allele for blue eyes.
ii. The allele for blue eyes is recessive.
iii. The probability that their next child will have blue eyes is 75%.
iv. The probability that their next child will have brown eyes is 50%.

a) (ii) and (iv) only
b) (i) and (ii) only
c) (i) and (iii) only
d) (iii) and (iv) only

15. The chromatids are joined to each other by **[1]**

a) Spindle
b) Centriole
c) Centromere
d) Aster

16. Mendel selected garden peas as his experimental material because **[1]**

i. Pea plants possess a number of well defined contrasting characters.

ii. Pea plants contain unisexual flowers.

iii. Pea plants have a short life cycle.

iv. Pea plants produce many seeds in one generation.

a) (i), (iii) and (iv) only

b) (i) and (ii) only

c) (i) and (iv) only

d) (i) and (iii) only

17. Father of Human genetics is **[1]**

a) H.G Khurana

b) Charles Darwin

c) Sir Archibald Garrod

d) Gregor Mendel

18. The egg of an animal contains 10 chromosomes, of which one is X-chromosome. How many autosomes would be there in the karyotype of this animal? **[1]**

a) 8

b) 18

c) 20

d) 9

19. Which of the following organism has only one type of sex chromosome called X-chromosome? **[1]**

a) Ant

b) Lizard

c) Cricket

d) Bee

20. In an experiment to study independent inheritance of two separate traits : shape and colour of seeds, the ratio of the different combinations in F_2 progeny would be **[1]**

a) 1 : 3

b) 1 : 2 : 1

c) 9 : 1 : 1 : 3

d) 9 : 3 : 3 : 1

21. If a round, green seeded pea plant (RRyy) is crossed with wrinkled, yellow seeded pea plant (rrYY) the seeds to be produced is F, generation will be: **[1]**

a) Wrinkled and green

b) Round and green

c) Round and yellow

d) Wrinkled and yellow

22. The genotype for the height of an organism is Tt. What conclusion may be drawn from this? **[1]**

a) There is one allele for height with two different forms.

b) There are at least two different alleles for the gene for height.

c) There are two different genes for height, each having a single allele.

d) The allele for height has at least two different genes.

23. In a monohybrid cross between two heterozygous individuals, percentage of heterozygous individuals obtained in F_1 generation is **[1]**

a) 75%

b) 25%

c) 100%

d) 50%

24. Select the group which shares maximum number of common characters- **[1]**

a) two individuals of a species

b) two genera of a family

c) two species of a genus

d) two genera of two families

25. The branch of biology-related with heredity and variation is called **[1]**

a) Genetics
b) Livinglogy
c) Taxonomy
d) Evolution

26. A cross made between two pea plants produces 50% tall and 50% short pea plants. The gene combination of the parental pea plants must be **[1]**

a) Tt and Tt
b) TT and Tt
c) Tt and tt
d) TT and tt

27. Which of the following was not the outcome of Mendel's experiments? **[1]**

a) Factors reside in chromosomes
b) Dominant trait
c) Independent assortment
d) Segregation of factors

28. How are the two strands in a DNA molecule held together? **[1]**

a) Phosphate band
b) Ionic bond
c) Covalent bond
d) Hydrogen bond

29. Name the chromosomes that possess the gene for maleness and femaleness in humans. **[1]**

a) body cell chromosomes
b) Sex chromosomes
c) Autosomes
d) Somatic ctromosomes

30. Which of the following is not a character selected by Mendel? **[1]**

A. Flower shape
B. Pod colour
C. Pod position
D. Branch length

a) A and C
b) A and D
c) B and C
d) A, B and D

31. In which of the following organisms sex determination occurs under the effect of environmental factors? **[1]**

a) Chrysemys picta
b) Drosophila melanogaster
c) Ailuropoda
d) Pavo cristatus

32. Two species of hen X and Y breed in the month of April and November respectively. They cannot interbreed due to _____. **[1]**

a) Physiological isolation
b) Behavioural isolation
c) Temporal isolation
d) Mechanical isolation

33. For evolution to occur in a population, which of the following must happen? **[1]**

i. The frequencies of some alleles in an organism's genotypes must change during its lifetime.
ii. The frequencies of each allele in an organism's genotype must remain constant within its lifetime.
iii. The frequencies of some alleles in a population's gene pool must change over successive generations.
iv. The frequencies of each allele in a population's gene pool must remain constant over successive generations.

a) Statement (i) is correct.
b) Statement (ii) is correct.

c) Statement (iii) is correct.
d) Statement (vi) is correct.

34. In a plant, smooth seeds(S) are dominant over wrinkled seeds(s) and green seeds (G) are dominant over yellow seeds (g). A plant homozygous for smooth and green seed is crossed with a plant having wrinkled and yellow seeds. The F_1 offspring are self crossed to produce F_2 generation. If a total of 160 offspring are produced, how many plants are expected to be having wrinkled and green seeds in F_2 generation, according to a typical Mendelian cross? **[1]**

a) 90
b) 10
c) 30
d) 20

35. In a cross between pure tall pea plants (TT) and pure dwarf pea plants (tt) the offsprings of F_1 generation were all tall. When F_1 generation was self-crossed, the gene combinations of the offsprings of F_2 generation will be: **[1]**

a) Tt : tt
b) TT : tt
c) TT : Tt : tt
d) TT : Tt

36. The component of a chromosome that controls heredity is **[1]**

a) RNA
b) Histones
c) DNA
d) Proteins

37. A cross between a tall plant (TT) and short pea plant (tt) resulted in progeny that were all tall plants because **[1]**

a) height of pea plant is not governed by gene ‘T’ or ‘t’
b) tallness is the dominant trait
c) tallness is the recessive trait
d) shortness is the dominant trait

38. In any population, no two individuals are absolutely similar. Why? **[1]**

39. List any two pairs of visible contrasting characters of garden pea plants used by Mendel for his experiments stating the dominant and recessive characters in each pair. **[1]**

40. How many contrasting traits Mendel noted in garden pea? **[1]**

41. What will be in sex of the offspring developing from 44 + XX zygote? **[1]**

42. In human beings, the probability of getting a male or a female child is 50%. Explain with the help of a flow diagram only. **[1]**

43. Name the molecule having information for making proteins in the cell. **[1]**

44. What is the full name of the father of genetics? **[1]**

45. How many pairs of chromosomes are present in human beings? Out of this how many are sex chromosomes? How many types of sex chromosomes are found in human beings? **[1]**

46. Give any one character of gene. **[1]**

47. Write the genotype of man with blood group 'A'. **[1]**

48. Define the term **Heredity**. **[1]**

49. How many pairs of chromosomes are present in human beings? **[1]**

50. What is Mendel's monohybrid ratio? **[1]**

51. On which plant did Mendel work? **[1]**

52. What indication do we get by reappearance of dwarf plant in F_2 -generation? **[1]**

53. Can changes in non-reproductive tissue pass on to next generation? **[1]**

54. Why is the progeny always tall when a tall pea plant is crossed with a short pea plant? **[1]**

55. Give an example where sex is determined by environmental factors. **[1]**

56. Why do you understand by the double helical structure of DNA? Who proposed this structure? **[1]**

57. Explain how the original number of chromosomes present in the parents are restored in the progeny. Name the cell division by which chromosome number is maintained in the progeny. **[1]**

58. **Assertion (A):** A child which has inherited X chromosome from father will develop into a girl child. **[1]**
Reason (R): Girl child inherits X chromosome from father and Y chromosome from mother.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

59. **Assertion (A):** Accumulation of variation in a species increases the chances of its survival in changing environment. **[1]**
Reason (R): Accumulation of heat resistance in some bacteria ensure their survival even when temperature in environment rises too much.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

60. **Assertion (A):** The sex of a child is determined by the mother. **[1]**
Reason (R): Humans have two types of sex chromosomes: XX and XY.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

61. **Assertion (A):** Sex of the children will be determined by what they inherit from their mother. **[1]**
Reason (R): Women have XX sex chromosomes.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

62. Match the following with correct response. **[1]**

Column A	Column B
(i) Genes	(a) Units of inheritance
(ii) Factors	(b) Impressions of past organism
(iii) Fossils	(c) Entities which control the expression of traits
(iv) Sex chromosomes	(d) Determine sex of an individual

a) (i) - (c), (ii) - (b), (iii) - (d), (iv) - (a)
b) (i) - (b), (ii) - (d), (iii) - (a), (iv) - (c)
c) (i) - (d), (ii) - (a), (iii) - (c), (iv) - (b)
d) (i) - (a), (ii) - (c), (iii) - (b), (iv) - (d)

63. Match the following with correct response. **[1]**
(1) Transmission of characters from parent to offspring
(2) Differences among the individual of same species

(3) Branch of science deals with heredity and variation

(4) Development of new organism by modifications in pre existing ones

(A) Hereditary

(B) Genetics

(C) Variation

(D) Evolution

a) 1-B, 2-D, 3-A, 4-C

b) 1-C, 2-B, 3-D, 4-A

c) 1-D, 2-A, 3-C, 4-B

d) 1-A, 2-C, 3-B, 4-D

64. Match the following with correct response. **[1]**

(1) Phenotype	(A) Gene complement of an individual
(2) Genotype	(B) Factor which cannot express its effect
(3) Dominant factor	(C) Factor which can express its effect
(4) Recessive factor	(D) Observable characteristics

a) 1-A, 2-C, 3-B, 4-D

b) 1-D, 2-A, 3-C, 4-B

c) 1-C, 2-B, 3-D, 4-A

d) 1-B, 2-D, 3-A, 4-C

65. Consider the following two statements: **[1]**

i. The trait that expresses itself in F_1 generation.

ii. The trait that keeps on passing from one generation to another.

The appropriate terms for the statements (i) and (ii) respectively are:

a) Dominant trait, Inherited trait

b) Recessive trait, Inherited trait

c) Recessive trait, Dominant trait

d) Dominant trait, Recessive trait

66. Consider the following statements: **[1]**

i. The sex of a child is determined by what it inherits from the mother.

ii. The sex of a child is determined by what it inherits from the father.

iii. The probability of having a male child is more than that of a female child.

iv. The sex of a child is determined at the time of fertilisation when male and female gametes fuse to form a zygote.

The correct statements are:

a) (i) and (iii)

b) (ii) and (iv)

c) (iii) and (iv)

d) (i), (iii) and (iv)

67. Which of the following statement is correct? **[1]**

A. For every hormone there is a gene

B. For every protein there is a gene

C. For every enzyme there is a gene

D. For every fat molecule there is gene

a) B and C

b) A and C

c) A, B and C

d) A, B and D

68. Select the statements that describe characteristics of genes **[1]**

i. genes are specific sequence of bases in a DNA molecule

ii. a gene does not code for proteins

iii. in individuals of a given species, a specific gene is located on a particular chromosome

iv. each chromosome has only one gene

a) (i) and (iv)

b) (i) and (ii)

c) (i) and (iii)

d) (ii) and (iv)

69. Which of the following is not correct- **[1]**

a) For every molecule of fat there is a gene

b) For every protein there is a gene

c) For every hormone there is a gene

d) For production of every enzyme there is a gene

70. Find the correct statement: **[1]**

A. Chromosomes are the bearers of hereditary factors.

B. The wing of a bird and the bat are homologous organs.

C. J. B. S. Haldane suggested that life has evolved from simple organic molecules.

D. A child who inherits an X – chromosome from his father will be a boy.

a) (D)

b) (B)

c) (C)

d) (A)

71. **Fill in the blanks:** **[5]**

(a) Gene is the basic unit of _____ present on the chromosome, composed of DNA and codes for one polypeptide. **[1]**

(b) Gene is the part of a _____ which controls the appearance of a set of hereditary characteristics. **[1]**

(c) Human male produces _____ types of sperm and human female produces _____ types of ova. **[1]**

(d) _____ is a cross between two parents taking the alternative traits of one single character. **[1]**

(e) The passage or transmission of characters (from parents to offsprings) is known as _____. **[1]**

Solution

HERIDITY

Class 10 - Science

1.

(d) Gregor Mendel

Explanation:

Gregor Mendel is called the father of genetics because he was the first person in the world to observe the fact that characteristics were passed on from the parents to the children.

2.

(d) round and green

Explanation:

Since roundness and green colour are shown by capital letters in the genotype so they are dominant traits. We know that only dominant traits are expressed in F_1 generation.

3.

(b) copies of the same chromosome

Explanation:

The two versions of a trait that are brought in by the male and female gametes are situated on copies of the same chromosome. Each parent contributes one copy of the gene for a particular trait.

4. **(a)** one

Explanation:

A zygote has 23 pairs of chromosomes i.e., 46. Out of them, one pair is the sex chromosome.

5.

(d) Alleles

Explanation:

An alternative form of a gene is known as an allele. Alleles vary in their sequence which may or may not result in a variant phenotype of a particular trait. Alleles represent variations of a gene that is responsible for a particular trait.

6. **(a)** Seven

Explanation:

Mendel selected 14 different varieties of the pea and grouped them into seven pairs. Each pair was considered for a specific trait (characteristic) such as flower colour or seed shape or stem length, etc. The two members of each pair showed contrasting forms of the chosen trait, e.g., in a pair selected for stem length, one variety had a tall stem (6-7 feet tall) while the other had a dwarf stem.

7.

(c) Friedrich

Explanation:

DNA isolation is a process of purification of DNA from a sample using a combination of physical and chemical methods. The first isolation of DNA was done in 1869 by Friedrich Miescher.

8.

(b) In individuals of a given species, a specific gene is located on a particular chromosome.

Explanation:

In individuals of a given species, a specific gene is located on a particular chromosome.

9.

(b) Statement (i) is correct.

Explanation:

In humans, females have homomorphic sex chromosomes, i.e., two X chromosomes. Thus, they are homogametic, i.e., produce only one type of gametes which contain X chromosomes. Sex chromosomes of human males are heteromorphic or dissimilar, i.e., XY. Fluman males are therefore heterogametic, i.e., produce two types of gametes.

10. **(a)** 3 : 1

Explanation:

All of the colours in F_1 will be Vv (violet) when VV crosses with vv. When Vv crosses with Vv, the resulting F_2 will contain VV, Vv, vV, and vV, only one of which has white flowers while the others have violet ones. Ratio is thus 3 to 1.

11. **(d)** self pollination

Explanation:

i. Incomplete dominance results in F1 generation plants with all pink flowers when plants with pure red and white blooms cross.
ii. These plants on self-pollination or fertilization produce progenies (F2 generation) with red, pink, and white flowers in 1:2:1 ratio.
iii. This is a monohybrid cross as only one character or trait is involved in crossing.
iv. The relationship between two genetic variants is referred to as dominant.
v. Each gene has two alleles that an individual inherits from each parent.
vi. One allele of a gene, known as the dominant gene, will be expressed if the alleles are different.
vii. The impact of the other allele, known as the recessive one, is concealed.

12. **(b)** (iii) and (iv)

Explanation:

Males have two distinct sex chromosomes (XY) and are called the heterogametic sex (Chromosome-23). Females have two of the same kind of sex chromosome (XX)(Chromosome-23) and are called the homogametic sex. In human males, all the chromosomes (22- Autosomes) are paired perfectly except one (23^{rd}). These unpaired chromosomes are X and Y (Chromosome-23).

13. **(d)** girl

Explanation:

A zygote which has an X-chromosome inherited from the father will develop into a girl child.

14. **(b)** (i) and (ii) only

Explanation:

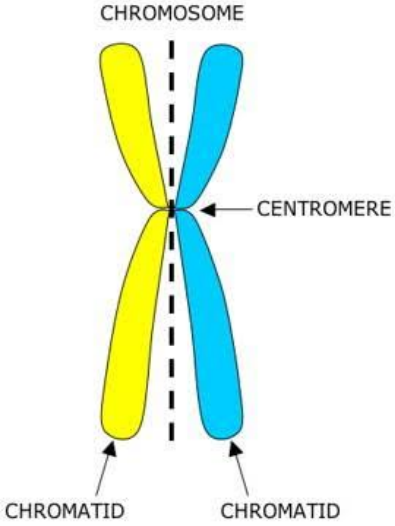
(i) and (ii) only

15. **(c)** Centromere

Explanation:

A sister chromatid refers to either of the two identical copies (chromatids) formed by the replication of a single chromosome, with both copies joined together by a common centromere. In other words, a sister chromatid may also be said to be 'one-half' of the duplicated chromosome. A full set of sister chromatids is created during the synthesis (S) phase of interphase, when all the chromosomes in a cell are replicated. The two sister chromatids are separated from each other into two different cells

during mitosis or during the second division of meiosis.



16. **(a)** (i), (iii) and (iv) only
Explanation:
(i), (iii) and (iv) only

17. **(d)** Gregor Mendel
Explanation:
Gregor John Mendel is considered as the father of genetics as he laid down the principles or laws of inheritance for the first time. Though his works were based on plants but the laws governing inheritance patterns are also applicable to humans and hence we call them as " Mendel's Laws of Inheritance".

18. **(b)** 18
Explanation:
Karyotype is the number and appearance of chromosomes in a nucleus of somatic cell. Somatic cells are diploid cells which make up the body. They have two sets of chromosomes. So, if an egg cell (gamete cell) which is a haploid cell (with single set of chromosomes)has 10 chromosome, then number of chromosomes present in a somatic cell will be 20 chromosomes . As egg cells are produced by female body, then among 20 chromosomes, two X chromosomes will be sex chromosome. So, karyotpe of that animals will be showing 18 autosomes.

19. **(c)** Cricket
Explanation:
- The X0 sex-determination system is a system that determines the sex of offspring among grasshoppers, crickets, cockroaches, and some other insects. In this system, there is only one sex chromosome, referred to as X. Males only have one X chromosome (X0), while females have two (XX).
- The zero (sometimes, the letter O) signifies the lack of a second X. Maternal gametes always contain an X chromosome, so the sex of the animals' offspring depends on whether a sex chromosome is present in the male gamete. Its sperm normally contain either one X chromosome or no sex chromosomes at all.

20. **(d)** 9 : 3 : 3 : 1
Explanation:
9 : 3 : 3 : 1

21. **(c)** Round and yellow

Explanation:

Since roundness and yellow colour are shown by capital letters in the genotype so they are dominant traits. We know that only dominant traits are expressed in the F1 generation.

22.

(b) There are at least two different alleles for the gene for height.

Explanation:

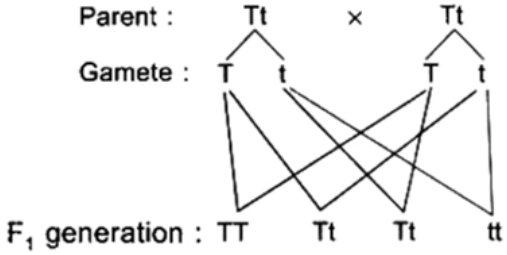
Genotype is the genetic composition of an organism, i.e., the combination of alleles it possesses. Every character in an organism is controlled by a gene that has at least two alleles that lie on the two homologous chromosomes at the same locus. These alleles may represent the same (homozygous, e.g., TT for height)or alternate expressions (heterozygous, e.g., Tt) of the same character. Thus, if genotype for the height of an organism is Tt, this means there are at least two different alleles for the gene for height, one is T and the other is t.

23.

(d) 50%

Explanation:

In a monohybrid cross between two heterozygous individuals, percentage of heterozygous individuals obtained in F_1 generation is 50%. This can be explained by the following cross



Therefore, percentage of heterozygous individuals (Tt and Tt) obtained in F_1 generation is 50%.

24. **(a)** two individuals of a species

Explanation:

species is the lowest level of classification and shows the high level of similarities among the organisms. so two individuals of a species have the maximum common characteristics.

25. **(a)** Genetics

Explanation:

Genetics is the study of genes, genetic variation, and heredity in living organisms. It is generally considered a field of biology, but intersects frequently with many other life sciences and is strongly linked with the study of information systems.

26.

(c) Tt and tt

Explanation:

Tt Tall plant and tt short plant.

27. **(a)** Factors reside in chromosomes

Explanation:

Gregor Mendel, through his work on pea plants, discovered the fundamental laws of inheritance. He deduced that genes come in pairs and are inherited as distinct units, one from each parent. Mendel tracked the segregation of parental genes and their appearance in the offspring as dominant or recessive traits.

28.

(d) Hydrogen bond

Explanation:

Each DNA molecule consists of two twisted strands of bases that form a shape called a double helix. The two strands are held together by hydrogen bonds between pairs of bases.

29.

(b) Sex chromosomes

Explanation:

Sex chromosomes possess the gene for maleness and femaleness in humans.

In humans, the sex chromosomes comprise one pair of a total of 23 pairs of chromosomes. The other 22 pairs of chromosomes are called autosomes.

Individuals having two X chromosomes (XX) are females; individuals having one X chromosome and one Y chromosome (XY) are males.

30. **(a)** A and C

Explanation:

Mendel selected seven pairs of contrasting characters. Plant Height, Pod Shape, Pod Color, Seed Shape, Seed Color and Flower Position. So flower shape and pod position not included here.

31. **(a)** Chrysemys picta

Explanation:

In Chrysemys picta, a species of turtle, high incubation temperature above $33^{o}C$ results in development of female progeny while a temperature below $28^{o}C$ produces only males. It is an example of sex determination under the effect of environmental factors.

32.

(c) Temporal isolation

Explanation:

Reproductive isolation, i.e., prevention of interbreeding between two species may happen in a number of ways. Temporal isolation is one of them. It prevents interbreeding between two groups due to differences in their mating seasons.

33.

(c) Statement (iii) is correct.

Explanation:

Evolution may be described as the change in heritable characteristics of a population over successive generation. So, for evolution to occur, allele frequency must change for whole group of population over successive generation.

34.

(c) 30

Explanation:

30

35.

(c) TT : Tt : tt

Explanation:

TT : Tt : tt

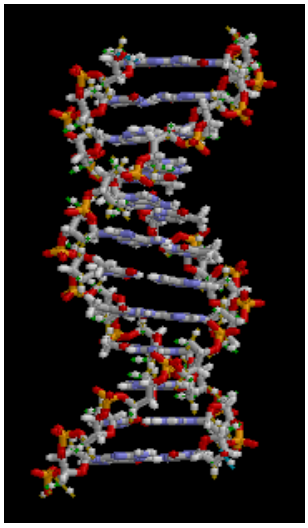
36.

(c) DNA

Explanation:

Heredity is the passing on of traits from parents to their offspring, either through asexual reproduction or sexual reproduction; the offspring cells or organisms acquire the genetic information of their parents.

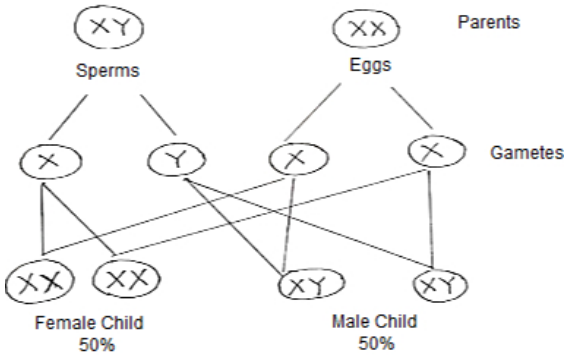
Heritable traits are known to be passed from one generation to the next via DNA, a molecule that encodes genetic information.



37. **(b)** tallness is the dominant trait

Explanation:

According to the law of dominance, the character that is expressed in the F_1 generation is called the dominant trait whereas character that is not expressed in F_1 generation is knowns as recessive trait. Thus, tallness is the dominant trait.

38. No two individuals in the population are absolutely alike as there are variation in the DNA due to the Crossing-over and Recombination during the DNA copying process.
39. 2 visible characters of garden pea plants are:
    - Tallness (dominant), Dwarfness (recessive)
    - Yellow seeds (dominant), Green seeds (recessive)
40. Seven
41. Female
42. 

43. DNA
44. Gregor Johann Mendel
45. There are 23 pairs of chromosomes present in human beings. One pair is sex chromosome. They are XX and XY. So there are two types of sex chromosomes.
46. Gene has a fixed position on a chromosome.
47. Genotype of father with blood group A are: I^AI^O , I^AI^A
48. Heredity refers to the passing of traits or characteristics from parents to offspring through genetic information encoded in DNA.
49. 23 pairs of chromosomes are present in human beings. Out of which 22 pairs are autosomes and 1 pair is sex chromosomes.
50. Monohybrid is a cross between two pure organisms in order to study the inheritance of a single pair of alleles. It produces a phenotypic monohybrid ratio of 3:1 in F_2 generation.
51. Garden pea
52. After obtaining progeny in F_2-generation in a dihybrid cross, Mendel concluded that when two pairs of traits are combined in a hybrid, one pair of character segregates independently of the other pair of character.
53. No, because they cannot pass on to the DNA of germ cells.

54. The trait which represents the tallness (T) in a pea plant is dominant over the dwarf trait (t), so progeny becomes tall. both are inherited but the dominant is expressed.
55. In snail, sex is determined by environmental factors (temperature). Which is called TSD temperature dependent sex determination.
56. James Watson and Francis Crick proposed the double helical structure of the DNA. According to this structure,
    i. DNA Molecule consists of two polynucleotide strands forming a double helix. Each helical turn has a length of 3.4nm in which ten nucleotides are present.
    ii. Each polynucleotide strand has a backbone of sugar and phosphate. The nitrogenous base is attached to the sugar.
    iii. The nitrogenous bases of the two strands of a double helix form a pair with the help of hydrogen bonds. Adenine pairs with thymine by two hydrogen bonds, whereas guanine pairs with cytosine by the three hydrogen bonds.
    iv. The hydrogen bonds hold the two strands of the helix together.
57.
    - Parents produce germ cells in specialised organs which have only half the number of chromosomes as compared to non-reproductive body cells. When these germ cells from two parents combine during sexual reproduction to obtain a progeny/ zygote, it restores the original number of chromosomes as in the parents.
    - Meiosis

58.
(c) A is true but R is false.
Explanation:
Father produces two types of sperms, one with X and one with Y chromosome whereas mother produces all egg with X chromosome. Zygote that inherits X chromosome from father has XX chromosomes and develops into baby girl whereas zygote which inherits Y chromosome from father has XY chromosomes and develops into baby boy.

59.
(b) Both A and R are true but R is not the correct explanation of A.
Explanation:
Both A and R are true but R is not the correct explanation of A.

60.
(d) A is false but R is true.
Explanation:
A is false but R is true.

61.
(d) A is false but R is true.
Explanation:
A is false but R is true.

62.
(d) (i) - (a), (ii) - (c), (iii) - (b), (iv) - (d)
Explanation:
- Genes are the primary unit of inheritance that are specific for a specific individual.
- Factors are the traits which are transferred from parents to offsprings.
- Fossils are the dead remains of extinct species.
- Sex chromosomes decide the sex of an organism whereas autosomes decide the phenotypic expressions.

63.
(d) 1-A, 2-C, 3-B, 4-D
Explanation:
- Heredity is the passing on of traits from parents to their offspring, either through asexual reproduction or sexual reproduction; the offspring cells or organisms acquire the genetic information of their parents.
- Variation, in biology, any difference between cells, individual organisms, or groups of organisms of any species caused either by genetic differences (genotypic variation) or by the effect of environmental factors on the expression of the genetic potentials (phenotypic variation).

- The branch of biological science which deals with heredity and variations is termed as Genetics. The word ‘genetics’ (a Greek word meaning to generate) was proposed by William Bateson (1902).
- In biology, evolution is the change in the characteristics of a species over several generations and relies on the process of natural selection. The theory of evolution is based on the idea that all species' are related and gradually change over time.

64.

(b) 1-D, 2-A, 3-C, 4-B

Explanation:

A) phenotype is the expressed physically visible trait in an organism.

B) genotype is the coding of the physically visible expressions.

C) dominant factor are the genotypes which express them in homozygous as well as heterozygous condition.

D) recessive factor are the genotypes which are not able to express them in heterozygous condition.

65. **(a)** Dominant trait, Inherited trait

Explanation:

Dominant trait, Inherited trait

66.

(b) (ii) and (iv)

Explanation:

(ii) and (iv)

67.

(c) A, B and C

Explanation:

Hormones, proteins and enzymes are the result of specific gene sequences and different type of hormones, proteins and enzymes are secreted by varying gene codings.

Fats are combination of fatty acids and glycerol and is completely not a gene based secretion.

68.

(c) (i) and (iii)

Explanation:

Genes are units of hereditary and are responsible for inheritance. Genes control the expression of a trait or a character in an organism. Genes are located on the chromosomes inside the nucleus of the cell.

69. **(a)** For every molecule of fat there is a gene

Explanation:

Hormone and enzymes are proteins and formation of any particular protein is controlled by a particular gene. Hence, all other options are correct.

70.

(d) (A)

Explanation:

This statement is correct that chromosomes are bearers of hereditary units or genes and each chromosome carries hundreds or thousands of genes.

71. Fill in the blanks:

(i) heredity

(ii) Chromosome

(iii)Two, one

(iv)Monohybrid

(v) inheritance or heredity