

Very Short Answer Type Questions

1. Which of the processes, sexual reproduction or asexual reproduction, bring about maximum variations in the offsprings?

Answer

In the process of sexual reproduction maximum variations in the offsprings occur.

2. Name one variation in humans connected with ears.

Answer

Free earlobes and attached earlobes are an example of variation in human ears.

3. What constitutes the link between one generation and the next?

Answer

The link between one generation and the next is constituted by Gametes. These help in passing on the paternal and maternal characteristics.

4. If the trait A exists in 10% of a population of an asexually reproducing species and a trait B exists in 60% of the same population, which trait is likely to have arisen earlier?

Answer

Trait B is likely to have arisen earlier, due to the greater rate in population.

5. Mendel said that the characteristics or traits of organisms are carried from one generation to the next by internal factors which occur in pairs. What is the modern name for these factors?

Answer

Genes is the modern name of these factors is genes.

6. Some plants occur in one of the two sizes: tall or dwarf. This characteristic is controlled by one pair of genes. Tallness is dominant to dwarfness. Choose suitable letters for this gene pair.

Answer

Let us assume that 'T' stands for tall, and 't' stands for dwarf. Hence, the gene pair will be Tt.

7. What are the chromosomes XY and XX known as?

Answer

Chromosomes XY and XX are known as sex chromosomes.

8. Which of the two, sperm or ovum, decides the sex of the child?

Answer

The sperm decides the sex of a child.

**9. State whether the following statement is true or false:
The sex of an infant is not a case of inheritance of characteristics.**

Answer

False

10. A new born child has an XY pair of chromosomes. Will it be a baby boy or a baby girl?

Answer

The child will be a boy.

11. Which of the following combinations of sex chromosomes produce a male child: XX or XY?

Answer

Combination XY of sex chromosomes produces a male child.

12. Name the first scientist who studied the inheritance of traits from one generation to the next.

Answer

The first scientist, who studied the inheritance of traits from one generation to the next was Gregor Mendel.

13. What type of plants were used by Mendel for conducting his experiments on inheritance?

Answer

Mendel used different varieties of pea plants for conducting his experiments on inheritance.

14. The gene for red hair is recessive to the gene for black hair. What will be the hair colour of a person if he inherits a gene for red hair from his mother and a gene for black hair from his father?

Answer

The hair colour of the person will be black because the gene for red hair is recessive compared to black.

15. What are the four blood groups in humans?

Answer

The four blood groups in humans are A, B, AB and O.

16. Name one reptile in each case where higher incubation temperature leads to the development of: (a) male progeny, (b) female progeny.

Answer

- (a) Lizard
- (b) Turtle

17. Fill in the following blanks with suitable words:

- (a) Genes always work in _____
- (b) In pea plants, the gene for dwarfness is _____ whereas that for tallness is _____.
- (c) Most people have _____ earlobes but some have _____ earlobes.
- (d) A human gamete contains _____ chromosomes whereas a normal body cell has _____ chromosomes in it.
- (e) All races of man have _____ blood groups.
- (f) The _____ chromosomes for a _____ are XX whereas that for a _____ are XY.

Answer

- (a) Genes always work in pairs.
- (b) In pea plants, the gene for dwarfness is recessive, whereas that for tallness is dominant.
- (c) Most people have free earlobes but some have attached earlobes.
- (d) A human gamete contains 23 chromosomes, whereas a normal body cell has 46 chromosomes in it.
- (e) All races of man have different blood groups.
- (f) The sex chromosomes for a female are XX, whereas that for a male are XY.

Short Answer Type Questions

18. Which of the following represent tall plants and which represent short plants (or dwarf plants)?

- (a) Tt
- (b) tt
- (c) TT

Give reason for your choice (The symbols have their usual meaning).

Answer

- (a) Tt represents tall plants, as T (tall) is dominant gene over recessive gene t (dwarf).
- (b) tt represents dwarf plants, as t (dwarf) due to the presence of recessive gene.
- (c) TT represents tall plants, as T (tall) due to the presence of dominant gene.

19. A man having blood group O marries a woman having blood group B and they have a daughter. What will be the blood group of the daughter?

Answer

The daughter will have equal chance of having blood group O and blood group B,

- 20. (a) Name the scientist who gave the laws of inheritance.**
(b) Name an animal in which individuals can change sex. What does this indicate?

Answer

- (a) Gregor Mendel
(b) Snail is an example of an animal that can change sex. This indicates that sex not determined genetically in some organisms.

- 21. Explain with an example, how genes control the characteristics (or traits).**

Answer

Genes are the section of DNA that carry the chromosome and determine the characteristics of an organism.

Suppose, a plant species possesses a gene for the characteristic called 'tallness'. The gene for tallness will give instructions to the plant cells to generate many plant-growth hormones due to which the plant will grow tall. On the other hand, if the plant has the gene for shortness, less plant-growth hormones will be produced, due to which the plant will not grow much and remain a dwarf plant.

- 22. (a) State one advantage of variation to a species.**
(b) What are sex chromosomes? How many sex chromosomes are there? Name them.

(a) The increase in the chances of the species' survival in a changing environment is the advantage of variation to a species.

(b) The chromosomes that determine the sex of a person are called sex chromosomes. There are two types of sex chromosomes, the X chromosome and the Y chromosome. XX determines the male and XY determines the female in human beings.

- 23. Explain how, sex is determined in human babies.**

Answer

There are two types of sex chromosomes, the X chromosome and the Y chromosome. XX determines the male and XY determines the female. The sex of a person is determined at the time of fertilization. If the father contributes X chromosome during fertilization through his sperm, then the baby born will be a girl. On the other hand, if chromosome Y is contributed through his sperm, then the new born will be a boy.

24. What do the following symbols used in the topic on heredity represent?

- (a) TT
- (b) tt
- (c) XX
- (d) XY

Answer

- (a) TT represents a tall plant.
- (b) tt represents a dwarf plant.
- (c) XX represents a female.
- (d) XY represents a male.

25. (a) What will you get in the F₁ and F₂ generations in the following cross?

Pure tall pea plant × Pure dwarf pea plant

(b) It is an example of monohybrid cross or dihybrid cross?

Answer

- (a) In the F₁ generation, we will get all tall plants. In the F₂ generation, we will get tall and dwarf plants in the ratio 3:1.
- (b) It is an example of monohybrid cross, as only one character (i.e., plant height) is considered for crossing.

26. In the F₂ generation of a cross, progeny having different traits are produced in the ratio 3:1. State whether it is a monohybrid cross or a dihybrid cross? Give one example of such a cross.

Answer

The given condition is a monohybrid cross. In the F₁ generation, when a tall pea plant (TT) is crossed with a dwarf pea plant (tt), all tall pea plants (with genotype Tt) are obtained. In the F₂ generation, if these tall plants (Tt) are self-crossed, then the tall and dwarf plants will be in the ratio 3:1.

- 27. (a) What is the genotype of dwarf plants which always produced dwarf offspring?
(b) What is the genotype of tall plants which always produced tall offspring?
(c) What is the genotype of (i) dwarf plants, and (ii) tall plants, whose parental cross always produces tall offspring?**

Answer

- (a) The genotype of dwarf plants which always produces a dwarf offspring is tt .
(b) The genotype of tall plants which always produces a tall offspring is TT .
(c) (i) The genotype of dwarf plants is tt
(ii) The genotype of tall plants is TT . The parental cross of (ii) always produces a tall offspring.

- 28. (a) If a normal human cell has 46 chromosomes, how many chromosomes will be there in a human (i) sperm cell, and (ii) zygote?
(b) What sizes of plants are produced if both parents have genes Tt ?**

Answer

- (a) (i) The number of chromosomes present in it will be 23 as the sperm cell will have half the number of chromosomes than present in a normal cell.
(ii) The number of chromosomes present in it will be 46 as the number of chromosomes in a zygote will be same as present in a normal cell.
(b) Tall and dwarf plants will be produced in the ratio 3:1.

29. In a human, how many chromosomes are present in :

- (a) a brain cell?
(b) a sperm in the testes?
(c) an egg which has just been produced by the ovary?
(d) a skin cell?
(e) a fertilized egg?**

Answer

- (a) 46 chromosomes
(b) 23 chromosomes
(c) 23 chromosomes
(d) 46 chromosomes
(e) 46 chromosomes

- 30. Gregor Mendel's first law of genetics states "Of a pair of contrasted characters, only one can be represented in a gamete by its internal 'factor'".**
(a) Give the modern name for this 'factor'.
(b) State where these factors are found in gametes.

- (a) Genes is the modern name for this factor.
(b) These factors or genes are present on chromosomes in gametes.

- 31. Does genetic combination of mother play a significant role in determining the sex of a new born baby?**

Answer

Genetic combination of father decides the sex of the baby which the mother will give birth to hence, genetic combination of mother does not play a significant role in determining the sex of a new born baby.

- 32. Give the contrasting traits of the following characters in pea plant and mention which is dominant and which is recessive:**
(a) Yellow seed
(b) Round seed

Answer

- (a) Green seed. Yellow seed is the dominant trait and green seed is the recessive trait.
(b) Wrinkled seed. Round seed is the dominant trait and wrinkled seed is the recessive trait.

Long Answer Type Questions

- 33. (a) What is meant by 'heredity'? What are the units of heredity?**
(b) State Mendel's first law of inheritance.

Answer

- (a) The transmission of characters from the parents to their offsprings is called heredity. Genes are the units of heredity which transfer characteristics from parents to their offsprings during reproduction.

(b) Mendel's first law of inheritance states that the characteristics of an organism are determined by internal factors which occur in pairs. Only one of a pair of such factors can be present in a single gamete.

**34. (a) Why did Mendel choose pea plants for conducting his experiments on inheritance?
(b) State Mendel's second law of inheritance.**

Answer

(a) Mendel chose pea plants for studying inheritance because of the following reasons:

- They had a number of clear cut differences which were easy to process.
- They were self pollinating plants.
- Many generations of pea plants can be produced in a comparatively short time span
- Their study is much simpler than that of animals.

(b) Mendel's second law of inheritance states that in the inheritance of more than one pair of traits in a cross simultaneously, the factors responsible for each pair of traits are distributed independently to the gametes.

**35. (a) What do you understand by the term 'variation'?
(b) Name two human traits which show variation.
(c) How does the creation of variation in a species ensure its survival?**

(a) The differences in the characters (or traits) among the individuals of a species is called variation.

(b) Human height and skin colour are two traits which show variation.

(c) The great advantage of variation to a species is that it increases their chances of survival in a changing environment. Variants help the species to survive in all the conditions. Environmental conditions such as heat, light, pests, and food availability can change suddenly at only one place. If variants were not there, the entire species would have been destroyed.

36. (a) What are genes? Where are they located in our body?
(b) What is meant by dominant genes and recessive genes? Give one example of each.
(c) Explain how, characteristics (or traits) are inherited through genes.

Answer

- (a) Genes are units of heredity which transfer characteristics (or traits) from parents to their offsprings during reproduction. Genes are located in chromosomes.
- (b) The gene which decides the appearance of an organism even in the presence of an alternative gene is known as dominant gene. The gene which can decide the appearance of an organism only in the presence of another identical gene is called a recessive gene. For example, in pea plants, the dominant gene for tallness is T and the recessive gene for dwarfism is t .
- (c) Genes are responsible for the characteristic features of an organism. The characteristics or traits of parents are transmitted to their progeny through genes present on their chromosomes during the process of sexual recombination. There is a pair of genes for each characteristic of an organism. Each parent passes only one of the two genes of the pair for each characteristic to its progeny through gametes. Thus, the male gamete and female gamete carry one gene for each characteristic from the gene pairs of parents. But when a male gamete fuses with a female gamete during fertilisation, they make a new cell called zygote with a full set of genes. This zygote grows and develops to form a new organism having characteristics from both the parents.

37. (a) How do Mendel's experiments show that traits may be dominant or recessive?
(b) How do Mendel's experiments show that traits are inherited independently?

Answer

- (a) Mendel conducted the experiments using or pea plant. He selected homozygous tall (TT) and dwarf (tt) pea plants. He crossed the tall pea plant with the dwarf pea plant. It was observed that the F_1 generation are all tall plants. Thus, it was concluded that the gene causing tallness is dominant while the gene causing dwarfness is recessive. The trait expressing itself in the hybrid is the dominant one. This experiment proves Mendel's first law of inheritance. It states that when a pair of contrasting factors is brought in a hybrid, one factor inhibits the appearance of the other, one which inhibits is the dominant one and which is inhibited is recessive.
- (b) Mendel performed an experiments in which he took a tall plant with round seeds and a short plant with wrinkled-seeds. In F_1 , They were all tall and had round seeds. Tallness and round seeds were thus dominant traits. When he used these F_1 progeny to generate F_2 progeny by self-pollination, he found that some F_2 progeny were tall plants with round seeds, and some were short plants with wrinkled seeds. At the same time there were tall plants, but had wrinkled seeds, while others were short, but had round seeds. Thus, Mendel's experiments show that the tall/short trait and the round seed/wrinkled seed trait are independently inherited.

Multiple choice questions:

38. When two parents are crossed, the offspring are referred to as:

- (a) recessives
- (b) test cross
- (c) F₁ generation
- (d) F₂ generation

Answer

- (c) F₁ generation

39. A cross between two individuals results in a ratio of 9 : 3 : 3 : 1 for four possible phenotypes of progeny. This is an example of a :

- (a) dihybrid cross
- (b) monohybrid cross
- (c) test cross
- (d) none of these

Answer

- (a) dihybrid cross

40. For his experiments on heredity, Mendel used:

- (a) papaya plants
- (b) potato plants
- (c) pea plants
- (d) pear plants

Answer

- (c) pea plants

41. The human animal which has an XY pair of chromosomes is called:

- (a) male
- (b) hybrid
- (c) female
- (d) doomed

Answer

- (a) male

42. The science of heredity is known as:

- (a) biology
- (b) embryology
- (c) genetics
- (d) biochemistry

Answer

- (c) genetics

43. A gene is a :

- (a) hybrid
- (b) heritable trait
- (c) pure breed
- (d) part of a chromosome that transmits a trait

Answer

- (d) part of a chromosome that transmits a trait

44. A normal cell of human body contains 23 pairs of chromosomes. The number of chromosomes in a sex cell (sperm or ovum) of a human being is most likely to be :

- (a) 46
- (b) 23
- (c) 21
- (d) 42

Answer

- (b) 23

45. In order to ensure that he had pure-breeding plants for his experiments, Mendel :

- (a) cross-fertilized each variety with each other
- (b) let each variety self-fertilize for several generations
- (c) removed the female parts of the plants
- (d) removed the male parts of the plants.

Answer

- (b) let each variety self fertilize for several generations

46. In the human blood grouping, the four basic blood types are type A, type B, type AB, and type O. The blood proteins A and B are:

- (a) simple dominant and recessive traits
- (b) incomplete dominant traits
- (c) codominant traits
- (d) sex-linked traits

Answer

- (c) codominant traits

47. A plant with two 'small' genes breeds with a plant with two 'tall' genes to produce :

- (a) small plants and tall plants in the ratio 1 : 3
- (b) all small plants
- (c) all tall plants
- (d) tall plants and small plants in the ratio 3 : 1

Answer

- (c) all tall plants

48. A pregnant woman has an equal chance of her baby being blood group A or blood group AB. Which one of the following shows the possible genotypes of the woman and the father of her child?

- (a) $I^A I^A$ and $I^B I^O$
- (b) $I^A I^B$ and $I^B I^O$
- (c) $I^A I^O$ and $I^B I^O$
- (d) $I^A I^B$ and $I^A I^O$

Answer

- (a) $I^A I^A$ and $I^B I^O$

49. The palisade cells of a species of plant contain 28 chromosomes. How many chromosomes will there be in each gamete produced by the plant?

- (a) 56
- (b) 28
- (c) 14
- (d) 4

Answer

(c) 14

50. Which of the following may be used to obtain an F_2 generation?

- (a) allowing flowers on a parent plant to be self-pollinated
- (b) allowing flowers on an F_1 plant to be self-pollinated
- (c) cross-pollinating an F_1 plant with a parent plant
- (d) cross-pollinating two parent plants

Answer

(a) allowing flowers on a parent plant to be self-pollinated

51. The following results were obtained by a scientist who crossed the F_1 generation of pure-breeding parents for round and wrinkled seeds.

Dominant trait	Recessive trait	No. of F_2 offspring
Round seeds	Wrinkled seeds	7524

From these results, it can be concluded that the actual number of round seeds he obtained was:

- (a) 1881
- (b) 22572
- (c) 2508
- (d) 5643

Answer

(d) 5643

52. The visible characteristic in an organism is known as:

- (a) prototype
- (b) stereotype
- (c) phenotype
- (d) genotype

Answer

(c) phenotype

53. The exchange of genetic material takes place in:

- (a) vegetative reproduction
- (b) asexual reproduction
- (c) sexual reproduction
- (d) budding

Answer

- (c) sexual reproduction

54. A cross between a tall plant (TT) and short plant (tt) resulted in progeny that were all tall plants because :

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

Answer

- (a) tallness is the dominant trait

55. The number of pair(s) of sex chromosomes in the zygote of humans is:

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

Answer

- (b) two

56. In peas, a pure tall plant (TT) is crossed with a pure short plant (tt). The ratio of pure tall plants to pure short plants in F₂ generation will be:

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

Answer

- (c) 1 : 1

57. The two versions of a trait (character) which are brought in by the male and female gametes are situated on:

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

Answer

- (a) copies of the same chromosome

58. Select the statements that describe characteristics of genes :

- (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 (ii)**
- (b) (i) and (iii)**
- (c) (i) and (iv)**
- (d) (ii) and (iv)**

Answer

- (b) (i) and (iii)

59. Select the group which shares the maximum number of common characters:

- (a) two individuals of a species**
- (b) two species of a genus**
- (c) two genera of a family**
- (d) two genera of two families**

Answer

- (a) two individuals of a species

- 60. A trait in an organism is influenced by:**
- (a) paternal DNA only
 - (b) maternal DNA only
 - (c) both maternal and paternal DNA
 - (d) neither by paternal nor by maternal DNA.

Answer

- (c) both maternal and paternal DNA

- 61. In human males all the chromosomes are paired perfectly except one. This/these unpaired chromosomes is/are :**
- (i) large chromosome
 - (ii) small chromosome
 - (iii) Y chromosome
 - (iv) X chromosome

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

Answer

- (c) (iii) and (iv)

- 62. The sex of a child is determined by which of the following?**
- (a) the length of the mother's pregnancy
 - (b) the length of time between ovulation and copulation
 - (c) the presence of and X chromosome in an ovum
 - (d) the presence of a Y chromosome in a sperm

Answer

- (d) the presence of a Y chromosome in a sperm

- 63. A zygote which has inherited an X chromosome from the father will develop into :**
- (a) baby boy
 - (b) baby girl
 - (c) adult
 - (d) either boy or girl

Answer

(b) baby girl

64. Which of the following statement is incorrect?

- (a) for every hormone there is a gene
- (b) for every protein there is a gene
- (c) for production of every enzyme there is a gene
- (d) for every type of fat there is a gene

Answer

(d) for every type of fat there is a gene

65. If the ratio of each phenotype of the seeds of pea plants in the F_2 generation is 9 : 3 : 3 : 1, it is known as :

- (a) tetrahybrid ratio
- (b) monohybrid ratio
- (c) dihybrid ratio
- (d) trihybrid ratio

Answer

(c) dihybrid ratio