Class 10th Science

Chapter - 9

Heredity and Evolution

Textual Questions and Answers :

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Q.1. If a trait A exist 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 ?

Ans :- The trait B which exists in 60% of the population is likely to have arisen earlien . This is because the traits produced in an organism during successive generations get accumulated in the populations of the species .

Q.2. How does the creation of variations in a species promote its survival ?

Ans :- The creation of variations to a species is that it increases the changes of its survival in a changing environment . For example the accumulation of ' heat resistant ' variation in some bacteria will ensure its survival even when the temperature in its environment rises too much due to a heat wave or some other reasons . On the other hand , the bacteria which did not have this variation to with stand heat would not survive under these circumstances and dic .

Q.1. How do Mendel's experiments show that traits may be dominant or receive ?

Ans :- The trait which expressed in 75% individuals in F_2 generation after self fertilisation is dominant . The trait which appears in 25% individuals is recessive.

Q.2. How do Mendel's experiments show that traits are inherited independently ?

Ans :- Mendal took two pairs of alternative expression of two traits of pea plant and crossed them . The F_1 progeny showed only the dominant characteristics among each pair . The F_2 progeny had phenotypes similar to parents but also new phenotypes that did not exists in the parents . This indicates that pair of alternate characteristics behave independently of the other pair and are thus inherited independent of each other .

Q.3. A man with blood group A marries a women with the blood , group O and their daughter has blood group O. Is this information enough to tell you which of the traits – blood group A or O - is dominant ? Why or why not ?

Ans :- No , this information is not enough to tell us which of the traith , blood group A or blood group O , is dominant . This is because :

(i) If the blood group A is dominant trait and blood group O is recessive trait , the daughter can have blood group O.

(ii) and even if the blood group A is recessive trait but blood group O is dominant trait , the daughter can still have blood group O.

Q.4. How is the sex of the child determined in human beings ?

Ans :- The chromosomes which determine the sex of a person are called sex chromosomes . There are two types of sex chromosomes one is called X chromosome and the other is called Y chromosome .

(i) A male has one X chromosome and one Y chromosome . This means that half the male gametes or half the sperms will have X chromosomes and the other half will have Y chromosomes .

(ii) A female has two X chromosomes but no Y chromosomes . This means that all the female gametes called ova will have only X chromosomes .

The sex of child depends on what happens at fertilisation :

(a) If a sperm carrying Y chromosome fertilises an ovum which carries X chromosome , then the child born will be a boy " This is because the child will have XY combination of sex chromosomes .

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Q.1. What are the different ways in which individuals with a particular trait may increase in a population ?

Ans :- If a variation occurs in a population and that variation results in better survival of the organism in the prevailing natural conditions , then the trait would be selected naturally and more individuals with that trait would survive in the population .

Q.2. Why are traits acquired during the life - time of an individual not inherited ?

Ans :- For a trait of an organism to be inherited , it should being about a change in the genes present in the reproductive cells or gametes of that organism . The traits acquired during the life time of a person do not bring about a change in the genes present in its reproductive cells or gametes and hence they are not inherited by the offsprings .

Q.3. Why are the small numbers of surviving tigers a cause of worry from the point of view of genetics ?

Ans :- The tiger have very less variation in genetic characteristics among each other and if the natural conditions would charge drastically no tiger may survive.

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Q.1. What factors could lead to the rise of a new species?

Ans :- Geographical isolation of a population caused by various types of barriers . The geographical isolation leads to reproductive isolation

EXERCISES

Q.1. A Mendelian experiment consisted of breeding tall pea plants bearing violet flowers with short pea plants bearing with flowers . The progeny all bore violet flowers, but almost half of them were short . This suggests that the genetic make - up of the tall parent for can be depicted as –

(a) TTWW

(b) TTww

(c) TtWW

(d) TtWw

Ans :- (c) TtWW .

Q.2. An example of homologous organs is

(a) Our arm and a dog's fore - leg.

(b) Our teeth and an elephant's tasks.

(c) Potato and runners of grass.

(d) All of the above.

Ans :- (d) All of the above.

Q.3. In evolutionary terms , we have more in common with

(a) A chinese school - boy

(b) A chimpanzee.

(c) A spider.

(d) A bacterium.

Ans :- (a) A chinese school - boy .

Q.4. A study found that children with light - coloured eyes are likely to have parents with light - coloured eyes. On who this basis can we say anything about whether the light eye colour trait is dominant or recessive ? Why or why not ?

Ans :- As the trait is expressed in all the children of such parents , the parents are homozygous for light eye colour . However , it cannot be concluded whether the light eye colour is dominant or recessive .

Q.5. How are the areas of study - evolution and classification interlinked ?

Ans :- The more characteristics two organisms have in common , the more closely they are related . And the more closely they are the evolutionary chain.sto related , the more recently they will have had a common ancestor in evolutionary chain.

The more different characteristics two organisms have , the more remotely they are related . And the more remotely they are related , they will have had a common ancestor in the more remote past .

Q.6. Explain the terms analogous and homologous organs with examples .

Ans :- Analogous organs :- Those organs which have different basic structure or different basic design but have similar appearance and perform similar functions are called analogous organs .

For example : - The wings of an insect and a bird have different structures but they perform the same function of flying .

Homologous organs :- Those organs which have the same basic structure or same basic design but different functions are called homologous organs . For examples the forelimbs of a man , a lizard , a frog , a bird and a bat seem to be built from the same basic design of bones but they perform different functions .

Q.7. Outline a project which aims to find the dominant coat colour in dogs .

Ans :- A black homozygous male is mated with a white homozygous female . If the progeny has all black dogs then the dominant coat colour is black .

Q.8. Explain the importance of fossils in deciding evolutionary relationship.

Ans :- The importance of fossils in deciding evolutionary relationship is that they provide evidence that the present animals and plants have originated from the previously existing animals and plants through the process of continuous evolution .

Q.9. What evidence do we have for the origin of life from inanimate malter ?

Ans :- Miler and Urey conducted an experiment in 1953 in which they assembled the inorganic gases , known to be prevalent in early earth and maintained the temperature at 100° C and passed sparks over the mixture of gases . At the end of a week , 15% of the carbon was converted to simple compounds of carbon including amino acids which are the building blocks of proteins . This shows that complex organic molecules can arise from simple inorganic molecules under certain conditions which prevailed during the early period in earth's life . These complex molecules are building blocks of cells and they can give rise to a living organism capable of self duplication .

Q.10. Explain how sexual reproduction gives rise to more viable variations than asexual reproduction . How

does this affect the evolution of those organisms that al thom reproduce sexually ?

Ans :- The asexual reproduction gives rise to small variations because in this process the DNA of only one parent is copied . Due to this , the offsprings produced look almost the same . On the other hand sexual reproduction gives rise to large variations because in this process DNA from the gametes of two parents in combined together .

The large genetic variations produced during sexual reproduction lead to the continuous evolution of those organisms which reproduce sexually . In fact , sexual reproduction plays an important role in the origin of new species having different characteristics . All this is not possible in the case of asexual reproduction .

Q.11. How is the equal genetic contribution of male and female parents ensured in the progeny ?

Ans :- The equal genetic contribution of male and female parents in a progeny is ensured through the special type of reproductive cells which have only half the amount of DNA as compared to other body cells . So when the gametes from male and female parent combine during sexual reproduction to form a fertilised egg called zygote , they contribute equal amount of DNA.

Q.12. Only variation that confer advantage to an individual organism will survive in a population . Do you agree with this statement ? Why or why not ?

Ans :- Variations which confer an advantage to an individual organism may or may not survive in the population depending upon the social behaviour of the organism . A in a population while a variation in an animal like a leopard may survive .

Additional Questions and Answers :

Q.1. What is called heredity ?

Ans :- The transmission of characters or traits from the parents to their offsprings is called heredity .

Q.2. What do you mean by variation . Give example .

Ans :- The differences in the characters or traits among the individuals of a species is called variation . For example , human height is a trait which shows variation . This is because some people are very tall , some are less tall , some have medium height , some have short height whereas others are very short .

Q.3. What is gene ?

Ans :- A gene is a unit of DNA on a chromosome which governs the synthesis of one protein that controls a specific characteristic of an organism.

Q.4. Define :- (a) Dominant gene.

(b) recessive gene.

Ans :- (a) Dominant gene :- The gene which decides the appearance of an organism even in the presence of an alternative gene is known as a dominant gene .

(b) Recessive gene :- The gene which can decide the appearance of an organism only in the presence of another identical gene is called a recessive gene .

Q.5. What do you mean by phenotype ? Give example .

Ans :- The characteristic or trait which is visible in an organism is called its phenotype .

For example , being tall ' or ' short ' are phenotypes of a plant because these traits can be seen by us or they are visible to us .

Q.6. What is hybrid ?

Ans :- A new form of plant resulting from a cross or breeding of different varieties of a plant is known as hybrid.

Q.7. Define Mendel's first law of inheritance .

Ans :- According to Mendel's first law of inheritance : - The characteristics or traits 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 singh gamete .

Q.8. Define Mendel's second law of inheritance .

Ans :- According to Mendel's second law of inheritance:- 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 .

Q.9. world Explain an acquired trait with an example .

Ans :- A trait of an organisms which is not inherited ' but develops in response to the environment is called an acquired trait . For example , if a beetle does not get sufficient food for a considerable time , its weight will be reduced due to starvation . The low weight of this beetle is an acquired trait of the beetle which has bee acquired in response to the environment which contained insufficient food.

Q.10. Define evolution . Why it is called organic evolution ?

Ans :- Evolution is the sequence of gradual changes which take place in the primitive organisms over millions of years in which new species are produced .

Since the evolution is of the living organisms so it is called organic evolution .

Multiple choice questions :

Q.1. When two parents are crossed , the offspring are referred to as :

(a) Recessives.

(b) Test cross.

(c) F_1 generation.

(d) F_2 generationen.

Ans :- (c) F_1 generation.

Q.2. 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.

Ans :- (a) Dihybrid cross.

Q.3. For this experiments on heredity . Mendel used

(a) Papaya plants.

(b) Potato plants.

(c) Pea plants.

(d) Pear plants.

Ans :- (c) Pea plants.

Q.4. The human animal which has an XY pair of chromosomes is called

(a) Male.

(b) Hybrid.

(c) Female.

(d) doomed.

Ans :- (a) Male.

Q.5. The science of heredity is known as

(a) Biology.

(b) Embryology.

(c) Genetics.

(d) Biochemistry.

Ans :- (c) Genetics.

Q.6. A gene is a :

(a) Hybrid.

(b) Heritable trait.

(c) Pure breed

(d) Part of a chromosome that er lo sto sam quan do transmits a trait.

Ans :- Part of a chromosome that er lo sto sam quan do transmits a trait.

Q.7. A normal cell of human body contain 23 pairs of chromosomes . The number of chromosomes in a sex cell (sperm of ovum) of a heuman being is most likely to be .

(a) 46

(b) 23

(c) 21

(d) 42

Ans :- (b) 23.

Q.8. In order to ensure that he hade pure-breeding plants for his experiments, Mendel.

(a) Cross fertilised each variety with each other.

(b) Let each variety self fertilise for several generations.

(c) Remove the female parts of the plants.

(d) Removed the male parts of the plants.

Ans :- (b) Let each variety self fertilise for several generations.

Q.9. In the human blood grouping the four basic blood A, type B, 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.

Ans :- (c) Codominant traits.

Q.10. A plant with '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

Ans :- (c) All tall plants.

Q.11. 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^AI^A and I^BI^o

(b) I^AI^B and I^BI^o

(c) I^AI^o and I^BI^o

(d) I^AI^B and I^AI^o

Ans :- (a) I^AI^A and I^BI^o

Q.12. 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

Ans :- (c) 14 .

Q.13. Which of the following may be used to obtain on 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.

Ans :- (b) Allowing flowers on an F_1 plant to be self - pollinated .

Q.14. The visible characteristic in an organism is known as :

(a) Prototype.

(b) Stereotype.

(c) Phenotype.

(d) Genotype.

Ans :- (c) Phenotype.

Q.15. The exchange of genetic material takes place in :

(a) Vegetative reproduction.

(b) A sexual reproduction.

(c) sexual reproduction.

(d) Budding.

Ans :- (c) sexual reproduction.

Q.16. 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.

Ans :- (a) Tallness is the dominant trait.

Q.17. The number of pair of sex chromosomes in the zygote of human is :

(a) One.

(b) Two.

(c) Three.

(d) Four.

Ans :- (a) One.

Q.18. 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 F_2 generation will be :

(a) 1:3

(b) 3:1

(c) 1:1

(d) 2:1

Ans :- (c) 1:1

Q.19. The two variations of a trait 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.

Ans :- (a) Copies of the same chromosome.

Q.20. A trait in an organism is influenced by :

(a) Paternal NDA only.

(b) Maternal DNA only.

(c) Both maternal and paternal DNA.

(d) Neither by paternal nor by maternal DNA

Ans :- (c) Both maternal and paternal DNA.

Q.21. In human males all the chromosomes are paired perfectly except one . This / these unpaired chromosomes in / 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)

Ans :- (c) (iii) and (iv)

Q.22. 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.

Ans :- (b) Baby girl.

Q.23. If the ratio of each phenotype of the seeds of pen plant 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.

Ans :- (c) Dihybrid ratio.

Q.24. In evolutionary terms, we have more in common with :

(a) A chinese school boy.

(b) A chimpanzee.

(c) A spider.

(d) A bacterium.

Ans :- (b) A chimpanzé.

Q.25. The human species has genetic roots in:

(a) America.

(b) Africa.

(c) Australia.

(d) Antarctica.

Ans :- (b) Africa.

Q.26. Which of the following gas was not present in early earth atmosphere?

(a) Ammonia.

(b) Oxygen.

(c) Hydrogen sulphide.

(d) Hethane.

Ans :- (b) Oxygen.

Q.27. A gradual charge, over a long period, in a form of life in known as :

(a) Erosion.

(b) Evolution.

(c) Revolution.

(d) Evaluation.

Ans :- (b) Evolution.

Q.28. Scientists believe that all life originated in :

(a) The sea.

(b) The Soil.

(c) The ground.

(d) The air.

Ans :- (a) The sea.

Q.29. According to scientists ares have evolved from :

(a) Mammals.

(b) Amphibians.

(c) Reptiles.

(d) Arthropods.

Ans :- (c) Reptiles.

Q.30. The theory of evolution of species by natural selection was given by

(a) Mendal.

(b) Daruin.

(c) Palton.

(d) Lamark.

Ans :- (b) Darwin.

Q.31. The term ' father of genetics ' is used for the scientists :

(a) Morgan.

(b) Mendal.

(c) Darwin.

(d) Marie curie.

Ans :- (b) Mendal.

Q.32. One of the following traits cannot be inherited . This one is :

(a) Colour of eyes.

(b) Colour of skin.

(c) Size of body.

(d) Nature of hair.

Ans :- (c) Size of body.

Q.33. Only one of the following characteristic of the parents can be inherited by their children . This one is :

(a) Deep scar on chin.

(b) Snub nose.

(c) Technique of swimming.

(d) Cut nose.

Ans :- (b) Snub nose.

Q.34. The organs which perform different functions but have the same basic structure are known as :

(a) Homologous organs.

(b) Analogous organs.

(c) Homolytic organs.

(d) Analytic organs.

Ans :- (a) Homologous organs.

Q.35. The organs which perform similar functions but have different basic structure are called .

(a) Asymmetric organs.

(b) Analogous organs.

(c) Homologous organs.

(d) Homophonic organ.

Ans :- (b) Analogous organs.

Q.36. Wing of an insect and forelimb of a bird are :

(a) Analogous organs.

(b) Analeptic organs.

(c) Homologous organs.

(d) Homophobic organs.

Ans :- (a) Analogous organs.

Q.37. If the fossil of an organism is found in the deeper layers of earth , then we can predict that :

(a) The extinction of organism has occured recently.

(b) The extinction of organism has occured thousands of years ago .

(c) The fossil position in the layers of earth in not related to its time of extinction.

(d) Time of extinction cannot be determined .

Ans :- (b) The extinction of organism has occurred thousands of years ago .

Q.38. One of the following traits of the parents cannot be passed on to their future generations . This trait is :

(a) Cleft chain.

(b) pointed chin.

(c) Scarred chin.

(d) Broad chin.

Ans :- (c) Scarred chin.

Q.39. Some dinosorous has feathers although they could not fly but birds have feathers that help them to fly. In the es context of evolution , this means that :

(a) Reptiles have evolved from birds.

(b) There is no evolutionary connection between reptiles and birds.

(c) Birds have evolved from reptiles.

Ans :- (c) Birds have evolved from reptiles.

Q.40. Select the incorrect statement from the following.

(a) Frequency of certain genes in a population changes over several generations resulting involution.

(b) Reduction in the weight of an organism due to starvation is genetically controlled.

(c) Low weight parents can have heavy weight progeny.

(d) Traits which are not inherited over generations do not cause evolution .

Ans :- (b) Reduction in the weight of an organism due to starvation is genetically controlled.

Q.41. New species may be formed if :

(i) DNA undergoes significant changes in germ cells.

(ii) Chromosome number changes in the gamete.

(iii) There is no change in the genetic material.

(iv) Mating does not take place.

(a) (i) and (ii)

(b) (i) and (iii)

(c) (ii) , (iii) and (iv)

(d) (i) , (ii) and (iii)

Ans :- (a) (i) and (ii)

Q.42. According to the evolutionary theory , formation of a new species in generally due to :

(a) Sudden creation by nature.

(b) Accumulation of variations over several generations.

(c) Clones formed during asexual reproduction.

(d) Movement of individuals from one habitat to another.

Ans :- (b) Accumulation of variations over several generations.

Q.43. The presence of which of the following types of organs in two animals indicates that they are not derived from a common ancestor ?

(a) Homologous organs.

(b) Excretory organs.

(c) Analogous organs.

(d) Reproductive organs.

Ans :- (c) Analogous organs.

Q.44. The presence of which of the following types of organs in two organisms indicates that they are derived from the same ancestor ?

(a) Analogous organs.

(b) Respiratory organs.

(c) Digestive organs.

(d) Homologous organs.

Ans :- (d) Homologous organs.

Q.45. One of the following has not been produced from wild cabbage by the process of artificial selection . This one is

(a) Kohlrabi.

(b) Cabbage.

(c) Spinach.

(d) Kale.

Ans :- (c) Spinach.

Q.46. The fossil trilobite was originally :

(a) An arthropod.

(b) An invertebrate.

(c) A reptile.

(d) An ave.

Ans :- (a) An arthropod.

Q.47. One pair of organs in the following animals are not homologous . This is :

(a) Forelimbs in humans and lizard.

(b) Forelimbs in lizard and frog.

(c) Wings in butterfly and bat.

(d) Wings in bat and bird.

Ans :- (c) Wings in butterfly and bat.

Q.48. The wings of a housefly and the wings of a sparrow are an example of :

(a) Analogous organs.

(b) Vestigial organs.

(c) Respiratory organs.

(d) Homologous organs.

Ans :- (a) Analogous organs.

Q.49. Select the group which shares the maximum number of common characters :

(a) Two individuals of a species.

(b) Two species of genus.

(c) Two genera of a family.

(d) Two genera of two families.

Ans :- (a) Two individuals of a species.

Q.50. The sex of a child is determined by which of the blw following ?

(a) The length of the mother's pregnancy .

(b) The length of time between ovulation and copulation.

(c) The presence of an X chromosome in an ovum .

(d) The presence of a Y chromosome in a sperm .

Ans :- (d) The presence of a Y chromosome in a sperm.