

Very Short Answer Type Questions

[1 Mark]

Q. 1. What is meant by characteristics?

Ans. It is the detail of appearance or behaviour; in other words, a particular form or a particular function

Example: Four limbs of human beings is a characteristic and that plant can perform photosynthesis is also a characteristic.

Q. 2. Who is known as the father of genetics?

Ans. Gregor Johann Mendel is known as the father of genetics.

Q. 3. Define chromosome.

Ans. Chromosome is a thread-like structure that bears genes and are enclosed within a nucleus. It is composed of DNA and protein.

Q. 4. Define variation.

Ans. The occurrence of differences among the individuals of a species is called variation.

Q. 5. Define a gene.

Ans. Gene is a segment of a DNA molecule which carries the code for the synthesis of a specific protein.

Q. 6. Define alleles.

Ans. Genes which code for a pair of contrasting traits are known as alleles, i.e., they are different forms of the same gene.

Q. 7. Write the expanded form of DNA.

Ans. Deoxyribonucleic acid

Q. 8. Where is DNA found in a cell?

Ans. DNA is found in genes or chromosomes.

Q. 9. What is the function of a gene?

Ans. Gene is the carrier of the genetic information from one generation to the next.

Q. 10. Who proposed the theory of natural selection?

Ans. Charles Darwin proposed the theory of natural selection.

Q. 11. Which of the following traits are recessive in pea plant?

Dwarfness, violet flower, wrinkled seed.

Ans. Dwarfness and wrinkled seeds are the recessive characters.

Q. 12. How many pairs of chromosomes are found in human beings?

Ans. 23 pairs of chromosomes are found in human beings.

Q. 13. In humans, the gene for black hair colour is B and gene for brown hair colour is b. What will be the hair colour of person having the genetic constitution?

(a) BB (b) bb (c) Bb

Ans. (a) Black hair

(b) Brown hair

(c) Black hair (Hybrid)

Q. 14. Write the names of two types of chromosomes found in an organism.

Ans. Autosomes and sex chromosomes.

Q. 15. How many chromosomes are present in a sperm and an ovum?

Ans. Sperm and ovum have 23 chromosomes each.

Q. 16. What is a sex chromosome?

Ans. The chromosomes which are associated with sex determination are called sex chromosomes.

Q. 17. A woman has only daughters, analyse the situation genetically and provide a suitable explanation.

Ans. The woman produces ova with 'X' chromosome. The man produces sperms with 'X' and 'Y' chromosome which actually determines the sex of the baby. In this case, everytime the male X chromosome only fuses with the female X chromosome thus producing XX combination.

Q. 18. Which sex chromosomes are found in male and female human beings?

Ans. Males have one X and one Y-chromosomes, whereas females have two X-chromosomes.

Q. 19. Who gave the theory of inheritance of acquired characters?

Ans. Lamarck.

Q. 20. Define mutation.

Ans. Sudden changes in the genetic form of an organism which are passed on to the next generation are called mutations. Mutations lead to variations in an organism.

Q. 21. What are fossils?

Ans. Fossils are the remains or impressions of the dead animals and plants that lived in the past.

Q. 22. What is the significance of Archaeopteryx in evolution?

Ans. *Archaeopteryx* provides evidence of evolution of birds from reptiles and its study shows that:

- (i) birds and reptiles had a common ancestor.
- (ii) birds have evolved from reptiles.

Q. 23. Why are acquired characters not inheritable?

Ans. Acquired characters are not inherited because they affect the somatic cells and these changes are not incorporated in the chromosomes of cells that will form germ cells.

Q. 24. What is genetic drift?

Ans. The elimination of the genes of certain traits when a section of a species population migrates or dies due to natural calamity. It alters the gene frequency of the remaining population.

Q. 25. How do we know how old a fossil is?

Ans. Age of fossils can be estimated by the depth of the layer of rocks in which they are found. Age of fossils can also be detected from the ratio of isotopes in the fossils containing rocks.

Q. 26. What is organic evolution?

Ans. Evolution is the sequence of gradual changes of the living organisms, which takes place in the primitive organisms over millions of years resulting in the formation of new species.

Q. 27. What are the basic events in evolution?

Ans. A gradual genetic change in a group of living beings to produce new forms brought about by changes in DNA during reproduction are the basic events in evolution.

Short Answer Type Questions – I

[2 marks]

Q. 1. Why offsprings differ from parents in certain characters?

Ans. It is due to biparental percentage. The genes on chromosomes which pass over to the next generation is partly derived from both the parents (mother and father). During fertilisation of egg by the sperm, new combination of chromosomes enter the zygote, due to which certain variations occur in the offsprings. Thus, brothers and sisters show variations in their complexion, habits and behaviour.

Q.2. What are the causes of variations?

Ans. Following are the causes of variations:

(i) Dual percentage: Offsprings inherit some features from mother and some from father, hence no offspring will exactly resemble to either of the parent or each other.

(ii) Mutation in gene or chromosomal pattern also causes variations.

Q. 3. Give the pair of contrasting traits of the following characters in pea plant and mention which is dominant and recessive

(i) yellow seed

(ii) round seed

Ans. (i) yellow – dominant
green – recessive

(ii) round – dominant
wrinkled – recessive

Q. 4. What is the contribution of Mendel genetics?

Ans. Mendel observed the occurrence of contrasting character of garden pea in various generations. On this basis, he interpreted that these contrasting characters are controlled by factors. He considered each and every character as a unit, which is controlled by a 'factor'. Factors are carriers of hereditary information. Now, factors are known as genes.

Q. 5. Do genetic combination of mothers play a significant role in determining the sex of a new born?

Ans. No, because of mothers have a pair of X-chromosomes. All children will inherit an 'X' chromosome from their mother regardless of whether they are boys or girls.

Q. 6. How does use and disuse of an organ help in evolution of a new species?

Ans. According to Lamarck, those organs which are used regularly become strong and more developed. On the other hand, those organs which are not used regularly become weak and degenerate. Such characters are inherited to the offsprings and so on. In the due course of time, such characters become permanent in later generations and become quite different from their ancestors, resulting in the formation of a new species.

Q.7. A very small population of a species faces a greater threat of extinction than a larger population. provide a suitable genetic explanation.

Ans. Fewer individuals in a species impose extensive inbreeding among them. This limits the appearance of variations and puts the species at a disadvantage if there are changes in the environment. Since the individuals fail to cope up with the environmental changes, they may become extinct.

Q. 8. Does the occurrence of diversity of animals on earth suggest their diverse ancestry also? Discuss this point in the light of evolution.

Ans. Though animals have a vast diversity in structures they probably do not have a common ancestry, because common ancestry may greatly limit the extent of diversity. As many of these diverse animals are inhabiting the same habitat, their evolution by geographical isolation and speciation is also not likely. Thus, a common ancestry for all animals is not the likely theory.

Q.9. All the human races like Africans, Asians, Europeans, Americans and others might have evolved from a common ancestor. Provide a few evidences in support of this view.

Ans. All human races have evolved from a common ancestor because everybody has:

- (i) Common body design, structure, physiology and metabolism
- (ii) Constant chromosome number
- (iii) Common genetic blue print
- (iv) Freely inter-breeding species.

Q. 10. A change in DNA that is useful for one property to start with, can become useful later for a different function. Explain.

Ans. A change/feature/property of an organism that may have helped it to adopt to an environmental condition can also become useful for a completely different function in the future. For example: feathers in birds, a character developed and selected during natural selection because it provided insulation in cold weather have become useful in later stages for flight.

Some dinosaurs had feathers, but they could not fly. Birds later adapted the feathers to fly.

Q. 11. List two differences in tabular form between dominant trait and recessive traits. What percentage/proportion of the plants in the F₂ generation/progeny were round, in Mendel's cross between round and wrinkled pea plants?

Ans.

Dominant trait	Recessive trait
(i) The trait which appears in the F ₁ progeny is dominant.	(i) The trait which remains hidden or which does not appear in the F ₁ progeny is the recessive trait.
(ii) It appears in more number.	(ii) It appears in less number.

75% of the plants were with round seeds.

Q. 12. How many pairs of chromosomes are present in human beings? Out of these how many are sex chromosomes? How many types of sex chromosomes are found in human beings.

Ans. 23 pairs of chromosomes are present in human beings. One pair of these are sex chromosomes. Two types of sex chromosomes are there: XX and XY.

Short Answer Type Questions – II

[3 marks]

Q. 1. What is DNA copying? State its importance.

Ans. A process where a DNA molecule produces two similar copies of itself in a reproducing cell is called DNA copying.

Its importance are:

- (i) It makes the transmission of characters from parents to the next generation possible.
- (ii) It causes variation in the population.

Q. 2. "We cannot pass on to our progeny the experiences and qualifications earned during our life time". Justify the statement giving reason and examples.

Ans. We acquire knowledge and skill in our lifetime such as learning dance, music, physical fitness, etc. But these skills cannot be passed to our progenies because:

- (i) Such characters or experiences acquired during one's lifetime do not bring any change in the DNA of the germ cell.
- (ii) Only germ cells are responsible for passing on the characters from the parents to the progeny.

Q. 3. "Different species use different strategies to determine sex of a newborn individual. It can be environmental cues or genetically determined". Explain the statement by giving example for each strategy.

Ans. Environmental cue:

In some animals, the temperature at which fertilised eggs are kept determines whether the developing animal in egg is male or female.

In some animals like snail, individual can change sex.

Genetical cue:

A child who inherits an X chromosome from the father will be a girl and one who chromosome from the father will be a boy.

Q. 4. How do variations occur in an offspring?

Ans. Dissimilarities between members of the same species is called variations. Two offsprings of the same parents show certain variations. Variations occur due to sex chromosomes. Variations

arising in germplasm (genes) of the organism are heritable. Mother and father contribute to the gene pattern of the offsprings through their chromosomes, in which recombination occurs at the time of gametogenesis. In zygote formation, gene pattern of both parents come together, that causes some Variations between parents and offsprings and amongst offsprings also.

Q. 5. Why is variation beneficial to the species but not necessary for the individual?

Ans. The importance of variation in organism introduced during reproduction is that it helps the species of various organisms to survive and flourish even in adverse environment. If all the organisms of a population living in that habitat are exactly identical, then there is a danger that all off them may die and no one would survive under those conditions. This will eliminate the species from the habitat completely. However, if some variations are present in some individual organism to tolerate excessive heat or cold, then there is a chance for survive and flourish even in adverse excessive heat or cold. Thus, variation is useful for the survival of a species over time.

Q. 6. What is speciation? List four factors responsible for speciation.

Ans. Speciation is the formation of new species from the pre-existing population. Factors responsible for speciation:

- (i) Genetic drift (ii) Natural selection
- (iii) Geographical isolation (iv) Mutation

Q. 7. List in tabular form, two distinguishing features between the acquired traits and the inherited traits with one example of each.

OR

List three distinguishing features, in tabular form, between acquired traits and the inherited traits.

Ans.

Acquired Traits	Inherited Traits
(i) Does not bring about change in the DNA of the germ cell. (ii) Cannot be passed on to the progeny. (iii) Cannot direct evolution. Examples: Acquiring knowledge, loss of weight, etc.	(i) Brings about change in the DNA of the germ cell. (ii) Cannot be passed on to the progeny. (iii) Can direct evolution. Examples: Skin colour, colour of the eye, etc.

Q. 8. In one of his experiments with pea plants mendel observed that when a pure tall pea plant is crossed with a pure dwarf pea plant, in the first generation, F₁ only tall plants appear.

(a) What happens to the traits of the dwarf plants in this case?

(b) When the F₁ generation plants were self-fertilised, he observed that in the plants of second generation, F₂ both all plants and dwarf plants were present. Why it happened? Explain briefly.

Ans. (a) The dwarf traits of the plants is not expressed in the presence of the dominant tall trait.

(b) In the F₂ generation, both the tall and dwarf traits are present in the ratio of 3: 1. This showed that the traits for tallness and dwarfness are present in the F₁ generation, but the dwarfness, being the recessive trait does not express itself in the presence of tallness, the dominant trait.

Q. 9. What are chromosomes? Explain how in sexually reproducing organisms the number of chromosomes in the progeny is maintained.

Ans. Chromosomes are thread-like structure, made of protein and DNA, found in the nucleus at the time of cell division.

In sexually reproducing organisms, the gametes undergo meiosis, and hence, each gamete contains only half a set of chromosomes. When two gamete fuse, the zygote formed contains the full set of chromosomes. Hence the formation of gamete by meiosis helps to maintain the number of chromosomes in the progeny.

Q. 10. “Two areas of study namely ‘evolution’ and ‘classification’ are interlinked”. Justify this statement.

Ans. Different forms of organisms have evolution during the course of evolution. Classification deals with grouping of these organisms into groups and subgroups based on their similarities and differences. The more characteristics any two species have in common more closely they are related. In other words, they will have a more recent ancestor. Thus, classification helps tracing the evolutionary relationships between the two organisms. Hence classification and evolutions are interlinked.

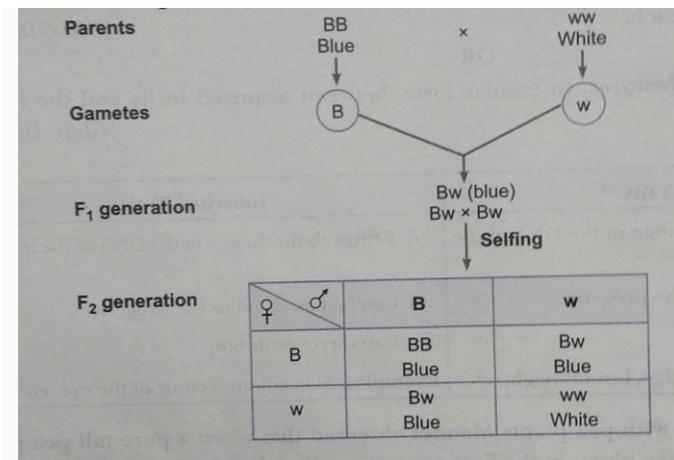
Q. 11. A pea plant with blue colour flower denoted by BB is cross-bred with a pea plant with white flower denoted by ww.

(a) What is the expected colour of the flowers in the F₁ progeny?

(b) What will be the percentage of plants bearing white flower in F₂ generation, when the flowers F₁ plants were selfed?

(c) State the expected ratio of the genotype BB and Bw in the F₂ progeny.

Ans.



- (a) Blue
- (b) 25%
- (c) BB: Bw = 1: 2

Q. 12. Explain the following:

- (a) Speciation
- (b) Natural selection

Ans. (a) The process by which new species develop from the existing species is known as speciation. The factors which could lead to speciation are

(i) Geographical isolation of population caused by various types of barriers such as mountain ranges, rivers and seas. This leads to reproductive isolation because of which there is no flow of genes between separated groups of population.

(ii) Genetic drift caused by drastic changes in the frequencies of particular genes by chance alone.

(iii) Variations caused in individuals because of natural selection.

(b) According to Darwin's theory of natural selection, the individuals who are most suitable and fit are successful in struggle for existence for food, space, mate, etc. Their offsprings are also better developed and adapted to the environment. Whereas one who are less adapted to the environment may die. Thus, nature selects better adapted organisms. This is called **natural selection** of the well adapted, better developed individuals of species.

Q. 13. "Fossils are related to evolution", Justify this statement. Give the two ways by which age of the fossils can be estimated?

Ans. Preserved traces of living organisms are called fossils.

Two ways of determining age of fossils are:

- (i) Relative – fossils closer of the surface are more recent.
- (ii) Dating – finding the ratio of different isotopes of the same element.

Q. 14. (i) Planaria, insects, octopus and vertebrates all have eyes. Can we group eyes of these animals together to establish a common evolutionary origin? Justify your answer. (ii) “Birds have evolved from reptiles “. State evidence to prove the statement.

Ans. (i) No, the structure of the eye in each of the organisms is different.

(ii) Fossils of certain dinosaurs and reptiles show imprints of feathers along with their bones but they could not fly presumably, using the feathers for insulation only. Later they evolved and adapted feathers for flight, thus becoming the ancestors of present day birds.

Q. 15. Mention three important features of fossils which help in the study of evolution.

Ans. (a) Fossils represent modes of preservation of ancient species.

(b) Fossils help in establishing evolutionary traits among organisms and their ancestors.

(c) Fossils help in establishing the time period in which organisms lived.

Q. 16. Explain analogous organs and homologous organs. Identify the analogous and homologous organs amongst the following:

Wings of an insect, wings of a bat, forelimbs of frog, forelimbs of a human.

Ans. Analogous organs are those organs which have different structural designs and origin but perform similar functions.

Homologous organs are those which have the same basic structural design and origin but perform different functions.

Analogous organs: Wings of an insect, wings of a bat.

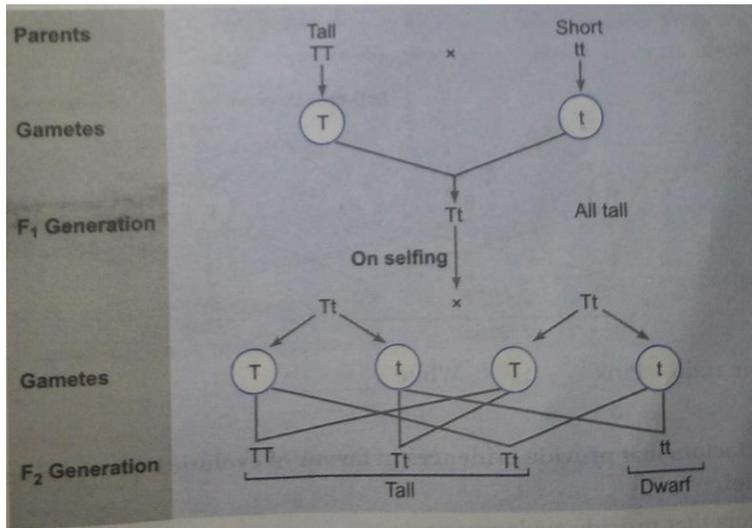
Homologous organs: Forelimbs of a frog, forelimbs of a human.

Q. 17. Describe the contribution of Lamarck.

Ans. The gradual unfolding of organisms from pre-existing organisms through changes since the beginning of life is called evolution. The theory proposed by J.B. Lamarck is known as the theory of inheritance of acquired characters. According to this theory, the use and disuse of an organ leads to acquiring of change in that organ. These changes or variations can be passed on from one generation to the next but this idea of inheritance of acquired characters was soon discarded.

Q. 18. Name the organism Mendel used for his experiments. Explain about F₁ and F₂ progeny obtained by Mendel when he bred the tall and the short varieties of the organism he experimented with.

Ans. Mendel used garden pea.



Q. 19. "It is possible that a trait is inherited but may not be expressed." Give a suitable example to justify this statement.

Or

With the help of an example justify the following statement: "A trait may be inherited, but may not be expressed".

Ans. Yes, it is possible that a trait is inherited but may not be expressed.

For example, when pure tall pea plants are crossed with pure dwarf pea plants, only tall pea plants are obtained in F₁ generation.

On selfing tall plants of F₁, both tall and dwarf plants are obtained in F₂ generation in the ratio 3:1. Reappearance of the dwarf character, a recessive trait in F₂ generation shows that the dwarf trait was present in individuals of F₁ but it did not express.

Q. 20. Name two homologous structures in vertebrates. Why are they so called? How do such organs help in understanding an evolutionary relationship

Ans. Two homologous structures in vertebrates are:

(i) limbs of birds and reptiles

(ii) limbs of reptiles and amphibians

These are called so because the organs have similar structure to perform different functions in various vertebrates.

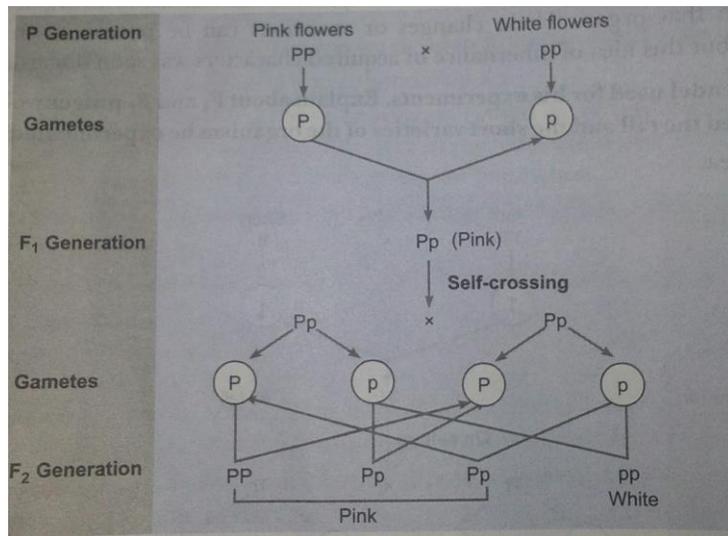
Q. 21. In a cross between plants with pink flowers and plants with white flowers the offsprings of F₁ generation all had pink flowers. When the F₁ generation was self-crossed, it

was observed in the F₂ generation that out of 100, 75 flowers were pink. Make a cross and answer the following:

(a) What are the genotypes of the F₁ progeny?

(b) What is the ratio of Pink: White flowers in the F₂ generation?

Ans.



Phenotypic ratio Pink : White
3 : 1

Q. 22. List three factors that provide evidences in favours of evolution in organisms and state the role of each in brief.

Ans. Three factors that provide evidences are:

- (i) Homologous organs-organisms with apparently different looking organs may have similar origin.
- (ii) Analogous organs-organisms with similar looking organs may have different origin.
- (iii) Fossils-allow us to make estimates of how far back evolutionary relationships go. Fossils when chronologically arranged help in tracing the evolutionary history of an organism.

Q. 23. Does geographical isolation of individuals of a species lead to formation of a new species? Provide a suitable explanation.

Ans. Yes, geographical isolation gradually leads to genetic drift. This may impose limitations to sexual reproduction of the separated population. Slowly the separated individuals will reproduce among themselves and generate new variations. Continuous accumulation of those new

variations through a few generations may ultimately lead to the formation of a new species.

Long Answer Type Questions

[5 Marks]

Q. 1. Explain with reason why giraffe has long neck.

Ans. According to Lamarck's theory of use and disuse, giraffes had to stretch their necks and forelimbs for feeding on leaves of tall trees because of which these organs were elongated. But this theory has been completely discarded. It is now proposed that, the giraffe's neck evolved with time because of 'necking' battle with time and natural selection, only giraffes with long necks survived.

Q. 2. Give the basic features of the mechanism of inheritance.

Ans. (i) Characters are controlled by genes.

(ii) Each gene controls one character.

(iii) There may be two or more forms of gene.

(iv) One form may be dominant over the other.

(v) Genes are present on chromosomes.

(vi) An individual has two forms of gene whether similar or dissimilar.

(vi) The two forms separate at the time of gamete formation.

(vii) The two forms are brought together in the zygote.

Q. 3. A. Mention any two points of difference between acquired and inherited traits.

B. If the tail of a mouse is cut for twenty one generations, will the tail occur in the twenty second generation of that mouse? Give reason to support your answer.

C. Define the term-Natural Selection.

Ans. A.

Acquired Traits	Inherited Traits
1. These are traits acquired during one's lifetime. 2. These are not inheritable. 3. Not present in the genetic make up. 4. Change in DNA will not result in any change in Change such traits.	These are traits inherited from one's predecessors. These are inheritable. Present in the genetic makeup. Change is DNA will bring about change in such traits.

B. The mouse will continue to have information for presence of tail in its DNA. So, it will continue to have tail because absence of tail is an acquired trait.

C. Natural selection means that nature selects the best trait in a species, leading to survival of fittest and evolution of species.

Q. 4. In the following crosses write the characteristics of the progeny.

Cross	Progeny
(a) RR YY X RR YY Round, yellow and round, yellow	_____
(b) Rr Yy x Rr Yy Round, yellow and round, yellow	_____
(c) rr yy × rr yy Wrinkled, green and wrinkled, green	_____
(d) RR YY × rr yy Round, yellow and wrinkled, green	_____

Ans. (a) Round, yellow

(b) Round, yellow

Round, green

Wrinkled, yellow

Wrinkled, green

(c) Wrinkled, green

(d) Round, yellow

Q. 5. How do Mendel's experiments show that the

(a) traits may be dominant or recessive,

(b) traits are inherited independently?

Ans. (a) When Mendel cross pollinated pure tall pea plants with pure dwarf pea plants, only tall plants were obtained in F₁ generation. On self pollinating the F₁ progeny, both tall and dwarf plants appeared in F₂ generation in the ratio 3: 1.

Appearance of tall character in both the F₁ and F₂ shows that it is a dominant character. The absence of dwarf character in F₁ generation and its reappearance in F₂ shows dwarfness is the recessive character.

(b) When Mendel first crossed pure-breed pea plants having round-yellow seeds with pure-breed pea plants having wrinkled-green seeds, he found that only round-yellow seeds were produced in the first-generation. No wrinkled-green seeds were obtained in the F₁ generation.

From this, it was concluded that round shape and yellow colour of the seeds were dominant traits over the wrinkled shape and green colour of the seeds.

When the F_1 generation pea plants having round-yellow seeds were cross-bred by self-pollination, then four types of seeds having different combinations of shape and colour were obtained in second generation (F_2). These were round-yellow, round-green, wrinkled-yellow and wrinkled-green seeds.

Such a cross is known as dihybrid cross as two sets of corresponding characters are considered. Mendel observed that along with round-yellow and wrinkled-green, two new combinations of characteristics, round-green and wrinkled-yellow, had appeared in the F_2 generation. On the basis of this observation, Mendel concluded that though the two pairs of original characteristics (seed colour and shape) combine in the F_1 generation, they get separated and behave independently in the subsequent generation.

Q. 6. What are the various evidences in favour of evolution?

OR

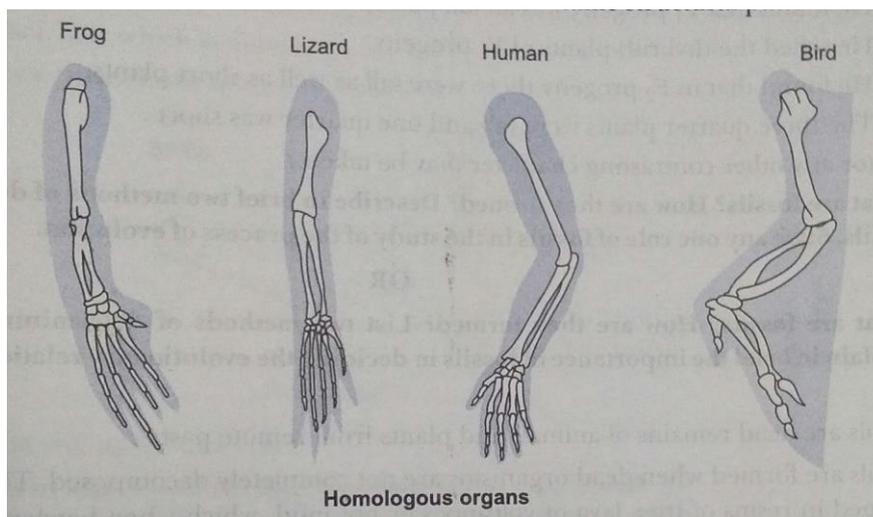
Explain with an example for each, how the following provides evidences in favour of evolution in organisms:

(a) Homologous organs (b) Analogous organs (c) Fossils

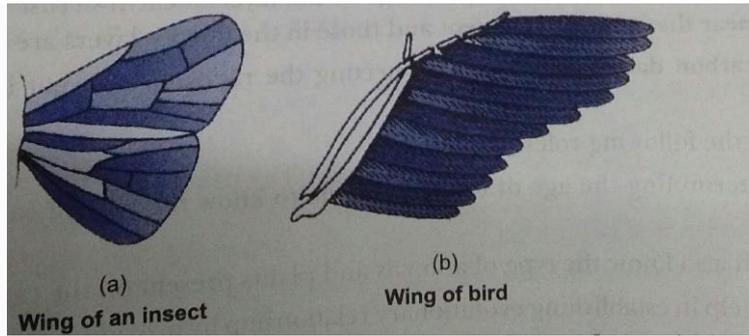
Ans. The following are the various evidences in favour of evolution:

(a) Homologous organs: Organs with a common basic structural design but with different functions are said to be homologous organ. For example, forelimbs of a frog, lizard, bird and man.

The forelimbs of man are used for grasping, of lizard for running, of frog for propping up and bird for flying. They have different functions but have same structural pattern.



(b) Analogous organs: The analogous organs have different basic structure but perform similar functions. For example, the wing of insects and the wing of birds, have a totally different anatomy and origin but they perform the same function of flying in air.



(c) Evidences from fossils: The fossils also provide evidences for evolution. For example, the fossil *Archaeopteryx* looks like a bird but it bears a number of other features, which are found in reptiles. This observation provides a clue that birds have evolved from reptiles.

Q.7. Describe Darwin's theory of evolution.

Ans. Following are the points of Darwin's theory of natural selection:

- (i) Over-production: Every organism has enormous potential to reproduce.
- (ii) Struggle for existence: Population size of an organism is limited due to struggle between the members of same species as well as the members of different species. It is due to struggle for food, space and mate.
- (iii) Variation: Due to struggle, the fit organisms possess some variations which are favourable, and they can leave the progeny to continue the favourable variations.
- (iv) Survival of the fittest: The fittest organism survive to continue the favourable variations.
- (v) Formation of a new species: These variations when accumulated for long time, leads to the origin of a new species.

Q. 8. Explain Mendel's experiment with peas on inheritance of characters considering only one visible contrasting character.

Ans. Mendel conducted breeding experiments with garden peas:

- (a) He studied plants (pure) of a tall/short varieties.
- (b) He crossed them and obtained F_1 progeny.
- (c) He found that F_1 progeny was all tall plants.
- (d) He selfed the (hybrid) plants of F_1 progeny.
- (e) He found that in F_2 progeny there were tall as well as short plants.
- (f) The three quarter plants were tall and one quarter was short. or any other contrasting character may be taken.)

Q. 9. What are fossils? How are they formed? Describe in brief two methods of determining the age of fossils. State any one role of fossils in the study of the process of evolution.

OR

What are fossils? How are they formed? List two methods of determining the age of fossils. Explain in brief the importance of fossils in deciding the evolutionary relationships.

Ans. Fossils are dead remains of animals and plants from remote past.

Fossils are formed when dead organisms are not completely decomposed. The organisms may get trapped in resins of tree, lava of volcanoes or hot mud, which when hardens retains the animal's parts thus forming fossils.

Two methods of determining the age of fossils are:

(a) Relative method: By estimating the age of the layer of earth's crust where the fossil is found. Fossils near the surface are recent and those in the deeper layers are more ancient.

(b) Radio-carbon dating method: By detecting the ratios of different isotopes of carbon in the fossils.

Fossils play the following roles:

(i) By determining the age of fossils we come to know the type of earth strata present at that time.

(ii) We can also know the type of animals and plants present on the earth at that time.

(iii) They help in establishing evolutionary relationship by providing connecting links.
(Any one)

Q. 10. what is speciation? List four factors that could lead to speciation. which of these cannot be a major factor in the speciation of a self-pollinating plant species? Explain. Give reason to justify your answer.

Ans. Speciation is the formation of new species from the pre-existing population.

Factors responsible for speciation:

(i) Genetic drift (ii) Natural selection

(iii) Geographical isolation (iv) Mutation

Geographical isolation cannot be a major factor in the speciation of a self pollinating plant species because physical barrier cannot be created in self-pollinating plants.

Q. 11. A. How does speciation take place?

B. Define the term gene.

C. The gene for red hair is recessive to the gene for black hair. What will be the hair

colour of a child if he inherits a gene for red colour from his mother and a gene for black hair from his father? Express with the help of flow chart.

Ans. A. Speciation may take place by

- (i) Migration
- (ii) Natural selection
- (iii) Mutation
- (iv) Genetic drift (Any two)

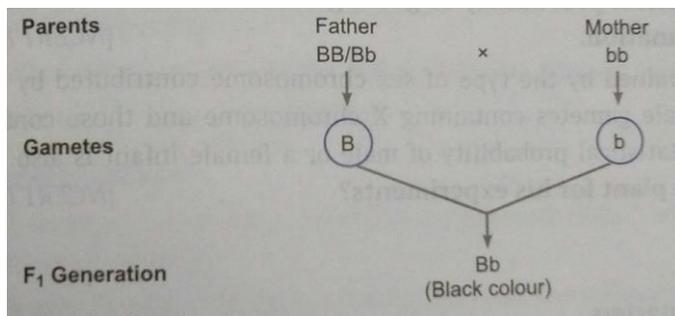
B. The segment of DNA which is functional and is made of nucleic acids and protein is called gene.

C. Given,

Mother has red hair which is recessive, i.e., bb

Father has black hair which is dominant, i.e., BB or Bb.

The inheritance pattern can be shown as follows:



Thus, the child will have black hair.

Q. 12. Explain the ways in which evolutionary relationships can be traced.

Ans. Evolutionary relationships can be traced in the following ways:

(i) Study of homologous organs: Some organs in different organisms are similar in structure and design because they are inherited from a common ancestor. For example, forelimbs of horse, wings of bird and arms of man may be functionally different, but because of their similarity in structure, origin and design, they indicate that horse, birds and man are closely linked and had a common ancestor.

(ii) Study of fossils: Fossils are the remains or impressions of organisms that existed in the past, allow us to study organ structure of organisms that are no longer alive. Comparing their organ structure with organ structure of present day organisms also enable us to trace evolutionary relationships.

(iii) Comparing DNA of different species: This will give us a direct estimate of how much the DNA has changed during the formation of these species. This, too, can be used as a criterion to trace evolutionary relationships.

Q. 13. How has the method of 'artificial selection' by humans helped in the evolution of different vegetables?

Ans. A wild variety of a plant may show different variations. Humans have selected some such variants and grown them for generations and during the course of time, they have become totally different species.

For example, variants in wild cabbage were selected on the basis of certain features to generate different vegetables.

- (i) Short distances between leaves, led to formation of green leaf buds-the common cabbage.
- (ii) Arrested flower development has bred broccoli.
- (iii) The variant with sterile flowers has made the cauliflower.
- (iv) Variant with swollen leaf parts-kohlrabi.
- (v) Variant with larger leaves-kale.

HOTS (Higher Order Thinking Skills)

Q.1. Why do all the gametes formed in human females have X chromosome?

Ans. Human females have two X chromosomes called sex chromosomes. During meiosis at the time of gamete formation, one X chromosome enters each gamete. Hence all the gametes possess an X chromosome.

Q.2. In human beings, the statistical probability of getting either a male or female child is 50:50. Give a suitable explanation.

Ans. The sex of an infant is determined by the type of sex chromosome contributed by the male gamete. Since the ratio of male gametes containing X chromosome and those containing Y chromosome is 50: 50, the statistical probability of male or a female infant is also 50: 50.

Q.3. Why did Mendel choose pea plant for his experiments?

Ans. (a) Easy to grow
(b) Short lifespan
(c) Easily distinguishable characters
(d) Larger size of flower
(e) Self-pollinated

Q. 4. Give reasons for the appearance of new combinations of characters in the F₂ progeny.

Ans. The tall/short and round/wrinkled seed trait are independently inherited.

Q.5. Why is making anti-viral drugs more difficult than making anti-bacterial medicines?

Ans. Since viruses have very few biochemical mechanisms of their own, anti-viral drugs can't be made so easily.

Q.6. Evolution has exhibited a greater stability of molecular structure when compared with morphological structures. Comment on the statement and justify your opinion.

Ans. We see immense diversity in size, form, structure and morphological features in the living world. But at the molecular level these diverse types of organisms exhibit unbelievable similarity. For instance, the basic biomolecules like DNA, RNA, carbohydrates, proteins, etc., exhibit remarkable similarity in all organisms.

Value Based Questions

Q. 1. In a quarry of sandstone, a digger found some bones below the rocks. He took them out and was about to throw them away when his fellow digger told him that this could be a fossil and they should hand it over to the museum.

Answer the following questions based on the above situation:

- (i) Which values are promoted by the fellow digger?**
- (ii) What contributions are the diggers making to the scientific world?**
- (iii) Imagine yourself to be the person in the museum whom the diggers approach.**

What would be your response to the diggers' discovery?

Ans. (i) Rational thinking, awareness, preservation of heritage.

(ii) They provided a link which can help scientists to study the process of evolution and know more about the world in which humans did not exist.

(iii) I would take the bones samples and send them for carbon dating to find which period they belong to.