

- Q1.** What is the effect of DNA copying which is not perfectly accurate on the reproduction process?
- Q2.** Define heredity.
- Q3.** Write the sex of the baby that inherits Y chromosome from the father.
- Q4.** Give common and scientific names of the plant on which Mendel experimented.
- Q5.** Give an example where sex determination is regulated by environmental factors.
- Q6.** What is the phenotypic ratio of a dihybrid cross in F₂ generation.
- Q7.** What are the basic events in evolution?
- Q8.** What is organic evolution?
- Q9.** What is variation?
- Q10.** What is meant by natural selection?
- Q11.** What is meant by artificial selection?
- Q12.** Name the scientist who gave theory of evolution.
- Q13.** What is genetic drift?
- Q14.** Define mutation.
- Q15.** Define species.
- Q16.** Write two factors that could lead to rise of new species.
- Q17.** How do we know how old a fossil is?
- Q18.** Identify analogous and homologous organs amongst the following:
Wings of an insect, Wings of bat, Forelimbs of lizard, Forelimbs of bird.
- Q19.** Give one example of an evolutionary change produced in an organism for one purpose which later on became more useful for different functions.
- Q20.** Which of the following fossils is invertebrate and which one is vertebrate?
(a) Dinosaur (b) Ammonite
- Q21.** There are certain changes that are small though are very significant. What is this process known as?
- Q22.** Give the respective scientific terms used for studying: (a) the mechanism by which variations are created and inherited, and (b) the development of new type of organisms from the existing ones.
- Q23.** Mention the information source of making proteins in the cell. What is the basic event in reproduction?
- Q24.** In human beings there are only 23 pairs of chromosomes but there are unlimited characteristic features. Justify.

- Q25.** How do natural selection and artificial selection differ?
- Q26.** Give one example each of characters that are inherited and the ones that are acquired in humans. Mention the difference between the inherited and the acquired characters.
- Q27.** In a monohybrid cross between tall pea plants denoted by TT and short pea plants denoted by tt, Preeti obtained only tall plants denoted by Tt in the F1 generation. However, in F2 generation she obtained both tall and short plants. Using the above information explain the law of dominance.
- Q28.** Explain with the help of example where the colour change gives no survival advantage to a species.
- Q29.** Define variation in relation to a species. Why is variation beneficial to the species?
- Q30.** (a) What is genetic drift?
(b) Which type of organism will have more variation – sexually and asexually reproducing organisms? Justify.
- Q31.** Define the following:
(a) Natural selection. (b) Reproduction isolation.
- Q32.** Give reasons, why:
(a) all organisms have many common features?
(b) fossils furnish the direct and most reliable evidence for evolution?
- Q33.** Name two homologous structures in vertebrates. Why are they named so? What is the significance of these structures in the study of evolution?
- Q34.** "Our teeth and an elephant's tusks are homologous organs". Justify this statement. What do the analogous organs indicate?
- Q35.** State two differences between homologous organs and analogous organs.
- Q36.** Give two uses of fossils. How does the study of fossils provide evidence in favour of organic evolution.
- Q37.** Sometimes, accidentally a dead body or its parts get buried under depositing sediments and are preserved. These are fossils. How can the estimation of the age of fossils be done?
- Q38.** (a) Give the evidence that the birds have evolved from reptiles.
(b) Insects, octopus, planaria and vertebrates possess eyes. Can we group these animals together on the basis of eyes that they possess? Justify your answer giving reason.
- Q39.** Why did human race spread from Africa to other parts of the world?
- Q40.** (a) What will be the consequence when a small population of individuals is separated due to a large barrier in between them?
(b) DNA has a property that it is used as a tool in genetic engineering. Mention the property.
- Q41.** How can we say that change in genes can be brought about by change in DNA?
- Q42.** Write the full form of DNA. Name the part of the cell where it is located. Explain its role in the process of reproduction of the cell.
- Q43.** Name the organism Mendel used for his experiment. Explain about F1 and F2 progeny obtained by Mendel when he bred the tall and the short varieties of the organism he experimented with.
- Q44.** In the following crosses, write the characteristics of the progeny:
(a) Rr Yy × Rr Yy (b) rr yy × rr yy (c) RR YY × rr yy

Q45. How do Mendel's experiments show that traits are inherited independently? Depict with the help of a cross.

Or

Mendel performed experiment with pea plants. when he crossed two pea plants with contrasting characters like round and wrinkled seeds, he found that the plants with wrinkled seeds reappeared in F₂ generation. Show the cross and give the ration of plants obtained in F₂ generation. Which parental character is dominant in the above situation?

Q46. Mention the factor which is mainly responsible for inherited traits. State the two outcomes of Mendel's experiments.

Q47. In a monohybrid cross pink coloured flowers are dominant over white coloured flowers. If parents belong to pure breeding dominant trait and pure breeding recessive trait, what will be the phenotype or morphological feature of F₁ generation? If F₁ plants are self-fertilised, what would be the phenotypic ratio, or how many dominant and recessive traits will be produced in the progeny? Explain with illustration.

Q48. The gene for blue eyes (b) is recessive to gene for brown eyes (B). The given figure shows both brown and blue eyes

	BB	bb		
	Bb	?		
bb	Bb	Bb	bb	

- Write the symbol of the mother (genotype).
- What is the genotype of grandmother and grandfather?
- What is the percentage of individuals with brown and blue eyes respectively

Q49. The genotype of a round seeded pea plant is denoted as RR and that of wrinkled seeded plants as rr. When cross between them occurs:

- What will be the phenotype expected in F₁ generation?
- Give the % age of wrinkled seeded plants if F₁ plants are self-pollinated.
- In which ratio do you find RR, rr and Rr in F₂ progeny?

Q50. Explain the method of sex determination in humans.

Or

"Only father is responsible for the sex of a new born child". Explain with the help of a neat illustration

Or

"It is a matter of chance whether a couple will give birth to a boy or a girl". Justify the statement and support your answer with a neat illustration.

Q51. In fruit flies the sex chromosomes in males in XY and in females in XX.

- Does a male fly inherit X chromosome from his mother or father?
- How many types of gametes can a female fly produce?
- How many types of gametes can a male fly produce?

Q52. Study the given data and answer the questions that follow:

1	2	3
Parental plant cross-fertilized and seeds collected	F1 generation offspring	F2 generation offspring after Self-pollination of F1 hybrid.
Male parent - Round Green seeds Female parent - Wrinkled Yellow seeds	All seeds - Round Yellow	314 - Round Yellow 110 - Round Green 102 - Wrinkled Yellow 32 - Wrinkled Green

(a) What is the term given to this type of cross? (b) What does the data in column 2 indicate? State how you arrived at this conclusion.

Q53. Give the salient features of Darwin's theory of natural selection.

Q54. (a) If we cut the tail of a mouse, will tail occur in next generation of that mouse? Give reason to support your answer.

(b) What are the features that Archaeopteryx had in common to the reptiles?

Q55. Briefly explain the role of natural selection and genetic drift in speciation by citing an example.

Or

With the help of an example, explain how new species are produced.

Q56. Give reasons for your answer:

(a) Define speciation. Mention factors due to which this can happen.

(b) Will geographical isolation be a major factor in the speciation of an asexually reproducing organism? Justify giving reason.

Q57. Identify the diagrams shown below in evolutionary point of view. How do these organs provide evidence in favour of evolution?



Q58. Mention some of the tools of tracing evolutionary relationship among species.

Or

List and describe any two evidences for evolution.

Q59. Name the vegetable crops made from wild cabbage by artificial selection when farmers opted for

(a) arrested flower development

(b) sterile flowers

(c) swollen parts

(d) large leaves

Or

Explain the role of artificial selection in the evolution of different types of vegetables.

Q60. (a) Homologous organs are different from analogous, explain.

(b) Prokaryotic organisms are more primitive organisms than eukaryotes organisms, discuss.

- Q61.** (a) What is meant by natural selection? Explain.
(b) Why are thorn of *Bougainvillea* plant and a tendril of *Passiflora* plant considered homologous.
- Q62.** Why is it more appropriate to compare the process of evolution with branches of a tree rather than with a ladder?
- Q63.** What is meant by trait of a species? Distinguish between acquired and inherited traits giving an example of each.
- Q64.** What are the various evidences in favour of evolution? Give the examples.
- Q65.** Define the term 'evolution'.
"Evolution cannot be equated with progress". Justify this statement.
- Q66.** (a) Why do we say that homozygous plants produce pure progeny?
(b) Define heterozygous.
(c) Explain how the process of speciation takes place.
- Q67.** Mendel crossed a pea plant having inflated green pod with a constricted yellow pod.
(a) What type of a cross is it?
(b) What type of plants are obtained in F1?
(c) In F2 generation the phenotype ratio is 9 : 3 : 3 : 1. State the rule for the inheritance of traits observed by Mendel.
- Q68.** (a) Green and red colour of seeds are recessive and dominant traits respectively. Out of F1 and F2, in which generation will the green seed appear, if both parents are not hybrid. Explain giving reason.
(b) Dead remains of two species A and B were buried. Later only A's body was found to be a fossil but not B's. Give reason to explain it.
(c) Species A shares ten characteristics with B species, species C shares fifteen characteristics with D. Which of the two pairs share closer relation?
(d) After the death of two insects, one of the insects was buried in hot mud and the other in usually found mud. Which of the two is more likely to be preserved better and why?
- Q69.** "A trait may be inherited, but may not be expressed". Justify this statement with the help of suitable example.
- Q70.** (a) Define the gene of a particular protein.
(b) How may speciation take place?
(c) 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? From the flow chart of this cross.

- S1.** DNA copying cannot be perfectly accurate always. This leads to accumulation of variation, which results in evolution.
- S2.** Transmission of traits from one generation to next through genes is termed as heredity.
- S3.** Such a baby will have XY, therefore will be a male.
- S4.** Garden pea (common name).
Pisum sativum (scientific name).
- S5.** In snail and garden lizard, sex is determined by outside temperature.
- S6.** 3 : 1.
- S7.** Natural selection and variation are the basic events in evolution.
- S8.** Process of accumulation of variations/changes in DNA, leading to formation of new species, is organic evolution.
- S9.** When an offspring of same parents do not exactly resemble with each other and their parents. This is called variation.
- S10.** Selection of organisms by nature which are fit to live under changed environmental condition i.e., only those organisms in a population will survive which have useful variations to live under changed environmental situations.
- S11.** Artificial selection is the process by which man selects traits useful to him for improving the qualities of domesticated plants and animals. Thereby resulting in formation of new species.
- S12.** Theory of evolution was given by Charles Darwin.
- S13.** Sudden change in the frequency of a particular gene, due to migration, selection, mutation etc., is known as genetic drift.
- S14.** Sudden changes in the genetic make up of an organism, which are capable of expressing and are inheritable, are called mutation. These lead to variations.
- S15.** Group of individual that are capable of interbreeding, having similar features are said to belong to a species.
- S16.** (a) Geographical isolation. (b) Genetic drift. (c) Natural selection.
- S17.** Age of the fossil can be estimated by:
- (a) Digging the layers of the Earth – deeper the fossil, older it is and nearer the surface would be more recent ones.
- (b) Studying the amount of C_{14} (radioactive isotope of C) in the fossils. Since it has half life, therefore by quantitative analysis we can give approximate time period when that organism would have existed.
- S18.** **Homologous organs:** Forelimbs of lizard and forelimbs of bird. Both have same structure but different function.
Analogous organs: Wings of an insect and wings of a bat. Both have different structure but same function.
- S19.** Birds develops feathers, as they evolved to become warm blooded animals, to protect them from cold. But slowly, these feathers also helped them to evolve for aerial mode of life in search of food, shelter etc.

S20. (a) Dinosaur is a vertebrate. (b) Ammonite is an invertebrate.

S21. Variations are these changes and process is evolution.

S22. (a) Evolution, (b) Speciation.

S23. DNA is the basic source of making proteins in the cells.

The basic event in reproduction is the creation of a DNA copy. Cells use chemical reactions to build copies of their DNA. This creates two copies of the DNA in a reproducing cell, and they will need to be separated from each other. DNA copying occurs accompanied by the creation of an additional cellular apparatus. The DNA copies then separate, each having its own cellular apparatus for maintaining life processes.

S24. Chromosomes are made up of genes, which in turn are made up of DNA. Stretches of DNA code for a polypeptide *i.e.*, such stretches make a gene. Hence on each chromosome, there may be variable number of genes present which control unlimited number of features.

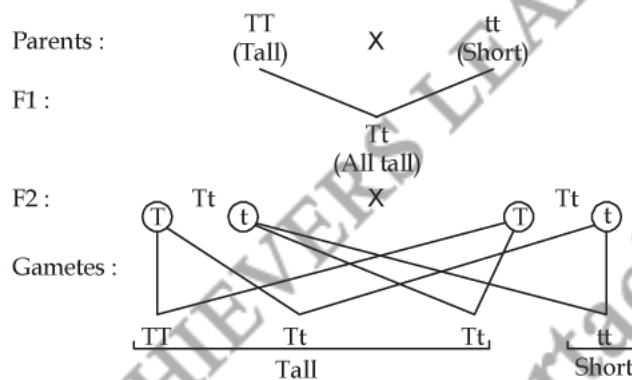
S25. Distinction between artificial selection and natural selection:

Artificial selection	Natural selection
In artificial selection, man selects a trait useful to him in breeding plants and animals.	In natural selection which occurs in world, nature selects traits favourable to the species in its environment.

S26. Inherited characters are blood group, eye colour etc., whereas acquired characters are being sportsman, dancer or scientist etc.

Inherited characters are transmitted from parents to the progeny as they are present on our genes. While acquired traits are those which a person acquires during his life time. Thus, they are not inheritable.

S27. Given



By this information, it is clear that in F1, when the genotype of tall plant Tt, they appear tall. This clearly means that when both the genes are present the effect is that of only 'T', which is dominant. The recessive gene is unable to express itself in presence of a dominant gene. According of Law of Dominance, a single copy of dominant trait is enough for its expression.

S28. Colour change need not always give survival advantage.

For example, if there is a population of red and blue beetles in an area. An elephant, who happens to pass by may stamp on this population. Thus, survival is only by chance and not due to selection.

Hence, survival here is due to chance and no advantage due to change in body colour.

S29. Variations are relatively small changes that occur due to errors during DNA copying in asexual reproduction or fusion of gametes in sexual reproduction.

These changes are subtle, maintaining the basic body design.

Sometimes, these variations may be such that they given an advantage during adverse conditions and hence help in survival. This is how variation helps in continuation of species.

- S30.** (a) Sudden change in the frequency of a particular gene, due to migration, selection, mutation etc., is known as genetic drift.
 (b) Sexually reproducing organisms will show more variation as it involves fusion of gametes from two different individuals. Also there is exchange of genetic material between homologous chromosomes during meiosis.
- S31.** (a) **Natural selection:** Nature selects the best traits in a species, leading to survival of fittest and evolution of species. This phenomenon is known as natural selection.
 (b) **Reproduction isolation:** It refers to the mechanism which check the population of two different groups from interbreeding.
- S32.** (a) All organisms would have evolved from a common ancestor and thus have similar basic functions.
 (b) Fossils are imprints or dead remains of plants and animals that existed in the past. Thus, they are most reliable evidence for evolution.
- S33.** (a) homologous structures in vertebrates are wings in birds and forelimbs of lizard.
 (b) They are so named as they have same structural design but different function.
 (c) Such structures give us idea about common ancestry.
- S34.** Our teeth and elephant's tusks are homologous organs as both have same basic structure but different functions. We use ours for chewing while elephants use their's to hold things.

Analogous organs indicate that even the organisms having different structures can adapt to perform similar functions for their survival under given environmental conditions.

S35.

Homologous organs	Analogous organs
(a) Homologous organs have same basic structural design.	(a) Analogous organs have different basic structural designs.
(b) They perform different functions in different organisms, e.g., forelimbs of frog and bird.	(b) They perform similar functions in different organisms. e.g., wings of a bird and wings of a bat.

S36. Uses of fossils are:

- (a) To help study evolution of plants and animals.
 (b) To know past climatic conditions.
 (c) To help calculate geological time etc.

Evidence in favour of organic evolution.

- (a) Fossils help to identify an evolutionary relationship between apparently different species.
 (b) The older fossils, present deeper, are simpler in body design, as compared to those present in upper layers which are more recent.

This clearly provides evidence in favour of organic evolution.

S37. It can be done in two ways:

- (a) The fossils found in upper layers are recent and the ones that are deeper are older.
 (b) By radio-active carbon dating.

S38. (a) Fossils are important evolutionary evidence to show what kind of organisms existed earlier.

Archaeopteryx is a fossil dinosaur with wings. This proves that it has features of both reptiles as well as birds. Hence we can say that birds evolved from reptiles.

- (b) These organisms cannot be grouped together as the structure of eye in each is very different. This means that have separate evolutionary origin.

S39. The earliest evidence for human race were found in Africa.

Some of our ancestors left Africa in search of food and shelter, in other areas and stayed on. Slowly, we migrated to most parts of the world.

They settled in different parts and adapted. There was mixing in these populations so they evolved as different races.

S40. (a) When a small group of individuals move away and there is a large barrier between them this smaller group will accumulate variation. This may ultimately lead to formation of new species. Thus, this leads to speciation due to geographical isolation.

(b) DNA is self-replicating *i.e.*, it can make its copies. This is the property used as a tool in genetic engineering.

S41. (a) A gene is a specific portion of DNA, occupying a specific location.

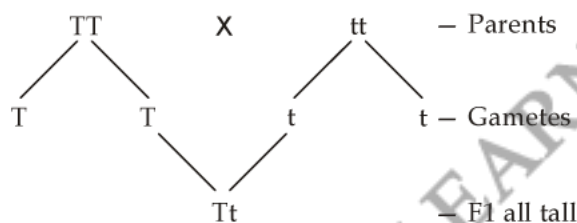
(b) It provides information for protein synthesis.

(c) It also provides stability to the species.

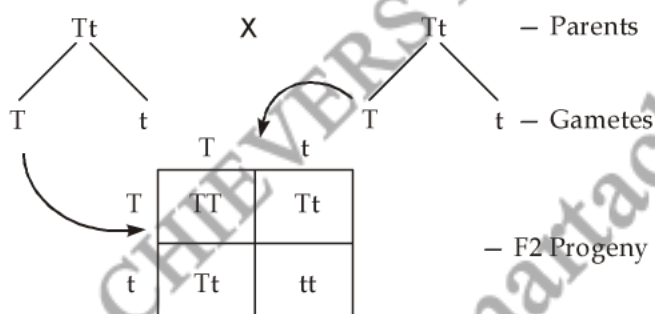
Thus, any change in genes will bring about change in DNA.

S42. DNA is Deoxyribo Nucleic Acid. It is generally located within the nucleus. It is the basic structure that makes up the chromosomes. It carries complete information for that organism. DNA is capable of replicating, thus making its own copies. For reproduction it is mandatory that the cell must pass on the information to the next generation. Since DNA is capable off dividing, so it plays most important role in reproduction.

S43. Organisms used by Mendel for his experiments was pea plant. Mendel took a pure tall plant (TT) and crossed it with a dwarf (tt) plant. The progeny thus obtained was called F1 progeny (First filial progeny).



Then he self pollinated the F1 progeny to obtain F2 generation



In F2 generation he found that 75% plants were tall and 25% were dwarf.

1TT (tall) : 2Tt (tall) : 1tt (dwarf)

S44. (a) Round yellow : 9

Round green : 3

Wrinkled yellow : 3

Wrinkled green : 1

(Reason - This cross is like F2 of Mendel's dihybrid cross)

(b) All wrinkled and green.

(Reason - all gametes produced will have only one trait)

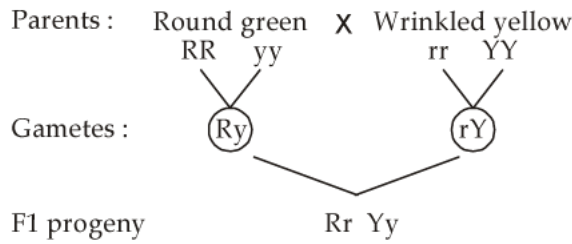
(c) All round and yellow.

(Reason - Like F1 in Mendel's cross - atleast one dominant and one recessive of each trait).

S45. When a pea plant with round green seeds was crossed with a pea plant with wrinkled yellow seeds, the F1 progeny were all plants with round, yellow seeds. It means round and yellow seeds are dominant traits while wrinkled green seeds are recessive traits.

When the F1 plants were self-pollinated and F2 progeny generated, there were four types of plants:

- (i) Round yellow seeds
- (ii) Round green seeds
- (iii) Wrinkled yellow seeds
- (iv) Wrinkled green seeds



	RY	Ry	rY	ry
RY	RR YY Round, yellow	RR Yy Round, yellow	Rr YY Round, yellow	Rr Yy Round, yellow
Ry	RR Yy Round, yellow	RR yy Round, green	Rr Yy Round, yellow	Rr yy Round, green
rY	Rr YY Round, yellow	Rr Yy Round, yellow	rr YY Wrinkled, yellow	rr Yy Wrinkled, yellow
ry	Rr Yy Round, yellow	Rr yy Round, green	rr Yy Wrinkled, yellow	rr yy Wrinkled, green

Result :
 Round Yellow = 9
 Round Green = 3
 Wrinkled yellow = 3
 Wrinkled Green = 1.

S46. DNA that contains all the information is the main factor responsible for inherited traits.

Outcomes of Mendel's experiments.

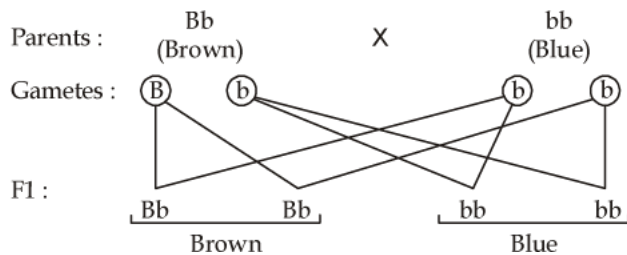
- (a) Both parents contribute equally towards the progeny.
- (b) Traits may be either dominant or recessive.
- (c) A dominant trait will be expressed in both heterozygous as well as homozygous condition while recessive trait will be expressed only in homozygous condition.
- (d) The traits are inherited independent of each other.

S47. Let the dominant trait be represented as PP and recessive as pp.

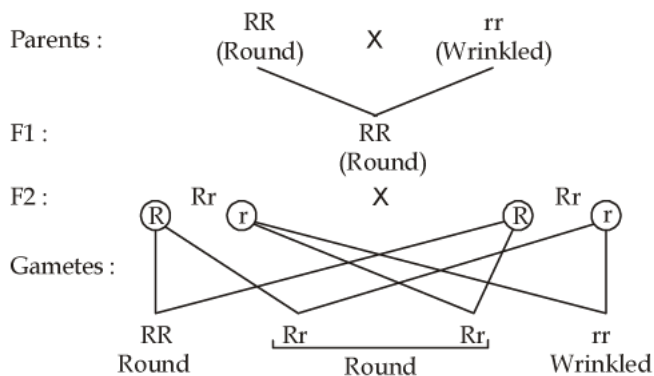
\therefore Parents are $PP \times pp$
 F1 : Pp
 All pink
 On selfing : $Pp \times Pp$
 $PP \ Pp \ Pp \ pp$
 F2 ratio : 3 pink : 1 white

Thus, it is seen that in F1, all progeny would resemble the dominant parent white in F2, 75% progeny resembles the dominant parent and rest 25% resemble recessive parent.

- S48.** (a) The genotype of mother will be bb.
 (b) Phenotype of grandmother and grandfather could be brown eyes and blue eyes respectively.
 (c) The percentage of individuals with brown eyes and blue eyes is 50% each.



S49.



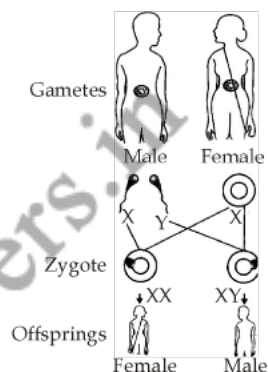
- (a) F1 phenotype will be all round.
 (b) Percentage of wrinkled seed plants on selfing of F1 plants will be 25%.
 (c) 1 : 2 : 1.

S50. Human beings have 22 pairs of autosomes and one pair of sex chromosome. This pair is XX in females and XY in males. Thus, if parents are

This cross shows that females produce all similar gametes, carrying X chromosome. while males produce two types of gametes 50% with X and 50% with Y chromosome.

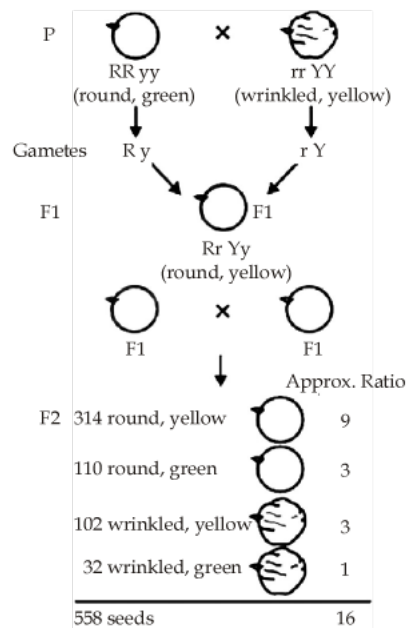
Hence, when a female gamete fuses with sperm with X chromosome, a female child is produced and when it fuses with sperm with Y chromosome, a male child is produced.

So, it is male that determines the sex of the child.



- S51.** (a) Since females have XX, so the male fly inherits X chromosome from his mother only.
 (b) A female fly produces only one type of gamete all with X chromosome.
 (c) Male fly produces two types of gametes 50% with X and 50% with Y.

- S52.** (a) Dihybrid cross.
 (b) Round shape and yellow colour in the pea plants are the dominant traits. On the other hand, wrinkled shape and green colour are recessive, and they assort independently.
 With the help of the following flow chart we reach at this conclusion:



Since in F1, all are heterozygous for both traits, so yellow and round are dominant traits. These traits are not inherited together and hence there are two new recombinants. Thus, they are inherited independently.

S53. Features Darwin's theory of natural selection:

- Every organism has potential for reproduction, still the population size remains within limit.
- It is struggle/competition for space, food and mating, within species or interspecific which limits the growth of any population.
- Nature selects those who are fit to live. Thus, only strong organisms survive and rest are eliminated. This is called 'survival of the fittest'.

- S54.** (a) Even after cutting tail of a mouse its progeny continues to have tail. This is because it is an acquired trait. The mouse continues to have information for presence of tail in its DNA and hence the progeny will be with tail.
 (b) Archaeopteryx has reptilian features as presence of tail, vertebra, teeth etc.

S55. Let us study the example of beetles. Let the original beetle population be red. If due to variation a green beetle was produced it would have survival advantage over red beetle. Thus, green beetles would be naturally selected, and will grow in number.

If few of these green beetles move to some other area, they adopt to changed environment and after few generations, would vary greatly from the original population of red beetles. These two populations may not be able to interbreed due to accumulation of variation.

Thus, due to Natural Selection and Genetic Drift, a new species of beetles is formed.

- S56.** (a) **Speciation:** It is the process of formation of new species from an existing one. Factors that can lead to speciation are:
 (i) Natural selection. (ii) Geographical isolation. (iii) Migration - Genetic drift.
 (b) In asexually reproducing organism, geographical isolation will not be a factor in speciation as it does not require another individual for reproduction. Only one individual is capable of producing next progeny hence geographical isolation will not act barrier.

S57. The diagram shows homologous organs. These are forelimbs of various organisms. All these forelimbs are similar in basic structure but differ in function. This suggests that these organisms would have evolved from a common ancestor.

S58. (a) **Homologous organs:** Homologous organs are those organs which have similar structure but different functions.

Example: Forelimbs of frog, human and bird.

(b) **Analogous organs:** Analogous organs are those organs which have similar functions but different structure.

Example: Wings of a bat, house fly and a bird.

(c) **Fossils:** These are imprints or dead remains of plants and animals. They indicate how one kind of organisms may have evolved from previously existing ones.

Example: Archaeopteryx – a fossil dinosaur that had wings.

This shows that birds would have evolved from reptiles.

S59. Human beings have artificially selected certain variants that arose in nature by chance. This led to evolution of different species.

For example, wild cabbage was cultivated and its variants were selected due to different advantages, by artificial selection.

(a) Short distances between leaves – led to formation of modern day cabbage.

(b) Arrested flower development – Broccoli.

(c) Sterile flowers – Cauliflower.

(d) Swollen parts – Kohlrabi.

(e) Large leaves – kale.

S60. (a)

Homologous organs	Analogous organs
(i) Homologous organs have same basic structural design.	(i) Analogous organs have different basic structural designs.
(ii) They perform different functions in different organisms, <i>e.g.</i> , forelimbs of frog and bird.	(ii) They perform similar functions in different organisms. <i>e.g.</i> , wings of a bird and wings of a bat.

(b) Prokaryotic organisms are more primitive organisms that have no membrane bound cell organelles, including nucleus whereas eukaryotes are organisms whose cells have well defined nucleus and membrane bound cell organelles.

S61. (a) **Natural selection** – It is selection of certain traits by nature in an individual of a population of a particular species.

This leads to survival advantage and hence variation leading ultimately to speciation.

(b) Thorn of *Bougainvillea* and tendril of *Passiflora* both are modified stem, *i.e.*, both have similar structure, but different function.

Thorn of *Bougainvillea* protects plants from being grazed while tendril of *Passiflora* helps the plants to climb up a support.

Hence, they are homologous organs.

S62. While studying evolution of various life forms, it is observed that from a single point or ancestors, there may have originated different lines, each leading to formation of a new species.

For example, both humans and chimpanzee have many common features which suggests that both would have had a common ancestor.

Also, it is not as if one species is eliminated to give rise to a new one. Homologous organs explain this well. Forelimbs of a frog, lizard, bird and horse have common design but different function.

This clearly suggests that all these organisms belonging to different groups originated from a common ancestor.

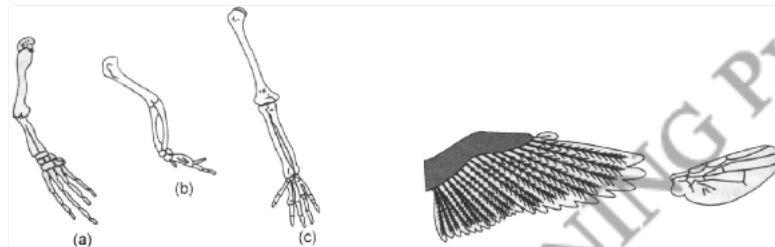
They evolved in their own way to perform and adapt to their mode of life to give rise to current forms. Hence, it is more appropriate to compare the process of evolution with branches of a tree, than with a ladder.

S63. The typical characters present in all individuals of a species are said to be trait of that species.

Acquired traits	Inherited traits
(a) An organism acquires during its life time.	(a) An organism inherits from its predecessors.
(b) Not present in the genetic makeup of an individual.	(b) Present in the genetic make up.
(c) Not inheritable.	(c) Inheritable.
(d) Change in DNA will not result in any change in such traits. <i>Example: Body weight.</i>	(d) Change in DNA will bring about change in such traits. <i>Example: Blood group.</i>

S64. Evidences in favour of evolution are:

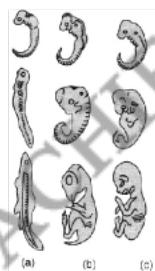
- (a) **Homologous organs:** Such organs which perform different functions but have similar structure and origin are called homologous organs. For example, forelimbs of bird, forelimb of man and frog perform different functions, but have similar basic structure. Presence of such organs indicate that all these vertebrates had common ancestors.
- (b) **Analogous organs:** Such organs which perform similar functions but are structurally different are called analogous organs. For example, wings of a bird and wing of an insect. Presence of such organs show that these organisms have different origin.



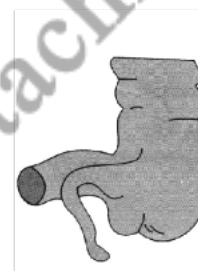
Skeleton of forelimbs of (a) Frog, (b) Bird and (c) Human, showing homologous features.

Wing of a bird and an insect showing analogous features.

- (c) **Evidences from embryology:** Early embryos of different vertebrates show striking similarities such as presence of tail. This indicates common origin and ancestry of different vertebrates.
- (d) **Vestigial organs:** These are the organs which appear functionless in one organism and functional in some others. For example, Vermiform appendix of the large intestine is non-functional in human beings but functional in herbivorous ruminant animals. Presence of such organs also show common ancestry.



Comparison of early development stages of embryo:
(a) Fish (b) Bird and (c) Human.



Vermiform Appendix of human being as vestigial organ.

- (e) **Evidences from fossils:** Archaeopteryx a fossil that resembles reptiles but has some bird like features. This shows that birds have been evolved from reptiles.

S65. The process by which we know how various life forms have come into being, from the previously existing ones is known as evolution.

Evolution cannot be equated with progress. This is because.

- (a) Evolution is caused due to variations in original form.
- (b) This may lead to formation of new species. But it does not mean that original type may not exist.
- (c) One trait of an organism may not be useful at all for others because of their different living environment.

- S66.** (a) Homozygous plants, whether for dominant or recessive trait have both identical genes for that trait. Thus, they always produce similar gametes resulting in pure breeding plants.
- (b) When the two chromosomes in the homologous pair are different i.e., one is dominant and other recessive, such a pair is said to heterozygous.
- (c) Let us study the example of beetles. Let the original beetle population be red. if due to variation a green beetle was produced it would have survival advantage over red beetle. Thus, green beetles would be naturally selected, and will grow in number.

If few of these green beetles move to some other area, adapt to changed environment and after few generations, would vary greatly from the original population of red beetles. These two populations may not be able to interbreed due to accumulation of variation.

Thus, due to Natural Selection and Genetic Drift, a new species of beetles is formed.

- S67.** (a) This is a dihybrid cross.
- (b) All plants are inflated, yellow pod plants.
- (c) In F₂, new recombinants are produced as the traits are assorting independently. The law given by Mendel is 'Law of Independent Assortment' which states that in a dihybrid cross where two different characters are being studied, which may be present together in an individual, are inherited independent of each other, in next generation.

- S68.** (a) Since it is given that green is recessive and red seeds are dominant, hence green colour of seeds will reappear only in F₂ generation.

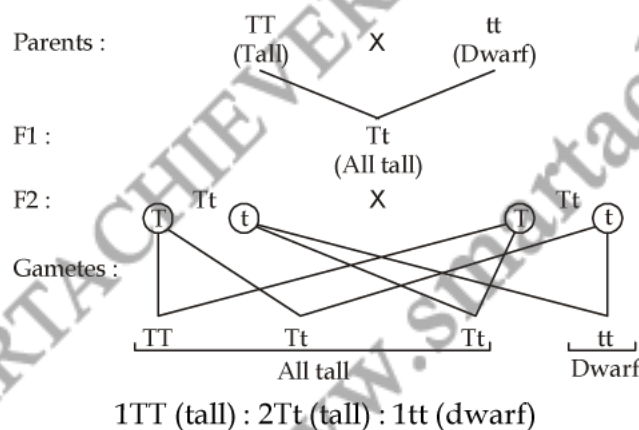
This is because, both parents are not hybrid for this trait, (as given) and hence the two recessive genes will come together only in F₂.

- (b) Fossils are formed only when the dead parts are hard and get buried immediately without getting decomposed.

In this case, A may have left its imprints as fossil while B may have decomposed and hence has not formed fossil.

- (c) Since more characteristics are shared between C and D, therefore they are more closely related.
- (d) The insect buried in hot mud is more likely to be preserved better, because it will not decompose quickly. Also the mud will harden on cooling, retaining the impression of body parts of the insect. Thus, insect buried in hot mud will be fossilised whereas other will not be.

- S69. [Hint]:** A trait may be inherited, but if it is recessive, it will not be expressed unless it is homozygous, e.g.,



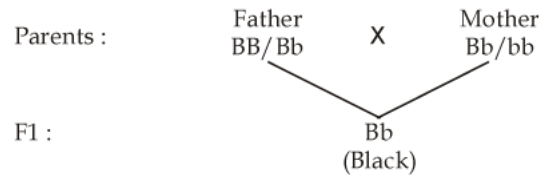
In F₂ generation he found that 75% plants were tall and 25% were dwarf.

- S70.** (a) Gene is a particular segment of DNA on a chromosome, that is capable of coding for a trait.
 (b) Speciation may take place by
 (i) Migration (ii) Mutation (iii) Genetic drift (iv) Natural selection
 (c) Given that

Red hair - Recessive \therefore bb

Black hair - Dominant \therefore BB.

This person inherits one recessive gene (b) from mother and a dominant gene (B) from father i.e.,



Hence, this person will have black hair as he is heterozygous for black.

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