

Heredity and Evolution

1 Mark Questions

1. Select the group which shares maximum number of common characters-

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

Ans. (d) two individuals of a species

2. Two pea plants one with round green seeds (RRyy) and another with

wrinkled yellow (rrYY) seeds produce F_1 progeny having round, yellow

(RrYy) seeds. When F_1 plants are selfed, the F_2 progeny will have the following combination of characters

- (a) 15:1
- (b) 9:3:3:1
- (c) 9:3:4
- (d) 12:3:1

Ans. (b) 9:3:3:1

3. Some dinosaurs had feathers although they could not fly but birds have feathers that help them to fly. In the context of evolution this means that-

- (a) reptiles have evolved from birds
- (b) there is no evolutionary connection between reptiles and birds
- (c) feathers are homologous structure in both the organisms
- (d) Birds have evolved from reptiles.

Ans. (d) Birds have evolved from reptiles.

4. What is monohybrid cross?

Ans. The cross which occurs between the plants showing two alternate forms of a trait (character).

5. What are autosomes and sex chromosomes?

Ans. Humans cell contain 23 pairs of chromosomes. Out of 23 pairs, 22 pairs are called autosomes, rest of 1 pair, which determine the sex of child is called sex chromosome.

6. Which of the following scientist gave the principles of inheritance?

- (a) Mendel
- (b) Griffin
- (c) Johanssen
- (d) Watson and Crick

Ans. (a) Mendel

7. Which of the following is not correct-

- (a) For every hormone there is a gene.
- (b) For every protein there is a gene.
- (c) For production of every enzyme there is a gene.
- (d) For every molecule of fat there is a gene.

Ans. (b) For every protein there is a gene.

8. According to the evolutionary theory formation of a new species occurs 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. Accumulation of variations over several generations.

9. Who coined the term 'gene'?

Ans. Johanssen (1909) coined the term gene.

10. What are dominant genes?

Ans. Gene which expresses itself is called dominant gene.

11. The concept of origin of species by natural selection was given by.

- (a) Lamarck**
- (b) Weismann**
- (c) Darwin**
- (d) Linnaeus**

Ans. (c) Darwin

12. If a round green seeded pea plant (RRYY) is crossed with wrinkled yellow seeded pea plant (rr yy) the seeds to be produced in F₁ generation will be.

- (a) Wrinkled and yellow**
- (b) round and green**
- (c) wrinkled and green**

(d) round and yellow.

Ans. (b) round and green

13. The genetic constitution of an organism is called.

(a) Genotype

(b) phenotype

(c) variation

(d) gene.

Ans. (a) Genotype

14. Write the scientific name of the plant on which Mendel carried out his experiments.

Ans. *Pisum sativum*

15. How many autosome are present in human sperm?

Ans. 22

16. Two pink colored flowers on crossing results in 1red, 2pink and 1white flower progeny. The nature of the cross is-

(a) cross fertilization

(b) self pollination

(c) double fertilization

(d) no fertilization

Ans. (a) cross fertilization

17. A basket of vegetable contains carrot, potato, radish, and tomato. Which of them represent the correct homologous structure

- (a) carrot and potato**
- (b) carrot and tomato**
- (c) radish and carrot**
- (d) radish and potato**

Ans. (c) Radish and carrot.

18. Mendel proposed that every character is controlled by-

- (a) one factor**
- (b) two factors**
- (c) one chromosome**
- (d) two chromosomes**

Ans. (b) Two factors.

19. Who is called father of genetics?

Ans. Gregor Mendel.

20. What is the scientific name of human being?

Ans. Homo sapiens

21. The theory of chemical evolution of life was experimentally demonstrated by-

- (a) Oparin**
- (b) Miller and Urey**
- (c) Mendel**

(d) Darwin

Ans. (b) Miller and Urey

22. Genetics is the study of-

(a) resemblances amongst individuals

(b) heredity and environment

(c) differences amongst individuals

(d) Heredity and variations.

Ans. (d) Heredity and variations.

23. Wing of a bird and wing of an insect are

(a) Homologous organs

(b) analogous organs

(c) vestigial organ

(d) both (a) and (b)

Ans. (a) Homologous organs

24. What is heredity?

Ans. The inheritance of character from parents to offsprings is called heredity.

25. What are Mendelian factors?

Ans. Heredity units which inherit character from parents to offsprings are called Mendalian factors.

26. A Mendelian experiment consisted of breeding tall pea plants bearing violet flowers with short pea plants bearing white 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 can be depicted as

(a) TTWW

(b) TTww

(c) TtWW

(d) TtWw

Ans. (c) TtWW

27. An example of homologous organs is

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

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

(c) Potato and runners of grass.

(d) All of the above.

Ans. (d) All of the above.

28. 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.

29. What happened when Mendel crossed two traits of a character in a pea plants?

Ans. Only dominant trait appeared in F

30. Who provided experimental evidence to support theory of origin of life from inanimate matter?

Ans. Miller and Urey

31. A normal pea plant bearing colored flowers suddenly start producing white flowers. What could be the possible cause?

Ans. The appearance of white flowers is due to mutation.

32. Mention any two recessive traits of garden pea.

Ans. Dwarf (height of plant), wrinkled seed

33. What is called phylogenetic system of classification?

Ans. Classification based on evolutionary relationships of organisms.

34. What will be the percentage of ab gametes produced by AaBb parent?

Ans. 25 percent

35. Mendel crossed a pure white recessive pea plant with a dominant pure red flowered plant. What will be the first generation f hybrids.?

Ans. Allred

36. Name the chemicals which were essential for origin of life.

Ans. Proteins and nucleic acid

37. Why males are called heterogametic?

Ans. Because they have dissimilar sex chromosomes.

38. What is the percentage possibility a couple of having daughters?

Ans. 50 percent

39. Name 2 organisms in which sex determination is regulated by environmental factors.

Ans. Turtle, lizard

40. Clones of sheep are carbon copy of each other except physical health. What kind of variation is it?

Ans. Phenotypic variation

2 Mark Questions

1. Why acquired traits are not inherited?

Ans. Acquired traits are those which are developed in the organisms during their life time. These traits are because of non-reproductive tissue, so cannot be passed.

2. How evolution and classification are linked?

Ans. Classification is the arrangement of organisms into groups on the basis of their characteristics. Characteristics are details of appearance or behaviour.

Classification based on evolution is considered the most advanced and effective.

The classification of organisms/ species into groups is a reflection of their common ancestors and hence evolutionary relationship also.

3. What are coacervates?

Ans. First life molecules which are formed due to formation of membrane around amino acids, sugars and nitrogenous bases aggregates are called coacervates. Further development in coacervates leads to origin of life.

4. How do the two factors for a character, present in diploid cells, behave at the time gamete formation?

Ans. Two factors called X and Y, segregate during gamete formation. Hence gamete is either X or Y.

5. Give the pair of contrasting traits of the following characters in plant and mention which one is recessive and which is dominant?

(a) yellow seed

(b) round seed

Ans. (a) Green seed- Dominant

Yellow seed- Recessive

(b) Wrinkled seed – Recessive

Round seed- Dominant

6. Mention two important features of fossils which help in evolution.

Ans. (a) Fossils provide direct evidence of evolution

(b) Fossil records also provide missing links between two groups of organisms, for example- Archaeopteryx.

7. What do you understand by the term natural selection?

Ans. According to theory of Natural selection, Nature select fittest animal for animal those who not fit, are eliminated by nature itself.

8. Mention the compliment of a sperm and the egg which will determine the birth of female child.

Ans. For girl child, sperm has X chromosome and egg also has X chromosome.

9. What is emasculation? Why is it done?

Ans. Removal of anther to avoid pollination in experimental plant is called Emasculation.

10. What is gene? Where are genes located?

Ans. Segments of DNA are called gene.
Genes are located on chromosomes.

11. How many contrasting characters did Mendel see in garden pea? Give any two of them.

Ans. Mendel observed seven contrasting characters in pea plant.
For Ex- flower position- axial and terminal. seed shape- round and wrinkled.

12. What is phenotypic ratio obtained by Mendel by monohybrid cross?

Answer with the help of diagram.

Ans.

P generation -

Purple Flowers (PP) X White Flowers (WW)

F1 generation

PW
Purple Flowers

VUKOM.Com

Gametes

P

W

P

PP
Purple

PW
purple

W

PW
Purple

WW
white

Phenotypic ratio = 3:1

13. Why acquired characters are not inherited?

Ans. Acquired traits are those which are developed in the organisms during their life time. They are not inherited to next generations. These traits are because of non-reproductive tissues, so cannot be passed.

14. How is the chromosome number restored in zygote?

Ans. Gametes (male and female) have N number of chromosomes. During fertilization gametes fuse and form zygote. Zygote retains 2N number of chromosomes.

15. What are variations? Give their types.

Ans. Although offspring of the same parents resemble one another as to their parents, yet there are differences among them. These differences are called variations. It is of two types-

(a) Reproductive- Passed from one generation to another.

(b) Non reproductive- Not passed from one generation to another.

16. Write difference between Autosomes and Allosomes.

Ans.

Autosomes	Allosomes (Sex Chromosomes)
Chromosomes which are not connected with sex determination.	Chromosomes which are connected with sex determination.
Similar in males and females.	Dissimilar in males (XY) and female (XX).
Generally 44 or 22 pairs in human beings.	Generally 2 or one pair in human beings.

17. What will be the sex of the embryo if an egg is fertilized by the sperm having

(a) $22+x$ and

(b) $22+y$ composition

Ans. (a) Female

(b) Male.

18. Mention two sources of variation.

Ans. (1) Errors in DNA copying.

(2) Random fertilization.

19. What is monohybrid and dihybrid cross? Give one example of each.

Ans. Monohybrid cross- It is the simplest cross in which inheritance of one character is studied. A cross is made between the pair of plants having one contrasting character such as tall or dwarf.

Dihybrid cross- A cross made between two plants having two pairs of contrasting character is called dihybrid cross. For ex. round and green seed crossed with yellow and wrinkled seed.

20. Why did Mendel choose pea plant for his experimentation?

Ans. Mendel selected garden pea for his experiment for the following reasons-

(a) The life span of this plant is very short so results can be obtained and studied faster.

(b) Garden pea has many characteristics which are in contrast to each other.

(c) Moreover this plant is small, easy to grow and reproduce large number of offsprings.

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

Ans. Trait B.

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

Ans. The different ways in which individual with a particular trait may increase are:

(a) Natural selection- Certain variations give survival advantage to individuals in a population in a changed situation resulting in increase of their population.

(b) Genetic drift- Accidents in small population even if they give no survival advantage also lead to increase to certain individual in population.

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

Ans. Any change in non-reproductive tissues cannot be passed on to the DNA of the germ cells. Therefore, the traits acquired during life-time on an individual are not inherited.

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

Ans. It will affect the frequency of selection which is essential for survival. For effective selection, the population must consist of an infinitely large number of individual in population.

25. Give an example of characteristics being used to determine how close two species are in evolutionary terms.

Ans. Analysis of the organ structure in fossils allows us to make estimates of how far evolutionary relationships go. For example presence of feather in some fossils dinosaurs indicate the birds are closely related to reptiles.

26. Can the wing of a butterfly and the wing of the bat be considered homologous organs?

Ans. No, though the function of wing in both the cases is same but their structural plan and origin is different.

27. Why are human beings who look so different from each other in terms of size, colour and looks said to belong to the same species?

Ans. The human beings are different from each other in terms of size, colour but are said to belong to the same species. This is because, despite of great diversity of human forms and features in different human races across the planet, the genetic footprints of all human beings can be traced back to same common ancestry of African roots. All humans are a single species and have originated from Homo sapiens, who were the earliest members of the human species in Africa. As there have been no well set geographical or reproductive isolation among different members of human species, this has led to numerous genetic makeups of traits with slight variation.

28. In evolutionary terms, can we say which among bacteria, spiders, fish and chimpanzees have a 'better' body design? Why or why not?

Ans. In evolutionary terms, we can not say which among bacteria, spiders, fish and chimpanzees have a 'better' body design. The notion of Better body design among different species is not justifiable. Because evolutionary process takes into account the development of most efficient and suitable features in body designs of organisms for survival and adaptation favoring to a particular niche. For example, organisms with Complex and seemingly better body design, may not survive particular situation. Whereas, organisms like bacteria with its primitive body design and simple microbial life form may survive in the most inhospitable and extreme environmental conditions that are extraordinarily hot, cold or acidic. Bacterial microbes can be found everywhere — deep under polar ice, in deserts,

around volcanic eruption on earth surface or thermal vents under deep sea or over earth surface, or even in outer space.

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

Ans. When we classify organism we look for similarities among organism which allows us to group them. Based on these principles we can work out the evolutionary relationship to the species.

30. Explain the importance of fossils in deciding evolutionary relationship.

Ans. (i) Study of fossils allow us to make estimates of how far back evolutionary relationship go organisms.

(ii) Study of age of fossils allows us to know which organisms evolved earlier and which later.

31. Write the characteristics on the basis of which duck-billed platypus is considered as a link between reptiles and mammals.

Ans. The characteristic resembling reptiles is laying of eggs and the characteristics resembling mammals is presence of mammary glands.

32. Why are the small number of surviving tigers a cause of worry from the point of view of genetics?

Ans. As the population of tigers is decreasing, there is loss of genes from the gene pool and there can't be recombinations and variations, thus no evolution.

33. How one is change adopted to perform different functions? Give one example

Ans. In evolution, one change occurred initially is used to perform other functions. For example, feathers were evolved for warmth, later they were adapted for flight.

34. Why are asexually reproducing organisms capable of showing hereditary features?

Ans. Asexual reproduction tends to preserve the similarities among all the individuals belonging to a give line of descent. Therefore, asexually reproducing organisms are capable of showing hereditary features.

35. If the sperm bearing Y-chromosome fertilizes the egg, the child born will not be entirely like his father. Why is it so?

Ans. It is so because the other sex chromosome, ie the X-chromosome will also have its effects And other autosomes of the egg will also show their characteristics.

36. In evolutionary erms, which among-bacteria, spider, fish and chimpanzee have a “body design? Why or why not?

Ans. Chimpanzee have the better body design as compared to others given. They are better adapted for locomotion, communication and thinking.

37. What is an offspring?

Ans. In sexual reproduction organisms raised are as a result of crossing over and exchange of gene segments and are known as offspring.

38. What are inherited traits? Give one example.

Ans. The characteristics which are transmitted from parents to their offsprings are called inherited traits. E.g. free and attached earlobes.

39. When Mendel crossed a Tall plant with a dwarf plant, no medium height plants were obtained in F generation. Why?

Ans. Because dominant genes express themselves and suppress the effect of recessive genes. So no medium sized plants were obtained.

40. The human hand, cat paw and horse foot when studied in detail show the same structure of bones and point towards a common origin.

i. What do you conclude from this?

ii. What is the term given to such structures?

Ans. (i) We can conclude that these organs had a similar origin.

(ii) They are Homologous organs.

41. How do we know how old a fossil is?

Ans. There are two methods:

(i) Relative method when we dig into the earth, the fossils we find closer to the surface are more recent than the fossils we find in deeper layers.

(ii) By detecting the ratios of different isotopes of the same element in the fossil material.

42. What will be the sex of a baby if sperm carrying X chromosome fertilizes egg in human beings. Why?

Ans. It will be a baby girl because fusion of gametes having X chromosomes leads to homozygous condition producing zygote with XX composition.

43. Feather imprints were preserved along the dinosaur's bones but dinosaurs could not fly. What was the significance of feathers in reptiles and later on for other species?

Ans. It is believed that feathers in dinosaurs might have provided insulation in cold weather but later on became useful for flights in birds.

44. What will be the blood groups of offspring's produced by the parents having following genotype?

Male -II

Female 1

Ans.

$\downarrow \text{GAMETES} \rightarrow$	I^O	I^A
I^A	$I^A I^O$ (i)	$I^A I^A$ (ii)
I^B I	$I^B I^O$ (iii)	$I^A I^B$ (iv)

Blood groups will be:

(i) A

(ii) A

(iii) B

(iv) AB

45. A woman with blonde curly hair married a man with black soft hair. All of their children in first generation had black soft hair but in next generation children had different combinations in the ratio of 9:3:3:1. State the law that governs this Expression

Ans. Law of independent assortment which states that the factors of different pairs of contrasting characters do not influence each other. They are independent of one another in their assortment.

3 Mark Questions

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

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

2. What are the different approaches to determine evolutionary history of man?

Ans. To construct evolutionary history of man, there are three approaches-

(1) Historical method- It gives direct evidence in the form of fossil records. The age of fossils can be determined by carbon dating methods.

(2) Comparative method- By comparing several existing forms, we can make ideas about their common ancestors and reconstruct their possible history.

(3) Analytic method- By observing present day human being vestigial organs and by studying the development pattern from embryo to adult.

3. What is fossilization? How are fossils formed?

Ans. The process of fossils formation is called fossilization. Fossils are formed when organisms die; their bodies get decomposed and lost. Sometimes the body or a part of it may be in such an environment that it does not let it decompose completely. The mud will eventually harden and retain the impression of the body parts of the organism. This mud with the impression will be called fossil of the organism.

4. What are homologous and analogous organ? Explain with the help of example.

Ans. Homologous organs are those which have similar basic structure and origin but may have different functions. For example- Hands of human beings and wings of birds.

Analogous organs- Organs which have different basic structure and origin but have similar function are called analogous organs.

For example- (1) wing of bat and wing of bird.

(2) wing of birds and wing of insect.

5. Differentiate between convergent and divergent evolution.

Ans.

Convergent Evolution	Divergent Evolution
Adapted for similar function.	Adapted for different function
Analogous organ.	Homologous organ.
Do not indicate evolutionary relationship.	Indicate evolutionary relationship.

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

Ans. The factors which are responsible for raising a new species are selection of environmental conditions for survival of a particular species. 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 in the population.

7. What are the different theories about origin of life?

Ans. (a) Theory of special creation- According to this theory the almighty god created life.

(b) Theory of spontaneous generation- According to this theory, life originated from non-living materials by the process of a biogenesis wring mud, decomposing matter, sun, air and water, etc.

(c) Cosmozoic theory- It states that life came to Earth from some heavenly bodies in the form of spores or seeds.

(d) Biogenesis- This theory states that life originated from pre-existing life.

(e) Modern theory of origin of life- According to this, complex organic molecule was formed from simple inorganic molecules only in suitable condition.

8. What is the difference between chemical evolution and organic evolution?

Ans.

Chemical Evolution	Organic Evolution
It is the formation of the complex organic compound from simple compound or element.	It is the formation of complex form of life from simple form of life.
It occurred at the time of origin of life.	It is still occurring.
Irreversible.	Reversible.
Speed of evolution is fast.	Speed of evolution is slow.

9. Give difference between homologous and analogous organs.

Ans.

Homologous organs	Analogous organs
Similar in origin and basic structure but may differ in function.	Dissimilar in origin and basic structure but may have similar function.
Provide idea of common ancestry.	Do not provide the idea of common ancestry.
For Ex- hands of human beings and forelimbs of horse.	For ex- wing of birds and insects

10. State three laws of Mendel.

Ans. Mendel's law-

- (a) Law of dominance- when two dissimilar factors of a character are present in an organism only one expresses itself (dominant factor) while other remain unexpressed (recessive factor)
 - (b) Principle of segregation – two factors of a character are separated at the time of gamete formation and each gamete gets only one factor for that character.
 - (c) Principle of independent assortment- this principle states that inheritance of two or more pair of contrasting traits is such a way that one pair of contrasting traits is independent of the other pair of contrasting traits.
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11. Describe how the sex of the offspring is determined in the zygote in human beings?

Ans. The males can produce two types of gametes, either X-type or Y-type. The females produce only one type of gametes or ova, X-type. If X-type sperm fuses with the ovum, then the sex of the baby will be female. If Y-type sperm fuses with

the ovum, then the sex of the baby will be male. Sex of the baby is decided at the time. Sex of the baby is decided at the time of fertilization.

12. Give a suitable explanation for “geographical isolation of individual of a species lead to formation of a new species?”

Ans. Reproduction barrier such as river (geographical isolation) between the sub population leading to:

- (a) Genetic drift or random changes in the gene frequency by chance alone e.g. selection of red or blue beetles instead of green in presence of crows.
 - (b) Natural selection or selection of the fittest by nature itself eg. Selection of green beetles instead of red ones in the presence of crows.
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13. State the evolutionary force which leads to origin of a new species.

Ans. Various elemental forces of evolution are-

- (a) Mutation
 - (b) Recombination (Crossing over during meiosis, Random assortment of gene at the time of gamete formation).
 - (c) Natural selection or survival of the fittest.
 - (d) Genetic drift.
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14. What is a fossil? How do fossils tell us about the process of evolution?

Ans. The dead remains of former living organisms are called fossils. The branch of biology which deals with the study of fossils is called paleontology. The study of fossils tells us that species arose from previously existing ones or that the evolution has occurred in nature and is still continuing.

15. Give difference between diploid and haploid.

Ans.

Diploid	Haploid
Two chromosomes set.	One chromosome set.
Chromosomes present in pairs.	Chromosomes present in singly.
Formed due to mitosis.	Formed due to meiosis
Found in Human beings and higher plants.	Found in lower plants.

16. Who disproved Lamarckism and how?

Ans. The concept of inheritance of acquired character of Lamarck was disproved by August Weismann. He cuts the tail of rat at the time of birth and continued this for 21 generation. But tailless rats were never born. This trait do not change the DNA of germ cells so cannot be inherited. Hence, the changes in non-reproductive tissue of an individual during its lifetime cannot be passed on to its progeny, and cannot direct evolution.

17. How does Archaeopteryx provide evidence for organic evolution?

Ans. Archeoptyrx has some features of reptiles, characters of dinosaurs as well as some features of birds like wings. This shows that birds are closely related to reptiles. Birds could evolve from reptiles.

18. What is divergent evolution? Explain with the help of an example.

Ans. The formation of dissimilar looking organisms from common ancestors is called divergent evolution. This is also known as adaptive radiation which represents evolution of new forms in several directions from the common ancestors

type. The current example of such a process is the evolution of wild cabbage. For over more than 200 years, humans have cultivated wild cabbage as a food plant and generated different vegetables (like cabbage, broccoli, cauliflower, kohlrabi and kale etc) from it by different artificial selections. Thus all these structures of different vegetables are descended from the same ancestor i.e. wild cabbage.

19. What is the difference between reproductive and non-reproductive variations?

Ans.

Non-Reproductive Variation	Reproductive Variation
Variation in somatic cells.	Variation in germ cells.
Not passed from one generation to another because they do not change the DNA of germs cells.	Passed from one generation to another because they change the DNA of germs cells.
Die with the death of the organism.	Do not die with the death of the organism.
Cannot direct evolution.	Can direct evolution.

20. Write similarities between Mendalian's factors and gene.

Ans. Mendel proposed the inheritance of traits from parents to offsprings by hereditary units called factors. Mendel suggested that every character is controlled by a pair of factors. Sutton and Boveri (1902) found striking similarities between the behaviours of Mendelian factors and the chromosomes during meiosis and fertilization. Factor and chromosomes are present in paired condition in the parents, seprate during meiosis and again get paired after fertilization.

21. How does the creation of variations in a species promote survival?

Ans. Depending on the nature of variations different individuals would have difference kinds of advantage to adjust in particular habitat. Variation help the individual to have different traits that may develop the organisms more tolerable.

22. How do Mendel's experiments show that traits may be dominant or recessive?

Ans. In Monohybrid cross of Mendel between tall and dwarf pea plant, all progeny in F_1 generation are tall and in F_2 generation, 75% of pea plants are tall but 25% are dwarf. This shows that traits are dominant or recessive.

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

Ans. When a pea plant having round green seeds is crossed with a pea plant having wrinkled yellow seeds in F_1 generation all the plants have round yellow seeds. But in F_2 generation two new traits that is round yellow and wrinkled green appear. This shows that traits are inherited independently.

24. A man with blood group A marries a woman with 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, the information is not enough because the blood group is determined by a pair of gene. One inherited from mother and other from father. In this case, the child inherited gene for O blood group from mother as well as father.

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

Ans. A child which inherits X chromosome from her father will be a girl and one who inherits Y chromosome from him will be a boy.

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

Ans. Following factors could lead to the rise of new species:

- (a) Changes in gene frequency in small breeding isolated populations.
 - (b) Natural selection
 - (c) Changes in number of chromosome.
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27. Will geographical isolation be a major factor in the speciation of self-pollinating plant species? Why or why not?

Ans. No, because geographical barrier do not allow breeding between such individuals of a population which reproduce sexually. Moreover asexually reproducing organism pass on the parental DNA to offspring which gives no chance of speciation.

28. Will geographical isolation be a major factor in the speciation of an organism that reproduces asexually? Why or why not?

Ans. Yes, due to geographical isolation, the two populations are separated. The levels of gene flow between them will decrease. The isolated population will breed with local population resulting in entry of isolated population into new population.

29. What are fossils? What do they tell us about the process of evolution?

Ans. Preserved traces of living organisms are called fossils. Fossils found closer to the surface of earth are more recent in origin than the fossils we find in deeper layers. Fossils also help us to find evolutionary relation between organisms.

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

Ans. No, since two copies of traits are inherited from parents, one from mother and the other from father. Unless we know the nature of these two variants of traits we can not tell which is dominant and which is recessive. Recessive traits appear when both the parents contribute recessive allele. From this statement we can only presume that both parents are contributing recessive allele.

31. Explain the terms analogous and homologous organs with examples.

Ans. Analogous organs: Such organs which perform similar function but are different in structure and origin. Example- Wings of birds and wings of insects.

Homologous organs: Such organs which may have different functions but similar structure and origin. Example- fore arm of frog, lizard and bird.

32. What evidence do we have for the origin of life from inanimate matter?

Ans. The evidence was given by Stanley L. Miller and Harold C. Urey in 1953. They assembled an atmosphere similar to that thought to exist on early earth over water. This was maintained by them at a temperature just below 100 degree Celsius and sparks were passed through the mixture of gases to simulate lightning. At the end of week, they found that 15% of the carbon had been

converted to simple compounds of carbon including amino acids which make up protein molecules.

33. Explain how sexual reproduction gives rise to more viable variations than asexual reproduction. How does this affect the evolution of those organisms that reproduce sexually?

Ans. Variations arise either because of errors in DNA copying or as a result of sexual reproduction. Due to sexual reproduction genetic variability increases in the population from one generation to another. This happens due to the fact that sexually reproducing organism inherits half the genes from each parent. These variations are very important for the process of evolution.

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

Ans. No, depending on the nature of variations different individuals have been different kinds of advantages. However, when a drastic change occurs in environment only those organisms in the population will survive which have an advantageous variation in that population to survive in changed environment.

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

Ans. Equal contribution of male and female parents is ensured in progeny during sexual reproduction. Each trait of progeny is determined by a pair of alleles and gametes of male and female contain one allele. Each allele pairs during fertilisation combine together to determine traits. Thus, the traits of progeny are determined by equal genes from male and female.

36. Is it true that when a new species is emerged, the old species is eliminated and why?

Ans. No, it is not true that when a new species is emerged, the old species is eliminated. Because when there is a change in any species, the change is only in a part or a few members of the species population. If the newly generated species after genetic change is better in any way, it will get more opportunity to survive and if the genetic change is against the environment, it will die. Thus, unchanged members of other species may also remain and tend to live in changed environment.

37. Why are traits acquired during life-time of an individual not inherited?

Ans. Traits acquired during life-time of an individual not inherited because change in non-reproductive tissue or somatic cells cannot be passed on to the DNA of germ cells. Thus, the acquired trait will die with the death of the individual. It is therefore non-heritable and cannot be passed on to its progeny.

38. The gene type of green stemmed tomato plants is denoted as GG and that of purple stemmed tomato plants as gg when these two are crossed.

- i. What colour of stem would you expect in F_1 progeny?**
 - ii. Give the percentage of purple stemmed plants if F_1 are self pollinated.**
 - iii. In what ratio would you find the gene types GG and Gg in the F_2 progeny?**
- Ans. i.** Colour of F_1 progeny — Green
- ii.** Percentage of purple stemmed plants in F_2 generation $\frac{1}{4}$ or 25%.
- iii.** Ratio of genotypes GG and Gg 1:2
-

39. What are the causes of variations in clones?

Ans. i. inaccuracies during DNA copying

- ii. Effect of environment termed acquired variation.
 - iii. Mutations are sudden stable changes which are discontinuous inheritable as produced due to changes in genetic make-up.
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40. Only variation that confer and advantage to an individual organism will survive in a population. Do you agree with this statement? Why or why not?

Ans. We agree with the statement. All the variation do not have an equal chance of surviving in the environment in which they find themselves. The chances of surviving depend on the nature of variation. Different individuals have different kind of advantages. A bacteria that can withstand heat will survive better in heat wave.

41. Study the given data and answer the questions following the data: Parental plants cross fertilised and seeds collected F_1 First Generation offsprings F_2 Offsprings of self pollination of F_1 Male parents always bare red flowers, Female parent always had white flowers, 330 seeds sown and observed, All 330 gave red flowers, Out of 44 seeds 33 seeds gave plants with red flowers and 11 seeds gave plants with white flowers.

i. What is the term for this type of cross?

i What does the data of the column marked F indicate?

iii. Express the gene type of the (a) parents (b) F_1 progeny and (c) F_2 progeny

Ans. i. Monohybrid cross

ii. Red colour of flower dominant over white flower

iii. a. Parents – (RR) and (rr)

b. F_1 progeny – Rr

c. F_2 progeny – RR, Rr and rr

42. Wild cabbage was converted into number of variants like cauliflower, broccoli and cabbage by man. What is this process known as ? Does it play an important role in organic evolution?

Ans. This process is known as artificial selection. It plays an important role in organic evolution because it is parallel to natural selection. It helps to produce new species having useful traits in less time.

43. How are variant genotypes produced?

Ans. Variant genotypes can be produced by:

1. Mutation in genes and chromosomes.
 2. Recombination of genes.
 3. Hybridization of genes.
-

44. Can geographical isolation lead to speciation? How?

Ans. Yes, geographical isolation can lead to speciation. Due to geographical isolation, the members of two sub groups may not be able to interbreed as a result of genetic drift. Natural selection also operates differently in these subgroups. This leads to speciation.

5 Mark Questions

1. (i) Who provided the evidence of DNA as genetic material?

(ii) Why DNA is called polynucleotide?

(iii) List three important features of double helical model of DNA.

Ans. (i) Mendel.

(ii) DNA is made up many units of nucleotides.

(iii) Important features-

(a) Both the chains in helical runs anti-parallel.

- (b) There two nitrogenous base Purine (A, G) and pyrimidine (T, C).
(c) A always bind with T and C always binds with G.
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2. Give the basic features of the mechanism of inheritance.

Ans. Basic features of mechanism of inheritance-

- (a) Each character is controlled by a pair of factors. The factors may be similar or dissimilar.
(b) When two dissimilar factors of a character are present in an organism, only one expresses itself while other remains unexpressed.
(c) Two factors of a character are separated at the time of gamete formation and get only one factor for that character.
(d) Inheritance of two or more pairs of contrasting traits in such a way that one pair of contrasting traits is independent of the other pairs of contrasting traits.
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3. Outline a project which aims to find the dominant coat colour in dogs.

