

1. State one advantage of variation of a species. [2009]

Ans. The variation of a species increases the chance of its survival in a changing environment.

2. What is the effect of DNA copying which is not perfectly accurate on the reproduction process? [2008]

Ans. DNA copies generated will be similar but it will not necessarily be identical to the original.

3. What decides that humans give rise to humans? (Imp.)

Ans. It is the heredity that decides that humans give rise to humans.

4. What are hereditary characteristics?

Ans. The characteristics which can be passed from parents to the children are called hereditary characteristics.

5. Are the variations created by sexual reproduction heritable or non-heritable? (Imp.)

Ans. The variations created in sexual reproduction are heritable.

6. What are the components of a chromosome? (Imp.)

Ans. Two chromatids attached at a centromere, together form a chromosome.

7. What is a retrovirus?

Ans. A virus that has RNA as its genetic material is known as a retrovirus, e.g., AIDS virus.

8. What is a sex chromosome?

Ans. A chromosome that helps in determining the sex of an individual is known as a sex chromosome.

9. How many chromosomes are there in a human ovum?

Ans. 23 chromosomes.

10. Who coined the term 'factor'? (Imp.)

Ans. The term 'factor' was coined by Mendel.

11. Give the monohybrid ratio.

Ans. Monohybrid ratio = 3 : 1.

12. Write the dihybrid ratio.

Ans. Dihybrid ratio = 9 : 3 : 3 : 1.

13. Define the term 'speciation'.

Ans. Speciation is the formation of new species from pre-existing species. Speciation depends on distribution of population, mutation, micro-evolution and macro-evolution.

14. What is a factor?

Ans. The carriers of hereditary information were called factors by Mendel.

15. Name the most accepted theory of evolution.

Ans. Synthetic theory of evolution.

16. Define the term 'evolution'.

Ans. Evolution can be defined as the gradual unfolding of the organisms from pre-existing organisms through change since the beginning of life.

17. Whose theory influenced Darwin? What did Darwin fail to explain? (Imp.)

Ans. The theory of Malthus inspired Darwin. Darwin failed to explain how variations arise.

18. Define 'recessive characteristic'.

Ans. Any characteristic present in the parental generation that does not appear in F1 generation but reappear in F2 generation is known as recessive character.

19. What is the basis of sex determination in most plants and animals? (Imp.)

Ans. In most plants and animals genetic basis of sex determination is gamete (chromosome).

20. What are fossils? What do they tell about the process of evolution? [2008]

Ans. The preserved traces or impressions of the body parts of living organisms are called fossils. Since fossils reveal evolutionary relationships among different organisms, they are the proof of organic evolution.

Two marks

1. 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 species, which trait is likely to have arisen earlier?

Ans. In asexual reproduction there very small variation in trait due to small inaccuracies in DNA copying . Therefore, trait B which exists in 60% of population must have arisen earlier than trait A which occurs in 10% of the population.

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

Ans. The variations generated in offspring do not have equal chances to survive and get inherited in the next generation as number of environment factors as well as on the nature of variation. For example, in a heat wave most of the bacteria will die but a few having pre-adaptation or variation to tolerate heat wave, will survive and multiply.

3. 'Variations that confer an advantage to an individual organism only will survive in a population.' Justify. [2008]

Ans. Useful variations give advantage to individuals in obtaining more food, reproduction, adaptation to environmental changes and higher success in the struggle for existence. They give benefit in survival and increasing the population. Differential reproduction increases the useful variations in the populations. Other individuals with harmful variations will be destroyed. For example, some bacteria have ability to tolerate high temperature. But other non-resistant bacteria will be killed.

4. What do you understand by the term heredity? [2008]

Ans. The transmission of recognisable traits or characters like height, complexion, eye-colour, shape of nose, shape of chin, etc. from the parents to their offspring is called heredity.

5. What constitutes the link between one generation and the next? [2008]

Ans. The hereditary information is transferred from parents to offspring through the gametes. So, gametes constitute the link between one generation and the next and pass on the paternal and maternal characters to the offspring.

6. "The sex of the children is determined by the what they inherit from their father and not from the mother."

Justify. [2008]

Ans. The children inherit similar chromosomes (22 + X) from the mother but the sex of the children will depend on the chromosome they inherit from the father. If a child inherits (22 + X) chromosomes from the father that will be a girl but when a child inherits (22 + Y) chromosomes from the father that will be a boy. Therefore, the sex of a child is determined by the inheritance of X or Y chromosome from the father.

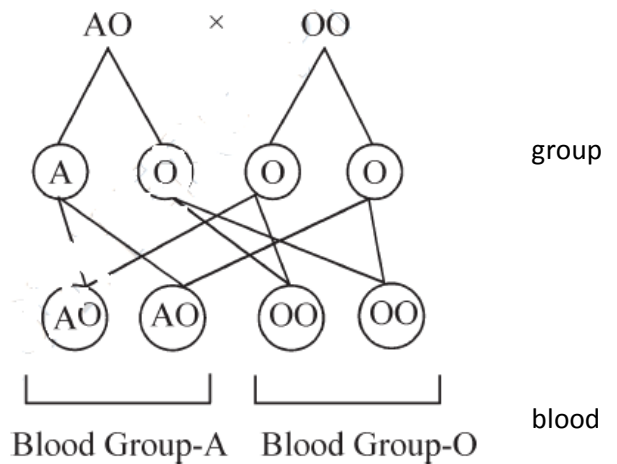
7. Explain the terms analogous and homologous organs with one example of each. [2008]

Ans. Analogous organs : — The organs which look alike and perform same functions but are quite different in basic structure and embryonic origin in different species are called analogous organs. For example, the wing of a bat and the wing of a bird are analogous organs.

Homologous organs : — The organs which are similar in basic structure but perform different functions in different species are called homologous organs. For example, the forelimbs of a human, a birds, a lizard and a frog show similarity in basic structures.

8. A man with blood group A marries a woman with blood 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? [2008]

Ans. Yes, the given information is enough. Blood group O is dominant. It is because the F1 progeny, i.e. daughter has group O which is dominant over blood group A.



see fig.

9. Define variation in relation to a species. Why is variation beneficial to the species? [2008]

Ans. The differences among the individuals of a plant or animal of a species are called variations. All the variations in a species do not equally survive in the environment where they are found. Depending on the nature of variation, different individuals have different types of advantages. For example – bacteria can survive in very high temperature also.

10. Describe briefly four ways in which individuals with a particular trait may increase in a population. [2008]

Ans. The individuals with a particular trait may increase in a population in the following ways–

- (i) Sufficient Food :- By obtaining more food the individuals can increase in growth and reproduction.
- (ii) Differential Reproduction :- It gives an advantage to the individuals to survive and reproduce.
- (iii) Variations : The useful variations help the individuals to adopt the environmental condition.
- (iv) Genetic Drift :- The random change in the frequency of alleles in a population over successive generations due to error during DNA copying on the gametes.

11. What are acquired characteristics? (Imp.)

Ans. Characteristics which people acquire during their lives, like knowledge and skills are called acquired characteristics. Development of muscles in an athlete is an acquired characteristic.

12. What is variation?

Ans. Variation is the difference or dissimilarity between parents and children as individuals of a species. It can be defined as the occurrence of difference among the individuals of a species.

13. Why is variation less common in asexually reproducing organisms?

Ans. Asexual reproduction tends to preserve the similarities among all the individuals belonging to a given line of descent. Therefore, asexually reproducing organisms show more hereditary features.

14. Clarify the term heredity and variation. (Imp.)

Ans. Heredity means continuity of features from one generation to another whereas variation is the occurrence of differences among the individuals.

15. Define variation in relation to a species. Why is variation beneficial to the species? (Imp.)

Ans. The differences or dissimilarities between the parents and the children as individuals of the same species are called variations.

Variation is beneficial to the species as

(i) they enable the organisms to adapt themselves in the changing environment.

(ii) variations form the basis of heredity.

(iii) they form raw materials for evolution and development of new species.

16. What are autosomes?

Ans. In females two copies of an unpaired chromosome are present along with paired chromosomes. These are known as sex chromosomes. The rest of the chromosomes are known as autosomes.

7. What is the reason that a male is called 'heterogametic'? (Imp.)

Ans. A male is called heterogametic because he forms two different types of gametes. One containing 'X' chromosome and the other containing 'Y' chromosome.

8. What was the basic study material of Mendel? How did he bring in the term 'factor'?

Ans. The basic study material of Mendel were the contrasting characters in various generations of garden pea. He said that these characters are controlled by units known as factors.

9. Why can the wings of a bird and the wings of a bat not be considered analogous? (Imp.)

Ans. Wings of a bird and a bat are modified forelimbs and hence, show structural similarity. Hence, they cannot be considered as analogous structures.

10. How did the Mendelian 'factors' acquire a change in the terminology? Who changed it?

Ans. The carriers of hereditary information were called 'factors' by Mendel. Johanssen later called these factors genes.

1. What is palaeontology? What is its importance? (Imp.)

Ans. Palaeontology is a branch of biology that deals with the study of fossils. It provides a direct evidence of evolution and is called a written document of evolution.

3 marks

1. The genotype of green stemmed tomato plants is denoted as GG and that of purple stemmed tomato plants is denoted as gg. When these two are crossed with each other :

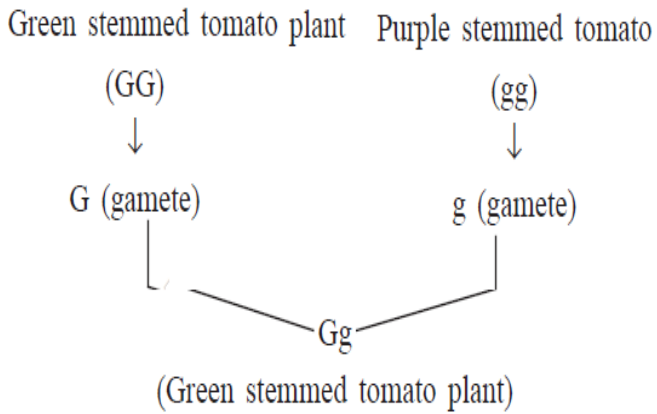
(a) What colour of stem would you expect in the F1 progeny?

(b) Give the percentage of purple stemmed plants if F1 plants are self pollinated.

(c) In what ratio would you find the genotypes GG and gg in the progeny?

Draw flow chart in support of your answer. [2011 (T-II)]

Ans. (a) Green stemmed tomato plant Purple stemmed tomato plant (b) If F1 plants are self pollinated 25% purple stemmed plants



♀ ↘ ♂ ↙	G	g
G	GG green stemmed	Gg Green stemmed
g	Gg Green stemmed	gg Purple stemmed

In F_1 generation, all the plants would be green stemmed.

(c) We would find the genotypes GG and gg in 1 : 1 ratio.

- 2. (a)** Name the plant used by Mendel to carry out his experiments.
(b) Study the following cross and answer the questions that follow :

Parents	Green and Wrinkled seed	×	Yellow and Round seed
F1 Generation	All Green and Round seeds		
F2 Generation	Green and Round (9)		Green and Wrinkled (3)
	Yellow and Round (3)		Yellow and Wrinkled (1)

(i) List the dominant and recessive characters.

(ii) Are the characters linked or independent? [2011 (T-II)]

Ans. (a) Garden Pea (*Pisum sativum*)

(b) (i) Dominant characters are Green and Round seeds.

Recessive characters are yellow and wrinkled seeds.

(ii) The characters are independent.

3. Acquired characters are not inherited. Justify the statement with an example. The wings of bat and the wings of insects are considered analogous organs. Why? [2011 (T-II)]

Ans. The acquired changes during a lifetime are not inherited by the progeny. It can be understood with the help of some examples such as —

If a group of mice having tail will breed, their progeny will also have the same type of tail but if the tail of all the mice is removed by surgery in each generation, no tailless mouse will be produced even after a few generations. It is because the removal of tail is a physical change which could not make a change in the gene responsible for the presence of tail in mice.

The wings of birds and the wings of insects are considered as analogous organs because they have different structures but perform the same function.

4. How has the method of artificial selection by humans helped in the evolution of different vegetables? Explain in brief giving an example. [2011 (T-II)]

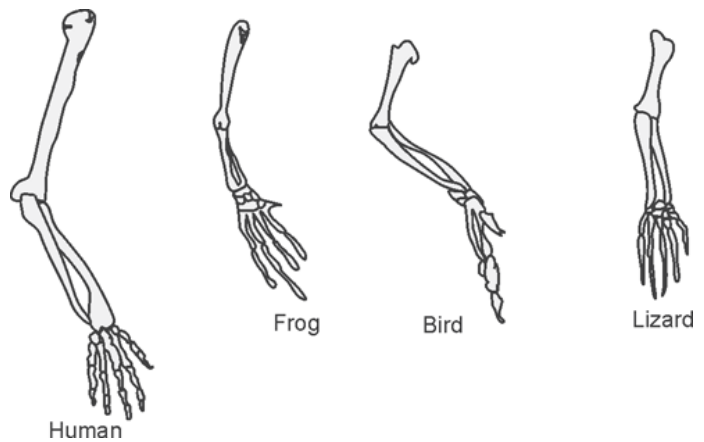
Ans. Humans have developed different varieties of vegetables from a single wild cabbage by artificial selection some of these are as follows —

- (i) Some farmers have wanted to select very short distances between the leaves and developed the present day cabbage.
- (ii) Some farmers selected immature green flowers and developed the broccoli.
- (iii) Some have selected the sterile flowers and developed the cauliflowers.
- (iv) Some farmers selected the swollen part of the wild cabbage and developed the kohlrabi.
- (v) Some of them have selected the larger leaves and developed Kale.

So all these vegetables are descended from a common ancestor.

5. (a) Write two factors which could lead to the rise of a new species.

(b) (i) What is the scientific term of the organs shown below? (ii) How do these organs provide evidence in support of evolution? [2011 (T-II)]



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

- (i) **Physical barrier** : Absence of gene flow amongst sub-populations due to the presence of physical barriers lead to the rise of a new species.
- (ii) **Gene Mutation** : A large mutation can make some members reproductively isolated from the rest. It leads to the rise of a new species.

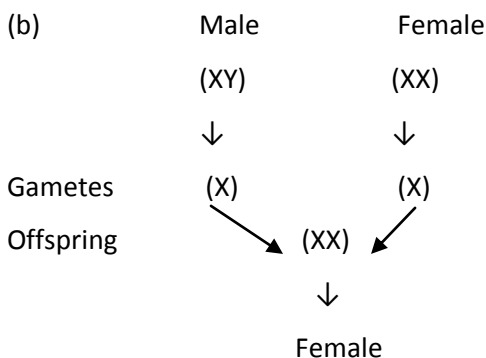
(b) (i) The organs shown above are homologous organs.

(ii) These organs are similar in basic structure and embryonic origin but perform different functions in different species.

6. (a) Name the type of sex chromosome present in human male and human female.

(b) With the help of a flow chart determine genetically in human beings the sex of the offspring if a sperm carrying X-chromosome fertilizes the egg? [2011 (T-II)]

Ans. (a) The type of sex chromosome present in human male and female is known as Chromosome.



If a sperm carrying X-chromosome fertilizes the egg, the offspring would be girl.

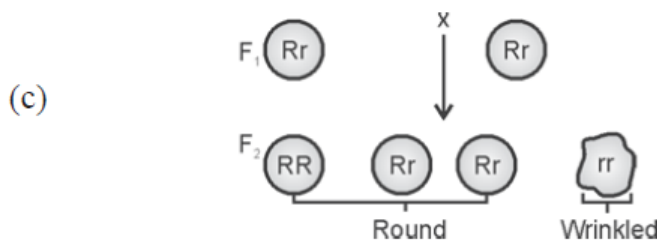
7. In pea plant round seed is dominant over the wrinkled. If a cross is carried between these two plants, give answer to the following questions. (a) Mention the genes for the traits of parents. (b) State the trait of F₁ hybrids. (c) Write the ratio of F₂ progeny obtained from this cross. What is the name of the cross? [2011]

The cross is monohybrid because in it only one pair of character is taken into consideration.

Ans. (a) The pea plant with round seeds — (RR)
The pea plant with wrinkled seeds — (rr)



The trait of F₁ hybrids is round (Rr)



Phenotypic ratio of F₂ progeny = 3 : 1

Genotypic ratio of F₂ progeny = 1 : 2 : 1

8. Guinea pig having black colour when crossed with guinea pig having same colour produced 100 offsprings out of which 75 were black and 25 were white. Now find out.

(a) What is the possible genotype of the guinea pig?

(b) Which trait is dominant and which trait is recessive?

(c) What is this cross called as and what is the ratio of F₂ progeny obtained from these cross?

[2011 (T-II)]

Ans. (a) The possible genotype of the guinea pig is Bb.

(b) Black colour is dominant and white colour is recessive.

(c) This cross is called monohybrid cross.

Phenotypic ratio of F₂ progeny is 3 : 1

Genotypic ratio of F₂ progeny is 1 : 2 : 1

9. Give appropriate terms for the following :

(a) The trait which can express itself in next generation.

(b) The trait an organism have due to inheritance.

(c) Origin of a new species from pre-existing one. [2011 (T-II)]

Ans. (a) Inherited trait (b) Inherited trait (c) Speciation

10. If a pure tall pea plant is crossed with a pure dwarf plant, then in the first generation only tall plants appear.

(a) What happens to the traits of the dwarf plant?

(b) In the second generation, the dwarf trait reappears. Why? [2011 (T-II)]

Ans. (a) According to law of dominance, "when a pair of contrasting characters are present together, only one is able to express itself in the F₁ generation while others remain suppressed". Dwarf trait is recessive trait which does not express itself in the hybrid (First generation).

(b) Both the characteristics (tall and dwarf) were inherited from the parents to F₁ progeny. In F₁ progeny only tallness character was expressed. However, the second generation progeny (F₂ progeny) expressed both characters in a particular ratio i.e. 3 : 1 (three tall and 1 dwarf).

11. How was it established that genes are located on the chromosomes? (Imp.)

Ans. In all the organisms, the number of chromosomes is fewer than the number of characteristic features, which are many. If 'genes' are responsible for a characteristic feature, they have to be certainly many more than the number of chromosomes. For example, in human beings, the total number of chromosomes is 23 pairs, but the total number of characters (genes) have been estimated to be between 30,000 to 40,000. This suggests that genes are located on the chromosomes.

12. Clarify the terms 'haploid' and 'diploid'. What is the relation between the two terms? **(Imp.)**

Ans. The paired condition of chromosomes is known as diploid whereas a set of unpaired chromosomes is said to be haploid.

During gamete formation, the diploid chromosomes segregate and haploid conditions achieved. After fertilisation, the diploid condition is again restored.

13. Explain the law of segregation by taking an example.

Ans. Law of segregation : Paired factors responsible for a character segregate into gametes and are recombined at the time of fertilisation.

When a yellow seeded and green seeded plants are crossed, the F₁ progeny are all yellow seeded. It indicates that yellow colour is dominant over green seed colour. When F₁ plants are selfed we get yellow and green seeded plants in the ratio of 3 :1.

14. Suggest three similarities between Mendel's 'factors' and 'chromosomes'.

Ans. Similarities between Mendel's factors and chromosomes are as follows :

- (1) Both Mendel's factors as well as chromosomes are present in pairs.
- (2) Both segregate during meiotic cell division to form gametes in which they remain unpaired.
- (3) After fertilisation the paired feature is again restored in the zygote which develops into an offspring.

15. Justify logically that many genes are present on one chromosome.

Ans. In all organisms the number of chromosomes is fewer than the number of characteristic features which are many. If 'genes' are responsible for characteristic features, they have to be certainly many more than the number of chromosomes.

16. Why are the traits acquired during lifetime of an individual not inherited? **[2009]**

Ans: This is because Acquired traits develop due to the effects of environmental factors, use and disuse of organs and special (conscious) efforts for example Learning of dance, music, etc.

Differences between Acquired and Inherited Traits :

Acquired Traits	Inherited Traits
☒ These are somatic variations.	☒ These are genetic variations.
☒ Acquired traits develop due to the effects of environmental factors, use and disuse of organs and special (conscious) efforts..	☒ Inherited traits develop due to reshuffling of genetic material and mutations
☒ These traits develop throughout the lifetime of an individual and die with the death of that individual.	☒ These traits are transferred (inherited) by the parents to their offspring. These do not die but are passed on to the next generation.
☒ Example— Learning of dance, music, etc, and muscular body of a wrestler..	☒ Example— Attached or free earlobe and curly hair