CHAPTER – 9

HEREDITY AND EVOLUTION

HOTS: (High Order Thinking Skill) Questions with Answers:

1. How one is change adopted to perform different functions? Give one example
2. What happened when Mendel crossed two traits of a character in a pea plants?
3. Who provided experimental evidence to support theory of origin of life from inanimate matter?
4. Why are asexually reproducing organisms capable of showing hereditary features?
5. If the sperm bearing Y-chromosome fertilizes the egg, the child born will not be entirely like his father. Why is it so?
6. A normal pea plant bearing colored flowers suddenly start producing white flowers. What could be the possible cause?
7. Mention any two recessive traits of garden pea.
8. Write the characteristics on the basis of which duck-biled platypus is considered as a link between reptiles and mammals.
9. Why are the small number of surviving tigers a cause of worry from the point of view of genetics?
10. What is called phylogenetic system of classification?
11. Is it true that when a new species is emerged, the old species is eliminated and why?
12. What will be the percentage of ab gametes produced by AaBb parent?
13. Mendel crossed a pure white recessive pea plant with a dominant pure red flowered plant. What will be the first generation of hybrids?
14. In evolutionary terms, which among-bacteria, spider, fish and chimpanzee have a “better” body design? Why or why not?
15. What is an offspring?
16. Why are traits acquired during life-time of an individual not inherited?
17. Name the chemicals which were essential for origin of life.
18. Why males are called heterogametic?
19. What is the percentage possibility a couple of having daughters?
20. Name 2 organisms in which sex determination is regulated by environmental factors.
21. What are inherited traits? Give one example.
22. When Mendel crossed a Tall plant with a dwarf plant, no medium height plants were obtained in F_1 generation. Why?
23. 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 F1 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 CG and Gg in the F_2 progeny?
24. 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?
25. What are the causes of variations in clones?

26. How do we know how old a fossil is?
27. Study the given data and answer the questions following the data:

Parental plants cross fertilised and seeds collected	F1 First Generation offsprings	F2 Offsprings of self pollination of F1
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?
ii. What does the data of the column marked F_1 indicate?
iii. Express the gene type of the (a) parents (b) F1 progeny and (c) F2 progeny

28. 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?

ANSWERS

1. 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.
2. Only dominant trait appeared in F_1
3. Miller and Urey
4. 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.
5. 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.
6. The appearance of white flowers is due to mutation.
7. Dwarf (height of plant), wrinkled seed
8. The characteristic resembling reptiles is laying of eggs and the characteristics resembling mammals is presence of mammary glands.
9. 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.
10. Classification based on evolutionary relationships of organisms.
11. 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.
12. 25 percent
13. All red
14. Chimpanzee have the better body design as compared to others given. They are better adapted for locomotion, communication and thinking.
15. In sexual reproduction organisms raised are as a result of crossing over and exchange of gene segments and are known as offspring.

16. 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.
17. Proteins and nucleic acid
18. Because they have dissimilar sex chromosomes.
19. 50 percent
20. Turtle, lizard
21. The characteristics which are transmitted from parents to their offsprings are called inherited traits. E.g. free and attached earlobes.
22. Because dominant genes express themselves and suppress the effect of recessive genes. So no medium sized plants were obtained.
23.
    i. Colour of F1 progeny – Green
    ii. Percentage of purple stemmed plants in F2 generation ¼ or 25%.
    iii. Ratio of genotypes GG and Gg 1:2
24. They have a common ancestry (i)Homologous organs
25. 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.
26. 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.
27.
    i. Monohybrid cross
    ii. Red colour of flower dominant over white flower
    iii. a. Parents – (RR) and (rr)
    b. F1 progeny – Rr
    c. F2 progeny – RR, Rr and rr
28. 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.

QUESTION BANK FOR PRACTICE

1. What name is given to a sequence of gradual changes over millions of year in which new species are produced.
2. Which are the two processes, sexual reproduction or asexual reproduction brings about marked variations in the offspring?
3. In which gametes are present X and Y chromosomes?
4. Name two processes which change the frequency of certain genes over generation in a population.
5. Explain with examples how characteristics of a population changes over the years for the following situations.

a. To gain survival advantage b. due to accidental survival c. Temporary change of characteristics

6. How will you substantiate the statement that heredity and its concepts were known to the ancient civilisations.
7. How many autosomes are present in a human sperm?
8. What are cross breed plants known as?
9. What does letter F represent in heredity?
10. How will you conclude that birds are closely related to reptiles?
11. Where did the earliest members of human beings live?
12. Which organ in man suggest that he is a descendent of herbivorous animals?
13. Why is appendix in human considered as vestigial?
14. Why offsprings differ from parents in certain characters?
15. What is meant by expression TT and Tt in Mendelian terms?
16. How is sex determined in human beings?
17. Why are flippers of whales and wings of birds are considered as homologous organs?
18. On the basis of the possibilities of combination of the sex chromosomes, what percentage probability does a couple have of having a son or a daughter. Show the same by making a cross.
29. Explain why evolution can't be said to progress from lower forms to higher forms.
20. How do Mendel's experiments show that traits may be dominant or recessive?
21. Explain with an example how variation took place due to inheritance?
22. Explain Urey and Miller's experiment showing evidence of the theory of origin of life.
23. How does the study of fossils provide evidence in favour of organic evolution.
24. Can the wing of a butterfly and the wing of a bat be considered homologous organs? Why or why not?
25. What do you understand by reproductive isolation? How is this mechanism responsible for speciation?
26. Though eyes are found in many organisms why can they not be grouped together?
27. Why can two sub-populations of a species not reproduce with each other? State two reasons. What will be the outcome of such a situation?