

BAL BHARATI PUBLIC SCHOOL, NOIDA

HAND OUT

HEREDITY AND EVOLUTOIN

CLASS X

GENETIC TERMINOLOGY

S.No	Term	Meaning	Example
1	Character	It is the feature of the individual	Stem Height
2	Trait	An inherited character and its detectable variant	Tall or Dwarf
3	Unit Factor	A unit of inheritance called gene by modern geneticists. Each gene or factor controls a character.	D & d
4	Allele	It represents at least two alternative forms of a gene or unit factor. Each gene consists of an allelomorph pair.	Dd
5	Gene Symbol	Each trait is provided a symbol	Tall height-T, Dwarf height-t
6	Phenotype	It is observable morphological appearance. The phenotype of an individual is determined by different combination of alleles.	Tall or Dwarf
7	Genotype	It is representation of individuals with respect to a single character or	DD,Dd,dd

		a set of characters.	
8	Homozygous	When the two alleles of a gene are similar and so two copies of the same alleles exist, they are said to be in homozygous combination.	DD/dd
9	Heterozygous	When the two alleles of a gene are different they are in heterozygous state.	Dd
10	Dominant	An allele that influences the appearance the phenotype even in the presence of an alternative allele	D
11	Recessive	An allele that influences the appearance of the phenotype only in the presence of another identical allele.	d

Q1. What is gene?

Ans: Gene is the unit of inheritance and is the basic part of the chromosomes. Each Character of an individual is determined by two factors, which are known as genes.

Q2. What is the scientific term for science of heredity and variation?

Ans: Genetics

Q3. Define inheritance?

Ans: It is the transmission of particular characters from generation to generations by means of genes.

Q4. What are the importance of variations?

Ans: Variations are the
_ Basis for heredity
_ First step for evolution
_ Provide Adaptability

Q4. Who was given the name 'father of genetics' and why?

Ans: Gregor Johann Mendel, because he was the first to explain laws of inheritance and transmission of characteristics from parents to offspring.

Q5. What was the basic study material of Mendel? How did he bring the term factor?

Ans: The basic study material of Mendel was the contrasting character in various generations of garden pea (*Pisum sativum*). He said that unit's known as 'factors' control these characters, which was later known as genes.

Q6. Why did Mendel choose the pea plant for his experiment?

Ans: He had chosen pea plant for his experiment because:

1. It is easy to cultivate and has a short life cycle.
2. It has sharply defined characters.
3. Flowers are bisexual and self- pollination is possible.
4. Cross-pollination can also be achieved easily.

Q7. Explain with an example how traits are inherited in human beings?

Ans: 1. The rules of inheritance of traits in human beings are related to both the father and mother which contribute equal amounts of genetic material to the child.
2. Each trait is influenced by both paternal and maternal DNA and thus, for each trait there will be two variations in each child.
3. Example: The earlobes of human being are closely attached to the side of the head in some and not in other (free ear lobes). Thus, free and attached earlobes are two variants in human populations.

Q8. How does the gene control traits? Explain with an example.

Ans: Genes control the traits in the following ways:

A section of DNA provides information for a protein in a cell is called a gene.

If the protein works efficiently, the traits get expressed in a better way.

Example:- Plant height depends on the amount of growth hormone released by protein. If the protein is efficient more growth hormone will be released and the plant will be taller. If the protein is inefficient the plant will be shorter. Thus, Genes control the traits.

Q9. 'Genes and chromosomes have similar behaviour'. Justify.

Ans: 1. Genes and chromosomes are present in pairs.
2. Both segregate during meiotic cell division to form gametes in which they remain unpaired. After fertilization, the paired feature is restored in zygote, which develops into the offspring. Thus, it is justified that genes and chromosomes have common behaviour.

Q10. Explain Mendel's experiment with peas on inheritance of traits considering only one visible contrasting character.

Or

How does Mendel's experiment show that traits may be dominant or recessive?

Ans: 1. Mendel took two parent plants with different characters as tall plants and short plant and studied the inheritance of single character. This is called monohybrid cross.
2. The first generation (F1) progeny all are tall plants.
3. Mendel then allowed the F1 plants to self pollinate.
4. In the second generation (F2) both tall and short plants appear in the ratio 3:1.

5. Thus indicates that both tallness and shortness traits were inherited in F1 plants but only the tallness trait was expressed.
6. The character that expresses itself in F1 generation is the dominant character (tall). The character that remains hidden in F1 generation but expresses itself in F2 generation is the recessive character (short)
7. This shows that two copies of the traits are inherited in each sexually reproducing organism.

Parent	tall	short		Tall		Tall
	TT	tt		Tt	X	Tt
gametes	T	t				
F1	Tt (all tall)			Tt		Tt
F2=3 : 1		F2		TT	tt	Tt
Tall : short				Tall	short	Tall

Q11. Explain Mendel's experiment with peas on heritage of traits considering two visible contrasting characters.

Or

How does Mendel's experiment show those traits are inherited independently?

Ans: This type of cross is called di-hybrid cross in which inheritance of two contrasting characters are studied:-

Mendel took pea plant with two different characters such as tall plant with round seeds and short plants with wrinkled seeds.

F1 progeny are all tall plants round seeds. Thus, tallness and round seeds are dominant characters.

F2 progeny showed tall plants round seeds, tall wrinkled, short round and short wrinkled in the ratio of 9:3:3:1.

In F2 progeny the new combination of characters are also visible.

The di-hybrid cross of Mendel showed that the tall/short trait and round/wrinkled seeds traits are independently inherited

Tall plant round seed X short plant wrinkled seed

Parents:	TT RR	tt rr		F1		F1
				TtRr	X	TtRr
				TR	Tr	tR
Gametes:	TR	tr		TR	TtRR	TtRr
				Tr	TTRr	Ttrr
				Tr	TtRR	ttRR
				Tr	TtRr	ttRr
				Tr	TtRr	ttrr

Tt Rr (tall round)

Q12. What are Mendel's laws of inheritance? Explain.

Ans: Mendel laws of inheritance:

1. The law of dominance: out of two alternative factors or alleles, only one expresses itself in an organism and that is called dominant and other one which does not show its effect is termed as recessive.
2. The law of segregation: according to this law a pair of contrasting factor or genes remains together and separate or segregate at the time of gamete formation.
3. The law of independent assortment: it states that if we consider the inheritance of two or more genes at a time, their distribution in the gametes and in the progeny is independent of each other. They rearrange themselves randomly.

Q13. Define the term 'speciation'. Also name a few factors, which are essential for the formation of a new species or speciation.

Ans: The origin of new species from the existing one is called 'speciation'

The factors responsible for the formation of a new species are-
Reproductive isolation, genetic variation and natural selection.

Q14. What are the different ways in which individuals with a particular trait may increase in a population?

Ans: Natural selection and genetic drift are the two ways by which individuals with a particular trait will increase in population.

Q15. Will geographical isolation be a major factor on the speciation of a self-pollination plant species? Why or why not?

Ans: No, it will not be a major factor because self-pollination occurs within the same plant and a geographical isolation can occur between different plant parts.

Q16. How are the areas of study-evolution and classification interlinked?

Ans: More the characteristics that are common between the species, the more closely they are related. This shows that these two species must have originated from a common ancestor.

This also means that recently they have had a common ancestor.

We can thus build up small group of species with recent common ancestors, then - groups of these with more distant common ancestors and so on. Thus we find that classification of species is in fact a reflection of their evolutionary relationship.

Q17. What is 'evolution'? Give an example of the characteristics being used to determine how close two species are in terms of evolution.

Ans: Evolution is the sequence of gradual changes which take place in the primitive organisms over millions of the years and new species are produced.

The characteristics are as follows:-

Degree of pairing between the DNA bases of one species with that of the other species.

Composition of the species proteins like cytochromes or haemoglobin proteins in the form of amino acid sequence between them.

Q18. What should be kept in mind while tracing a family tree of a species?

Ans: We need to remember the following:-

There are multiple branches possible at each and every stage of this process .It is not necessary that one species get eliminated to give rise to a new one. It will all depend on environment conditions.

It is not as if the newly produced species are in any way better than the older one.

It is simply that genetic drift and natural selection processes have combined to form a population having different body design that can reproduce with the original one.

Q19. Differentiate between artificial and natural selection?

Ans: Artificial Selection

1. It is an artificial process.
2. It is conducted by man on limited scale in a specific laboratory.
3. Traits selected for improvement are beneficial to man
4. Results are achieved in a short period.

Natural Selection

1. It is a natural phenomenon.
2. Conducted on a large scale all over the world.
3. Traits selected-for evolutions are beneficial to the species.
4. Results are achieved over o long Period.

Q20. Explain the terms analogous and homologous organs with examples.

Ans: The organs which have common origin and the same basic structure. But different functions are called Homogenous organs. For e.g. Forelimbs of frog and lizards, wings of birds and arms of human beings.

The organ which have different origin and structural plan. But appear similar and perform same function are called Analogous organs. For e.g. wings of birds and wings of insects.

Q21. Can the wings of a butterfly and the wings of a bat be considered homologous organs? Why or why not?

Ans: No they cannot be considered to be homologous organs because they have the same function and different structure and design.

Wings of a bat are folds of skin which between their finger of the forelimbs whereas wings of a butterfly are membranous folds associated with features.

Q22. An example of homologous organs is

- a) Our arm and a dog's foreleg
- b) Our teeth and an elephant tusks
- c) Potato and runners of grass
- d) All the above.

Ans: All of the above

Q23. What are fossils? How do they support the theory of evolution?

Ans: Fossils are the remains of organisms which are extinct now. Fossils may be in the form of preserved bodies and their parts or impressions of these organisms which were buried in the earth or sand long long ago.

They support the process of evolution in the following ways:

- The fossils present in the bottom rocks are simple while the most recent fossils found in the upper strata are highly complex. This geological succession completely agrees with the concept of evolution.
- Some fossils provide a connecting link between two groups e.g. study of fossils bird Archaeopteryx indicates that birds have evolved from reptile-like ancestors.
- Fossils records of certain mammals (horse, elephant, camel, man, etc) if arranged in a wise would present a complete history indicating how their evolution occurred.
- Fossils of the bodies of dinosaurs with feathers have found in the rocks, which were not used for flying, but they were for giving warmth to the body. They must have evolved into wings later meant for flying as seen in birds. This shows a close relationship between birds and reptiles.

ALL THE BEST!

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