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## GPT – Biology Handbook (Part 2)

**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?**

In asexual reproduction, the reproducing cells produce a copy of their DNA through some chemical reactions. However, this copying of DNA is not accurate and therefore, the newly formed DNA has some variations. It can be easily observed in the above figure that in asexual reproduction, very few variations are allowed.

Therefore, if a trait is present in only 10% of the population, it is more likely that the trait has arisen recently. Hence, it can be concluded that trait B that exists in 60% of the same population has arisen earlier than trait A.

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

Sometimes for a species, the environmental conditions change so drastically that their survival becomes difficult. For example, if the temperature of water increases suddenly, most of the bacteria living in that water would die. Only few variants resistant to heat would be able to survive. If these variants were not there, then the entire species of bacteria would have been destroyed.

Thus, these variants help in the survival of the species. However, not all variations are useful. Therefore, these are not necessarily beneficial for the individual organisms.

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

Mendel selected true breeding tall (TT) and dwarf (tt) pea plants. Then, he crossed these two plants. The seeds formed after fertilization were grown and these plants that were formed represent the first filial or F<sub>1</sub> generation. All the F<sub>1</sub> plants obtained were tall.

Then, Mendel self-pollinated the F1 plants and observed that all plants obtained in the F2 generation were not tall. Instead, one-fourth of the F2 plants were short

From this experiment, Mendel concluded that the F1 tall plants were not true breeding. They were carrying traits of both short height and tall height. They appeared tall only because the tall trait is dominant over the dwarf trait

### **How do Mendel's experiments show that traits are inherited independently?**

Mendel crossed pea plants having round green seeds (RRyy) with pea plants having wrinkled yellow seeds (rrYY). Since the F1 plants are formed after crossing pea plants having green round seeds and pea plants having yellow wrinkled seeds, F1 generation will have both these characters in them. However, as we know that yellow seed colour and round seeds are dominant characters, therefore, the F1 plants will have yellow round seeds.

Then this F1 progeny was self-pollinated and the F2 progeny was found to have yellow round seeds, green round seeds, yellow wrinkled seeds, and green wrinkled seeds in the ratio of 9:3:3:1.

### **How is the sex of the child determined in human beings?**

In human beings, the females have two X chromosomes and the males have one X and one Y chromosome. Therefore, the females are XX and the males are XY. The gametes, as we know, receive half of the chromosomes.

The male gametes have 22 autosomes and either X or Y sex chromosome. Type of male gametes: 22+X OR 22+ Y. However, since the females have XX sex chromosomes, their gametes can only have X sex chromosome. Type of female gamete: 22+ X

Thus, the mother provides only X chromosomes. The sex of the baby is determined by the type of male gamete (X or Y) that fuses with the X chromosome of the female

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

Small numbers of tigers means that fewer variations in terms of genes are available. This means that when these tigers reproduce, there are less chances of producing progeny with some useful variations. Hence, it is a cause of worry from the point of view of genetics

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

The presence of feathers in dinosaurs and birds indicates that they are evolutionarily related. Dinosaurs had feathers not for flying but instead these feathers provided insulation to these warm-blooded animals. However, the feathers in birds are used for flight. This proves that reptiles and birds are closely related and that the evolution of wings started in reptiles

**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?**

A species is a group of organisms that are capable of interbreeding to produce a fertile offspring. Skin colour, looks, and size are all variety of features present in human beings.

These features are generally environmentally controlled. Various human races are formed based on these features. However, there is no biological basis to this concept of races. Therefore, all human beings are a single species as humans of different colour, size, and looks are capable of reproduction and can produce a fertile offspring

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

**Homologous organs** are similar in origin (or are embryologically similar) but perform different functions. For example, the forelimbs of humans and the wings of birds look different externally but their skeletal structure is similar. It means that their origin is similar (as wings in birds are modifications of forearm) but functions are different - the wings help in flight whereas human forearm helps in various activities

**Analogous organs**, on the other hand, have different origin but perform similar functions. For example, the wings of a bird and a bat are similar in function but this similarity does not mean that these animals are more closely related. If we carefully look at these structures, then we will find that the wings of a bat are just the folds of skin that are stretched between its fingers whereas the wings of birds are present all along the arm. Therefore, these organs are analogous organs

**Why are some substances biodegradable and some non-biodegradable?**

Some substances such as metal, glass, plastic, etc. which cannot be decomposed by the living organisms are non-biodegradable wastes. These substances are non-biodegradable because the micro-organisms do not have enzymes that can digest these substances. Therefore, we classify them as non-biodegradable wastes. Other substances such as paper, vegetable wastes, etc. that can be easily broken down by enzymes are biodegradable wastes.

**What are trophic levels? Give an example of a food chain and state the different trophic levels in it.**

A trophic level is the level of species in an ecosystem on the basis of the source of nutrition such as producers, primary consumers, secondary consumers, etc.

The producers form the first trophic level as they manufacture food. The primary consumers form the second trophic level, the secondary consumers form the third, and the tertiary consumers form the fourth trophic level. Various trophic levels are connected through food chains. For example, in an aquatic food chain, phytoplanktons are the producers, zooplanktons are the primary consumers, and small fish is the secondary consumer and so on

**What is the role of decomposers in the ecosystem?**

Decomposers include micro-organisms such as bacteria and fungi that obtain nutrients by breaking down the remains of dead plants and animals. They help in the breakdown of organic matter or biomass from the body of dead plants and animals into simple inorganic raw materials, such as CO<sub>2</sub>, H<sub>2</sub>O, and some nutrients

**What is biological magnification? Will the levels of this magnification be different at different levels of the ecosystem?**

Biomagnification is the increase in the concentration of pollutants or harmful chemicals within each step of the food chain. The levels of biomagnification will be different at different trophic levels. For example, in a pond of water, DDT was sprayed and the producers were found to have 0.04 ppm concentration of DDT. Since many types of planktons are eaten by some fishes and clams, their body accumulates 0.23 ppm of DDT

**Why should we conserve forests and wildlife?**

We should conserve forests and wildlife to preserve the biodiversity (range of different life-forms) so as to avoid the loss of ecological stability. A large number of tribes are the inhabitants in and around the forests. If the forests are not conserved, then it may affect these inhabitants.

Without proper management of forest and wildlife, the quality of soil, the water sources, and even the amount of rainfall may be affected. Without forest and wildlife, life would become impossible for human beings.

**What is the utility of tissues in multicellular organisms?**

In multicellular organisms, the body system is based on the division of labour (like muscle cells form muscular tissue to which helps in movement). It means the cells performing a specific function are grouped together to form a



particular tissue. The different tissues are organized in a way to provide highest efficiency in functioning of the body.

### **What are the functions of areolar tissue?**

Functions of areolar tissue are It fills the space inside the organs, thus acts as a packing tissue between the organs., It supports many delicate organs in the body, It plays role in repair of tissue

### **Why do we classify organisms?**

There are millions of organisms on this earth. So, it is harder to study them one by one. Therefore, we look for similarities among them and classify them into different classes to study these different classes as a whole. Classification makes our study easier

### **On what basis are plants and animals put into different categories?**

Plants and animals are put into different categories on the basis of Mode of nutrition. Plants are autotrophs. They can make their food own while animas are heterotrophs which are dependent on others for food. Also, locomotion, absence of chloroplasts etc. make them different

### **Which organisms are called primitive and how are they different from the so-called advanced organisms?**

A primitive organism is the one which has a simple body structure and ancient body design or features that have not changed much over a period of time.

As per the body design, the primitve organisms which have simple structures are different from those so-called advanced organisms which have complex body structure and organization

### **Explain the basis for grouping organisms into five kingdoms.**

The basis for grouping organisms into five kingdoms are

**Complexity of cell structure** - There are two broad categories of cell structure: Prokaryotic and Eukaryotic. Thus, two broad groups can be formed, one having prokaryotic cell structure and the other having eukaryotic cell structure. Presence or absence of cell wall is another important characteristic

**Unicellular and multicellular organisms** - This characteristic makes a very basic distinction in the body designs of organisms and helps in their broad categorizations.

**Cell Wall:** Presence and absence of cell wall leads into grouping.

**Mode of nutrition** -Organisms basically have two types of nutritions - autotrophic who can manufacture their own food and heterotrophic who obtain their food from external environment, i.e., from other organisms). Thus, organisms can be broadly classified into different groups on the basis of their mode of nutrition

**Explain how animals in Vertebrata are classified into further subgroups.**

Animals in Vertebrata are classified into five classes:

**(i) Class Pisces:** This class includes fish such as Scoliodon, tuna, rohu, shark, etc. These animals mostly live in water. Hence, they have special adaptive features such as a streamlined body, presence of a tail for movement, gills, etc. to live in water.

**(ii) Class Amphibia:** It includes frogs, toads, and salamanders. These animals have a dual mode of life. In the larval stage, the respiratory organs are gills, but in the adult stage, respiration occurs through the lungs or skin. They lay eggs in water.

**(iii) Class Reptilia:** It includes reptiles such as lizards, snakes, turtles, etc. They usually creep or crawl on land. The body of a reptile is covered with dry and cornified skin to prevent water loss. They lay eggs on land.

**(iv) Class Aves:** It includes all birds such as sparrow, pigeon, crow, etc. Most of them have feathers. Their forelimbs are modified into wings for flight, while hind limbs are modified for walking and claspings. They lay eggs.

**(v) Class Mammalia:** It includes a variety of animals which have milk producing glands to nourish their young ones. Some lay eggs and some give birth to young ones. Their skin has hair as well as sweat glands to regulate their body temperature

**How do plants get nutrients?**

Soil is the main source of nutrients for plants. Plants absorb the dissolved nutrients by the roots from the soil. This water absorbed by the roots is transported by the xylem tissue throughout the plant body

**Which method is commonly used for improving cattle breeds and why?  
How is cross breeding useful in animals?**

To improve the cattle breed breeds, we generally use the cross breeding method. It is a process in which a cross is made between indigenous varieties of cattle by exotic breeds to get a cross breed which is high-yielding. During cross breeding, the desired characters taken into considerations are the off

springs should be high Yielding, should have early maturity and should be resistant to diseases and climatic conditions

### **What is the advantage of composite fish culture?**

Combination of five or six fish species in a single fish pond is known as composite fish culture. Basis of selection of species is food habits so that they do not compete for food among themselves. As a result, the food available in all parts of the pond is utilized without competing with each other. This increases the fish yield from the pond.

### **What is pasturage and how is it related to honey producton?**

Flowers available for nectar and pollen collection is known as pasturage . The quality and taste of honey depends on adequate quantity of pasturage and flowers available

