

## Studymate Solutions to CBSE Board Examination 2018-2019

Series : BVN

Code No. 57/1/1

Roll No.

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**Candidates must write the Code on the title page of the answer-book.**

- ▶ Please check that this question paper contains **10** printed pages.
- ▶ Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- ▶ Please check that this question paper contains **27** questions.
- ▶ **Please write down the Serial Number of the question before attempting it.**
- ▶ 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

## BIOLOGY

[Time allowed : 3 hours]

[Maximum marks : 70]

### General Instructions:

- (i) There are a total 26 questions and five sections in the question paper. All questions are compulsory.
- (ii) Section A contains question number 1 to 5. Very Short Answer type questions of one mark each.
- (iii) Section B contains question number 6 to 12. Short Answer type I questions of two marks each.
- (iv) Section C contains question number 13 to 24. Short Answer type II questions of three marks each.
- (v) Section E contains question number 25 to 27. Long Answer type questions of five marks each.
- (vi) There is no overall choice in the question paper, however, an internal choice is provided in one question of one mark, two question of two marks and five questions of five marks. An examinee is to attempt any one of the questions out of the two given in the question paper with the same question number.

**Disclaimer:** All model answers in this Solution to Board paper are written by Studymate Subject Matter Experts. This is not intended to be the official model solution to the question paper provided by CBSE. The purpose of this solution is to provide a guidance to students.

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**Section - A**

1. British geneticist R.C. Punnett developed a graphical representation of a genetic cross called "Punnett Square". Mention the possible result this representation predicts of the genetic cross carried.

**Ans.** It predicts about the phenotypic and genotypic ratio.

2. State the two principal outcomes of the experiments conducted by Louis Pasteur on origin of life.

**Ans.** Two principal outcomes are-

- (a) Life comes only from pre-existing life
- (b) Spontaneous generation theory was dismissed

3. Name the layer of the atmosphere that is associated with 'good ozone'.

**OR**

Mention the term used to describe a population interaction between an orchid growing on a forest tree.

**Ans.** Stratosphere

**OR**

Commensalism

4. What are 'flocs', formed during secondary treatment of sewage?

**OR**

Write any two places where methanogens can be found.

**Ans.** Flocs are masses of bacteria associated with fungal filaments to form mesh like structures.

**OR**

Two places where Methanogens found are-

- (a) Anaerobic sludge during sewage treatment.
- (b) Present in the rumen of cattle

5. At what stage does the meiosis occur in an organism exhibiting haplontic life cycle and mention the fate of the products thus produced.

**Ans.** Meiosis occurs after zygote formation. This is called zygotic meiosis. Haploid spores formed will give rise to the organisms.

**Section - B**

6. You are conducting artificial hybridization on papaya and potato. Which one of them would require the step of emasculation and why? However for both you will use the process of bagging. Justify giving one reason.

**Ans.** Potato would require emasculation as it has bisexual flowers while papaya would require only bagging along with potato for artificial hybridization because it has unisexual flowers. Thus after pollinating with the desired pollen we need to bag it to prevent further pollination by undesirable pollen grains.

7. How would the gene flow or genetic drift affect the population in which either of them happen to take place?

**Ans.** If gene migration, happens multiple times then it is known as gene flow. If the same change occurs by chance, it is called genetic drift. When migration of a section of population to another place and population occurs, gene frequencies change in the original as well as in the new population. New genes/alleles are added to the new population and these are lost from the old population.

8. Differentiate between the roles of B-lymphocytes and T-lymphocytes in generating immune responses.

**OR**

Principle of vaccination is based on the property of “memory” of the immune system. Taking one suitable example, justify the statement.

**Ans.** The B-lymphocytes produce an army of proteins in response to pathogens into our blood to fight with them. These proteins are called antibodies.

The T-cells themselves do not secrete antibodies but help B cells produce them. Because these antibodies are found in the blood, the response is also called as humoral immune response.

**OR**

The principle of immunisation or vaccination is based on the property of ‘memory’ of the immune system.

In Polio vaccination, a preparation of antigenic proteins of pathogen or inactivated/weakened pathogen (vaccine) are introduced into the body. The antibodies produced in the body against these antigens would neutralise the pathogenic agents causing Polio presently. The vaccines also generate memory – B and T-cells that recognise the pathogen quickly on subsequent exposure and overwhelm the invaders with a massive production of antibodies.

**9.** Explain the relevance of “Totipotency” and “Somaclones” in raising healthy banana plants from virus infected banana plants.

**Ans.** The capacity to generate a whole plant from any cell/explant is called totipotency. When these plants are obtained from somatic cells and they are genetically identical they are known as somaclones. An important application of the method is the recovery of healthy plants from diseased plant like banana. Although the plant is infected with a virus, the meristem (apical and axillary) is free of virus. Hence, one can remove the meristem and grow it in vitro to obtain virus-free plants.

**10.** How is a continuous culture system maintained in bioreactors and why?

**Ans.** The cells can also be multiplied in a continuous culture system wherein the used medium is drained out from one side while fresh medium is added from the other to maintain the cells in their physiologically most active log/exponential phase. This type of culturing method produces a larger biomass leading to higher yields of desired protein.

**11.** List any four ways by which GMO’s have been useful for enhanced crop output.

**Ans.** Genetic modified Organisms have been useful for enhanced crop output in the following:

- (i) made crops more tolerant to abiotic stresses (cold, drought, salt, heat).
- (ii) reduced reliance on chemical pesticides (pest-resistant crops).
- (iii) helped to reduce post harvest losses.
- (iv) enhanced nutritional value of food, e.g., Vitamin ‘A’ enriched rice.

**12.** Mention four significant services that a healthy forest ecosystem provide.

**OR**

Substantiate with the help of one example that in an ecosystem mutualists (i) tend to co-evolve and (ii) are also one of the major causes of biodiversity loss.

**Ans.** Healthy forest ecosystems provides the following significant services -purified air and water, mitigate droughts and floods, generate fertile soils, provide wildlife habitat.

**OR**

(i) Ophrys employs ‘sexual deceit’ to get pollination done by a species of bee. One petal of its flower bears resemblance to female bee thus attracting male bee for pollination. If the female bee’s colour patterns change even slightly for any reason during evolution, pollination success will be reduced unless the orchid flower co-evolves to maintain the resemblance of its petal to the female bee.

(ii) **Co-extinctions:** When a species becomes extinct, the plant and animal species associated with it in an obligatory way also become extinct. When a host fish species becomes extinct, its unique assemblage of parasites also meets the same fate.

### Section - C

**13.** Pollen banks are playing a very important role in promoting plant breeding programme the

world over. How are pollens preserved in the pollen banks? Explain. How are such banks benefiting our farmer? Write any two ways.

**Ans.** It is possible to preserve pollen grains of a large number of species for years in liquid nitrogen (-196°C). This process is called cryopreservation.

Such stored pollens can be used as pollen banks in crop breeding programmes.

For example:

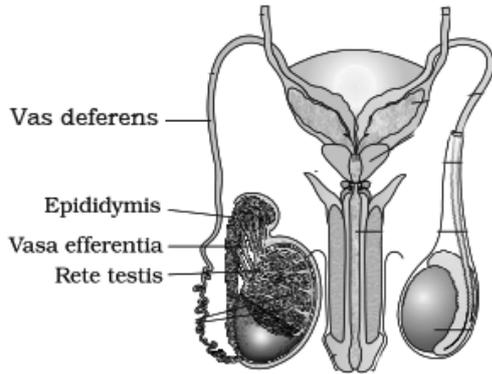
- (i) Producing disease resistant plants.
- (ii) Producing high yielding plants.

**14.** Draw a labelled diagram to show interrelationship of four accessory ducts in a human male reproductive system.

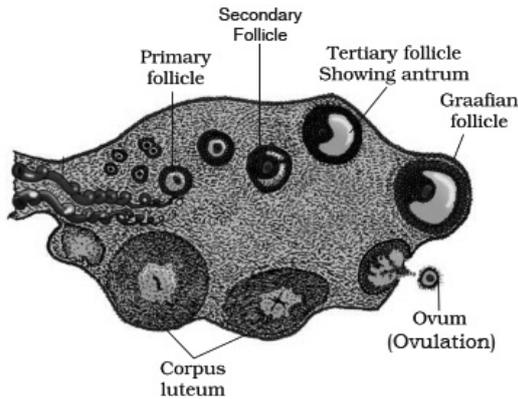
**OR**

Draw a sectional view of the human ovary showing the different stages of developing follicles, corpus luteum and ovulation.

**Ans.**



**OR**



**15.** Compare in any three ways the chromosomal theory of inheritance as proposed by Sutton and Boveri with that of experimental results on pea plant presented by Mendel.

**OR**

- (a) Explain linkage and recombination as put forth by T.H. Morgan based on his observations with *Drosophila melanogaster* crossing experiment.
- (b) Write the basis on which Alfred Sturtevant explained gene mapping.

**Ans.**

<b>Chromosomal theory of inheritance by Sutton and Boveri</b>	<b>Experimental result on pea plant by Mendel</b>
Chromosomes are also found in pairs.	Factors are found in pairs.
Homologous chromosomes synapse during meiosis and get separated to pass into different cells.	Mendelian factors also segregate during gamete formation and only one factor pass to one gamete.
The genes are carried onto the chromosomes.	Factors are stable and discrete units that controlled the expression of traits and, of the pair of alleles which did not blend with each other.

OR

- (a) Morgan carried out several dihybrid crosses in *Drosophila* to study genes that were sex-linked. The crosses were similar to the dihybrid crosses carried out by Mendel in peas. For example Morgan hybridised yellow-bodied, white-eyed females to brown-bodied, red-eyed males and intercrossed their  $F_1$  progeny. He observed that the two genes did not segregate independently of each other and the  $F_2$  ratio deviated very significantly from the 9:3:3:1 ratio (expected when the two genes are independent).

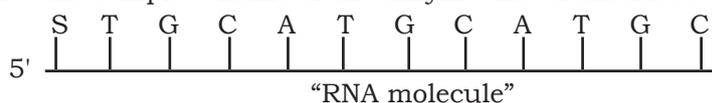
Morgan attributed this due to the physical association or linkage of the two genes and coined the term linkage to describe this physical association of genes on a chromosome and the term recombination to describe the generation of non-parental gene combinations. The two genes present on the same chromosome lie closer to each other then linkage is called strong. When the linkage is strong recombinations are less. On the other hand if the genes are placed far away from each other then the linkage is called weak and the recombinations will be more.

- (b) Alfred Sturtevant used the frequency of recombination between gene pairs on the same chromosome as a measure of the distance between genes and 'mapped' their position on the chromosome.

16. Explain the mechanism of DNA replication with the help of a replication fork. What role does the enzyme DNA-ligase play in a DNA replication fork?

OR

Construct and label a transcription unit from which the RNA segment given below has been transcribed. Write the complete name of the enzyme that transcribed this RNA.



- Ans.** DNA copying process in replication in the presence of an enzyme is DNA-dependent DNA polymerase, since it uses a DNA template to catalyse the polymerisation of deoxynucleotides. The process of replication within 38 minutes; that means the average rate of polymerisation has to be approximately 2000 bp per second. Not only do these polymerases have to be fast, but they also have to catalyse the reaction with high degree of accuracy. Any mistake during replication would result into mutations. Furthermore, energetically replication is a very expensive process. Deoxyribonucleoside triphosphates serve dual purposes. In addition to acting as substrates, they provide energy for polymerisation reaction (the two terminal phosphates in a deoxynucleoside triphosphates are high-energy phosphates, same as in case of ATP).

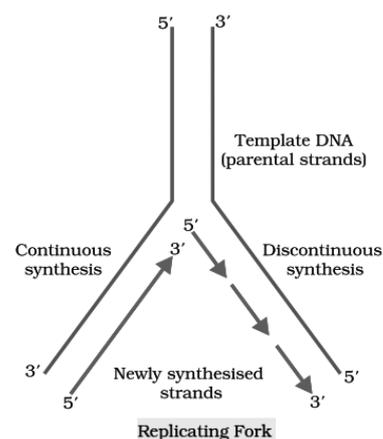
In addition to DNA-dependent DNA polymerases, many additional enzymes are required to complete the process of replication with high degree of accuracy. For long DNA molecules, since the two strands of DNA cannot be separated in its entire length (due to very high energy requirement), the replication occurs within a small opening of the DNA helix, referred to as replication fork. The DNA-dependent DNA polymerases catalyse polymerisation only in one direction, that is 5' to 3'. This creates some additional complications at the replicating fork. Consequently, on one strand (the template with polarity 3' replication is continuous, while on the other (the template with polarity 5' → 3'), it is discontinuous.

The DNA polymerases on their own cannot initiate the process of replication. Also the replication does not initiate randomly at any place in DNA. There is a definite region in *E. coli* DNA where the replication originates.

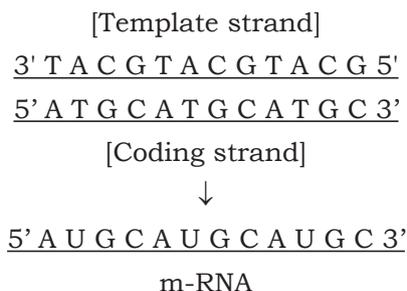
Such regions are termed as origin of replication.

**Role of DNA ligase:** It facilitates the joining of DNA strands together by catalysing the formation of phosphodiester bonds. It plays a role in repairing single breaks in duplex DNA.

OR



Question is wrong because given sequence is coding strand of DNA. Considering this coding sequence of DNA correct transcription unit is given below.



Enzyme is DNA dependent RNA polymerase which transcribes this RNA.

17. (a) Write two differences between *Homo erectus* and *Homo habilis*.  
 (b) Rearrange the following from early to late geological periods:  
 Carboniferous, Silurian, Jurassic.

Ans. (a)

<i>Homo erectus</i>	<i>Homo habilis</i>
Found in java in 1891, cranial capacity 900 CC.	Fossils found in East Africa, cranial capacity 650-800 CC.
Probably ate meat.	Did not eat meat.

- (b) Silurian → Carboniferous → Jurassic

18. Name the group of bacteria involved in setting milk into curd. Explain the process they carry in doing so. Write another beneficial role of such bacteria.

Ans. The group of bacteria involved in setting milk into curd is lactic acid bacteria (LAB), grow in milk and convert it to curd. During growth, the LAB produce acids that coagulate and partially digest the milk proteins which convert it into curd. A small amount of curd added to the fresh milk as inoculum or starter contain millions of LAB, which at suitable temperatures multiply, thus converting milk to curd.

Another beneficial role of such bacteria is that it also improves the nutritional quality by increasing vitamin B<sub>12</sub> content of the curd. A number of organic acids can also be found in curd.

19. Bee keeping practice is a good income generating industry. Write the different points to be kept in mind for successful bee keeping. Write the scientific name of the most common Indian species used for the purpose.

Ans. Different points to be kept in mind for successful bee keeping are-

- Knowledge of the nature and habits of bees
- Selection of suitable location for keeping the beehives
- Catching and hiving of swarms (group of bees)
- Management of beehives during different seasons
- Handling and collection of honey and of beeswax.

The scientific name of the most common Indian species used for this purpose is *Apis indica*.

20. (a) Match the microbes listed under Column-A with the products mentioned under Column-B.

**Column-A**

- (H) *Pencilillium notatum*  
 (I) *Trichoderma polysporum*  
 (J) *Monascus purpurea*  
 (K) *Saccharomyces cerevisiae*

**Column-B**

- (i) Statin  
 (ii) ethanol  
 (iii) antibiotic  
 (iv) Cyclosporin-A

- (b) Why does "Swiss Cheese" develop large holes?

- Ans. (a) (H) *Pencilillium notatum* (iii) antibiotic  
 (I) *Trichoderma polysporum* (iv) Cyclosporin-A  
 (J) *Monascus purpurea* (i) Statin  
 (K) *Saccharomyces cerevisiae* (ii) ethanol

- (b) Large holes in 'Swiss cheese' are due to production of a large amount of CO<sub>2</sub> by a bacterium named *Propionibacterium sharmanii*.

21. Describe the formation of recombinant DNA by the action of EcoRI.

**OR**

Describe the process of amplification of "gene of interest" using PCR technique.

**Ans.** Restriction enzyme cut the strand of DNA a little away from the center of the palindrome sites, but between the same two bases on the opposite strands.

The EcoRI cut the DNA strand from its recognition site- GAATTC

CTTAAG

It is used to cut both vector of foreign this will create sticky ends DNA which will be used in rDNA technology. Ligase enzyme is used to join them.

**OR**

PCR stands for Polymerase Chain Reaction.

**Steps of PCR are:**

**Denaturation:** The double stranded template DNA is heated to separate it into two single strands (90-95°C).

**Annealing:** The temperature is lowered to 50-55°C to enable the DNA primers to attach to the template DNA.

**Extension:** DNA polymerase a thermo stable taq polymerase isolated from Archaeobacteria. (*Thermus aquaticus*) add dNTPs complementary to template strand at 3' end of primer.

The process of replication of DNA is repeated many times so that DNA is amplified.

22. Two children, A and B aged 4 and 5 years respectively visited a hospital with a similar genetic disorder. The girl A was provided enzyme-replacement therapy and was advised to revisit periodically for further treatment. The girl, B was however, given a therapy that did not require revisit for further treatment.

- Name the ailments the two girls were suffering from?
- Why did the treatment provided to girl A require repeated visits?
- How was the girl B cured permanently?

**Ans.** (a) The ailment is Adenosine Deaminase deficiency.  
 (b) Girl A was given enzyme replacement therapy, in which functional ADA is given to the patient by injection. But the problem with this is that it is not completely curative as enzyme needs to be administered at regular intervals.  
 (c) Gene therapy. In this the gene isolate from marrow cells producing ADA is introduced into affected cells.

23. List six advantages of "ex-situ" approach to conservation of biodiversity.

**Ans.** Six advantages of ex-situ approach are-

- Plants and animals can be protected and given special care
- Plants and animal extinct in the wild, continue to be maintained in zoological parks
- It keeps the threatened species in enclosures
- Threatened species can be preserved in viable and fertile condition for long periods using cryopreservation techniques.
- Eggs can be fertilised in vitro, and plants can be propagated using tissue culture methods.
- Different genetic strains of commercially important plants can be kept for long periods in seed banks

24. While on a visit to a pond in the city-neighbourhood, visitors were delighted to find large expanse of water covered with colourful algal mass.

- As a student of biology, do you agree with their delight? Give reason in support of your answer.
- Explain the cause of such algal growth.

**Ans.** (a) I do not agree with the delight of the visitors because I am aware that this excessive algal growth known as algal bloom would impart a distinct colour to the water body drain

water of  $O_2$ , lead to deterioration of the water quality and fish mortality and thus affect the quality of water. These algae are extremely toxic to human beings and animals.

- (b) Presence of large amounts of nutrients in waters, pollutants from man's activities like effluents from the industries and homes can cause algal blooms.

### Section - D

25. (a) Explain one application of each one of the following:  
 (A) Amniocentesis (B) Lactational amenorrhoea  
 (C) ZIFT
- (b) Prepare a poster for the school programme depicting the objectives of: "Reproductive and Child Health Care Programme".

#### OR

- (a) Explain any two ways by which apomictic seed can develop.  
 (b) List one advantage and one disadvantage of a apomictic crop.  
 (c) Why do farmers find production of hybrid seeds costly?

- Ans. (a) (A) Application of "Amniocentesis" → To diagnose genetic problems in fetus.  
 (B) Application of lactational amenorrhoea: This is a temporary contraceptive method that relies on exclusive breast feeding it can be used from birth upto 6 months:  
 (C) ZIFT → We can transfer the zygote or early embryos (upto 8 blastomeres) into the fallopian during in vitro fertilization.
- (b) Objectives of RCH programme:  
 (i) Creating awareness among people about various reproduction related aspects.  
 (ii) Providing facilities.  
 (iii) Support for building up a reproductively healthy society.  
 (iv) To reduce infant mortality rate (IMR).  
 (v) Maternal mortality rate (MMR).

#### OR

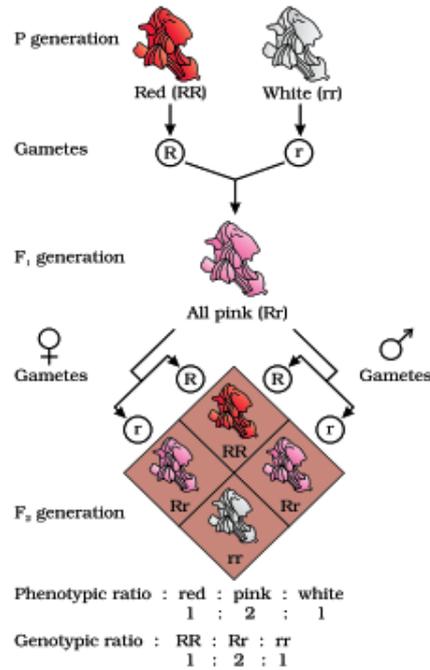
- (a) Two ways by which apomictic seed can develop are:  
 (i) Diploid egg cell is formed without reduction division and develops into the embryo without fertilisation.  
 (ii) Some of the diploid nucellar cells surrounding the embryo sac start dividing, protrude into embryo sac and develops into a embryo.
- (b) One advantage of apomictic crop:  
 → Apomictic seeds/crops are clones of mother plant  
 One disadvantage of apomictic crop:  
 → It reduces genetic diversity due to lack of variation.
- (c) Hybrid seed refers to a seed that is produced by cross pollination of plants in an artificial way. The scientists try thousands of combinations of parents to identify a desirable hybrid. It needs a lot of scientific research that is way it is so expensive to produce.

26. Differentiate between incomplete dominance and co-dominance. Substantiate your answer with one example of each.

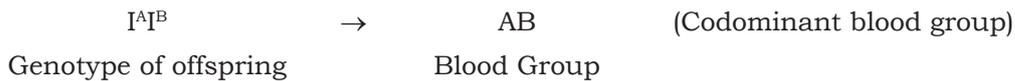
#### OR

- (a) Write the contributions of the following scientists in deciphering the general code.  
 George Gamow; Hargobind Khorana; Marshall Nirenberg; Severo Ochoa
- (b) State the importance of a Genetic code in protein biosynthesis.

- Ans. **Incomplete dominance:** is a form of intermediate inheritance in which one allele for a specific trait is not completely expressed over phenotype in which the expressed physical trait is a combination of the phenotypes of both alleles. E.g.: Snapdragon flower.



Codominance: Is a form of dominance where in the alleles of a gene pair in a heterozygote are fully expressed. This results in offspring with a phenotype that is neither dominant nor recessive. Eg. ABO blood grouping.



**OR**

- (a) — **Contribution of George Gamow:** He suggested that in order to code for all the 20 amino acids, be made up of three nucleotides. Idea of triplet (codon) was given by Gamow.
- **Hargobind Khorana:** The chemical method develop by Har Gobind Khorana was instrumental in synthesising RNA molecules with defined combinations of bases.
- **Marshall Nirenberg:** Introduced cell free system for protein synthesis finally helped the code to be deciphered.
- **Severo Ochoa:** Seuro Ochoa enzyme (polynucleotide phosphorylase) was also helpful in polymerising RNA with defined sequences.

- (b) Importance of genetic code in protein biosynthesis.
  - One codon codes for only one amino acid, thus, codon is specific for specific amino acid synthesis during translation.

Eg: AUG codon  $\xrightarrow{\text{codes}}$  methionine amino acid.  
 CCC codon  $\xrightarrow{\text{codes}}$  proline amino acid.

- 27.** (a) What is “population” according to you as a biology student?  
 (b) “The size of a population for any species is not a static parameter.” Justify the statement with specific reference to fluctuations in the population density of given region in a given period of time.

**OR**

- (a) What is hydrach succession?
- (b) Compare the pioneer species and climax communities of hydrach and xerarch succession respectively.
- (c) List the factors upon with the type of invading pioneer species depended secondary hydrach succession. Why is the rate of this succession faster than of primary succession?

**Ans.** (a) Population is a set of individuals of a particular species, which are found in a particular geographical area and can interbreed. The population that occupies a very small area and is smaller in size, is called local population.

- (b) The size of a population for any species is not a static parameter. It keeps changing in time, depending on various factors including food availability, predation pressure and reduce weather. In fact, it is these changes in population density that give us some idea of what is happening to the population – whether it is flourishing or declining. Whatever might be the ultimate reasons, the density of a population in a given habitat during a given period, fluctuates due to changes in four basic processes, two of which (natality and immigration) contribute an increase in population density and two (mortality and emigration) to a decrease.
- Natality refers to the number of births during a given period in the population that are added to the initial density.
  - Mortality is the number of deaths in the population during a given period.
  - Immigration is the number of individuals of the same species that have come into the habitat from elsewhere during the time period under consideration.
  - Emigration is the number of individuals of the population who left the habitat and gone elsewhere during the time period under consideration.

So, if  $N$  is the population density at time  $t$ , then its density at time  $t + 1$  is

$$N_{t+1} = N_t + [(B + I) - (D + E)]$$

Population density will increase if the number of births plus the number of immigrants ( $B + I$ ) is more than the number of deaths plus the number of emigrants ( $D + E$ ), otherwise it will decrease. Under normal conditions, births and deaths are the most important factors influencing population density, the other two factors assuming importance only under special conditions. For instance, if a new habitat is just being colonised, immigration may contribute more significantly to population growth than birth rates.

**OR**

- (a) Based on the nature of the habitat – whether it is water (or very wet areas) or it is on very dry areas – succession of plants is called hydrach or xerarch, respectively. Hydrarch succession takes place in wetter areas and the successional series progress from hydric to the mesic conditions.
- (b)

	<b><i>Hydrach succession</i></b>	<b><i>Xerarch succession</i></b>
Pioneer Species	In hydrach succession pioneer community are the small phytoplankton.	In xerarch succession pioneer community are usually lichens secrete acids to dissolve rock, helping in weathering and soil formation.
Climax Species	The climax community would be a forest, with time the water body is converted into land. This is called mesic condition.	In xerarch succession also climax community would be a forest hence xerarch succession also leads to mesic condition.

- (c) In secondary succession the species that invade depend on the condition of the soil, availability of water, the environment as also the seeds or other propagules present. Since soil is already there, the rate of succession is much faster and hence, climax is also reached more quickly. It is important to understand that succession, particularly primary succession, is a very slow process, taking maybe thousands of years for the climax to be reached. All succession whether taking place in water or on land, proceeds to a similar climax community – the mesic.

