# ISC SEMESTER 2 EXAMINATION
# SAMPLE PAPER - 3
# BIOLOGY PAPER 1 (THEORY)

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***Maximum Marks: 35***

***Time allowed: One and a half hour***

*Candidates are allowed an additional **10 minutes** for **only** reading the paper.*

*They must **NOT** start writing during this time.*

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*Internal choices have been provided in **one** question in **Section B***
*and **one** question in **Section C**.*

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## Section-A

**Question 1**

(i) How many number of wetlands are present in India?

(ii) Which gas is always present in photochemical smog?

(a) Ozone (b) $CO_2$

(c) Methane (d) $SO_2$

(iii) **Assertion:** Artificially acquired passive immunity results when antibodies or lymphocytes produced outside the host are introduced into a host.

**Reason:** A bone marrow transplant given to a patient with genetic immunodeficiency is an example of artificially acquired passive immunity.

(a) Both assertion and reason are true and reason is the correct explanation of assertion.

(b) Both assertion and reason are true but reason is not the correct explanation of assertion.

(c) Assertion is true but reason is false.

(d) Both assertion and reason are false.

(iv) Give one significant contribution of Ernst Haeckel.

(v) Expand the term ELISA.

(vi) Why is a large population of malaria infected regions heterozygous for sickle cell anaemia?

(vii) Which part of plant is best suited for making virus free plants?

## Section-B

**Question 2**

What are the Advantages of artificial insemination?

**Question 3**

Explain the term gene amplification and briefly describe what PCR is.

**Question 4**

Define co-extinction.

**Question 5**

Briefly explain cultural and accelerated eutrofication with example.

**Question 6**

(i) What do you mean by innate immunity? Explain the different types of barriers for innate immunity.

**OR**

(ii) What are the reasons behind the polyploidy in sexually reproducing organisms?

**Question 7**

What is alpha-lactalbumin?

**Question 8**

What are bioreactors and state their importance in biotechnology.

**Question 9**

Define :

(i) PAR

(ii) Autecology

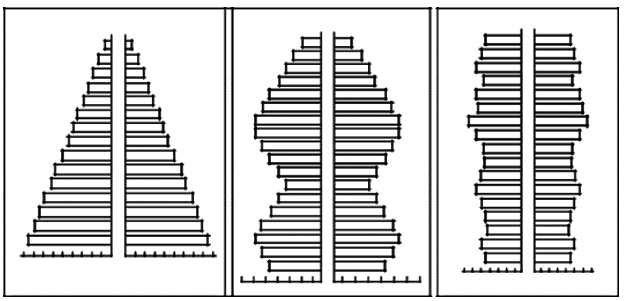
## Section-C

**Question 10**

(i) Name and describe three causes of biodiversity losses.

**OR**

(ii) The figure below shows different types of age pyramids, identify the types and also define them.



**Question 11**

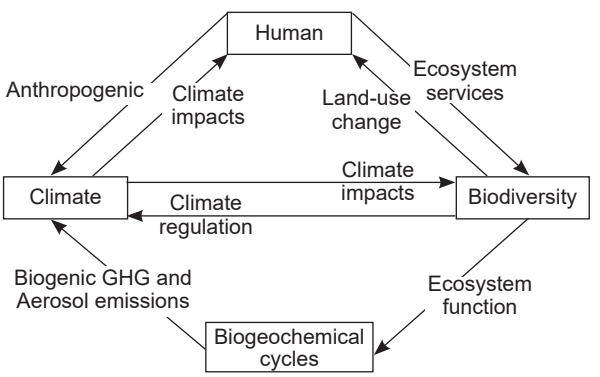
What are the differences of primary and secondary immune response?

**Question 12**

Write the steps involve in making recombinant DNA.

**Question 13**

Given is a schematic representation. Analyse and answer the questions asked on the basis of it:




(i) What does the graph show about?

(ii) What is the importance of biodiversity as according to the graph?

(iii) Do you think that climate has an adverse impact on biodiversity as according to the graph?

# Answers

## Section-A

**Answer 1.**

(i) 48

(ii) (d) $SO_2$

(iii) (b) Both assertion and reason are true but reason is not the correct explanation of assertion.

**Explanation :**

Artificially acquired passive immunity results when antibodies or lymphocytes that have been produced outside the host are introduced into a host. This type of immunity is immediate, short lived, lasting only a few weeks to a few months.

Bone marrow transplant given to a patient with genetic immunodeficiency. Here stem cells are being transplanted which gives rise to the lymphocytes or antibodies inside the patient. So, it can be considered as artificial passive immunity.

(iv) He proposed the recapitulation theory

(v) Enzyme Linked Immuno Sorbent Assay

(vi) Heterozygous individuals show mild anaemia as they have normal and abnormal haemoglobin and hence some of the cells are sickle-shaped. These individuals are highly resistant to malaria.

(vii) Auxillary and apical meristem.

## Section-B

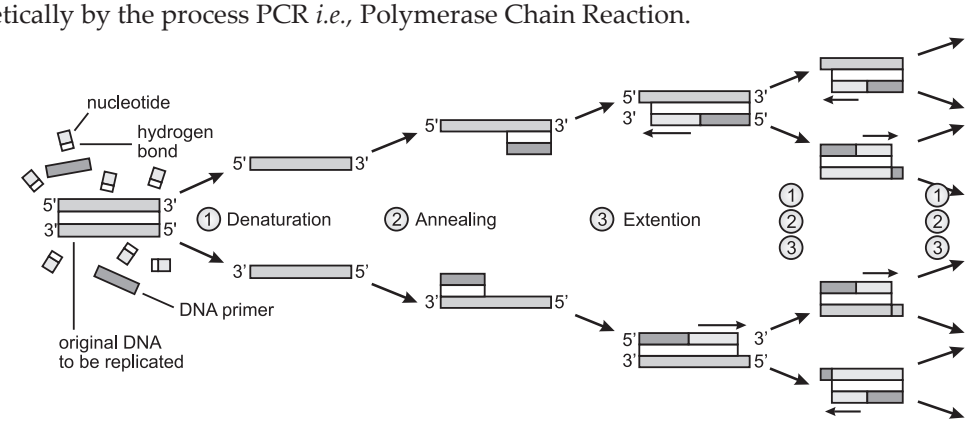
**Answer 2.**

Artificial insemination has a number of advantages and is mainly used to develop improved cattle breeds. Some of these are:

1. It makes selective breeding easier and ensures good quality cross-breeds.
2. By using this technique up to 3000 cows can be impregnated by the semen collected from one bull.
3. As semen can be frozen for a long time so it can be easily transported and artificial insemination of cows at distant and remote places could possible.
4. This method is economical and gives a high rate of successful fertilisation.

**Answer 3.**

The process of increasing the number of copies of a gene is known as gene amplification or gene duplication. Due to it, there can be an increase in RNA and in turn the protein produced by that gene. Gene amplification can be a result of an error in DNA replication, and repair machinery or error at the site of homologous recombination or for some scientific and medical purposes genes are amplified synthetically by the process PCR *i.e.,* Polymerase Chain Reaction.



PCR was developed by **Kary Mullis** in 1983 and he was awarded Nobel prize for the same. The process is inexpensive and rapid and from a very small portion of DNA, we can get thousands of copies.

**Process :**

There are three main steps in the process; Denaturation, Annealing and Extending:

1. **Denaturation:** The double-stranded template of DNA is heated at a temperature of 94-95°C to separate them into two different strands.
2. **Annealing:** During this step, the temperature is cooled to 50-54°C and the primers are annealed to single-stranded DNA.
3. **Extending:** This step is final step and the temperature is increased to 72°C and the DNA is elongated with the help of heat-stable enzyme Taq DNA polymerase.

   The process is repeated 20-40 times to get the desired amount of DNA.

**Answer 4.**

In a native habitat, one species is connected to the other in an intricate network. The extinction of one species causes the extinction of other species, which is associated with it. For example, the extinction of the host will cause the extinction of its parasites.

**Answer 5.**

The acceleration of ageing process of water resources due to human activities like heavy discharge of effluents from home or industry is termed as cultural and accelerated eutrophication. The prime contaminants which are responsible for this are nitrates and phosphates, which act as plant nutrients, thus over stimulating the algae growth. This causes decrease in DO need by other aquatic organisms. At the same time, other pollutants flowing into a lake may poison whole populations of fish whose further deplete dissolved oxygen, ultimately, causing the lake to die.

**Answer 6.**

(i) Innate immunity is non-specific type of defence, that is present at the time of birth. This is accomplished by providing different types of barriers to the entry of the foreign agents into our body. Innate immunity consists of following four types of barriers:

1. **Physical barriers:** Skin on our body is the first and foremost barrier which prevents entry of the microorganisms. Mucus coating of the epithelium lining of respiratory tract, gastrointestinal and urogenital tracts also helps in trapping microbes entering our body.
2. **Physiological barriers:** Acid in the stomach, saliva in the mouth, tears from eyes, all prevent microbial growth.
3. **Cellular barrier:** Certain types of leukocytes of our body like polymorpho-nuclear leukocytes and monocytes and natural killer cells in the blood as well as macrophages in tissues can phagocytose and destroy microbes.
4. **Cytokine barriers:** A virus-infected cell secretes proteins called interferons which protect non-infected cells from future viral infection.

**OR**

(ii) The reasons are as follows:

1. Fertilisation of a haploid gamete with another gamete containing 2n of more chromosomes.
2. Failure of separation of chromosomes (non-disjunction) during mitosis, resulting in doubling of chromosomes in a sex organ and then later in gametes.
3. Failure in meiosis during gamete formation, resulting in abnormal gametes containing more than n number of chromosomes.

**Answer 7.**

It is the primary protein in human milk which is extremely important for infants. Human alpha-lactalbumin enriched milk at 2.4 grams per litre. This transgenic milk is a more nutritionally balanced product than natural bovine milk and could be given to babies or the elderly with special nutritional or digestive needs.

**Answer 8.**

**Bioreactor:** these are the large vessels that are used to produce the desired gene products on large scale.

Some important aspects of a bioreactor are as follows:

1. Large volume of culture can be produced.
2. Raw materials are biologically converted into specific products, like proteins and enzymes.

It provides the optimal growth conditions, like temperature, pH, salts, vitamins, oxygen etc.

**Answer 9.**

(i) **PAR:** Radiations of wavelength between 400-700 nm is known as PAR (Photo-synthetically Active Radiation), it is light available for photosynthesis. PAR changes according to seasons and it also varies according to latitude and time of day. The term photon refers to both energy and photon fluxes.

(ii) **Autecology:** it is the study of the relationship of an individual to their environment.

## Section-C

**Answer 10.**

(i) The causes of biodiversity losses are as follows:

1. **Habitat loss and fragmentation:**
   (a) The main cause of the extinction of species is the destruction of their habitat. Ex. Tropical rain forest once covered 14% of the land surface but now only 6% of the land area is under tropical rain forest and caused mass destruction of such species.
   (b) When large habitats are broken up into small fragments due to various human activities, mammals and birds requiring large territories and certain animals with migratory habits are badly affected, leading to their population decline.
   (c) Pollution causes the degradation of many habitats and that threatens the survival of many species.
2. **Over-exploitation:** The natural resources are overexploited by humans and result in degradation and extinction of the resources.
3. **Alien species invasions:** When exotic species are introduced unintentionally or deliberately, some become invasive and cause harmful impacts resulting in the extinction of the indigenous species. The recent example of African catfish introduced for aquaculture purposes is posing a threat to the indigenous catfishes of Indian rivers.

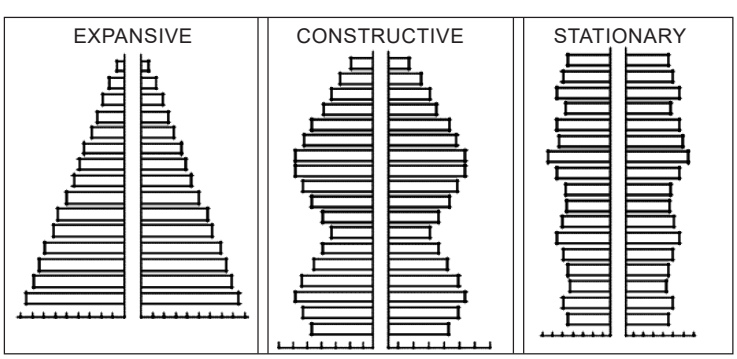
**OR**

(ii) There are generally three types of population pyramids created from age-sex distributions— Expansive, Constructive and Stationary.

Expansive population pyramids represent larger numbers or percentages of the population in the younger age groups. The populations with very large fertility rates and lower than average life expectancies show these types of pyramids.

Constructive population pyramids show lower numbers or percentages of younger people. Stationary or near-stationary population pyramids display somewhat equal numbers or percentages for almost all age groups.

So the given pyramids are:



**Answer 11.**

The difference between Primary immune response and secondary immune response is as follows:

| Sl. No | Primary immune response | Secondary immune response |
|---|---|---|
| 1. | It refers to the immune response as a result of the first encounter of an organism with an antigen. | Refers to the immune response as a result of the second and subsequent encounters with the same antigen. |
| 2. | It takes relatively longer for the immune system to respond. | The response of immune system is very rapid due to presence of memory cells who get into action immediately. |
| 3. | Results in a feeble or mild response and decline rapidly. | Results in a strong response that lasts much longer, may be life time. |
| 4. | The individual may suffer from the disease. However it results in the formation of memory cells that helps in secondary immune response. | Individuals may not suffer from the disease due to the heightened response. |

**Answer 12.**

The process of gene cloning involves replication and production of a large number of copies of recombinant DNA molecules. The entire gene-cloning procedure includes the following steps:

1. A fragment of DNA, containing the gene to be cloned, is inserted into a circular DNA molecule called a vector, to produce a recombinant DNA molecule.
2. The vector transports the gene into a host cell, which is usually a bacterium, although other types of living cells can be used.
3. Within the host cell, the vector multiplies, producing numerous identical copies, not only of itself but also of the gene that it carries.
4. When the host cell divides, copies of the recombinant DNA molecule are passed to the progeny and further vector replication takes place.
5. After a large number of cell divisions, a colony, or clone, of identical host cells is produced. Each cell in the clone contains one or more copies of the recombinant DNA molecule; the gene carried by the recombinant molecule is now said to be cloned.

**Answer 13.**

(i) It explains the link between the biodiversity and other components of the ecosystem.

(ii) It is important because of the following points:

1. It regulates the climate.
2. It controls the ecosystem functions like biogeochemical cycling of nutrients.
3. It provides ecosystem services to the human beings.

(iii) Yes, various anthropogenic processes and some ecosystem functions induce the changes in climatic patterns. This affects the biodiversity.

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