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

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**.*

Section-A

Question 1

(i) Scientific term for a foreign gene that is inserted in *r*DNA?

(ii) Transgenic organisms used for the commercial production of insulin is:

(a) Mycobacterium (b) E. coli

(c) Saccharomyces (d) Rhizobium

(iii) **Assertion:** Community with more species tends to be more stable than those with less species.
Reason: More will be the species, less will be year to year variation in total biomass.

(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 P. Erhlich

(v) Who gave the first clinical gene therapy?

(vi) Electrostatic precipitator need voltage in range of _____.

(vii) Why CNG preferred to diesel as a fuel in automobiles?

Section-B

Question 2

Give one word for the following:

(i) Species have disappeared from the wild as well as from cultivation.

(ii) Nutrient cycle whose reservoir exists in the Earth's crust.

Question 3

Why the bacteriophages used as vectors in RDT?

Question 4

Define hydrarch succession and xerarch succession.

Question 5

(i) Write the characteristics of climax community.

OR

(ii) What are the important features of a generalised energy flow model? Explain in brief.

Question 6

What are the advantages of biopesticides?

Question 7

How integrated pest management is carried out and what is its purposes?

Question 8

Explain the importance of the gene bank of wild species.

Question 9

What is the significance of genetic diversity?

Section-C

Question 10

Explain different enzymes involved in rDNA technology in brief.

Question 11

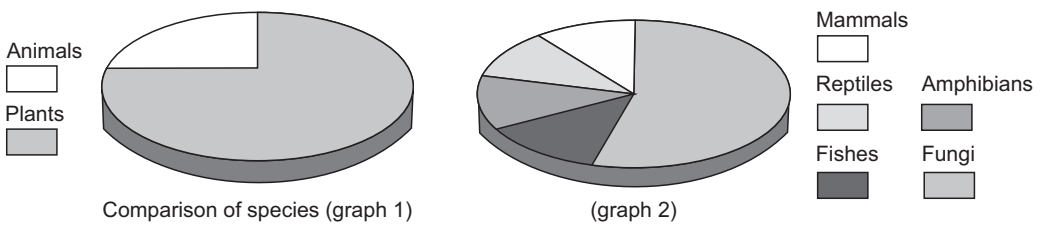
Name the vaccine for following disease and also mention their age group with efficacy of those vaccines.

(i) DPT-Hib
(ii) Hepatitis
(iii) Polio
(iv) Tuberculosis (TB)

Question 12

What are the different types of ecological diversities?

Question 13



Analyse the following given pie chart and answer the questions based on it.

(i) What conclusion can be derived from Graph 1?
(ii) What does Graph 2 say?
(iii) What is the ratio of fungi to the animals?

OR

Briefly explain Rivet Popper Hypothesis.

Answers

Section-A

Answer 1.

(i) Transgene
(ii) (b) E.coli
(iii) (a) Both assertion and reason are true and reason is the correct explanation of assertion.

Explanation :

Communities with more species are more stable due to variety of complex inter-relationships and interactions and hence there are less year to year variations in total productivity.

(iv) He gave the Rivet Popper Hypothesis.
(v) French Anderson
(vi) 20,000 to 1,00,000 Volt DC.
(vii) CNG is better fuel than petrol and diesel as it is cheaper, does not pollute environment and cannot be siphoned off by thieves. It cannot be adulterated also as petrol or diesel.

Section-B

Answer 2.

(i) extinct

(ii) sedimentary cycle

Answer 3.

Bacteriophages are used as vectors in RDT because of the very high copy number of bacteriophage genome within the bacterial cells bacteriophages are used as a vector. They also have the ability to gain an easy entry into the bacterial hosts to produce a large number of recombinant DNA.

Answer 4.

Hydrarch succession occurs in water bodies, like ponds and lakes. This succession series progress from hydric to mesic conditions.

Xerarch succession occurs in dry and hot terrestrial areas or dry low moisture conditions, like dunes, bare rocks etc.

Answer 5.

(i) The characteristics of climax community are as follows:

1. A climax community is in equilibrium with the environment. It's a stable community and does not show changes in species composition as long as the environmental conditions remain the same.
2. It's often has one or more dominant species. It is generally referred to as those species which collectively form greater biomass and are generally larger in size.
3. It may take hundreds of years for a climax forest community to be established on bare rock.
4. It supports large number of species and has high biomass.
5. It provides a wide range of food materials.
6. It has a diverse variety of niches for animals.

The species composition of climax community is determined by the regional climate and local conditions of soil, topography and water availability.

OR

(ii) Generalised energy flow model was first proposed by H. T. Odum in 1956. Following are the important features of the model:

1. Produces only about 1-5% of the total solar radiation. Most of the solar radiation gets dissipated as heat.
2. The energy captured in gross primary production of producers is utilised as:
   (a) A major part is used for maintenance of the standing crop i.e. used for respiration.
   (b) A part if used as food to herbivores.
   (c) Part remain unutilised and ultimately converted to detritus and serves as an energy resource to decomposers.
3. Energy captured by herbivores also used in various ways:
   (a) A major part is used for respiration.
   (b) A part is not assimilated in their body and passes out as faecal matter and transferred to decomposers.
   (c) The part that remains is available for carnivore food. From this part a part is not utilised by carnivores and so its gets transferred to decomposers after the death of herbivores.
4. The respiration cost increases sharply along successive higher trophic levels. On an average:
   (a) Respiration of producer consumes 20% of its gross productivity
   (b) Respiration of herbivore consumes 30% of its gross productivity.
   (c) Respiration of carnivore consumes 60% of its gross productivity.

   Hence there is huge loss of energy at successive higher trophic levels.
5. Since there is a step-wise reduction in energy in successive trophic levels, the length of food chain in ecosystem is generally limited to 4-5 trophic levels.

Answer 6.

The advantages of biopesticides are as follows:

1. Biopesticides are biodegradable and the cost is very low compared to chemical pesticides.
2. Use of biopesticides is expected to reduce the application of chemicals for the control of weeds, insect, pests and diseases.
3. The chemical pesticides have persistent toxin effects and are causing ecological imbalance by polluting the environment. The use of biopesticides will help to control these toxic substances.
4. Chemical pesticides are a good source of pollutants and biopesticides on the other hand are environment friendly and do not cause pollution.

Answer 7.

Today we understood the demerits of the use of chemical pesticides. It's needs for today to take care of chemical pesticides and selective use of biopesticides. Under the integrated pest management method following steps are taken to control or eliminate the use of chemical pesticides:

1. Soil conditioning, rotation of crops and improved sanitation practices are employed to reduce the pest population.
2. A target crop preferred by the pests is planted from the main economic crop to keep the pests away.
3. Mixed planting is done to reduce the number of particular pests and this helps to reduce the use of pesticides.
4. Instead of chemical fertilizers, the use of natural insecticides extracted from plants and microbes is encouraged.

Answer 8.

Wildlife has a great value as a gene bank of nature. It is of extreme importance in a breeding programme in agriculture, animal husbandry, etc. Man has tried to produce high-yielding varieties. These varieties should be disease-free and stress resistance as well. For these scientists look for useful genes present in the wild. Plants in the wild have to manage with unfavourable conditions. Over a period of time, they have evolved various strategies for survival.

Answer 9.

The significance of genetic diversity are as follows:

1. It enables a population to adapt to its environment and respond to natural selection. More genetic diversity in a species means, it can adapt better to the changed environment condition.

   More diversity → variations in population → better adaptation to changing environment conditions.

   Less diversity→ less variations or uniform in population → lead to death or wipeout of a population in changed environmental conditions.

   Species with little genetic variation are at a greater risk of extinction, especially when faced with a new disease, predator or environmental challenge.

   Low diversity leads to uniformity, like the production of large monocultures of genetically similar crops.
2. Genetic variations are important for evolution. They are the basis of speciation. Natural selection acts on variants within a population and leads to the evolution of different species. Genetic diversity within a species increases with environmental variability.
3. Due to genetic variations, there is diversity at the species and the community level. More species in a community means more genetic diversity and few species in a community means less genetic diversity.

Section-C

Answer 10.

DNA modifying enzymes are as follows:

1. **Restriction endonucleases:** These are also called 'molecular scissors' as they can cut DNA at a specific location from a plasmid as well as from the foreign DNA in such a way that they leave

single-stranded portions called sticky ends both at the plasmid as well as the foreign DNA. They are obtained from bacteria.

2. **DNA polymerase:** They are obtained from bacteria and they replicate DNA by synthesising a new strand of DNA from existing DNA. These are helpful in the cloning of genes.
3. **DNA ligases:** When cut by some restriction endonuclease, the resulting DNA fragments have the same kinds of sticky ends and these can be joined by using DNA ligases. This can join the piece of foreign DNA with the cut plasmid making it a circular plasmid again. Now the circular plasmid contains the plasmid gene as well as the foreign gene. They are also obtain from bacteria.

Answer 11.

Vaccine name	Disease	Age group	Efficacy
1. DPT-Hib	Diphtheria, Pertussis and tetanus-Haemophilus influenza type b.	All babies of 2,3 or 4 month.	90-99%
2. Hepatitis-B	Hepatitis	All babies whose mothers or close family members have been infected with hepatitis-B.	Unknown
3. Polio	Polio	All babies of 2, 3 or 4 months at the same time of inoculation of DPT-Hib.	Almost 100%
4. BCG	Tuberculosis (TB)	All children between 10 and 14 years.	70%

Answer 12.

Ecological diversities are:

1. **Alpha diversity:** It refers to the diversity of organisms sharing the same community. It is represented by studying the combination of species richness, evenness of species and abundance and the kind of species present in a community.
2. **Beta diversity:** It is a diversity that exists between two major ecosystems like grassland and forest. It is the diversity that exists in the transit zone where there are differences in species composition along the gradient of habitats or environmental gradients.
3. **Gamma diversity:** it is the diversity of habitats that exists over a large geographical area or total landscape. This diversity is represented by various habitats, number of niches, trophic levels and various ecological processes that sustain the energy flow. Since it represents diversity in a large area, it also focuses on various biotic interactions and the role of keystone species.

Answer 13.

(i) As according to the graph, there is maximum population of animals as compared to plants that comprise of 70 percent of the total species population.

(ii) As according to graph, in plants, the most species having its existence on earth is fungi.

(iii) The existing fungal species, their population is more than the total population of fishes, reptiles, amphibians and mammals.

OR

The importance of biodiversity for the survival of specific species can be explained by the Rivet Popper Hypothesis proposed by Paul Ehrlich. According to this hypothesis:

1. Ecosystem is like an aeroplane and all its parts are joined together using thousands of rivets.
2. If every passenger, travelling in it, starts popping a rivet to take home [causing a species to become extinct], it may not affect flight safety [due to proper function of the ecosystem], but as more and more rivets are removed the lane becomes dangerously weak over a period of time.
3. Moreover, which rivet is removed is also crucial, e.g. loss of rivets on the wings [called key species that derive major ecosystem functions] is a more serious threat than loss of rivets on seats or windows inside the plane.

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