ISC SEMESTER 2 EXAMINATION
SAMPLE PAPER - 2
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) Write the name of the first discovered restriction endonucleases.

(ii) Photochemical smog does not contain:

(a) PAN (b) CO_2

(c) NO_2 (d) O_3

(iii) **Assertion:** Diversity observed in the entire geographical area is called gamma diversity.
Reason: Biodiversity decreases from high altitude to low altitude.

(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 Misra.

(v) Write the full form of ADA.

(vi) Define contact inhibition.

(vii) Why are the plants raised through micropropagation termed as somaclones?

Section-B

Question 2

What is heterosis ?

Question 3

Beta galactosidase enzyme is considered a better selectable marker. Justify the statement.

Question 4

State any two differences between litter and detritus.

Question 5

(i) What is necessary to reduce sulphur from petroleum products?

OR

(ii) How micro climate is different from the climate of an area? Explain.

Question 6

What are statins?

Question 7

Expand ELISA. What is its use? What is its principle of working?

Question 8

What is alpha-1-antitrypsin? Name the disease caused by a mutation in it or its deficiency and transgenic animal used for its production.

Question 9

Discuss the factors that reduce the DO content in water.

Section-C

Question 10

Define alien species and endemic species quoting an example of each.

Question 11

What are the differences between B and T cells?

Question 12

Draw a well labelled diagram of vector pBR322 and discuss its characteristic features.

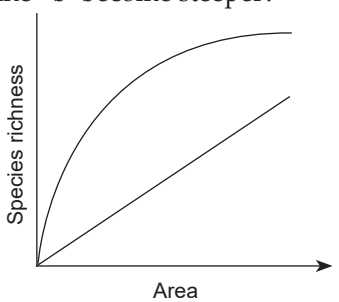
Question 13

The graph below shows the species-area relationship. Answer the following question as directed:

(i) Name the naturalist who studied the kind of relationship shown in the graph. Write the observation made by him.

(ii) Write the situations as discovered by ecologists when the value of 'Z' [slope of line(s)] lies between (a) 0.1 and 0.2 (b) 0.6 and 1.2.

(iii) When would the slope of the line 'b' become steeper?



OR

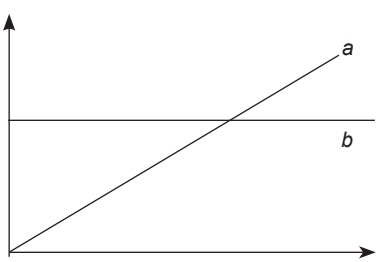
Analyse the following graph and answer the questions based upon it:

(i) In what reference is the graph given above?

(ii) What do 'a' and 'b' represent in the graph?

(iii) What are the two regulatory mechanisms that are followed by the organisms to maintain homeostasis?

(iv) Why tiny organisms are not found in the Polar Regions?



Answers

Section-A

Answer 1.

(i) Hind II

(ii) (b) CO_2

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

Explanation :

Alpha diversity is species specific diversity present in each community. Beta diversity is species diversity between two communities. Gamma diversity is species diversity in the entire geographical area. Biodiversity increases from high altitude to low altitude.

(iv) He is regarded as the father of Indian ecology.

(v) Adenosine Deaminase.

(vi) It is a property of normal cells in which the cells stops dividing when comes to their surrounding cells.

(vii) In this process the plants generated similar to the original plant through which they are grown, so they are called somaclones.

Section-B

Answer 2.

When two unrelated individual varieties or lines having desired genes are crossed, it results in a F_1 hybrid, that has the useful characters of both the parents. The F_1 hybrid is superior to both parents. The superiority of the hybrid over either of parent in one or more faults is called heterosis or hybrid vigour.

Answer 3.

The non-recombinants can be differentiated from recombinants on the basis of colour change when β-galactosidase is used as a selectable marker. When grown on a chromogenic substrate the non-recombinants show a colour change from colourless to blue whereas the recombinants are not able to show any colour change due to insertional activation. Moreover, the procedure involving β-galactosidase is a single step, easy and non-cumbersome.

Answer 4.

Difference between litter and detritus :

Sl. No.	Litter	Detritus
1.	Litter is all types of ground waste that has been disposed of improperly.	Detritus constitutes the remains of dead plants and animals.
2.	It contains biodegradable and non-biodegradable material.	It contains only biodegradable material.

Answer 5.

(i) It is necessary to reduce sulphur from petroleum products because sulphur dioxide formed as a result of fuel combustion and is highly hazardous for our environment. It has a significant impact on human health and is a major cause of acid rain.

OR

(ii) In a forest, the large and dense trees reduce the amount of light reaching the lower strata. The micro climate of the plants in this lower region is very different from the upper region. The light being less here, the temperature of the air is also lower than outside. Also it may be more humid in this region.

Answer 6.

Statins are a class of drugs that are prescribed by doctors to lower blood cholesterol levels in the blood. By doing this risk of heart attack and stroke can be minimised. They do this by blocking the enzyme HMG CoA reductase responsible for the production of cholesterol. The enzyme is present in the liver. Atorvastatin and Rosuvastatin are the most potent statins. Statins lower LDL cholesterol and total cholesterol levels. Statins may also help to stabilise plaque in the arteries.

Answer 7.

ELISA: Enzyme Linked Immuno Sorbent Assay. Mainly used to detect blood-borne diseases *e.g.,* HBV, HCV, HIV and HTLV.

This test is depending on the principle of antigen-antibody interaction. Specific antibodies bind the target antigen and detect the presence and quantity of antigens binding. In order to increase the sensitivity and precision of the assay. This provides us useful measurement of antigen-antibody concentration.

Answer 8.

Alpha-1-antitrypsin is a protein made by normal functioning liver cells. It has an important role in preventing damage to lungs and liver cells by an enzyme in white blood cells whose function is to prevent infections and alpha-1-antitrypsin prevents it from attacking normal cells. Emphysema is a disease that is caused by a mutation in AAT and it is an inherited disorder. Transgenic sheep can be used to produce milk that contains AAT.

Answer 9.

Following factors are responsible for the reduction of DO in water:

1. **Biological Oxygen Demand:** It is a measure of the oxygen demand by the aerobic decomposers to decompose biodegradable matters. Hence BOD is directly proportional to input of organic waste *i.e.* high input of organic waste increase BOD. Higher amount of organic wastes cause a drop in DO content in water.
2. **Chemical Oxygen Demand:** It is a measure of the oxygen equivalent of the requirement for oxidation of total organic matters present in a water body. High COD reduce DO in a water body.
3. **High Temperature:** With an increase in water temperature dissolution of oxygen gas in water reduce and that reduce DO in a water body.

Section-C

Answer 10.

Alien species is that one which is out of the area and invades the region, such species is known as alien species. Example–an invasion of Lantana camara, a weed species in the area.

The species that is confined to only the specific geographical area and cannot be found in any other ecological unit, such species are known as endemic species. For example–mango tree is an endemic species of the coastal area.

Answer 11.

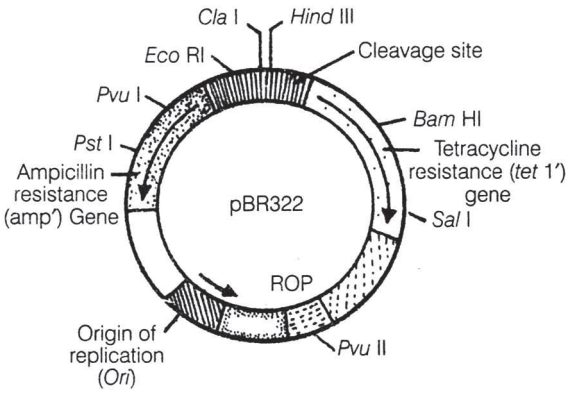
Sl. No.	B cells	T cells
1.	They form a part of the humoral immune system.	They form a part of the cell-mediated immune system.
2.	Processed in the bone marrow.	Matured in the thymus gland.
3.	Release the antibodies into the lymph which is eventually enter the blood.	Whole cell directly attacks the antigen or infected cells.
4	They defend the body against invading bacteria or viruses and do not react against transplants.	They defend the body against the pathogens as well as attack the transplants.

Answer 12.

1. pBR322 is 4363 bp in size, which helps in the easy purification of recombinant DNA molecules constructed with it. Even with 6 kb of additional DNA, a recombinant pBR322 molecule is still a manageable size.
2. The second feature of pBR322 is that it carries two sets of antibiotic resistance genes. Either ampicillin or tetracycline resistance can be used as a selectable marker for cells containing the plasmid.
3. Each marker gene includes unique restriction sites that can be used in cloning experiments. Insertion of new DNA into pBR322 that has been restricted with PstI, PvuI, or ScaI inactivates the amp R gene, and insertion using any one of eight restriction endonucleases (notably BamHI and HindIII) inactivates tetracycline resistance.
4. This great variety of restriction sites that can be used for insertional inactivation means that pBR322 can be used to clone DNA fragments with any of several kinds of sticky ends.
5. A third advantage of pBR322 is that it has a reasonably high copy number. Generally, there are about 15 molecules present in a transformed E. coli cell, however, this number can be increased up to 1000–3000, by plasmid amplification in the presence of a protein synthesis inhibitor such as chloramphenicol.

   An E. coli culture, therefore, provides a good yield of recombinant pBR322 molecules.

   A map of pBR322 showing the positions of the ampicillin resistance (ampR) and tetracycline resistance (terR) genes, the origin of replication (ori) and some of the most important restriction sites.



Answer 13.

(i) The naturalist Alexander Von Humboldt explained about the above given graph. His observations suggested that, the species richness increases with an increase in explored area but upto certain limit.

(ii) 1. It shows unaffected distribution in an area. It is a normal range.

2. The value shows steeper slope of regression, that can be analysed when the species area relationship is studied on very large area say, for example, an entire continent.

(iii) The slope of the line 'b' becomes steeper when large area such as continents are considered for species-area relationship.

OR

(i) It is the response given by the organism to the abiotic factors. When plotted on the graph they can be represented as above.

(ii) 'a' denotes the conformer organisms whereas 'b' denotes regulator organisms.

(iii) Organisms either thermoregulate (Regulation of temperatures) or osmoregulate (Regulation of osmotic pressure) to maintain homeostasis.

(iv) Tiny organisms expose maximum surface area through which large amount of heat produced in the body is given out. So in order to generate the energy again, they have to expand much more energy. Therefore, they are not found in the polar region.

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