

Question Paper

Conducted by the Central Board of Secondary Education (CBSE)



Time Allowed: 2 Hours

Maximum Marks: 35

General Instructions

- (i) This question paper contains **13 questions**. All questions are compulsory.
- (ii) Section A: Questions 1 to 6 carry 2 marks each.
- (iii) Section B: Questions 7 to 12 carry 3 marks each.
- (iv) Section C: Questions 13 carry 5 marks each.
- (v) Attempt one alternative where an internal choice is provided. Follow the instructions within each question.
- (vi) Draw neat, properly labelled diagrams wherever necessary.

Section A

1. State the most important contribution of the following microbes for human welfare:

- (a) *Monascus purpureus*
- (b) *Trichoderma Polysporum*

2(a). State the mode of action of cocaine on human body. Write the scientific name of the source plant it is obtained from.

OR

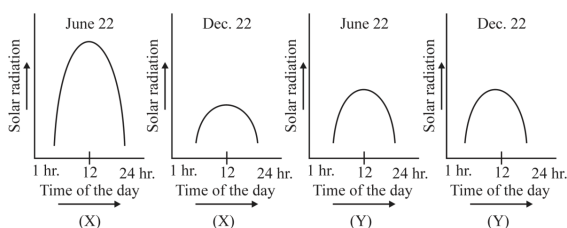
2(b). Enumerate four most common warning signs of drug and alcohol abuse amongst the youth.

3(a). (i) Write the observations made at the end of Connell's field experiment on barnacles on the rocky sea coasts of Scotland.

(ii) Name any two categories of organisms that in general are adversely affected by competition.

OR

3(b). The graphs (X) and (Y) given below depict the diurnal variations in the solar radiations in the month of June (Summer) and in December (Winters):

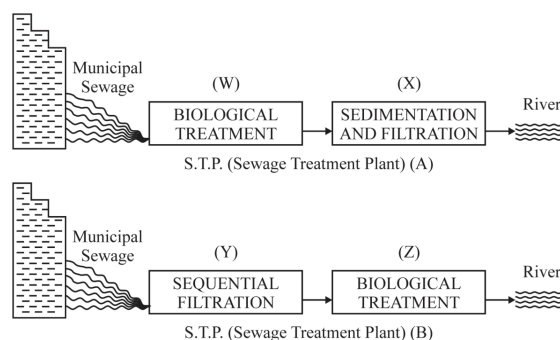


(i) Which of the two graphs depicts tropical region and temperate regions respectively?

(ii) Which of the two regions (X) or (Y) will show high biological diversity and why?

4. Ringworm is one of the most common infectious fungal disease in humans. Name any two genera of fungi which cause ringworm and state any of its two symptoms.

5. Study the given diagram of Sewage Treatment Plant (S.T.P.) and answer the questions that follow:



(a) Which one of the two 'S.T.P.' (A) or (B) will be more effective in treating the human excreta in the municipal waste?

(b) Write the steps followed in carrying the treatment of the sewage in step (Z), once the BOD of sewage is reduced significantly till it is passed on to the "anaerobic sludge digesters".

6. What would be the best method to measure the total population density of a dense bacterial culture in a petridish and why?

Section B

7. Different types of antibodies are produced in our body by the B-lymphocytes in response to a pathogen that enters in our blood. Name any two antibodies produced and draw a schematic representation of an antibody molecule and label its four parts.

8. A cell free method of amplifying DNA first developed in the mid 1980's revolutionized the field of biotechnology. Name the method and explain the basic steps of the technique involved.

9. 'An HIV patient normally doesn't die of 'AIDS', but death is caused due to many other infections.' Do you agree with the statement? Give explanatory reasons in support of your answer.

10. Explain how recombinant human insulin was prepared in 1983 by Eli Lilly an American company.

11. (a) Enlist two criteria that are used to identify a region for maximum protection as 'Biodiversity hotspots'.

(b) Name any two "hotspot" regions in our country.

12(a). Given below is an equation describing the Species-Area relationship between species richness and area for a wide variety of taxa as angiosperm plants, birds, bats etc.

$$S = CA^Z$$

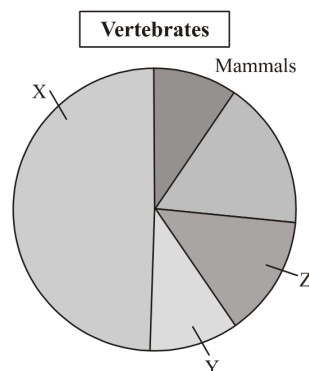
(i) Give a graphical representation of the given equation showing Species-Area relationship.

(ii) What does 'S' represent in the given equation?

(iii) What is the value of 'Z' (regression coefficient) for frugivorous birds and mammals in the tropical forests of different continents?

OR

12(b). Given below is a 'pie chart' representing the global biodiversity: proportionate number of species of major taxa.

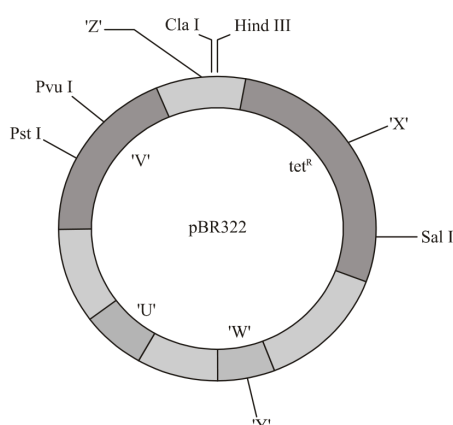


(i) Identify (X) and (Y) in the given 'pie chart'.

(ii) "Extinction of species across taxa are not random." Which group amongst the vertebrates is more vulnerable to extinction.

(iii) Give one example each of recent extinctions of species in Russia, Mauritius and Australia.

13(a). Cloning of genes, play a very significant role in genetic engineering, helping the transfer of desirable foreign genes into different hosts. The scientists, to make this process easier and effective are creating engineered vectors in such a way that they help easy linking of foreign DNA and selection of recombinants from non recombinants. 'pBR322' is one such engineered vectors developed by scientists. A diagram of an engineered vector pBR322 is given below:



- Name the host for this cloning vector.
- Identify 'Rep' and 'Ori' in the diagram from 'U', 'V', 'W', 'X', 'Y' and 'Z'. Write their functions.
- Draw the fragments that will be formed by the action of 'Z' (marked in the diagram) on the specific site of the DNA segment given below:

5' --- GTACGAATTCCTGA --- 3'
3' --- CATGCTTAAGGACT --- 5'

OR

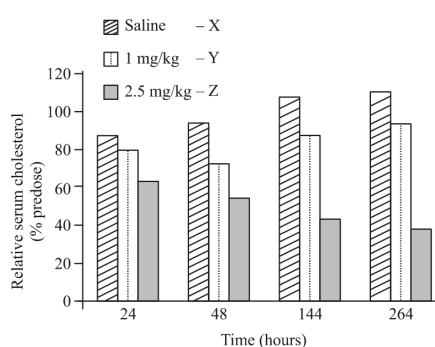
13(b). RNA interference (RNAi) holds great potential as a therapeutic agent for the treatment of human diseases and as biocontrol agents in controlling pests in the field of agriculture. An experiment was carried to study the use of 'RNAi' for the potential treatment of disorders of cholesterol metabolism. Some people possess genetic mutations with elevated levels of ApoB gene which predisposes them to coronary artery diseases.

Lowering the amount of ApoB can reduce the number of lipoproteins and lower the blood cholesterol.

Tracy Zimmerman and her colleagues used RNAi in 2006 to reduce the level of ApoB in non human primates Cynomolgus monkeys.

One group of monkeys were given RNAi treatment (small interfering RNAs, SiRNAs) (doses 1 mg/kg SiRNAs), second group of monkeys were given RNAi treatment (doses 2.5 mg/kg SiRNAs) and third group of monkeys were injected with saline.

The results of the study are depicted in the graph below:



- How does the treatment with 2.5 mg/kg brings an effect on cholesterol metabolism when compared from 24 hours and 144 hours.
- Write any two natural sources from where dsRNA molecule could be obtained for silencing the specific mRNA.
- How is RNAi used in controlling the infection on the roots of tobacco plants by the nematode *Meloidogyne incognita*.

- End of Question Paper -