CBSE EXAMINATION PAPER-2022

BIOLOGY

(Solved)

Time allowed : 3 hours | Maximum Marks : 63

General Instructions :

Read the following instructions carefully and follow them :

i. This question paper contains **33 questions.** All questions are **compulsory.**

ii. This question paper is divided into **5 sections.**

iii. **Section A** – questions number **1 to 5** are case based questions

iv. **Section B** – questions number **6 to 15** are multiple choice questions

v. **Section C** – questions number **16 to 22** are very short answer

vi. **Section D** – questions number **23 to 30** are short answer

vii. **Section E** – questions number **31 to 33** are long answer

viii. There is no overall choice given in the question paper. However, an internal choice has been provided in few questions.

ix. Use of calculator is NOT allowed.

Section A

Question 1.

Question 2.

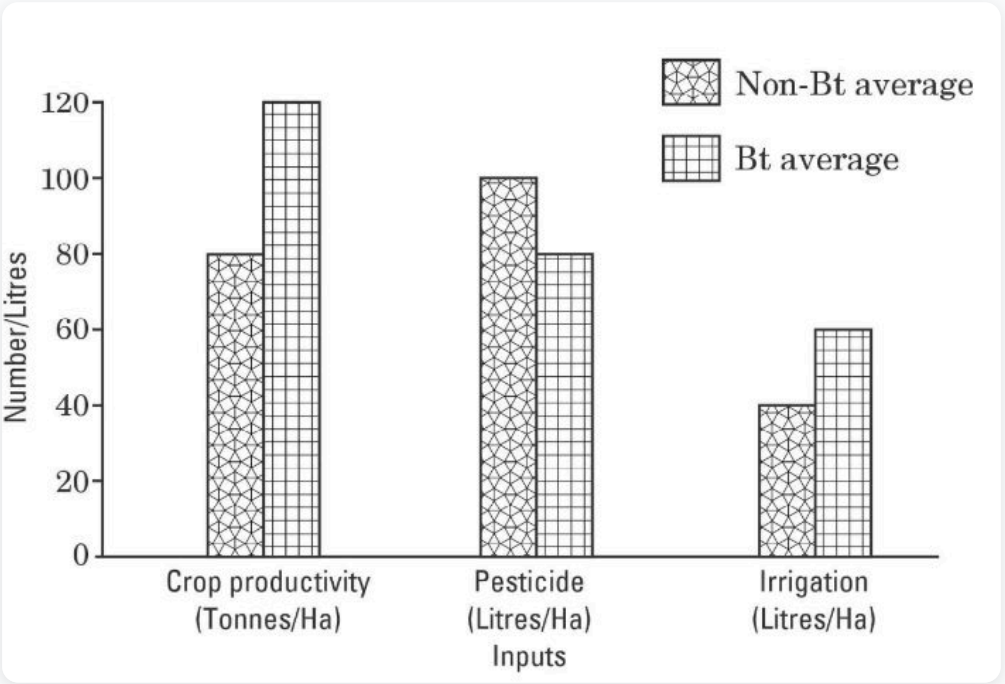
Gene of interest/alien gene is introduced by a cloning vector into a host cell to bring about a desired phenotypic expression in a host cell. The cloning vectors used are plasmid and bacteriophages. Biotechnologists in their labs, for desired results engineered specialised cloning vectors. One such vector is pBR322. Study the diagram carefully and answer the questions that follow.

Question 3.

Gene of interest/alien gene is introduced by a cloning vector into a host cell to bring about a desired phenotypic expression in a host cell. The cloning vectors used are plasmid and bacteriophages. Biotechnologists in their labs, for desired results engineered specialised cloning vectors. One such vector is pBR322. Study the diagram carefully and answer the questions that follow.

Question 4.

There are two different farm lands, one where Bt-cotton crop was cultivated and the other where non Bt-cotton crop (indigenous) was cultivated. Farmers responsible for this experimental cultivation were free to use the farming practices of their choice. During the cultivation period, the data was collected with respect to the amount of pesticide used, water required for irrigation and at harvesting time, the crop productivity. Based on the data collected, a bar graph was plotted which is shown below.



(1)

Write your interpretation, with reason, on the basis of the three parameters plotted in the graph.

[1 Marks]

(2)

Which one of the crops would you like to cultivate in your farm and why ?

[2 Marks]

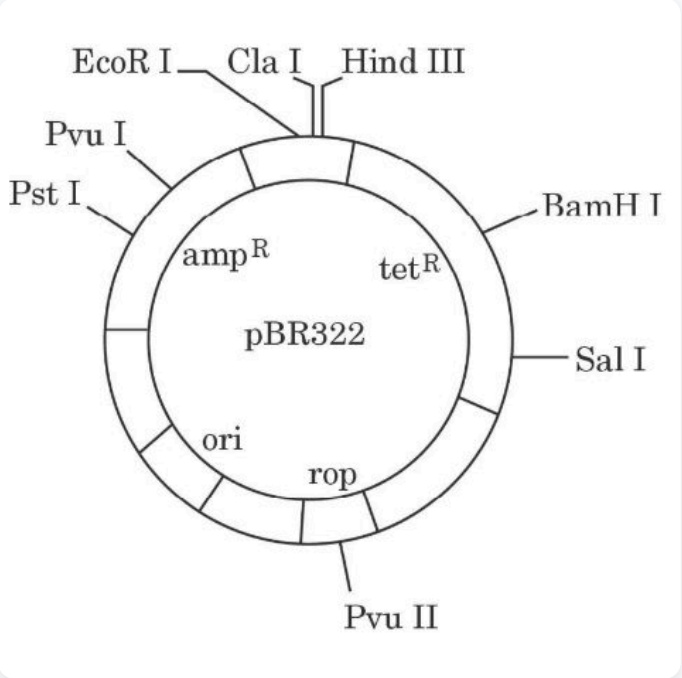
(3)

Which one out of these two crops would a farmer from Rajasthan like to cultivate and why ?

[2 Marks]

Question 5.

Gene of interest/alien gene is introduced by a cloning vector into a host cell to bring about a desired phenotypic expression in a host cell. The cloning vectors used are plasmid and bacteriophages. Biotechnologists in their labs, for desired results engineered specialised cloning vectors. One such vector is pBR322. Study the diagram carefully and answer the questions that follow.



(1)

Identify the gene you would select for the role of a selectable marker in pBR322. Explain why.

[1 Marks]

(2)

Will the experiment be successful if the alien DNA is ligated at Hind III restriction site ? Give reason in support of your answer.

[2 Marks]

(3)

Write the property/characteristic of plasmid and bacteriophage that makes them efficient cloning vectors.

[2 Marks]

Section B

Question 6.

The common bacterium found in the anaerobic sludge during sewage treatment and also in the rumen of cattle is:

[1 Marks]

(A) Methanogens

(B) Bacillus subtilis

(C) Azotobacter

(D) Escherichia coli

Question 7.

What are the effective biocontrol agents of several plant pathogens belonging to the group of viruses?

[1 Marks]

(A) Fungi

(B) Bacteria

(C) Mycoplasma

(D) Nematodes

Question 8.

Certain microbes used as biofertilizers fall under which taxonomic group?

[1 Marks]

(A) Fungi

(B) Virus

(C) Eukaryota

(D) Bacteria

Question 9.

Different species belonging to genus Trichoderma are useful to humans as well as to plants by:

[1 Marks]

(A) Promoting plant growth

(B) Enhancing nutrient uptake

(C) Decomposing organic matter

(D) Producing antibiotics

Question 10.

The impact of interaction on growth seen in the diagrams shows that:

[1 Marks]

(A) Diversity has no impact on growth

(B) One species may dominate

(C) Competition is beneficial for both species

(D) Cooperation increases growth rate

Question 11.

Which of the following statements best describes the population growth pattern observed?

[1 Marks]

(A) Stable population with minor fluctuations

(B) Decline due to resource depletion

(C) Exponential growth forever

(D) Logistic growth with carrying capacity

Question 12.

Which of the following diseases is not caused by a virus?

[1 Marks]

(A) AIDS

(B) Influenza

(C) Dengue

(D) Typhoid

Question 13.

Which of the following diseases is not caused by a virus?

[1 Marks]

(A) AIDS

(B) Influenza

(C) Dengue

(D) Typhoid

Question 14.

The pathogen *Plasmodium* is transmitted by:

[1 Marks]

(A) Housefly

(B) Female Anopheles mosquito

(C) Sand fly

(D) Male Anopheles mosquito

Question 15.

The pyramid of biomass in a terrestrial ecosystem is:

[1 Marks]

(A) Always inverted

(B) Irregular

(C) Spindle-shaped

(D) Always upright

Section C

Question 16.

Explain, giving two reasons, how immune response by "vaccine" is different from that by "antitoxin" in humans.

[2 Marks]

Question 17.

Mention the common bacterium found in the anaerobic sludge during sewage treatment and also in the rumen of cattle. How is this bacterium commercially useful ?

[2 Marks]

Question 18.

Some of the microbes used as biofertilizers are prokaryotes. Name the taxonomic group they come under. With the help of an example, mention how they act as biofertilizers.

[2 Marks]

Question 19.

Different species belonging to genus Trichoderma are useful to humans as well as to plants. Justify their roles by giving one instance of each.

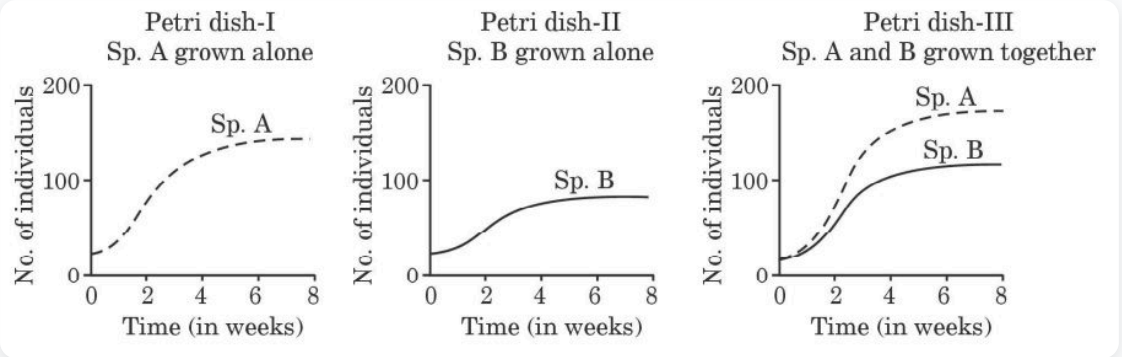
[2 Marks]

Question 20.

The figures given below show the results of a lab experiment in which two microbial species A and B belonging to same genus were grown in three petri dishes having same culture medium. In Petri dish-I, Species-A was grown alone for 8 weeks. In Petri dish-II, Species-B was grown alone for 8 weeks. In Petri dish-III, both the species were grown together with the same number as Petri dish-I and Petri dish-II for 8 weeks.

What conclusion will you draw from the graphs in terms of impact of interaction on growth ? Explain, giving reason.

[2 Marks]

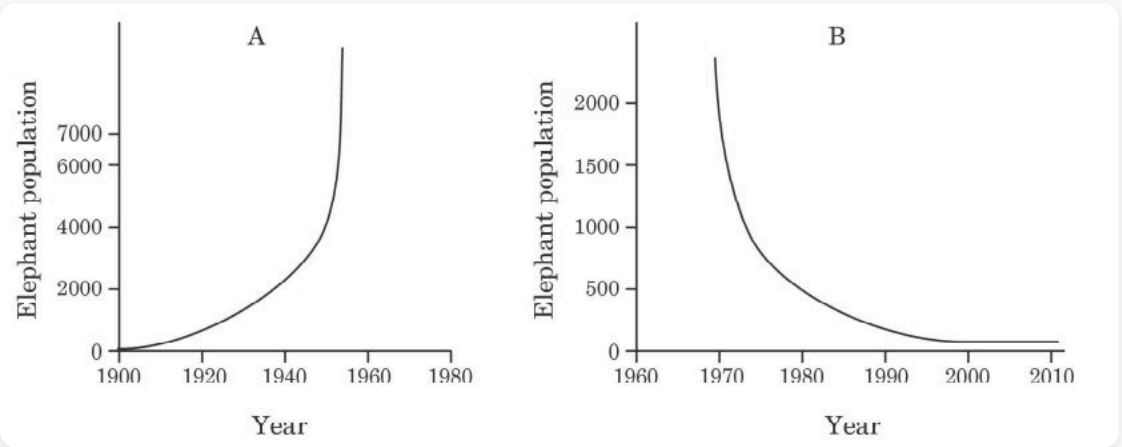


Question 21.

The graphs given below, A and B, represent population of elephants in two different National Parks (a hypothetical situation) at different times.

Study the graphs and comment upon the pattern of growth observed. Mention the possible reason for such patterns seen in nature.

[2 Marks]



Question 22.

Name the effective biocontrol agents of several plant pathogens belonging to group of viruses. Also write about the ways they support the environment.

[2 Marks]

Section D

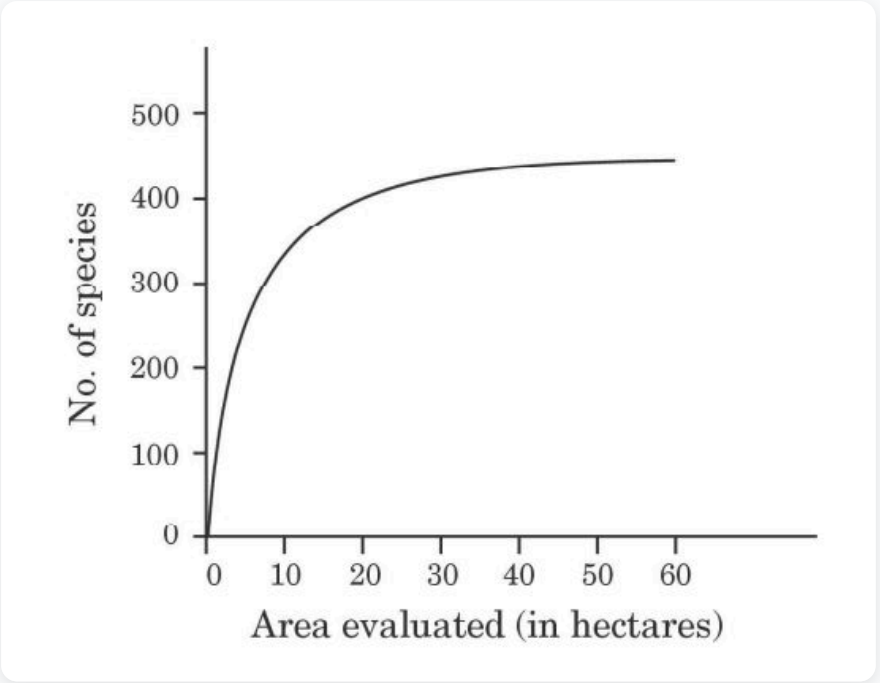
Question 23.

The graph given below shows species-area relationship of a certain region.

(i) Study the graph and explain what it represents.

(ii) After a while, a small area was taken for constructing a road which divided the region into two. Write the impact this construction would have on species richness of the region.

[3 Marks]



Question 24.

What are the consequences of loss of biodiversity in a region ? Explain.

[3 Marks]

Question 25.

Bacillus thuringiensis plays an important role in Integrated Pest Management strategy. Explain how. Name any two crops that are protected efficiently from pests.

[3 Marks]

Question 26.

With the help of a storyboard or a flowchart only, explain all the stages of how human insulin is produced through r-DNA technology.

[3 Marks]

Question 27.

(a) Explain the roles of (i) primary, and (ii) secondary lymphoid organs that are responsible for developing defence to combat the action of pathogens/foreign antigens which enter our body.

(b) Doctors generally advise not to undergo surgery of tonsils. Why ?

[3 Marks]

Question 28.

Causative agents of HIV-AIDS and COVID-19 belong to the same group of viruses. To diagnose and amplify the genetic material for further study of COVID-19 virus, 'RT-PCR' test is carried out.

(a) What does 'RT-PCR' stand for?

(b) Explain the various steps of PCR technique.

[3 Marks]

Question 29.

How did Dr. David Tilman relate experimentally, the stability of a community and its species richness ? Explain.

[3 Marks]

Question 30.

As per a recent newspaper report, a particular country showed declining population growth rate. According to you, what could be the two most possible reasons for this decline and why ?

[3 Marks]

Section E

Question 31.

Explain how genetically modified organisms (GMOs) are created. Describe any three applications of GMOs in agriculture and medicine.

[5 Marks]

Question 32.

Describe the process of fertilisation in flowering plants. Explain the development of the endosperm and embryo after fertilisation.

[5 Marks]

Question 33.

Explain the structure of a human sperm and the process of fertilisation in humans.

[5 Marks]