

Series AAB2/4



SET-2

प्रश्न-पत्र कोड  
Q.P. Code

57/4/2

रोल नं.  
Roll No.

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परीक्षार्थी प्रश्न-पत्र कोड को उत्तर-पुस्तिका के मुख-पृष्ठ पर अवश्य लिखें ।

Candidates must write the Q.P. Code on the title page of the answer-book.

- कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ 15 हैं ।
- प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए प्रश्न-पत्र कोड को परीक्षार्थी उत्तर-पुस्तिका के मुख-पृष्ठ पर लिखें ।
- कृपया जाँच कर लें कि इस प्रश्न-पत्र में 13 प्रश्न हैं ।
- कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, उत्तर-पुस्तिका में प्रश्न का क्रमांक अवश्य लिखें ।
- इस प्रश्न-पत्र को पढ़ने के लिए 15 मिनट का समय दिया गया है । प्रश्न-पत्र का वितरण पूर्वाह्न में 10.15 बजे किया जाएगा । 10.15 बजे से 10.30 बजे तक छात्र केवल प्रश्न-पत्र को पढ़ेंगे और इस अवधि के दौरान वे उत्तर-पुस्तिका पर कोई उत्तर नहीं लिखेंगे ।
- Please check that this question paper contains 15 printed pages.
- Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains 13 questions.
- **Please write down the serial number of the question in the answer-book before attempting it.**
- 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

जीव विज्ञान (सैद्धान्तिक)

BIOLOGY (Theory)

निर्धारित समय : 2 घण्टे

Time allowed : 2 hours

अधिकतम अंक : 35

Maximum Marks : 35

57/4/2



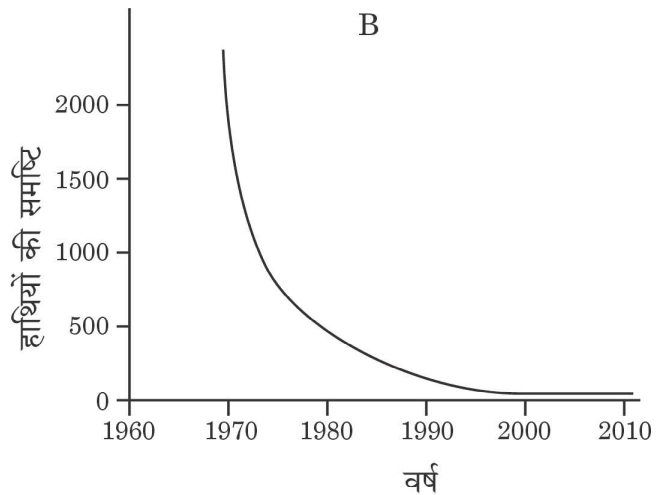
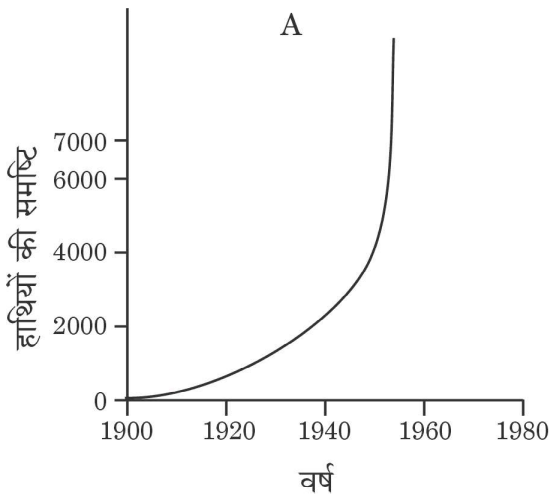
### सामान्य निर्देश :

निम्नलिखित निर्देशों को बहुत सावधानी से पढ़िए और उनका सख्ती से पालन कीजिए :

- (i) इस प्रश्न-पत्र में **13** प्रश्न हैं ।
- (ii) **सभी** प्रश्न अनिवार्य हैं ।
- (iii) यह प्रश्न-पत्र **तीन** खण्डों में विभाजित किया गया है — **खण्ड अ, ब और स** ।
- (iv) **खण्ड अ** में **6** प्रश्न हैं, प्रत्येक प्रश्न **2** अंकों का है ।
- (v) **खण्ड ब** में **6** प्रश्न हैं, प्रत्येक प्रश्न **3** अंकों का है ।
- (vi) **खण्ड स** में एक प्रकरण-आधारित प्रश्न है जिसके **5** अंक हैं ।
- (vii) सामान्यतः प्रश्न-पत्र में कोई विकल्प नहीं है । परन्तु कुछ प्रश्नों में आंतरिक विकल्प दिए गए हैं । ऐसे प्रश्नों में केवल एक विकल्प का ही उत्तर लिखना है ।
- (viii) जहाँ आवश्यक हो, वहाँ स्वच्छ, आनुपातिक तथा समुचित नामांकित चित्र बनाइए ।

### खण्ड अ

1. मानव में प्रतिरक्षा न्यूनता विषाणु (एच.आई.वी.) द्वारा मानव शरीर में प्रतिरक्षा न्यूनता कैसे उत्पन्न होती है ? 2
2. ट्राइकोडर्मा वंश (जीनस) की विभिन्न जातियाँ मानव तथा पौधों के लिए उपयोगी हैं । प्रत्येक के एक-एक उदाहरण की सहायता से उनकी भूमिकाओं को न्यायोचित सिद्ध कीजिए । 2
3. (क) नीचे दिए गए ग्राफ A तथा B में दो विभिन्न राष्ट्रीय उद्यानों में विभिन्न समयावधि में हाथियों की समष्टि (काल्पनिक परिदृश्य) को दर्शाया गया है ।



ग्राफों का अध्ययन कीजिए तथा प्रेक्षित वृद्धि के प्रतिरूप (पैटर्न) पर टिप्पणी कीजिए । प्रकृति में इस प्रकार के प्रतिरूप परिलक्षित होने के संभाव्य कारण का उल्लेख कीजिए ।

अथवा



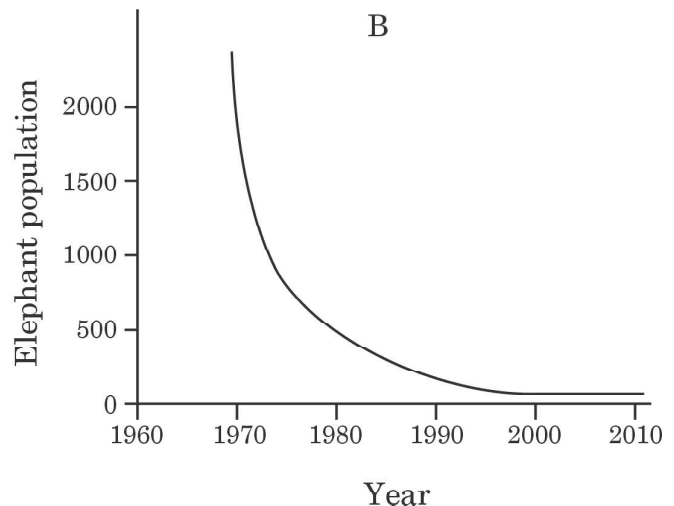
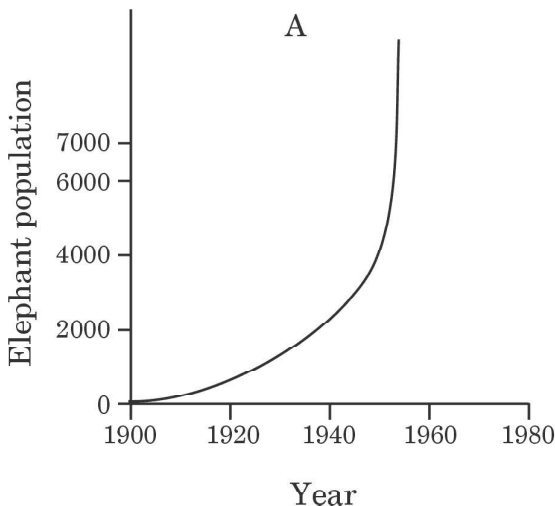
### General Instructions :

Read the following instructions very carefully and strictly follow them :

- (i) This question paper consists of **13** questions.
- (ii) **All** questions are compulsory.
- (iii) The question paper has **three** sections – **Section A, B and C**.
- (iv) **Section A** has **6** questions of **2** marks each.
- (v) **Section B** has **6** questions of **3** marks each.
- (vi) **Section C** has a case-based question of **5** marks.
- (vii) There is no overall choice in the question paper. However, internal choices have been provided in some questions. Attempt only one of the alternative in such questions.
- (viii) Wherever necessary, neat, proportional and properly labelled diagrams should be drawn.

### SECTION A

1. How does Human Immuno deficiency Virus cause immuno deficiency in the human body ? 2
2. 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
3. (a) 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

OR



(ख) हाल ही में प्रकाशित एक समाचार-पत्र के अनुसार, एक विशिष्ट राष्ट्र (देश) की जनसंख्या वृद्धि की दर में कमी परिलक्षित हुई है। आपके अनुसार, समष्टि वृद्धि दर में कमी आने के दो सर्वाधिक संभावित कारण कौन-से हो सकते हैं ?

2

4. विपरीत परिस्थितियों में अपने-आप को जीवित रखने (जीवनक्षम) के लिए कुछ जीव शीतनिष्क्रियता (हाइबर्नेशन) में चले जाते हैं तथा कुछ अन्य ग्रीष्म निष्क्रियता (अस्टिवेशन) में चले जाते हैं। शीतनिष्क्रियता, ग्रीष्म निष्क्रियता से किस प्रकार भिन्न है ? प्रत्येक का एक-एक उदाहरण दीजिए।

2

5. (क) वाहित मल उपचार के दौरान अवायवीय आपंक में तथा मवेशियों (गौपशुओं) के रूमेन में उभयनिष्ठ रूप से पाए जाने वाले जीवाणु का नामोल्लेख कीजिए। यह जीवाणु वाणिज्यिक (व्यावसायिक) रूप से किस प्रकार उपयोगी है ?

2

#### अथवा

(ख) अनेक पादप रोगजनकों के विषाणु समूह के प्रभावी जैव-नियंत्रण कारकों का नाम लिखिए। यह भी लिखिए कि वह किस प्रकार पर्यावरण हितैषी हैं।

2

6. मानवों में “टीका (वैक्सीन)” प्रतिरक्षा अनुक्रिया, “प्रतिआविष (एंटीटॉक्सिन)” अनुक्रिया से किस प्रकार भिन्न है ? दो कारणों द्वारा व्याख्या कीजिए।

2

#### खण्ड ब

7. “आनुवंशिकतः रूपांतरित पौधों को आनुवंशिकता रूपांतरण रहित पौधों की अपेक्षा श्रेष्ठ माना जाता है।” तीन कारण देते हुए व्याख्या कीजिए, क्यों।

3



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(b) 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 ? 2

4. To survive unfavourable conditions, some organisms hibernate and others go into aestivation. How is hibernation different from aestivation ? Give one example of each. 2

5. (a) 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

**OR**

(b) Name the effective biocontrol agents of several plant pathogens belonging to group of viruses. Also write about the ways they support the environment. 2

6. Explain, giving two reasons, how immune response by “vaccine” is different from that by “antitoxin” in humans. 2

### **SECTION B**

7. “Genetically modified plants are considered to be superior to non-genetically modified plants.” Explain, giving three reasons why. 3

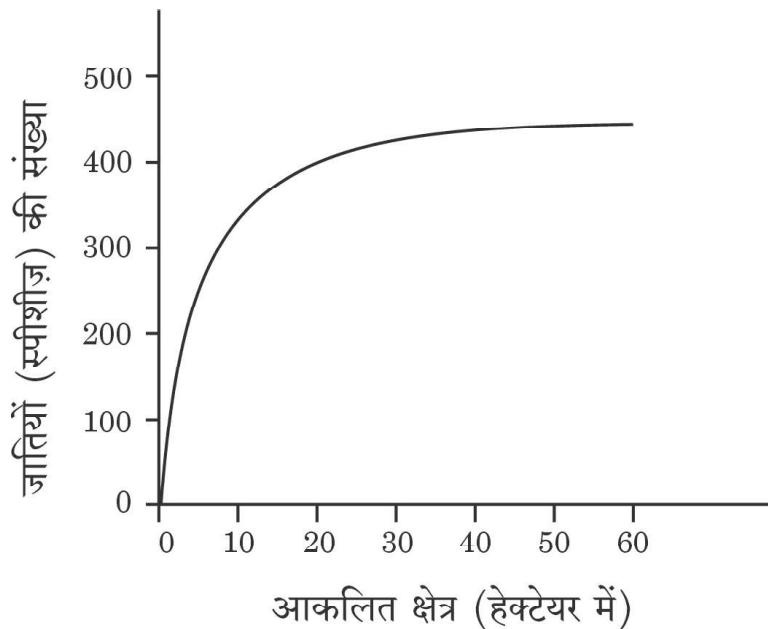


8. (क) हमारे शरीर में प्रविष्ट होने वाले रोगजनकों/विजातीय प्रतिजनों के प्रति प्रतिरक्षा विकसित करने में मानव (i) प्राथमिक, तथा (ii) द्वितीयक लसीकाभ अंगों की भूमिकाओं की व्याख्या कीजिए ।

(ख) चिकित्सक सामान्यतः टाँसिलों (गलतुण्डिका) की शल्यक्रिया नहीं कराने की सलाह देते हैं । क्यों ?

3

9. (क) नीचे दिए गए ग्राफ में एक विशिष्ट क्षेत्र के जातीय-क्षेत्र संबंध को दर्शाया गया है ।

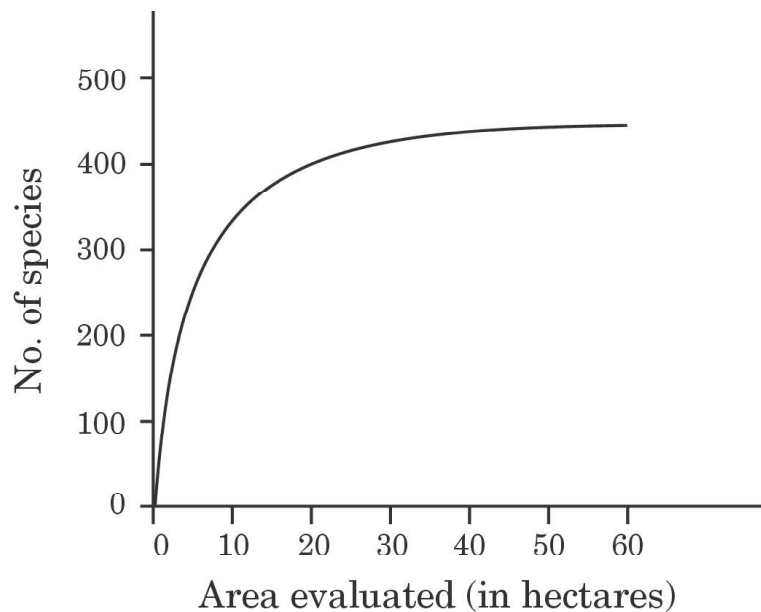


(i) ग्राफ का अध्ययन करके समझाइए कि यह क्या निरूपित करता है ।



- 
8. (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

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



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



- (ii) कुछ समय पश्चात् इसके एक हिस्से के कुछ क्षेत्र को सड़क बनाने के लिए अधिग्रहित कर लिया गया जिससे मूल क्षेत्र दो भागों में बँट गया । इस निर्माण से क्षेत्र की जातीय समृद्धि पर पड़ने वाले प्रभाव को लिखिए । 3

### अथवा

- (ख) डॉ. डेविड टिलमैन ने एक समुदाय के स्थायित्व और उसकी जातियों की समृद्धि को प्रयोगात्मक रूप से कैसे संबंधित किया ? व्याख्या कीजिए । 3

10. एच.आई.वी.-एड्स तथा कोविड-19 के रोगकारक विषाणुओं के एक ही समूह के सदस्य हैं । कोविड-19 की पहचान (निदान) करने तथा इसके आनुवंशिक पदार्थ का प्रवर्धन करने के लिए 'आर.टी.-पी.सी.आर. (RT-PCR)' परीक्षण किया जाता है ।

(क) 'RT-PCR' क्या अभिव्यक्त करता है ?

- (ख) पी.सी.आर. तकनीक के विभिन्न चरणों की व्याख्या कीजिए । 3

11. समाकलित पीड़क प्रबंधन कार्यक्रम (युक्ति) में बैसीलस थूरीनजिएंसिस एक महत्वपूर्ण भूमिका अदा करता है । कैसे, व्याख्या कीजिए । किन्हीं दो फ़सलों के नाम लिखिए जिन्हें पीड़कों से प्रभावी ढंग से सुरक्षित किया गया है । 3

12. तीन उदाहरणों की सहायता से जैव विविधता के संरक्षण के 'व्यापक रूप से उपयोगी' तर्क की व्याख्या कीजिए । 3





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- (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

**OR**

- (b) How did Dr. David Tilman relate experimentally, the stability of a community and its species richness ? Explain. 3

10. 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

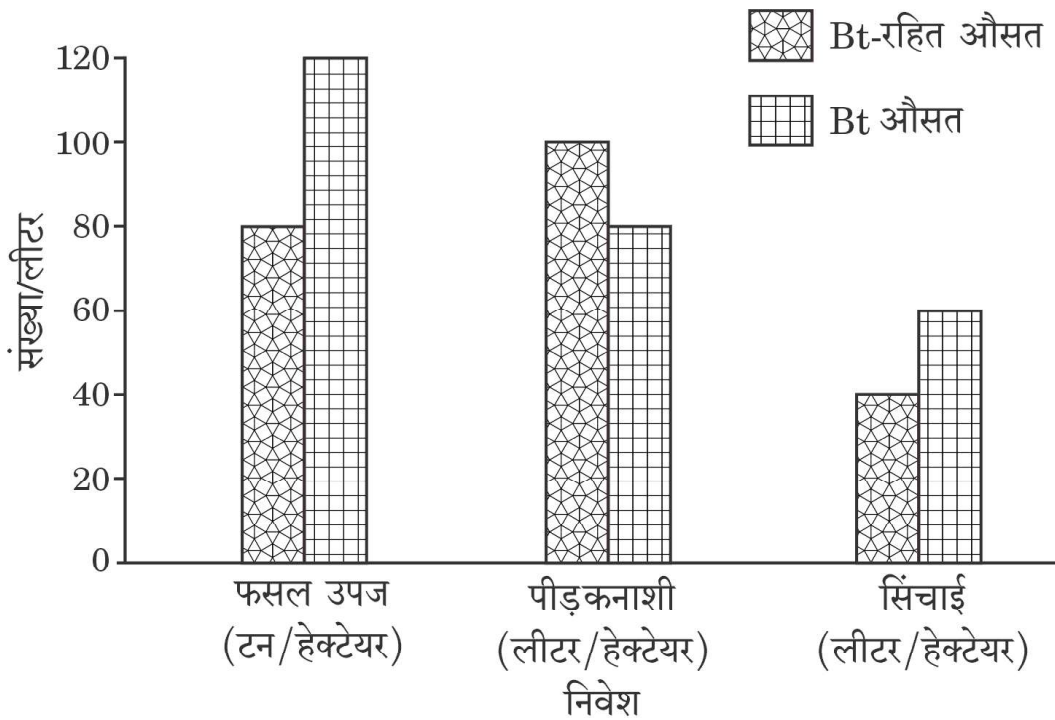
11. *Bacillus thuringiensis* plays an important role in Integrated Pest Management strategy. Explain how. Name any two crops that are protected efficiently from pests. 3

12. With the help of three examples, explain the 'broadly utilitarian' argument for conservation of biodiversity. 3



## खण्ड स

13. (क) दो अलग-अलग खेतों में से एक में Bt-कपास की फ़सल को तथा दूसरे में कपास की Bt-रहित (देशज) किस्म को उगाया गया। इस प्रायोगिक खेती के लिए किसानों को अपनी पसन्द की पद्धति द्वारा फ़सल उगाने की छूट दी गई। इस खेती के दौरान पीड़कनाशी की उपयोग की गई मात्रा, सिंचाई के लिए आवश्यक जल तथा कटाई के समय फ़सल की उपज के आंकड़े एकत्र किए गए। इससे प्राप्त आंकड़ों के आधार पर एक स्तम्भ ग्राफ का आरेख बनाया गया जिसे नीचे दर्शाया गया है।



निम्नलिखित प्रश्नों के उत्तर लिखिए :

5

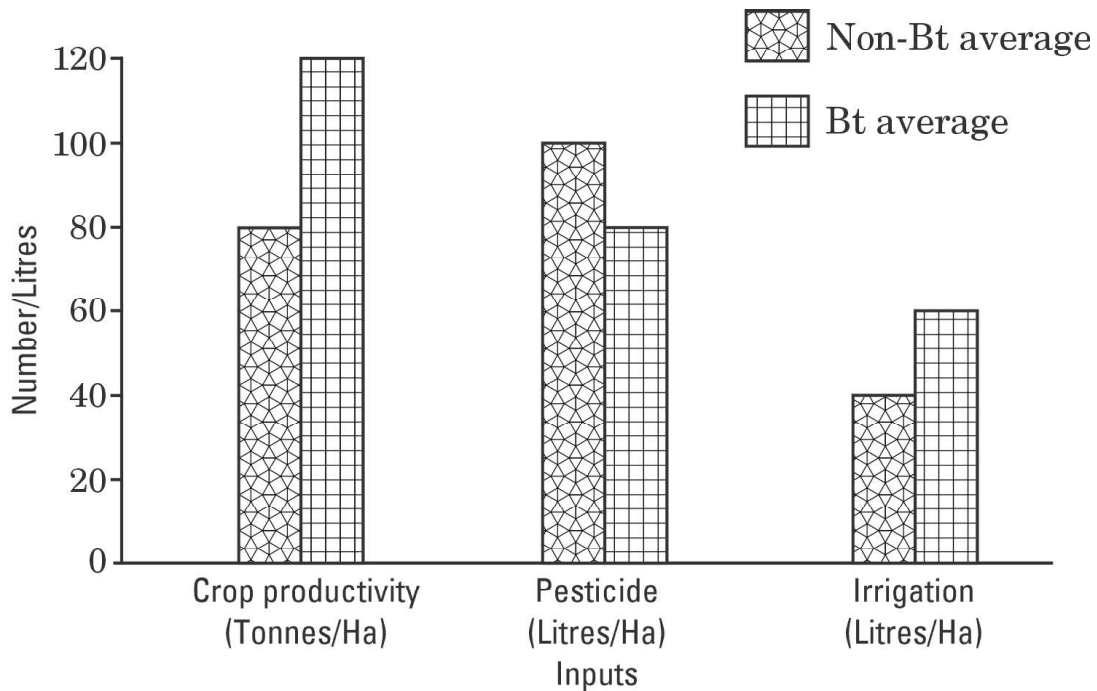
- ग्राफ में दिए गए तीन प्राचलों के आधार पर कारण सहित अपना निर्वचन (व्याख्या) लिखिए।
- अपने खेत में आप कौन-सी फ़सल उगाना चाहेंगे और क्यों ?
- राजस्थान का किसान इन दोनों में से कौन-सी फ़सल उगाना पसन्द करेगा और क्यों ?

अथवा



## SECTION C

13. (a) 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.



Answer the following questions :

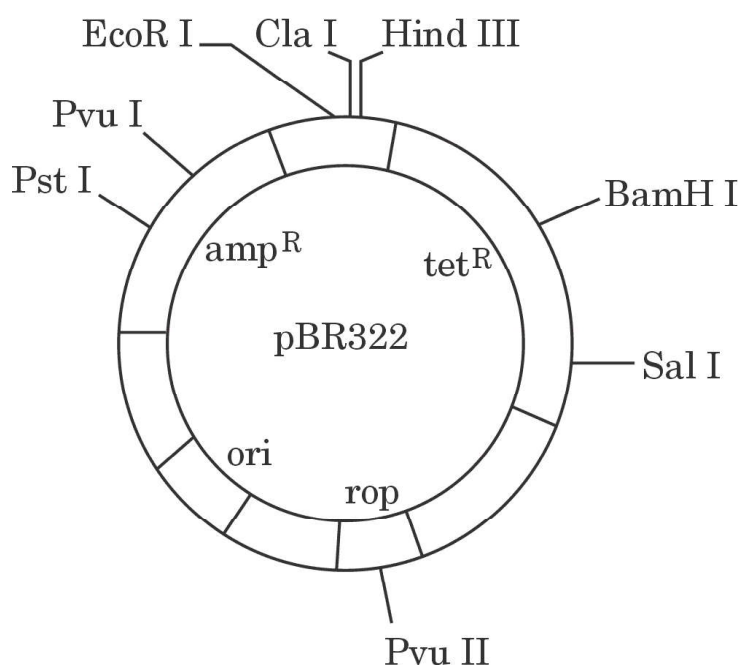
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- Write your interpretation, with reason, on the basis of the three parameters plotted in the graph.
- Which one of the crops would you like to cultivate in your farm and why ?
- Which one out of these two crops would a farmer from Rajasthan like to cultivate and why ?

OR



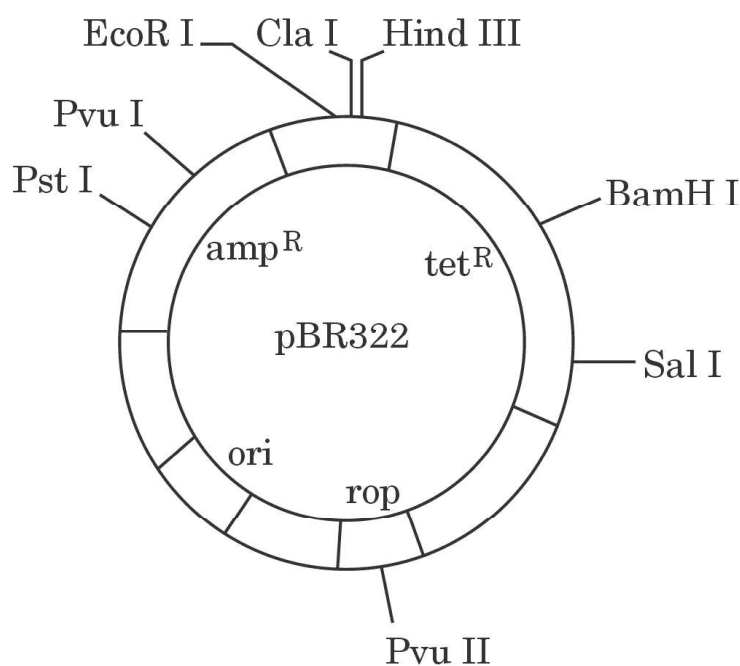
- (ख) एक परपोषी कोशिका में वांछित फीनोटाइप अभिव्यक्ति के लिए एक उपयोगी जीन/विजातीय जीन को एक क्लोनिंग संवाहक द्वारा एक परपोषी कोशिका में निवेशित किया गया। प्लाज़्मिड तथा जीवाणुभोजियों को क्लोनिंग संवाहक के रूप में उपयोग किया जाता है। वांछित परिणाम प्राप्त करने के लिए प्रयोगशालाओं में जैव प्रौद्योगिकीविद् विशेष अभियांत्रिक क्लोनिंग संवाहकों का उपयोग करते हैं। pBR322 इसी प्रकार का एक संवाहक है। दिए गए चित्र का ध्यानपूर्वक अध्ययन कीजिए तथा नीचे दिए गए प्रश्नों के उत्तर लिखिए। 5×1=5



- (i) 'ईकोआर I (EcoR I)', 'BamH I' तथा 'हिन्ड III' क्या निरूपित करते हैं ?  
उनके प्रकार्य लिखिए।
- (ii) pBR322 में वरणयोग्य चिह्नक की भूमिका निभाने के लिए आप जिस जीन का चयन करेंगे उसे पहचानिए। समझाइए क्यों।



- (b) 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.  $5 \times 1 = 5$



- (i) What do 'EcoR I', 'BamH I' and 'Hind III' represent ? State their functions.
- (ii) Identify the gene you would select for the role of a selectable marker in pBR322. Explain why.



- 
- (iii) उस अभिलक्षण का नाम लिखिए जो प्लाज़्मिड तथा जीवाणुभोजी को दक्ष क्लोनिंग संवाहक बनाता है ।
- (iv) जैव प्रौद्योगिकीविद् अपने अभियांत्रिक क्लोनिंग संवाहक में हमेशा 'ori' जीन को निवेशित करते हैं । कथन की न्यायसंगतता लिखिए ।
- (v) यदि विजातीय डी.एन.ए. को हिन्ड III प्रतिबंधन स्थल से जोड़ा जाए, तो क्या वह प्रयोग सफल होगा ? अपने उत्तर के समर्थन में कारण लिखिए ।



- 
- (iii) Write the property/characteristic of plasmid and bacteriophage that makes them efficient cloning vectors.
- (iv) Biotechnologists always insert 'ori' gene in their engineered cloning vector. Justify the statement.
- (v) Will the experiment be successful if the alien DNA is ligated at Hind III restriction site ? Give reason in support of your answer.



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**Senior Secondary School Term II Examination, 2022**

**Marking Scheme – BIOLOGY (SUBJECT CODE – 044)**

**(PAPER CODE – 57/4/2)**

**General Instructions: -**

1. You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully.
2. **“Evaluation policy is a confidential policy as it is related to the confidentiality of the examinations conducted, Evaluation done and several other aspects. Its’ leakage to public in any manner could lead to derailment of the examination system and affect the life and future of millions of candidates. Sharing this policy/document to anyone, publishing in any magazine and printing in News Paper/Website etc may invite action under IPC.”**
3. Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one’s own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed. **However, while evaluating, answers which are based on latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and marks be awarded to them. In class-X, while evaluating two competency based questions, please try to understand given answer and even if reply is not from marking scheme but correct competency is enumerated by the candidate, marks should be awarded.**
4. The Head-Examiner must go through the first five answer books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. The remaining answer books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
5. Evaluators will mark(  $\checkmark$  ) wherever answer is correct. For wrong answer ‘X’ be marked. Evaluators will not put right kind of mark while evaluating which gives an impression that answer is correct and no marks are awarded. **This is most common mistake which evaluators are committing.**
6. If a question has parts, please award marks on the right-hand side for each part. Marks awarded for different parts of the question should then be totaled up and written in the left-hand margin and encircled. This may be followed strictly.
7. If a question does not have any parts, marks must be awarded in the left-hand margin and encircled. This may also be followed strictly.
8. If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out.
9. No marks to be deducted for the cumulative effect of an error. It should be penalized only once.



10. A full scale of marks 0-35 has to be used. Please do not hesitate to award full marks if the answer deserves it.
11. Every examiner has to necessarily do evaluation work for full working hours i.e. 8 hours every day and evaluate 30 answer books per day in main subjects and 35 answer books per day in other subjects (Details are given in Spot Guidelines). This is in view of the reduced syllabus and number of questions in question paper.
12. Ensure that you do not make the following common types of errors committed by the Examiner in the past:-
  - Leaving answer or part thereof unassessed in an answer book.
  - Giving more marks for an answer than assigned to it.
  - Wrong totaling of marks awarded on a reply.
  - Wrong transfer of marks from the inside pages of the answer book to the title page.
  - Wrong question wise totaling on the title page.
  - Wrong totaling of marks of the two columns on the title page.
  - Wrong grand total.
  - Marks in words and figures not tallying.
  - Wrong transfer of marks from the answer book to online award list.
  - Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.)
  - Half or a part of answer marked correct and the rest as wrong, but no marks awarded.
13. While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as cross (X) and awarded zero (0) Marks.
14. Any unassessed portion, non-carrying over of marks to the title page, or totaling error detected by the candidate shall damage the prestige of all the personnel engaged in the evaluation work as also of the Board. Hence, in order to uphold the prestige of all concerned, it is again reiterated that the instructions be followed meticulously and judiciously.
15. The Examiners should acquaint themselves with the guidelines given in the Guidelines for spot Evaluation before starting the actual evaluation.
16. Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totaled and written in figures and words.
17. The Board permits candidates to obtain photocopy of the Answer Book on request in an RTI application and also separately as a part of the re-evaluation process on payment of the processing charges.

**MARKING SCHEME**  
**Senior Secondary School Examination TERM–II, 2022**  
**BIOLOGY (Subject Code–044)**  
**[ Paper Code : 57/4/2 ]**

**Maximum Marks : 35**

Q. No.	EXPECTED ANSWER / VALUE POINTS		Marks
	<b>SECTION—A</b>		
<b>1.</b>	By attacking Macrophages and helper T-Lymphocytes (cells), progressively decreasing their numbers		1+1
			2
<b>2.</b>	<i>Trichoderma</i> act as biocontrol agent for several plant pathogens, <i>Trichoderma</i> produces Immunosuppressive agent/Cyclosporin A/ Immunosuppressant useful for humans.		1+1
			2
<b>3.</b>	(a)		$\frac{1}{2} + \frac{1}{2}$
	<ul style="list-style-type: none"> <li>Graph A depicts exponential growth/ geometric growth, due to unlimited resources and absence of checks/ environmental resistances</li> <li>Graph B shows extinction, due to lack of resources and environmental resistances.</li> </ul>		$\frac{1}{2} + \frac{1}{2}$
	<b>OR</b>		
	(b)		
	<b>Possible Reasons for decline in human population :</b> Increased Emigration, Increased Mortality, Decreased Birth Rate / Natality, Use of contraceptives, spread of epidemic or any other relevant reason <div style="text-align: right;">(any two reasons)</div>		1 + 1
<b>4.</b>	<i>Hibernation</i>	<i>Aestivation</i>	
	Winter sleep	Summer sleep	1
	Eg. Bear / any other correct example	Eg. Snail / Fish /any other correct example	$\frac{1}{2} + \frac{1}{2}$
<b>5.</b>	(a) ● <i>Methanobacterium</i> / <i>Methanogen</i>		1

	<div>●It helps in production of biogas/gobar gas</div> <div>OR</div> <div>(b) ●Baculoviruses / <i>Nucleopolyhedrovirus</i></div> <div>●Species specific, narrow spectrum insecticidal application, no negative impact on plants / vertebrates / non-target insects, help to conserve beneficial insects, useful in IPM, useful in ecologically sensitive area</div> <div>(Any two)</div>		1
			1
			1/2×2
			2
6.	Immune response by vaccine	Immune response by antitoxin	1+1
	Immune response is generated by antibodies produced in response to weakened antigen introduced in the body	Immune response is generated by pre-formed antibodies or antitoxin is injected	
	Response takes sometime	Quick immune response	
	Memory cells are generated / long lasting	One time response	
	Vaccine provides active immunity	Antitoxin provides passive immunity	
	( Any two differences )		2
	SECTION – B		
7.	Made crops more tolerant to abiotic stresses (cold, drought, salt, heat), reduced reliance on chemical pesticides (pest-resistant crops), helped to reduce post harvest losses, increased efficiency of mineral usage by plants (this prevents early exhaustion of fertility of soil), enhanced nutritional value of food, e.g., golden rice, i.e., Vitamin ‘A’ enriched rice, any other relevant example		1×3
	( Any three )		3
8.	(a) (i) Origin and /or Proliferation and maturation of lymphocytes / the immature lymphocytes differentiate into antigen sensitive lymphocytes/ provide micro environment for development and maturation of T-lymphocytes.		1
	(ii) Traps the microorganisms (antigens) and activate the lymphocytes that then proliferate to become effector cells (cause immune response) / provides site for interaction of lymphocytes with antigens		1
			1

	(b) Tonsils are secondary lymphoid organs / trap the antigen (pathogen) which then activate the mature lymphoid organs to become effector cells/ provides site for interaction of lymphocytes with antigens	3
9.	<p>(a) (i) “Within a region species richness increased with increasing explored area, but only up to a limit.”</p> <p>(ii) Very gradually impact on species diversity will be visible/species diversity will be gradually reduced/ negative impact on species diversity.</p> <p style="text-align: center;"><b>OR</b></p> <p>(b) Dr. Tilman carried out long-term experiments in outdoor plots, he observed plots with more species showed less year-to-year variation in biomass, he showed increased diversity (species richness) contributed to higher productivity.</p>	<p>1+1</p> <p>1</p> <p>1+1+1</p> <p>3</p>
10.	<p>(a) Real Time-Polymerase Chain Reaction / Reverse Transcriptase- Polymerase Chain Reaction</p> <p><b>Note: One mark is to be awarded for attempting this question</b></p> <p>(b) ● <u>Denaturation</u> by heating /DNA strands are separated by heating, <u>Annealing</u> of two primers to complementary region of DNA/ Joining of primer to complementary region of DNA, <u>Extension</u> of primers, using thermostable DNA Polymerase or <i>Taq</i> Polymerase</p> <p>(The process is repeated many times/amplification)</p> <p style="text-align: center;">//</p> <div data-bbox="497 1279 1120 1702"> <p>The diagram illustrates the three steps of PCR: 1. Denaturation: A double-stranded DNA (dsDNA) molecule is heated to separate into two single strands. 2. Annealing: Short DNA primers bind to the single strands. 3. Extension: DNA polymerase (Taq polymerase) and deoxynucleotides are added to extend the primers, creating two new dsDNA molecules. The process is repeated many times for amplification.</p> </div>	<p>1</p> <p><math>\frac{1}{2} \times 4</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p>3</p>
11.	<p>● Spores of <i>Bacillus thuringiensis</i> available as sachets are mixed with water and sprayed on vulnerable plants, insect will die if they eat the plant.</p> <p>● Examples: <i>Brassica</i>, fruit trees</p> <p style="text-align: center;">//</p> <p>● Scientists have introduced Bt toxin gene into plants, Insect will die if they eat the plant.</p>	<p>1+1</p> <p><math>\frac{1}{2} + \frac{1}{2}</math></p> <p>1+1</p>

	● Examples: Bt rice, Bt cotton, Bt tomato, Bt potato, Bt soyabean, or any other examples	$\frac{1}{2} + \frac{1}{2}$
		3
12.	Oxygen provided to all living beings (through photosynthesis), pollination (without which plant cannot give us fruits and seeds), aesthetic pleasure, any other relevant point	1 x 3
		3
	<b>SECTION – C</b>	
13.	<p>(a) (i) ● Crop productivity is quite high in Bt crop as compared to non-Bt crop.</p> <ul style="list-style-type: none"> <li>● Pesticide use has reduced in Bt crop It saves resources and is environment friendly.</li> <li>● Water is required more for Bt crop as compared to non-Bt crop.</li> </ul> <p>(ii) Weighing all the parameters it is concluded that Bt crop will be beneficial to farmers. (Less pesticide, more output)</p> <p>(iii) Usually in Rajasthan there is shortage of water hence farmers would like to cultivate non Bt - cotton crop.</p> <p style="text-align: center;"><b>OR</b></p> <p>(b)(i) ● All are restriction endonucleases</p> <ul style="list-style-type: none"> <li>● act as a molecular scissors / cut at a specific site within DNA</li> </ul> <p>(ii) <math>\text{amp}^R / \text{tet}^R</math>, help in identification and selection of transformants from non-transformants / identification of recombinant from non recombinant</p> <p>(iii) Have the ability to replicate within bacterial cells independent of the control of chromosomal DNA / Autonomously replicating / bacteriophages and some bacteria have high copy number per cell, can replicate the desirable gene into large number of copies, presence of selectable marker, presence of cloning sites, presence of ori.</p> <p style="text-align: right;">(Any one)</p> <p>(iii) It is the sequence where replication begins / It controls copy number of vector</p> <p>(iv) No, identification and selection of transformants from non-transformants/ identification of recombinant from non recombinant would not be possible</p>	<p>1+1+1</p> <p>1</p> <p>1</p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2} + \frac{1}{2}</math></p> <p>1</p> <p>1</p> <p><math>\frac{1}{2} + \frac{1}{2}</math></p>
		5

\* \* \*