Please check that this question paper contains 11 printed pages.

Code number 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 26 questions.

Please write down the Serial Number of the question 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.
General Instructions:

(i) There are a total of 26 questions and five sections in the question paper. All questions are compulsory.

(ii) Section A contains questions number 1 to 5, very short-answer type questions of 1 mark each.

(iii) Section B contains questions number 6 to 10, short-answer type I questions of 2 marks each.

(iv) Section C contains questions number 11 to 22, short-answer type II questions of 3 marks each.

(v) Section D contains question number 23, value based question of 4 marks.

(vi) Section E contains questions number 24 to 26, long-answer type questions of 5 marks each.

(vii) There is no overall choice in the question paper, however, an internal choice is provided in one question of 2 marks, one question of 3 marks and all the three questions of 5 marks. In these questions, an examinee is to attempt any one of the two given alternatives.
SECTION A

1. Write the dual purpose served by Deoxyribonucleoside triphosphates in polymerisation.

2. Name two diseases whose spread can be controlled by the eradication of Aedes mosquitoes.

3. How do cytokine barriers provide innate immunity in humans?

4. Write the names of the following:
   (a) A 15 mya primate that was ape-like
   (b) A 2 mya primate that lived in East African grasslands

5. Mention the chemical change that proinsulin undergoes, to be able to act as mature insulin.
6. Your advice is sought to improve the nitrogen content of the soil to be used for cultivation of a non-leguminous terrestrial crop.

(a) Recommend two microbes that can enrich the soil with nitrogen.

(b) Why do leguminous crops not require such enrichment of the soil?

7. With the help of an algebraic equation, how did Hardy-Weinberg explain that in a given population the frequency of occurrence of alleles of a gene is supposed to remain the same through generations?

OR

Although a prokaryotic cell has no defined nucleus, yet DNA is not scattered throughout the cell. Explain.

8. How did a citizen group called Friends of Arcata Marsh, Arcata, California, USA, help to improve water quality of the marshland using Integrated Waste Water Treatment? Explain in four steps.
You have obtained a high yielding variety of tomato. Name and explain the procedure that ensures retention of the desired characteristics repeatedly in large populations of future generations of the tomato crop.

10. (a) H丝绸之路 乡村振兴战略的名称和解释。
(b) 农民在乡村振兴中起什么作用？
(a) Name the source plant of heroin drug. How is it obtained from the plant?
(b) Write the effects of heroin on the human body.

खण्ड C

SECTION C

11. पूर्ण विकसित (परिपक्व) रासायनिक शुरुआत का चित्र बनाइए। इसके तीन भागों का नामांकन कर उनके कार्य लिखिए।
Draw a diagram of a mature human sperm. Label any three parts and write their functions.

12. (a) वी.एन.टी.आर. का पूरा नाम लिखिए तथा डी.एन.ए. फिंगरप्रिंटिंग (डी.एन.ए. अंगूठीलिपी) में इसकी भूमिका का वर्णन कीजिए।
(b) डी.एन.ए. अंगूठीलिपी तकनीक के कोई दो अनुप्रयोग लिखिए।
(a) Expand VNTR and describe its role in DNA fingerprinting.
(b) List any two applications of DNA fingerprinting technique.

13. अनिष्क्रियता तथा अनिष्क्रियता में विभेद कीजिए। प्रत्येक का एक-एक उदाहरण भी दीजिए।
Differentiate between Parthenocarpy and Parthenogenesis. Give one example of each.

14. विकल्प से सभी युवा माताओं को यह सलाह दी जाती है कि उनके नवजात शिशुओं के लिए स्तनपान सबूतत है। क्या आप इससे सहमत हैं? कारण सहित अपने उत्तर की पुष्टि कीजिए।
Medically it is advised to all young mothers that breastfeeding is the best for their newborn babies. Do you agree? Give reasons in support of your answer.
Explain the mechanism of ‘sex determination’ in birds. How does it differ from that of human beings?

(a) How has the development of bioreactor helped in biotechnology?
(b) Name the most commonly used bioreactor and describe its working.

Explain the roles of the following with the help of an example each in recombinant DNA technology:
(a) Restriction Enzymes
(b) Plasmids

Explain out-breeding, out-crossing and cross-breeding practices in animal husbandry.

(a) Organic farmers prefer biological control of diseases and pests to the use of chemicals for the same purpose. Justify.
(b) Give an example of a bacterium, a fungus and an insect that are used as biocontrol agents.
(a) Differentiate between analogous and homologous structures.

(b) Select and write analogous structures from the list given below:

(i) Wings of butterfly and birds
(ii) Vertebrate hearts
(iii) Tendrils of bougainvillea and cucurbita
(iv) Tubers of sweet potato and potato

21. (a) “नावें की अपेक्षा भारत में पारंपरिक विविधता अधिक है।” क्या आप इस कथन से सहमत हैं? कारण बताते हुए अपने उत्तर की पुष्टि कीजिए।

(b) आनुवंशिक जैव-विविधता तथा जातीय (स्पीशीज) जैव-विविधता में अंतर लिखिए जो जैविक संगठन के सभी स्तरों में परिवर्तित होते हैं।

अथवा

जब किसी नदी में शहीद वाहित मल का विसर्जन किया जाता है, तो नदी के लक्षणों पर पड़ने वाले प्रभाव की व्याख्या कीजिए।

(a) “India has greater ecosystem diversity than Norway.” Do you agree with the statement? Give reasons in support of your answer.

(b) Write the difference between genetic biodiversity and species biodiversity that exists at all the levels of biological organisation.

OR

Explain the effect on the characteristics of a river when urban sewage is discharged into it.

22. तंबाकू के पौधों में मिल्वाडेग्राइन इनकोगानिशिया के संक्रमण के नियंत्रण में एग्रोबैक्टरियम का संवाहक के रूप में उपयोग किस प्रकार सहायक रहा है? सही अनुक्रम में व्याख्या कीजिए।

How has the use of Agrobacterium as vectors helped in controlling Meloidogyne incognitia infestation in tobacco plants? Explain in correct sequence.
SECTION D

23. Looking at the deteriorating air quality because of air pollution in many cities of the country, the citizens are very much worried and concerned about their health. The doctors have declared health emergency in the cities where the air quality is very severely poor.

(a) Mention any two major causes of air pollution.

(b) Write any two harmful effects of air pollution to plants and humans.

(c) As a captain of your school Eco-club, suggest any two programmes you would plan to organise in the school so as to bring awareness among the students on how to check air pollution in and around the school.
खण्ड E

SECTION E

24. (a) पुष्पी पादपों की किन्हीं दो युक्तियों का वर्णन कीजिए जो स्वयःमन तथा परनिषेधन को बाधित करती हैं।

(b) एक आवृत्तिर्जी के बीजांड की किसी एक सहाय कोशिका में परागनलिका के प्रवेश के उपरांत द्विनिषेधन तक की परिघटनाओं का वर्णन कीजिए।

अथवा

(a) मानव स्त्रियों में आर्तव चक्र की व्याख्या कीजिए।

(b) मानव स्त्रियों में आर्तव चक्र की वैज्ञानिक समझ गर्भ निरोधक उपाय के रूप में किस प्रकार सहायक हो सकती है?

(a) Describe any two devices in a flowering plant which prevent both autogamy and geitonogamy.

(b) Explain the events upto double fertilisation after the pollen tube enters one of the synergids in an ovule of an angiosperm.

OR

(a) Explain menstrual cycle in human females.

(b) How can the scientific understanding of the menstrual cycle of human females help as a contraceptive measure?

25. (a) उस जीव का वैज्ञानिक नाम लिखिए जिसका उपयोग थॉमस हंट मॉर्गन और उनके साथियों ने अपने प्रयोगों में किया था। जीवों के संदर्भ में सहलनता और पुनर्योजन के बीच सहसंबंध में उनके द्वारा किए गए अध्ययन की व्याख्या कीजिए।

(b) मॉर्गन के साथ कार्य करते हुए स्टर्टवेंट ने जीव चित्रण (जीन मैपिंग) की व्याख्या किस प्रकार की?

अथवा
(a) Write the scientific name of the organism Thomas Hunt Morgan and his colleagues worked with for their experiments. Explain the correlation between linkage and recombination with respect to genes as studied by them.

(b) How did Sturtevant explain gene mapping while working with Morgan?

OR

(a) State the ‘Central dogma’ as proposed by Francis Crick. Are there any exceptions to it? Support your answer with a reason and an example.

(b) Explain how the biochemical characterisation (nature) of ‘Transforming Principle’ was determined, which was not defined from Griffith’s experiments.

26. (a) विभिन्न अंजेल कारकों के प्रति विभिन्न जन्तुओं की निम्नलिखित अनुक्रियाएँ परिलक्षित होती हैं। प्रत्येक के एक-एक उदाहरण की सहायता से इनका वर्णन कीजिए।

(i) नियमन करना
(ii) संरूपण रखना
(iii) प्रवास करना
(iv) निलंबित करना

(b) 80 तिलियों की एक समाधि में यदि एक सप्ताह में 8 तिलियों की मृत्यु हो जाती है, तो उस अवधि में तिलियों की समाधि की मृत्यु दर की गणना कीजिए।

अथवा
(a) Following are the responses of different animals to various abiotic factors. Describe each one with the help of an example.

(i) Regulate
(ii) Conform
(iii) Migrate
(iv) Suspend

(b) If 8 individuals in a population of 80 butterflies die in a week, calculate the death rate of population of butterflies during that period.

OR

(a) What is a trophic level in an ecosystem? What is ‘standing crop’ with reference to it?

(b) Explain the role of the ‘first trophic level’ in an ecosystem.

(c) How is the detritus food chain connected with the grazing food chain in a natural ecosystem?