



## Series EF1GH/C



SET~2

प्रश्न-पत्र कोड 57/C/2  
Q.P. Code 57/C/2

रोल नं.						
Roll No.						

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.

## जीव विज्ञान (सैद्धान्तिक)

### BIOLOGY (Theory)

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निर्धारित समय : 3 घण्टे

Time allowed : 3 hours

अधिकतम अंक : 70

Maximum Marks : 70

#### नोट / NOTE :

- (i) कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ 19 हैं।  
Please check that this question paper contains 19 printed pages.
- (ii) प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए प्रश्न-पत्र कोड को परीक्षार्थी उत्तर-पुस्तिका के मुख-पृष्ठ पर लिखें।  
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.
- (iii) कृपया जाँच कर लें कि इस प्रश्न-पत्र में 33 प्रश्न हैं।  
Please check that this question paper contains 33 questions.
- (iv) कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, उत्तर-पुस्तिका में प्रश्न का क्रमांक अवश्य लिखें।  
Please write down the serial number of the question in the answer-book before attempting it.
- (v) 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।  
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.



## सामान्य निर्देशः

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

- (i) इस प्रश्न-पत्र में **33** प्रश्न हैं । सभी प्रश्न अनिवार्य हैं ।
- (ii) यह प्रश्न-पत्र पाँच खण्डों में विभाजित है – खण्ड क, ख, ग, घ एवं ङ ।
- (iii) खण्ड क में प्रश्न संख्या **1** से **16** तक बहुविकल्पीय (MCQ) प्रकार के एक-एक अंक के प्रश्न हैं ।
- (iv) खण्ड ख में प्रश्न संख्या **17** से **21** तक अति लघु-उत्तरीय (VSA) प्रकार के दो-दो अंकों के प्रश्न हैं ।
- (v) खण्ड ग में प्रश्न संख्या **22** से **28** तक लघु-उत्तरीय (SA) प्रकार के तीन-तीन अंकों के प्रश्न हैं ।
- (vi) खण्ड घ में प्रश्न संख्या **29** तथा **30** केस-आधारित चार-चार अंकों के प्रश्न हैं । प्रत्येक प्रश्न में उप-प्रश्न हैं तथा एक उप-प्रश्न में आंतरिक विकल्प दिया गया है ।
- (vii) खण्ड ङ में प्रश्न संख्या **31** से **33** तक दीर्घ-उत्तरीय (LA) प्रकार के पाँच-पाँच अंकों के प्रश्न हैं ।
- (viii) प्रश्न-पत्र में समग्र विकल्प नहीं दिया गया है । यद्यपि, खण्ड ख के **1** प्रश्न में, खण्ड ग के **1** प्रश्न में, खण्ड घ के **2** प्रश्नों में तथा खण्ड ङ के **3** प्रश्नों में आंतरिक विकल्प का प्रावधान दिया गया है । परीक्षार्थी को इन प्रश्नों में से किसी एक प्रश्न का उत्तर लिखना है ।
- (ix) जहाँ कहीं आवश्यक हो, साफ-सुधरे और उचित रूप से नामांकित चित्र बनाए जाने चाहिए ।

### खण्ड क

प्रश्न संख्या **1** से **16** तक बहुविकल्पीय (MCQ) प्रकार के एक-एक अंक के प्रश्न हैं ।

$16 \times 1 = 16$

1. मानवों में निम्नलिखित में से कौन-सा हॉर्मोन सर्टोली कोशिकाओं के प्रकार्य को नियंत्रित करता है ?  
 (a) एफ.एस.एच. (b) एस्ट्रोजन  
 (c) ए.सी.टी.एच. (d) टेस्टोस्टेरॉन
2. टैक पालीमरेज का स्रोत जीव है :  
 (a) एशरिकिआ कोलाई (b) एग्रोबैक्टीरियम ट्र्यूमीफेशिएंस  
 (c) थर्मस एक्वेटिक्स (d) बैसीलस थुरीनजिएंसीस
3. मेंडल द्वारा अध्ययन किए गए मटर के पौधों में सात विपर्यास लक्षणों में से फूल, फली तथा बीज से संबंधित विशेषक क्रमशः थे :  
 (a) 2, 1, 2 (b) 2, 2, 2  
 (c) 1, 2, 1 (d) 1, 1, 2
4. निम्नलिखित में से किस तकनीक का उपयोग टेस्ट ट्यूब बेबी कार्यक्रम में किया जाता है ?  
 (a) अंतः कोशिकीय शुक्राणु निक्षेपण  
 (b) अंतः गर्भाशयी वीर्यसेचन  
 (c) युग्मक अंतः डिंबवाहिनी स्थानांतरण  
 (d) युग्मनज अंतः डिंबवाहिनी स्थानांतरण



### ***General Instructions :***

*Read the following instructions carefully and strictly follow them :*

- (i) This question paper contains **33** questions. **All** questions are **compulsory**.
- (ii) This question paper is divided into **five** sections – Section **A, B, C, D** and **E**.
- (iii) In **Section A** – Questions no. **1** to **16** are multiple choice (MCQ) type questions, carrying **1** mark each.
- (iv) In **Section B** – Questions no. **17** to **21** are very short answer (VSA) type questions, carrying **2** marks each.
- (v) In **Section C** – Questions no. **22** to **28** are short answer (SA) type questions, carrying **3** marks each.
- (vi) In **Section D** – Questions no. **29** and **30** are case-based questions, carrying **4** marks each. Each question has subparts with internal choice in one subpart.
- (vii) In **Section E** – Questions no. **31** to **33** are long answer (LA) type questions, carrying **5** marks each.
- (viii) There is no overall choice. However, an internal choice has been provided in **1** question in Section **B**, **1** question in Section **C**, **2** questions in Section **D** and **3** questions in Section **E**. A candidate has to attempt only **one** of the alternatives in such questions.
- (ix) Wherever necessary, neat and properly labelled diagrams should be drawn.

## SECTION A

Questions no. 1 to 16 are Multiple Choice (MCQ) type Questions, carrying 1 mark each.  $16 \times 1 = 16$



5. डीएनए अंगुलिछापी का आधार क्या है ?

(a) डीएनए में प्यूरीन तथा पिरिमिडीन के आपेक्षिक/तुलनात्मक अनुपात  
(b) रक्त, त्वचा तथा लार में पाए जाने वाले डीएनए में तुलनात्मक अंतर का होना  
(c) अंगुलिछापों के उभार तथा खाँचों में पाए जाने वाले डीएनए की तुलनात्मक मात्रा  
(d) अनुषंगी डीएनए (डीएनए के पुनरावृत्ति अनुक्रम) जो उच्च श्रेणी बहुरूपता प्रदर्शित करते हैं

6. पौधों में चरघातांकी वृद्धि को निम्न रूप से दर्शाया जा सकता है :

(a)  $L_t = L_0 + rt$  (b)  $W_1 = W_0 e^{rt}$   
(c)  $W_1 = W_0 e^{rt}$  (d)  $W_1 = W_0 + e^{rt}$

7. एक अज्ञात रक्त समूह वाली स्त्री एक 'B-रक्त समूह' वाले पुरुष से विवाह करती है। उस युगल से उत्पन्न प्रथम संतान का रक्त समूह 'O' था जबकि, उसके चार वर्षों के पश्चात् जन्मी संतान का रक्त समूह 'AB' था। ABO रक्त समूह के आधार पर महिला का रक्त समूह और संभावित जीनोटाइप है :

(a) रक्त समूह A,  $I^A I^O$  (b) रक्त समूह AB,  $I^A I^B$   
(c) रक्त समूह B,  $I^B I^O$  (d) रक्त समूह O,  $I^O I^O$

8. अनंतस्पर्शी प्रावस्था की स्थिति में समष्टि :

(a) की वृद्धि होती है (b) का अवनमन (घटती) होता है  
(c) स्थिर रहती है (d) बदलती रहती है

9. ग़लत ढंग से मिलान किए गए युग्म को चुनिए।

(a) खासी तथा जयंतिया पहाड़ियाँ – मेघालय  
(b) अरावली पर्वत – कर्नाटक  
(c) पश्चिमी घाट – महाराष्ट्र  
(d) चंदा तथा बस्तर क्षेत्र – मध्य प्रदेश

10. निम्नलिखित विकल्पों में से सही विकल्प को चुनिए जो चित्र में दर्शाए गए पुष्पी पौधे से प्राप्त होने वाली झाँग के साथ सही ढंग से मेल करता है :



(a) धतूरा – विभ्रमकारी (हैलुसिनोजन) (b) कैनेबिस – उद्धीपक  
(c) धतूरा – अवसादक (d) पोस्ट (पोपी) – अवसादक (डीप्रेसेंट)



(a) Datura – Hallucinogen      (b) Cannabis – Stimulant  
(c) Datura – Depressant      (d) Poppy – Depressant



**11.** जीन क्लोनिंग के लिए प्लाज्मड उपयुक्त वाहक माने जाते हैं क्योंकि :

- (a) वे डीएनए के छोटे वलयाकार अणु होते हैं जो होस्ट (पोषी) गुणसूत्रीय डीएनए के साथ पुनर्योगित हो जाता है।
- (b) डीएनए के छोटे वलयाकार अणु होते हैं जिनका अपना प्रतिकृतियन उद्भम स्थल होता है।
- (c) वे असीमकेन्द्रकी तथा ससीमकेन्द्रकी कोशिकाओं के बीच आवागम कर सकते हैं।
- (d) वे प्रतिजैविक प्रतिरोधी जीन का संवाहन करते हैं।

**12.** बीटी क्रपास में संकेताक्षर 'बीटी' का अभिप्राय है :

- (a) बायोटेक्नोलॉजी (जैव प्रौद्योगिकी)
- (b) बायोटॉक्सिन (जीव-विष)
- (c) बैसीलस थुरीनजिएंसीस द्वारा निर्माचित आविष
- (d) कीट द्वारा निर्माचित आविष

प्रश्न संख्या 13 से 16 के लिए, दो कथन दिए गए हैं — जिनमें एक को अभिकथन (A) तथा दूसरे को कारण (R) द्वारा अंकित किया गया है। इन प्रश्नों के सही उत्तर नीचे दिए गए कोडों (a), (b), (c) और (d) में से चुनकर दीजिए।

- (a) अभिकथन (A) और कारण (R) दोनों सही हैं और कारण (R), अभिकथन (A) की सही व्याख्या करता है।
- (b) अभिकथन (A) और कारण (R) दोनों सही हैं, परन्तु कारण (R), अभिकथन (A) की सही व्याख्या नहीं करता है।
- (c) अभिकथन (A) सही है, परन्तु कारण (R) गलत है।
- (d) अभिकथन (A) गलत है, परन्तु कारण (R) सही है।

**13.** अभिकथन (A) : कोकेन सुखाभास (यूफोरिया) तथा ऊर्जा में वृद्धि की अनुभूति उत्पन्न करता है।  
कारण (R) : यह तंत्रिका प्रेषक (न्यूरोट्रांसमीटर) डोपेमीन के परिवहन में अवरोध उत्पन्न करता है।

**14.** अभिकथन (A) : गर्भाशय ग्रीवा टोपी तथा वॉल्ट स्ट्रियों द्वारा उपयोग किए जाने वाले अवरोधक उपाय हैं।  
कारण (R) : शुक्राणुओं की भक्षकाणु क्षमता के कारण यह युक्तियाँ गर्भाधान को अवरुद्ध कर देती हैं।

**15.** अभिकथन (A) : केला एक अनिषेकजनित फल है।  
कारण (R) : यह केवल अंडाशय से ही विकसित होता है।



11. Plasmids are suitable vectors for gene cloning because :

- (a) They are small circular DNA molecules which can integrate with the host chromosomal DNA.
- (b) They are small circular DNA molecules with their own origin of replication site.
- (c) They can shuttle between prokaryotic and eukaryotic cells.
- (d) They carry antibiotic resistance genes.

12. The abbreviation 'Bt' in Bt Cotton stands for :

- (a) Biotechnology
- (b) Biotoxin
- (c) Toxin released by *Bacillus thuringiensis*
- (d) Toxin released by insect

For Questions number 13 to 16, two statements are given — one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

- (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
- (b) Both Assertion (A) and Reason (R) are true, but Reason (R) is **not** the correct explanation of the Assertion (A).
- (c) Assertion (A) is true, but Reason (R) is false.
- (d) Assertion (A) is false, but Reason (R) is true.

13. *Assertion (A)* : Cocaine produces a sense of euphoria and energy.  
*Reason (R)* : It interferes with the transport of neurotransmitter dopamine.

14. *Assertion (A)* : Cervical caps and vaults are barrier methods of contraception used by human females.  
*Reason (R)* : They prevent conception by phagocytosis of sperms.

15. *Assertion (A)* : Banana is a parthenocarpic fruit.  
*Reason (R)* : It develops only from the ovary.



16. अभिकथन (A) : अधिकतर “विकासवादी वृक्षों” में पारस्परिक संबंधों के पैटर्न की सूचना को क्षैतिज अक्ष तथा समय (काल) को ऊर्ध्वाधर अक्ष द्वारा दर्शाया जाता है।  
कारण (R) : एक “विकासवादी वृक्ष” जनकों एवं उनकी संततियों के संबंधों के पैटर्न को प्रतिबिम्बित करता है।

### खण्ड ख

17. “कीटों को मकरंद तथा परागकणों से पुरस्कृत नहीं किया जाता तो भी कीट पुष्पों का परागण करते हैं।”  
एक समुचित उदाहरण की सहायता से व्याख्या कीजिए। 2

18. चारों नाइट्रोजनी क्षार तथा सही ध्रुवणता दर्शाते हुए द्विकुंडली डाइन्यूक्लिओटाइड डीएनए शृंखला के एक भाग का व्यवस्थात्मक आरेख बनाइए। 2

19. (a) निम्नलिखित के अध्ययन के लिए पारजीवी जंतु (ट्रांसजेनिक एनिमल्स) किस प्रकार लाभकारी सिद्ध हुए हैं :  
(i) सामान्य शरीरक्रिया एवं विकास  
(ii) रासायनिक सुरक्षा परीक्षण  
अथवा  
(b) पौधों के ऐसे चार अनुप्रयोगों का उल्लेख कीजिए जिनके जीन हस्तकौशल द्वारा परिवर्तित किए गए हैं। 2

20. निम्नलिखित मानदंडों के आधार पर मानव स्त्रियों के आर्तव चक्र की पुटकीय प्रावस्था तथा स्नावी प्रावस्था के बीच विभेद कीजिए :  
(a) चक्र में इनके होने के दिन  
(b) पुटक की अवस्था  
(c) अवस्थाओं को प्रभावित करने वाले हॉर्मोन्स  
(d) गर्भाशय के अन्तःस्तर परत की अवस्था 2

21. (a) मानव के उस लसीकाभ अंग का नाम लिखिए जो विभिन्न प्रकार की कोशिकाओं का निर्माण करता है।  
(b) ऐसी रक्त कोशिकाओं का नाम लिखिए जो इस लसीकाभ अंग से अन्य लसीकाभ अंगों में स्थानांतरित हो जाते हैं तथा प्रतिरक्षा प्रदान करने हेतु इनमें होने वाले परिवर्तनों का भी उल्लेख कीजिए। 2



16. *Assertion (A) :* Most “evolutionary trees” place information about pattern of relationship on horizontal axis and time on vertical axis.

*Reason (R) :* An “evolutionary tree” depicts pattern of relationship among parents and offsprings.

## SECTION B

17. “Insects do pollinate flowers even when not rewarded with nectar and pollen grains.” Explain with the help of an example. 2

18. Draw a schematic diagram of a part of double stranded dinucleotide DNA chain with all the four nitrogenous bases and showing correct polarity. 2

19. (a) How have transgenic animals proved to be beneficial in the study of : 2  
(i) Normal physiology and development ?  
(ii) Chemical safety testing ?

## OR

(b) Mention four applications of plants whose genes have been altered by manipulation. 2

20. Differentiate between Follicular phase and Luteal phase of the Menstrual cycle in human females on the basis of the following criteria : 2  
(a) Days of their occurrence in the cycle  
(b) Stage of the follicle  
(c) Hormones influencing the phases  
(d) State of endometrium

21. (a) Name the lymphoid organ in humans that produces different types of cells.  
(b) Mention the name of the blood cells that migrate from this lymphoid organ to another lymphoid organ, and state the changes it undergoes so as to provide immunity. 2

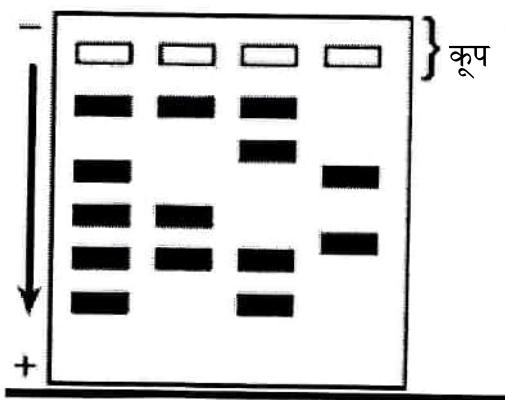


## खण्ड ग

22. द्वितीय विश्व युद्ध में घायल सैनिकों के उपचार में उपयोग किए गए प्रतिजैविक (एंटिबायोटिक) का नाम लिखिए। इसकी खोज एक आकस्मिक घटना के कारण हुई, व्याख्या कीजिए। 2  
उन वैज्ञानिकों के नाम लिखिए जिन्हें इस खोज के लिए नोबल पुरस्कार दिया गया। 1

23. (a) थैलेसीमिया को मैंडलीय विकार के रूप में क्यों वर्गीकृत किया गया है ? इस विकार (रोग) के अभिलक्षण तथा कारण लिखिए। 2  
(b) यह दात्र कोशिका अरक्तता (सिक्कल सेल एनिमिया) से किस प्रकार भिन्न है ? 1

24. एक प्रतिबंधन एंजाइम एक विशिष्ट डीएनए अणु का पाचन कर उसे खंडों में विभाजित कर देता है। इन खंडों पर एक तकनीक का प्रयोग किया गया तथा प्राप्त परिणाम को नीचे दिए गए आरेख द्वारा दर्शाया गया है। चित्र का प्रेक्षण कर दिए गए संबंधित प्रश्नों के उत्तर लिखिए।



(a) इस तकनीक का नाम तथा इसका उद्देश्य लिखिए।  
(b) निम्नलिखित चरणों में अपनाए जाने वाली क्रियाविधि की व्याख्या कीजिए :  
(i) उपयोग किए जाने वाले माध्यम का नाम तथा इसकी भूमिका  
(ii) डीएनए का अभिरंजन तथा निष्कर्षण 3

25. (a) आवृत्तबीजी (एंजियोस्पर्म) के एक परिपक्व भ्रून कोष का स्वच्छ आरेख बनाकर उसके किन्हीं चार कोशिकीय घटकों को नामांकित कीजिए।  
(b) तंतुरूप समुच्चय का प्रकार्य लिखिए। 3

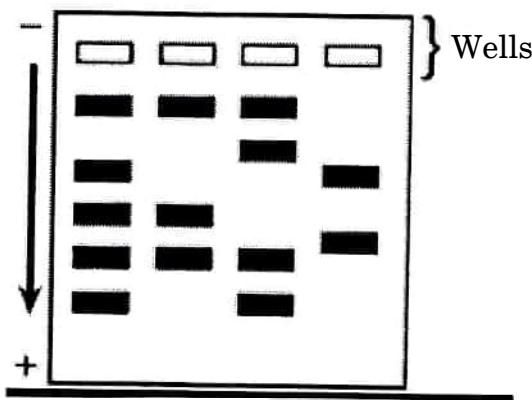


## SECTION C

22. Name the antibiotic that was used to treat wounded soldiers in World War II. Explain its chance discovery. 2  
Name the scientists who were awarded the Nobel Prize for this discovery. 1

23. (a) Why is thalassemia categorised as a Mendelian disorder ? Write the symptom and the cause of the disease. 2  
(b) How is it different from Sickle cell anaemia ? 1

24. A restriction enzyme digests a certain DNA into fragments. The fragments are subjected to a technique, the result obtained is in the illustration given below. Observe and answer the questions that follow.



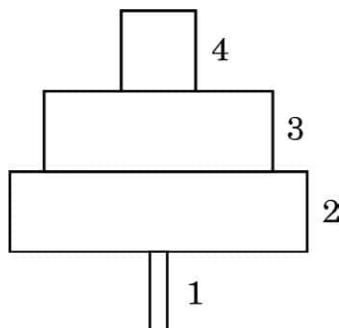
(a) Name the technique and its purpose.  
(b) Explain the procedure carried out under the following steps :  
(i) Matrix used and its role  
(ii) Staining and extraction of the DNA 3

25. (a) Draw a neat diagram of a mature angiospermic embryo sac and label any four cellular components.  
(b) Write the function of filiform apparatus. 3



26. (a) (i) नीचे दिए गए आरेख में पिरैमिड के प्रकार की पहचान कीजिए तथा समुचित उदाहरण की सहायता से व्याख्या कीजिए कि यह किस प्रकार बनता है।

2



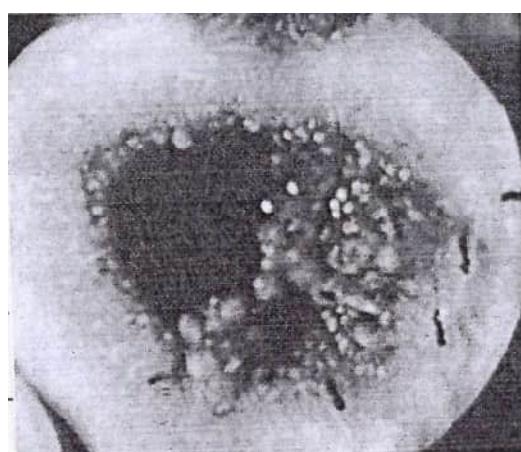
(ii) “एक प्रदत्त प्रजाति, एक ही पारिस्थितिक तंत्र में एक से अधिक पोषण रीतियों में अधिष्ठित हो सकती है।” कथन की न्यायसंगतता सिद्ध कीजिए।

1

#### अथवा

(b) (i) निम्नलिखित चित्र में समष्टियों की पारस्परिक क्रिया का नाम लिखकर उसकी व्याख्या कीजिए।

1



(ii) व्यष्टियों (जीवों) के मध्य होने वाली इसी प्रकार की पारस्परिक क्रिया की कृषि में व्यावसायिक उपयोगिता वाले दो अन्य उदाहरणों की व्याख्या कीजिए।

2

27. (a) स्ट्रेटोकोकस नीमोनी के ‘आर’ प्रभेद तथा ‘एस’ प्रभेद के बीच अंतर का उल्लेख कीजिए।  
 (b) ग्रिफ़ीथ द्वारा अपने प्रयोग में अपनाए गए विभिन्न चरणों को लिखिए तथा प्रयोग के अंत में उनके निष्कर्ष का भी उल्लेख कीजिए।

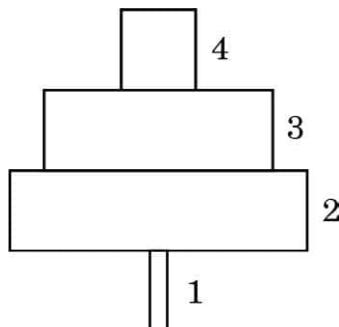
3

28. एक आरेखित निरूपण की सहायता से समझाइए कि किसी समष्टि में विभिन्न लक्षणों पर प्राकृतिक वरण की संक्रिया किस प्रकार होती है।

3



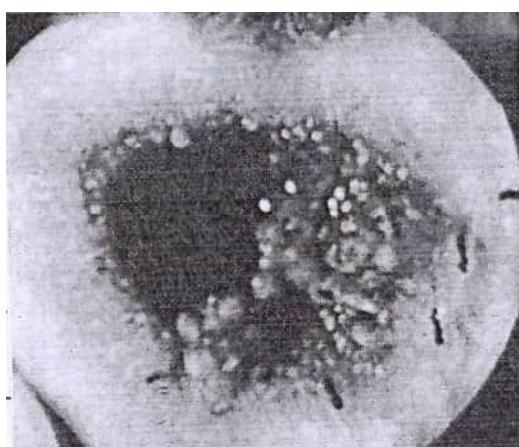
26. (a) (i) Identify the kind of pyramid given below and explain with the help of an example how it is formed. 2



(ii) "A given species may occupy more than one trophic level in the same ecosystem." Justify. 1

**OR**

(b) (i) Name and explain the kind of interaction in the following figure. 1



(ii) Explain two other examples where the same type of interaction among organisms is commercially useful in agriculture. 2

27. (a) Mention the difference between the 'R' strain and 'S' strain in *Streptococcus pneumoniae*. 2

(b) Write the steps followed by Griffith during the course of his experiment and the conclusion he arrived at, at the end of his experiment. 3

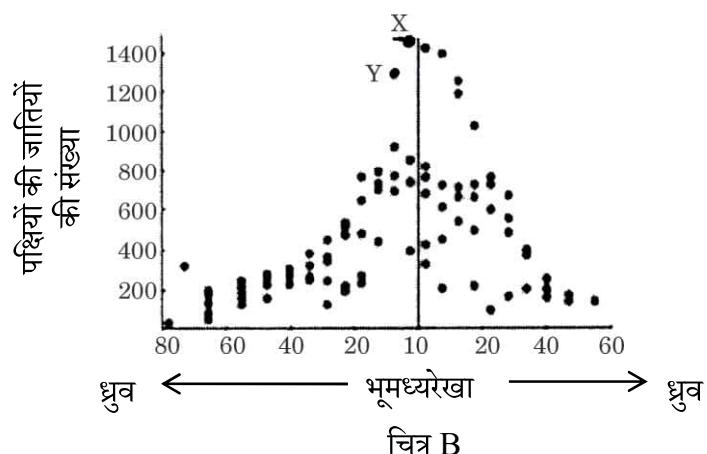
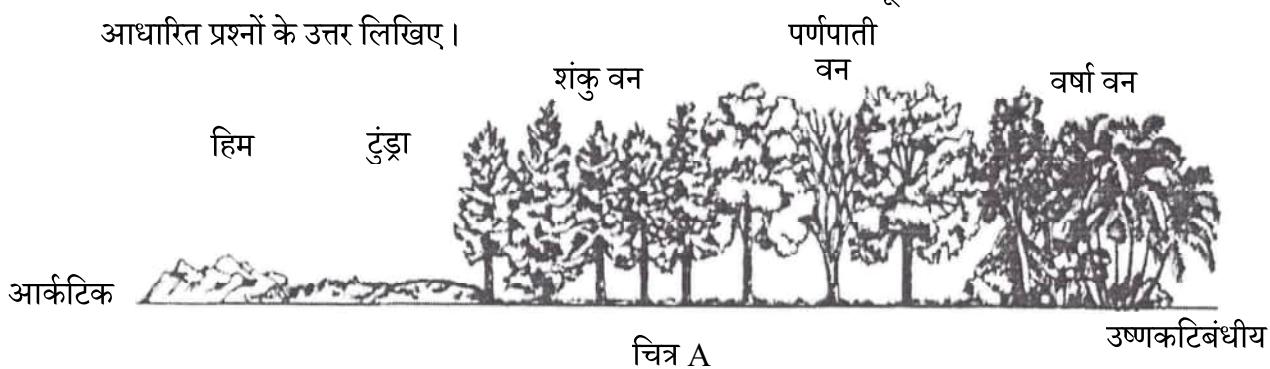
28. Explain with the help of a diagrammatic representation, how natural selection operates on different traits in a population. 3



## खण्ड घ

प्रश्न 29 तथा 30 प्रकरण-आधारित प्रश्न हैं। प्रत्येक प्रश्न के उपभाग हैं तथा एक उपभाग में आंतरिक विकल्प दिया गया है।

29. संपूर्ण विश्व में पौधों तथा जंतुओं में विविधता एकसमान नहीं है, वरन् इससे एक असमान वितरण परिलक्षित होता है। नीचे प्रदर्शित अभिचित्रण 'A' तथा 'B' का ध्यानपूर्वक अध्ययन करके उन पर आधारित प्रश्नों के उत्तर लिखिए।



(i) (a) चित्र A में आपके द्वारा प्रेक्षित जैव विविधता के पैटर्न (प्रतिमान) का उल्लेख कीजिए। 1  
अथवा

(b) चित्र B में पक्षियों की जातियों (स्पीशीज़) की संख्या दर्शाइ गई है। 'X' तथा 'Y' चिह्नित देशों को पहचानिए। 1

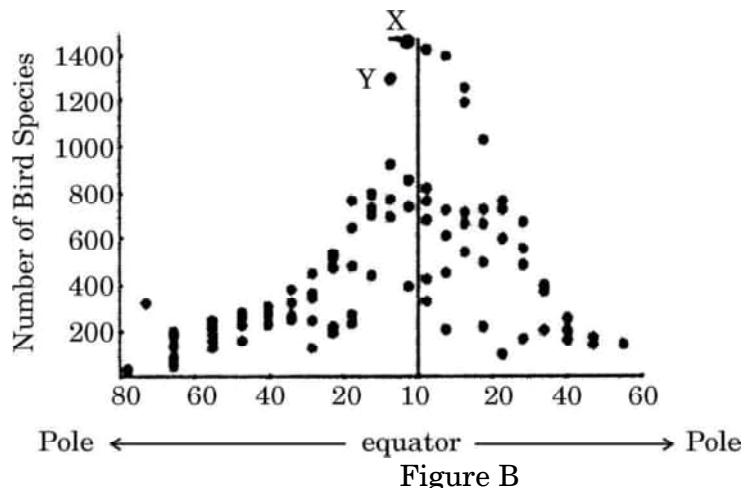
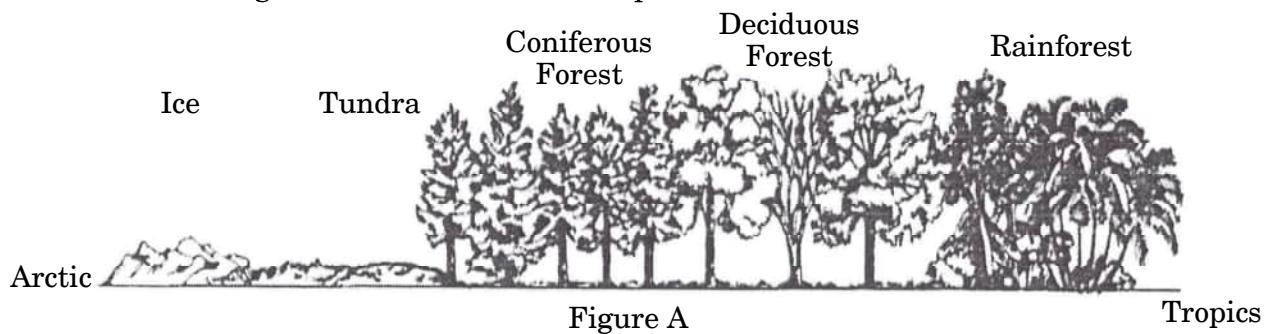
(ii) चित्र A में प्रेक्षित जैव विविधता के पैटर्न के लिए उत्तरदाइ तीन कारणों की व्याख्या कीजिए। 3



## SECTION D

Questions number 29 and 30 are case-based questions. Each question has subparts with internal choice in one subpart.

29. The diversity of plants and animals is not uniform throughout the world but shows a rather uneven distribution. Study carefully the illustrations 'A' and 'B' given below. Answer the questions based on them.



(i) (a) Mention the pattern of biodiversity that you observe in Figure A. 1

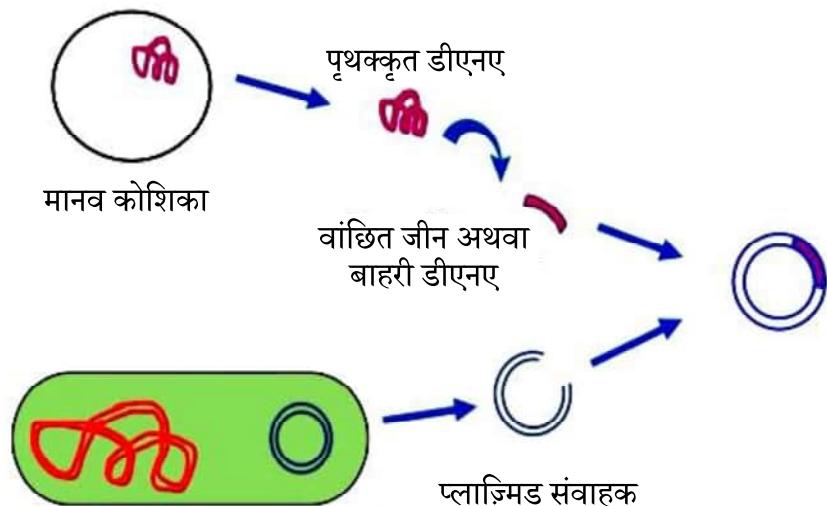
OR

(b) Figure B shows number of bird species. Identify the countries marked 'X' and 'Y'. 1

(ii) Explain the three reasons for the pattern of biodiversity that is observed in Figure A. 3



30. कक्षा के प्रदर्शन पट्ट पर लगे चित्रण आरेख को निम्न रूप से दर्शाया गया है। इस आरेख का अध्ययन करके संबंधित प्रश्नों के उत्तर लिखिए।



(i) (a) प्रदर्शित विशिष्ट तकनीक का नाम लिखिए। 1  
**अथवा**

(b) जीवाणु कोशिकाओं तथा कवक कोशिकाओं से डीएनए पृथक करने हेतु आवश्यक एंजाइमों के नाम क्रमशः लिखिए। 1

(ii) एली लिली कंपनी के वैज्ञानिकों द्वारा मधुमेह के रोगियों के लिए अत्यधिक लाभदायक दवा के उत्पादन में उपयोग किए गए विभिन्न चरणों की व्याख्या प्रदर्शित चित्र की सहायता से कीजिए। 3

### खण्ड ड

31. (a) 'कैंसर' के संदर्भ में निम्नलिखित की व्याख्या कीजिए : 1

(i) संस्पर्श संदमन (कॉटेक्ट इनहिबिशन) 1

(ii) सभी प्रसामान्य कोशिकाओं में आदि-अर्बुद जीन (प्रोटो-आँकोजीन) होते हैं 1

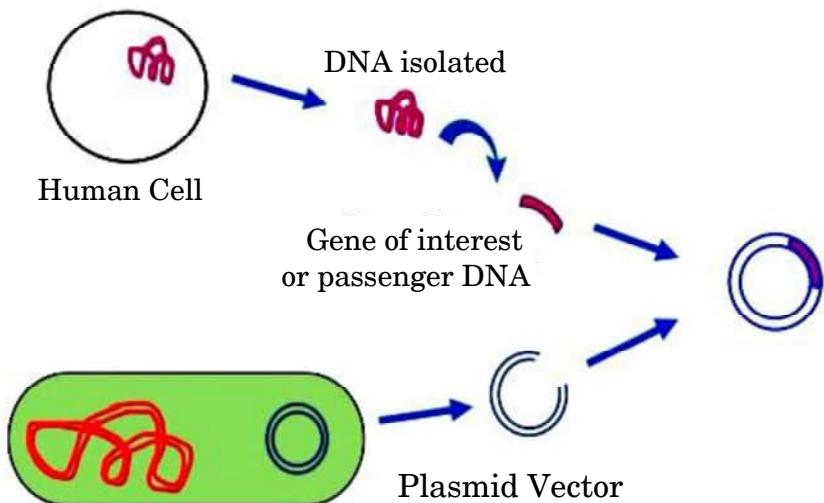
(iii) कैंसरजन का नाम तथा उनकी भूमिका लिखिए 1

(iv) सुदम (बिनाइन) तथा दुर्दम (मैलिंगेंट) अर्बुद में अंतर लिखिए 2

### अथवा



30. An illustration given below was on the display board in the class. Study the illustration and answer the questions that follow.



(i) (a) Name the particular technique shown. 1

**OR**

(b) Name the enzymes needed to isolate the DNA from bacterial and fungal cells respectively. 1

(ii) Taking the help of the illustration, explain the steps used by the scientists at Eli Lilly Company to produce a drug that proved to be highly beneficial to diabetic patients. 3

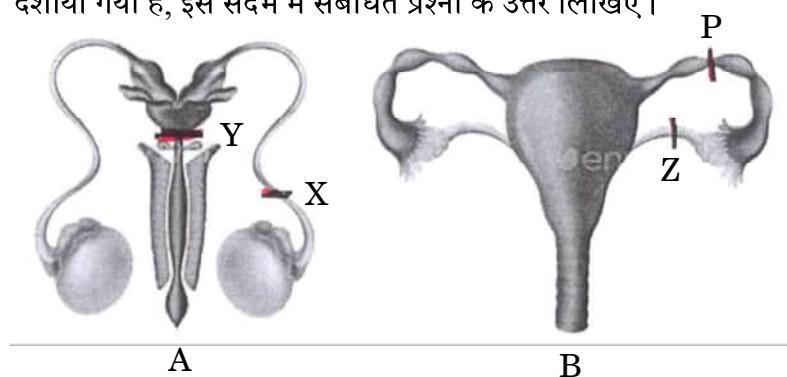
### **SECTION E**

31. (a) Explain the following with reference to 'Cancer' :

(i) Contact Inhibition 1  
(ii) All normal cells have proto-oncogenes 1  
(iii) Name of carcinogens and their role 1  
(iv) Difference between benign and malignant tumours 2

**OR**



(1) चित्र 'A' तथा 'B' में प्रदर्शित नामांकनों की पहचान कीजिए जहाँ यह प्रक्रिया की गई है।

(2) उपर्युक्त तकनीकों के तकनीकी नाम तथा अपनाई गई कार्यविधि लिखिए।



(b) (i) Why is it necessary to treat sewage water before it can be discharged into rivers and streams ? Explain different steps carried out in the treatment of sewage water and the production of fuel during this process.

(ii) Mention the initiative taken by the Ministry of Environment and Forests to save the major rivers of our country from pollution.

**32.** (a) (i) Why is tRNA called an adapter molecule ?

(ii) Draw the clover-leaf structure of initiator tRNA with the anticodon at the correct place.

(iii) Name and explain the first step in formation of polypeptide and mention its significance.

(iv) What are UTRs ? Mention their location and importance.

**OR**

(b) (i) What is an 'operon' in a bacterial system ?

(ii) Draw a schematic self-explanatory diagram of a lac operon in a 'switched-on' condition. Give the correct labelling at the respective positions.

**33.** (a) (i) Draw a labelled diagram of a matured human ovum ready for fertilization. Explain the events thereafter, leading to zygote formation.

(ii) It is said that the sex of the baby is decided as soon as the process of fertilization begins. Justify the statement.

**OR**

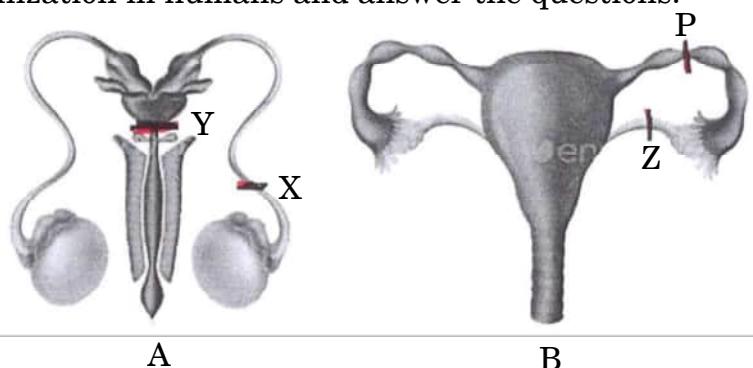
(b) (i) Write any four steps that you would recommend to improve the human reproductive health standards in India.

(ii) Refer to the following diagrams 'A' and 'B' showing sterilization in humans and answer the questions.

A
B

(1) Identify the labellings in the diagrams 'A' and 'B' where the procedure is carried out.

(2) Write the technical terms, and the procedures followed in the above-mentioned techniques.



- (1) Identify the labellings in the diagrams 'A' and 'B' where the procedure is carried out.
- (2) Write the technical terms, and the procedures followed in the above-mentioned techniques.

**Marking Scheme****Strictly Confidential****(For Internal and Restricted use only)****Senior School Certificate Supplementary Examination, 2023****SUBJECT NAME: BIOLOGY (SUBJECT CODE 044) (PAPER CODE 57/C/2)****General Instructions: -**

<b>1</b>	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.
<b>2</b>	<b>“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 various rules of the Board and IPC.”</b>
<b>3</b>	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. <b>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 due marks be awarded to them. In class-XII, 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, due marks should be awarded.</b>
<b>4</b>	The Marking scheme carries only suggested value points for the answers These are in the nature of Guidelines only and do not constitute the complete answer. The students can have their own expression and if the expression is correct, the due marks should be awarded accordingly.
<b>5</b>	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. If there is any variation, the same should be zero after deliberation and discussion. 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.
<b>6</b>	Evaluators will mark( ✓ ) wherever answer is correct. For wrong answer CROSS 'X' be marked. Evaluators will not put right ( ✓ ) while evaluating which gives an impression that answer is correct and no marks are awarded. <b>This is most common mistake which evaluators are committing.</b>
<b>7</b>	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.
<b>8</b>	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.

<b>9</b>	If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out with a note <b>“Extra Question”</b> .
<b>10</b>	No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
<b>11</b>	A full scale of marks 0-70 has to be used. Please do not hesitate to award full marks if the answer deserves it.
<b>12</b>	Every examiner has to necessarily do evaluation work for full working hours i.e., 8 hours every day and evaluate 20 answer books per day in main subjects and 25 answer books per day in other subjects (Details are given in Spot Guidelines).
<b>13</b>	<p>Ensure that you do not make the following common types of errors committed by the Examiner in the past:-</p> <p>Leaving answer or part thereof unassessed in an answer book.</p> <p>Giving more marks for an answer than assigned to it.</p> <p>Wrong totalling of marks awarded on an answer.</p> <p>Wrong transfer of marks from the inside pages of the answer book to the title page.</p> <p>Wrong question wise totalling on the title page.</p> <p>Wrong totalling of marks of the two columns on the title page.</p> <p>Wrong grand total.</p> <p>Marks in words and figures not tallying/not same.</p> <p>Wrong transfer of marks from the answer book to online award list.</p> <p>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.)</p> <p>Half or a part of answer marked correct and the rest as wrong, but no marks awarded.</p>
<b>14</b>	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.
<b>15</b>	Any un assessed portion, non-carrying over of marks to the title page, or totalling 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.
<b>16</b>	The Examiners should acquaint themselves with the guidelines given in the <b>“Guidelines for spot Evaluation”</b> before starting the actual evaluation.
<b>17</b>	Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totalled and written in figures and words.
<b>18</b>	The candidates are entitled to obtain photocopy of the Answer Book on request on payment of the prescribed processing fee. All Examiners/Additional Head Examiners/Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each answer as given in the Marking Scheme.

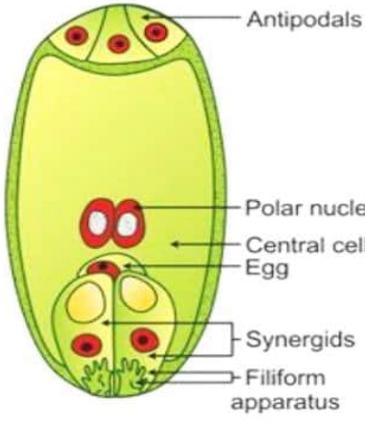
**MARKING SCHEME**  
 Senior Secondary School Supplementary Examination, 2023  
**BIOLOGY (Subject Code-044)**  
**[Paper Code: 57/C/2]**

**Maximum Marks: 70**

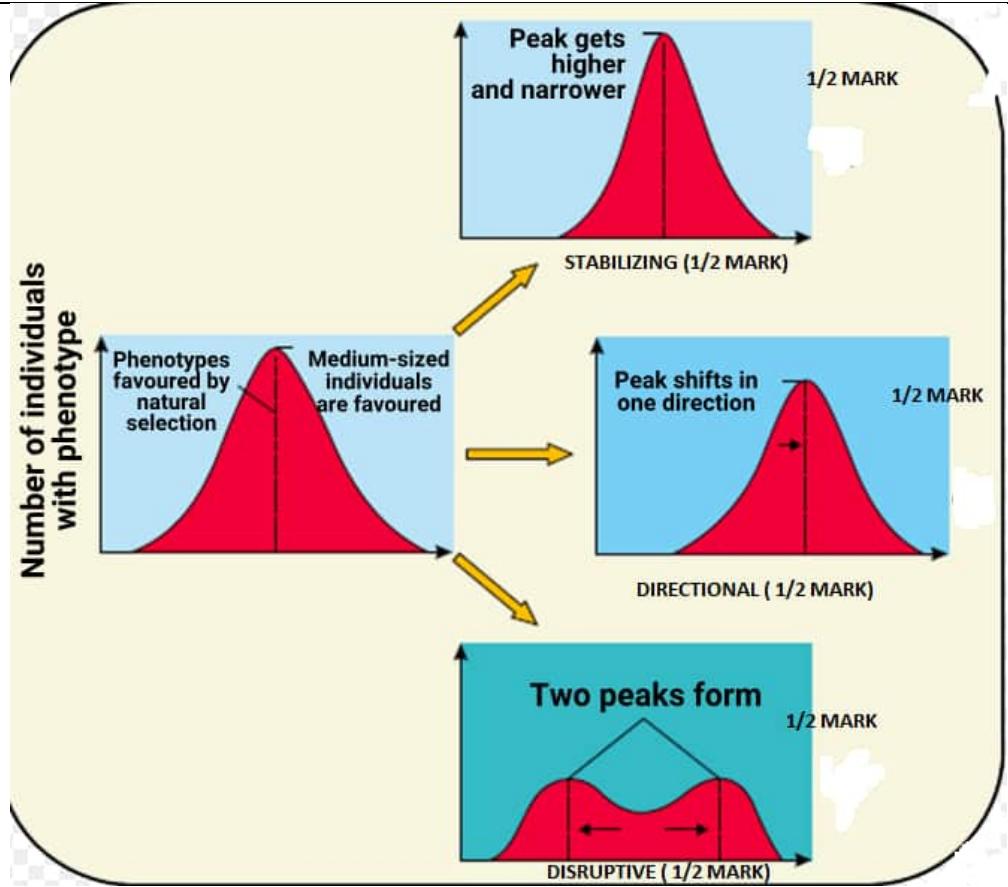
<b>Q. No.</b>	<b>EXPECTED ANSWER / VALUE POINTS</b>	<b>Marks</b>	<b>Total Marks</b>
	<b>SECTION—A</b>		
<b>1.</b>	(a) / FSH	1	1
<b>2.</b>	(c) / <i>Thermus aquaticus</i>	1	1
<b>3.</b>	(b) / 2,2,2	1	1
<b>4.</b>	(a) / Intra Cytoplasmic sperm injection // (d) / Zygote Intra Fallopian Transfer	1 // 1	1
<b>5.</b>	(d) / Satellite DNA(repetitive sequences of DNA) that show high degree of polymorphism.	1	1
<b>6.</b>	(c) / $W_1 = W_0 e^{rt}$	1	1
<b>7.</b>	(a) / Blood group A, $I^A I^O$	1	1
<b>8.</b>	(c) / Stabilized.	1	1
<b>9.</b>	(b) / Aravalli Hills- Karnataka.	1	1
<b>10.</b>	(a) / <i>Datura</i> – Hallucinogen.	1	1
<b>11.</b>	(b) / They are small circular DNA molecules with their own origin of replication site.	1	1
<b>12.</b>	(c) / Toxin released by <i>Bacillus thuringiensis</i>	1	1
<b>13.</b>	(a) / Both (A) and (R) are true, and (R) is the correct explanation of (A).	1	1
<b>14.</b>	(c) / (A) is true, but(R) is false.	1	1
<b>15.</b>	(b) / Both (A) and (R) are true, but(R) is not the correct explanation of (A).	1	1
<b>16.</b>	(c) / (A) is true, but(R)is false.	1	1
	<b>SECTION B</b>		
<b>17.</b>	Amorphophallus or Yucca plant and insect (moth), Floral rewards to pollinator by providing safe place to lay eggs / The Mediterranean orchid <i>Ophrys</i> and insects (bees and bumble bees), employs ‘sexual deceit’ to get pollination done by a species of bee same bee ‘pseudocopulates’ with another flower it transfers pollen to it and thus pollinates the flower.	1+1	

	<b>( 1 mark for example and 1 mark for its correct explanation)</b>		2			
18.	<p>( <math>\frac{1}{2}</math> mark for A=T , <math>\frac{1}{2}</math> mark for G =C , <math>\frac{1}{2}</math> mark for correct polarity, <math>\frac{1}{2}</math> mark for correct backbone of dsDNA)</p>	$\frac{1}{2} \times 4$	2			
19	<p>(a)</p> <p>(i) Transgenic animals are designed to allow the study of gene regulation and effects of gene on the normal functions of the body / The result obtained by introducing gene from other species that alter the formation of any growth like factors( such as insulin like growth factor) is used to know its biological role.</p> <p>(ii) Transgenic animals are made more sensitive to toxic substances and when exposed to these substances the effect is studied to get results in lesser time.</p> <p style="text-align: center;"><b>OR</b></p> <p>(b)</p> <ul style="list-style-type: none"> <li>-Made crops more tolerant to abiotic stresses (cold, drought, salt, heat).</li> <li>-Reduced reliance on chemical pesticides (pest-resistant crops).</li> <li>-Helped to reduce post-harvest losses.</li> <li>-Increased efficiency of mineral usage by plants (this prevents early exhaustion of fertility of soil).</li> <li>-Enhanced nutritional value of food, e.g., golden rice, i.e., Vitamin 'A' enriched rice.</li> <li>-In addition to these uses, GM has been used to create tailor-made plants to supply alternative resources to industries, in the form of starches, fuels and pharmaceuticals.</li> </ul> <p style="text-align: right;"><b>(Any Four applications)</b></p>	1	1			
20.	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;"></td> <td style="width: 33%; text-align: center;">Follicular phase</td> <td style="width: 33%; text-align: center;">Luteal Phase</td> </tr> </table>		Follicular phase	Luteal Phase	$\frac{1}{2}$	
	Follicular phase	Luteal Phase				

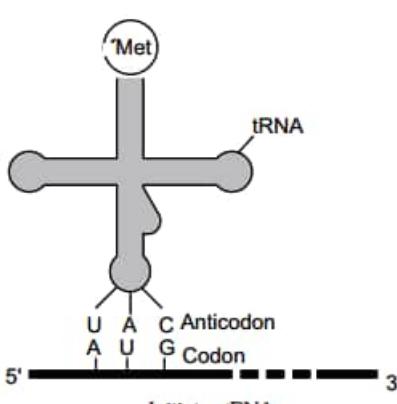
		<p>(a) Days of their occurrence in the cycle</p> <p>6<sup>th</sup> -13<sup>th</sup> /6<sup>th</sup> -14<sup>th</sup> day</p> <p>15<sup>th</sup> -28<sup>th</sup>/15<sup>th</sup> -29<sup>th</sup> day</p>		
		<p>(b) Stage of the follicle</p> <p>Development of Primary follicle into Graafian follicle</p>	Transformation of Graafian follicle into Corpus Luteum	
		<p>(c) Hormones influencing the phases</p> <p>LH / FSH/ Estrogen</p>	Progesterone	
		<p>(d) State of endometrium</p> <p>Regeneration of endometrium through proliferation.</p>	Endometrium further proliferate and thickens.	
		<b>(½ mark to be awarded for every correct difference)</b>		
		<b>2</b>		
<b>21</b>		<p>(a) Bone marrow</p> <p>(b) T- Lymphocytes, Maturation/ Proliferation / become antigen sensitive / become effector cells.</p>	<p>1</p> <p>½ +½</p>	<b>2</b>
		<b>SECTION-C</b>		
<b>22</b>		<ul style="list-style-type: none"> <li>Penicillin</li> <li>Alexander Fleming while working on <i>Staphylococci</i> bacteria, once observed a mould growing in one of his unwashed culture plates around which <i>Staphylococci</i> could not grow, He found out that it was due to a chemical produced by the mould and he named it Penicillin after the mould <i>Penicillium notatum</i>.</li> <li>Alexander Fleming, Ernest Chain, Howard Florey.</li> </ul> <p style="text-align: center;"><b>(1/2 mark each for any two correct names)</b></p>	<p>½</p> <p>½×3</p> <p>½ +½</p>	<b>3</b>
<b>23</b>		<p>(a)</p> <ul style="list-style-type: none"> <li>As it is determined by alteration or mutation in a single gene and follow Mendelian principle of inheritance.</li> <li>Anaemia.</li> <li>The defect is due to either mutation or deletion of genes synthesising the globin chains ( α and β chains of Hb) located on chromosome number 16 or 11.</li> </ul> <p>(b) Thalassemia is quantitative problem of synthesising reduced globin molecules whereas sickle cell anaemia is qualitative problem of synthesising incorrectly functioning globin.</p>	<p>1</p> <p>½</p> <p>½</p> <p>1</p>	<b>3</b>
<b>24</b>		<p>(a) Gel electrophoresis, to separate DNA fragments.</p>	½+½	

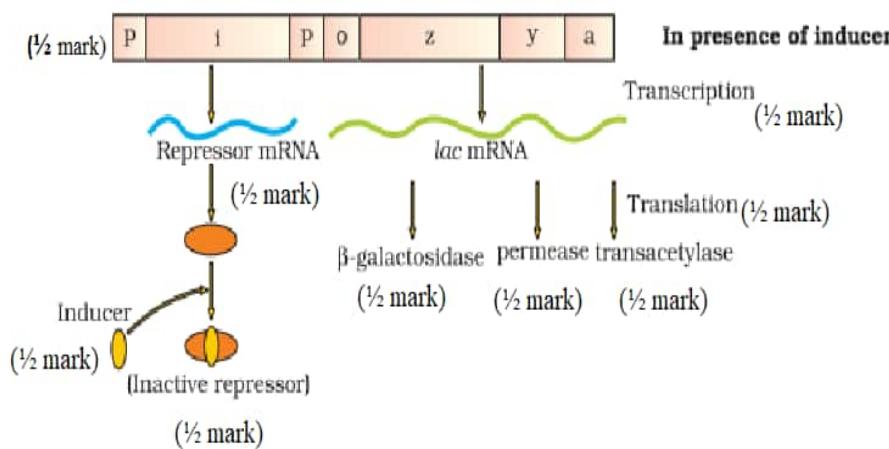
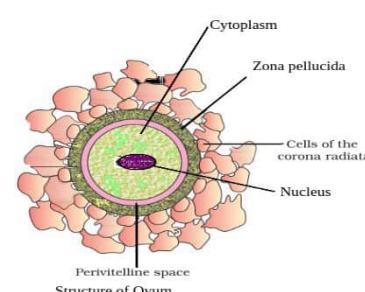
	<p>(b)</p> <p>(i) Agarose gel, to separate DNA fragments according to their size through sieving effect.</p> <p>(ii) Stained with Ethidium bromide followed by exposure to UV light which can be seen as orange coloured DNA band, Separated DNA bands are cut out from the gel and extracted from gel piece. (by the process of elution)</p>	$\frac{1}{2} + \frac{1}{2}$	
25	<p>(a)</p>  <p><b>Mature Embryo Sac</b></p> <p><b>(<math>\frac{1}{2}</math> mark each for any 4 correct labellings)</b></p> <p>(b) Guide pollen tube into synergids.</p>	$\frac{1}{2} \times 4$	3
26	<p>(a)</p> <p>(i)</p> <ul style="list-style-type: none"> <li>• Pyramid of number</li> <li>• One big tree supports large number of insects which support smaller number of birds which support still smaller number of bigger birds,</li> </ul> <p><b>(Any other correct explanation with example)</b></p> <p>(ii) Given species may occupy more than one trophic level in the same ecosystem at the same time-for example a sparrow is a primary</p>	1 1 1	3

	<p>consumer when it eats seeds fruits peas and a secondary consumer when it eats insects and worms.</p> <p><b>(Any other correct explanation with example)</b></p> <p><b>OR</b></p> <p>(b) (i)</p> <ul style="list-style-type: none"> <li>• Mutualism</li> <li>• Wasp laying eggs in a fig fruit The wasp pollinates the fig inflorescence while searching for suitable egg-laying sites and developing seeds used as food for the developing wasp larvae. Both the interacting species are benefitted.</li> </ul> <p>(ii) Examples Rhizobium in root nodules of leguminous plants fix atmospheric nitrogen and in turn gets food, Cyanobacteria in paddy fields fix atmospheric nitrogen and in turn gets food ,Pollination in plants by insects and the insects get nectar while plants get pollinated</p> <p><b>(Any two example with correct explanations)</b></p>								
27	<p>(a)</p> <table border="1"> <tr> <td>‘R’ Strain</td> <td>‘S’ Strain</td> </tr> <tr> <td>Non-Virulent</td> <td>Virulent</td> </tr> <tr> <td>No polysaccharide coat</td> <td>Have polysaccharide coat</td> </tr> </table> <p><b>(1/2 mark for any one difference)</b></p> <p>(b)</p> <p>S strain → Inject into mice → Mice die</p> <p>R strain → Inject into mice → Mice live</p> <p>S strain (heat killed) → Inject into mice → Mice live</p> <p>S strain (heat killed)+ R stain → Inject into mice → Mice die</p> <p>Conclusion: He concluded that the R strain bacteria had somehow been transformed by the heat-killed S strain bacteria / Some ‘transforming principle’ transferred from heat killed S strain and transform R strain into S strain.</p>	‘R’ Strain	‘S’ Strain	Non-Virulent	Virulent	No polysaccharide coat	Have polysaccharide coat	<p>1/2</p> <p>1/2</p> <p>1+1</p>	3
‘R’ Strain	‘S’ Strain								
Non-Virulent	Virulent								
No polysaccharide coat	Have polysaccharide coat								

28	 <p>The diagram shows four bell-shaped curves representing the distribution of phenotypes in a population. The y-axis is labeled 'Number of individuals with phenotype'.</p> <ul style="list-style-type: none"> <li><b>Stabilizing Selection (1/2 MARK):</b> The peak is high and narrow, with the text 'Peak gets higher and narrower' and '1/2 MARK'.</li> <li><b>Directional Selection (1/2 MARK):</b> The peak shifts in one direction, with the text 'Peak shifts in one direction' and '1/2 MARK'.</li> <li><b>Disruptive Selection (1/2 MARK):</b> Two peaks form, with the text 'Two peaks form' and '1/2 MARK'.</li> <li><b>Natural Selection (1/2 MARK):</b> The peak is broad, with the text 'Phenotypes favoured by natural selection' and 'Medium-sized individuals are favoured'.</li> </ul> <p>Yellow arrows point from the text labels to their corresponding curves.</p>	$\frac{1}{2} \times 6$	3
<b>SECTION-D</b>			
29	<p>(i)</p> <p>(a) Biodiversity increases as we move from arctic towards tropics/ biodiversity decreases as we move from tropics towards arctic</p> <p style="text-align: center;"><b>OR</b></p> <p>(b) X- Columbia Y- India/ South America</p> <p style="text-align: center;"><b>(Or any other correct name)</b></p> <p>(ii) Tropics harbor more biological diversity:</p> <ul style="list-style-type: none"> <li>-Speciation is generally a function of time unlike temperate regions subjected to frequent glaciations in the past tropical latitudes have remained relatively undisturbed for millions of years and thus had a long evolutionary time for species diversification.</li> <li>-Tropical environments are less seasonal relatively more constant and predictable which promote niche specialization and lead to a greater species diversity.</li> </ul>	1	$\frac{1}{2} \times 2$



	<ul style="list-style-type: none"> <li>Primary treatment- physical removal of floating debris through sequential filtration and sedimentation, secondary treatment / biological treatment, primary effluent is passed to large aeration tank where it is constantly agitated and air is pumped into it, This allow vigorous growth of aerobic microbes into floc which significantly reduces organic matter or BOD, flocs are allowed to settle in settling tank this sediment is called activated sludge, major part of sludge is pumped into anaerobic sludge digestor to produce biogas</li> </ul> <p>(ii) Ganga Action plan, Yamuna action plan ,to build a large number of sewage treatment plants so that only treated sewage may be discharged into the rivers.</p> <p style="text-align: center;"><b>(Any two points to be considered)</b></p>	$\frac{1}{2} \times 6$	
32	<p>(a)</p> <p>(i) tRNA has anticodon loop that has bases complimentary to the codon on mRNA and has amino acid acceptor end to bind specific amino acid / tRNA on one hand read the code on mRNA and on other hand would bind to specific amino acids.</p>	1	
	<p>(ii)</p> 	1	
	<p>(iii)</p> <ul style="list-style-type: none"> <li>Charging of tRNA / aminoacylation of tRNA</li> <li>Amino acids are activated in the presence of ATP and linked to their cognate tRNA, When two charged tRNA are close enough they form peptide bond between them energetically</li> </ul>	1 $\frac{1}{2} + \frac{1}{2}$	

	<p>(iv)</p> <ul style="list-style-type: none"> <li>Untranslated regions are some additional sequences present on mRNA that are not translated</li> <li>At both 5'-end (before start codon) and at 3'-end (after stop codon) required for efficient translation</li> </ul> <p><b>OR</b></p> <p>(b) (i) Operon is an arrangement of polycistronic structural gene which is regulated by common promoter and regulatory genes with operator region.</p>	$\frac{1}{2}$ $\frac{1}{2}$ 1
	<p>(ii)</p>  <p><b>In presence of inducer</b></p> <p>Transcription (½ mark)</p> <p>Translation (½ mark)</p> <p><math>\beta</math>-galactosidase (½ mark)      permease (½ mark)      transacetylase (½ mark)</p> <p>Inducer (½ mark)      (Inactive repressor) (½ mark)</p> <p>( Any 8 correct labelling)</p>	$\frac{1}{2} \times 8$ 5
33	<p>(a)</p> <p>(i)</p>  <p>Structure of Ovum</p>	$\frac{1}{2} \times 3$

	<p>During fertilisation a sperm comes in contact with the zona pellucida layer of the ovum and induces changes in the membrane that block the entry of additional sperms , The secretions of the acrosome help the sperm enter into the cytoplasm of the ovum through the zona pellucida and the plasma membrane , This induces the completion of the meiotic division of the secondary oocyte , and results in the formation of a second polar body and a haploid ovum (oovid) , the haploid nucleus of the sperms and that of the ovum fuse together to form a diploid zygote.</p> <p>(ii)</p> <p>If sperm carrying X chromosomes fertilize egg child born will be a female baby, If sperm carrying Y chromosome fertilize the egg child born will be a male baby.</p>	$\frac{1}{2} \times 5$	
	<b>OR</b>		
	(b)		
	(i)		
	<p>-Educating them about safe and hygienic sexual practices and sexually transmitted diseases.</p> <p>-Educating people in marriageable age group about the birth control measures pre-natal and post-natal care of the mother and significance of breastfeeding.</p> <p>-Sex education should be provided to the school going children so as to discourage myths and misconceptions about sex related aspects.</p> <p>-A legal ban on the checking of the gender of the foetus.</p> <p>-Create awareness about sex-abuse and drawbacks of population explosion.</p> <p>-Proper infrastructural and professional facilities to attain reproductive health standards (Any other correct recommendation)</p>	$\frac{1}{2} \times 4$	
	<b>(Any Four Points)</b>		
	(ii)		
	(1) 'A'-X, 'B'-P	$\frac{1}{2} + \frac{1}{2}$	
	(2)		
	<ul style="list-style-type: none"> <li>• 'A' - Vasectomy , small part of vas deferens is removed or tied up</li> <li>• 'B' -Tubectomy, small part of fallopian tube is removed or tied up</li> </ul>	$\frac{1}{2} + \frac{1}{2}$	
		$\frac{1}{2} + \frac{1}{2}$	
			5