**SET-3**

**Series GBM**

कोड नं.
**Code No. 57/3**

रोल नं.
Roll No. | | | | | | | |

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

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

- कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ **11** हैं ।
- प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए कोड नम्बर को छात्र उत्तर-पुस्तिका के मुख-पृष्ठ पर लिखें ।
- कृपया जाँच कर लें कि इस प्रश्न-पत्र में **26** प्रश्न हैं ।
- **कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, 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 **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.

# जीव विज्ञान (सैद्धान्तिक)

# BIOLOGY (Theory)

*निर्धारित समय : 3 घण्टे* *अधिकतम अंक : 70*

*Time allowed : 3 hours* *Maximum Marks : 70*

*सामान्य निर्देश :*

*(i)* *प्रश्न-पत्र में पाँच खण्डों में **26** प्रश्न दिए गए हैं । **सभी** प्रश्न अनिवार्य हैं ।*

*(ii)* *खण्ड **A** में प्रश्न संख्या **1** से **5** अति लघु-उत्तरीय प्रश्न हैं, प्रत्येक प्रश्न **1** अंक का है ।*

*(iii)* *खण्ड **B** में प्रश्न संख्या **6** से **10** लघु-उत्तरीय प्रश्न प्रकार I के हैं, प्रत्येक प्रश्न **2** अंकों का है ।*

*(iv)* *खण्ड **C** में प्रश्न संख्या **11** से **22** लघु-उत्तरीय प्रश्न प्रकार II के हैं, प्रत्येक प्रश्न **3** अंकों का है ।*

*(v)* *खण्ड **D** में प्रश्न संख्या **23** मूल्य आधारित प्रश्न **4** अंकों का है ।*

*(vi)* *खण्ड **E** में प्रश्न संख्या **24** से **26** दीर्घ-उत्तरीय प्रश्न हैं, प्रत्येक प्रश्न **5** अंकों का है ।*

*(vii)* *प्रश्न-पत्र में समग्र पर कोई विकल्प नहीं है, फिर भी **2** अंकों वाले एक प्रश्न में, **3** अंकों वाले एक प्रश्न में और **5** अंकों वाले सभी तीनों प्रश्नों में भीतरी चयन-विकल्प दिए गए हैं । प्रत्येक परीक्षार्थी को ऐसे प्रश्नों के दो विकल्पों में से कोई एक प्रश्न हल करना है ।*

***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.*

## खण्ड A
## SECTION A

**1.** किसी ताप बिजली संयंत्र में एक स्थिर-वैद्युत अवक्षेपित्र कई हज़ार उच्च वोल्टता उत्पन्न करने में समर्थ नहीं है । इसके कारण होने वाला पारितंत्रीय परिणाम लिखिए । *1*

An electrostatic precipitator in a thermal power plant is not able to generate high voltage of several thousands. Write the ecological implication because of it.

**2.** जीवाणु शरीर में Bt-आविष का उत्सर्जन निष्क्रिय क्रिस्टलों के रूप में होता है । कपास गोलक शलभ (बॉल वर्म) के शरीर में इसमें क्या हो जाता है कि यह गोलक शलभ को मार देता है ? *1*

Bt-toxins are released as inactive crystals in the bacterial body. What happens to it in the cotton boll worm body that it kills the boll worm ?

**3.** ओपैरिन और हाल्डेन की जीवन की उत्पत्ति के संदर्भ में दी गई दो धारणाओं का उल्लेख कीजिए । *1*

State two postulates of Oparin and Haldane with reference to origin of life.

**4.** उस संकरण के प्रकार का नाम बताइए जिससे बैंगनी रंग के फूलों वाले मटर के पौधे का जीनप्ररूप पता लगाने में सहायता मिलती है । *1*

Name the type of cross that would help to find the genotype of a pea plant bearing violet flowers.

**5.** गायों के एक झुंड में जनन-क्षमता और उत्पादकता की कमी दृष्टिगोचर होती है । इस समस्या पर पार पाने के लिए एक कारण और एक सुझाव दीजिए । *1*

A herd of cattle is showing reduced fertility and productivity. Provide one reason and one suggestion to overcome this problem.

## खण्ड B

## SECTION B

**6.** CFCs का उपयोग बंद करने से मानव जीवन को होने वाले चार लाभों की सूची बनाइए । *2*

**अथवा**

उन दो विधियों का एक-एक उदाहरण देते हुए सुझाव दीजिए, जो विरले अथवा संकटापन्न स्पीशीज़ की सुरक्षा करने में सहायता करती हैं । *2*

List four benefits to human life by eliminating the use of CFCs.

**OR**

Suggest two practices giving one example of each, that help protect rare or threatened species.

**7.** यीस्ट के दो प्रकारों के द्विपदीय नाम लिखिए और उनकी सहायता से उत्पन्न व्यावसायिक जैवसक्रिय उत्पादों को भी बताइए । *2*

Give the binomials of two types of yeast and the commercial bioactive products they help to produce.

**8.** नीचे दिए गए आनुवंशिक कूटों में अंतर बताइए : *2*

(a) असंदिग्ध और सार्वत्रिक

(b) अपह्रासित और प्रारंभक

Differentiate between the genetic codes given below :

(a) Unambiguous and Universal

(b) Degenerate and Initiator

**9.** परागकोश में से झड़ते समय परागकणों में कितनी कोशिकाएँ उपस्थित होती हैं ? कोशिकाओं के नाम बताइए । *2*

How many cells are present in the pollen grains at the time of their release from anther ? Name the cells.

**10.** मानव शरीर के भीतर पहुँचने के बाद HIV कोशिकाओं के जिस समूह में प्रवेश करता है उसका नाम बताइए । इन कोशिकाओं में क्या होता है और बाद में इन कोशिकाओं को किस नाम से पहचाना जाता है ? यहाँ से HIV जिन कोशिकाओं पर आक्रमण करता है उनके समूह का नाम बताइए । *2*

Name the group of cells the HIV enters after getting into the human body. What happens in these cells and what are these cells subsequently referred to as ? Name the next group of cells the HIV attacks from here.

## खण्ड C

## SECTION C

**11.** *रामापिथिकस, आस्ट्रेलोपिथिकस* और *होमो हैबिलिस* को पृथ्वी पर उनके विकास के क्रम में पुनर्व्यवस्थित कीजिए । उनकी विकासीय विशिष्टताओं की चर्चा कीजिए । *3*

Rearrange *Ramapithecus, Australopithecus* and *Homo habilis* in the order of their evolution on the Earth. Comment on their evolutionary characteristics.

**12.** (a) पुनर्योगज DNA बनाने में 'विलोमानुक्रमी न्यूक्लिओटाइड अनुक्रम' के महत्त्व की व्याख्या कीजिए ।

(b) उपर्युक्त प्रक्रिया में प्रतिबंधन एंडोन्यूक्लिऐज़ का उपयोग बताइए । *3*

(a) Explain the significance of 'palindromic nucleotide sequence' in the formation of recombinant DNA.

(b) Write the use of restriction endonuclease in the above process.

**13.** मानव मल पदार्थ से संदूषित जल और भोजन के सेवन के कारण मानवों में फैलने वाला रोग, उसका रोगकारक जीव, रोगलक्षण (कोई तीन) तथा उसके वेक्टर का नाम बताइए । *3*

**अथवा**

(a) अभिभावकों को इस बात का डर क्यों रहता है कि कहीं उनके किशोर आश्रित बच्चों को नशीले पदार्थों/मदिरा की लत न पड़ जाए ?

(b) किशोर बच्चों को नशीले पदार्थों/मदिरा की लत पड़ जाने के संदर्भ में 'व्यसन' और 'निर्भरता (dependence)' की व्याख्या कीजिए । *3*

Name a human disease, its causal organism, symptoms (any three) and vector, spread by intake of water and food contaminated by human faecal matter.

**OR**

(a) Why is there a fear amongst the guardians that their adolescent wards may get trapped in drug/alcohol abuse ?

(b) Explain 'addiction' and 'dependence' in respect of drug/alcohol abuse in youth.

**14.** (a) मानव जीनोम परियोजना में निहित दो प्रणालियों की सूची बनाइए । बताइए कि उन्हें किस प्रकार प्रयुक्त किया गया था ।

(b) 'YAC' का पूरा नाम बताइए और उल्लेख कीजिए कि उसे किसके लिए इस्तेमाल किया गया था । *3*

(a) List the two methodologies which were involved in human genome project. Mention how they were used.

(b) Expand 'YAC' and mention what was it used for.

**15.** हीमोफ़ीलिया और थैलासीमिया मानवों के दो रुधिर-संबंधित विकार हैं । उनके कारण बताइए तथा दोनों के बीच अंतर भी स्पष्ट कीजिए । आनुवंशिक विकार की उस श्रेणी का नाम बताइए जिसके अंतर्गत ये दोनों आते हैं । *3*

Both Haemophilia and Thalassemia are blood related disorders in humans. Write their causes and the difference between the two. Name the category of genetic disorder they both come under.

**16.** (a) नारियल के संदर्भ में, निषेचन के पश्चात् भ्रूणपोष के परिवर्धन की चर्चा कीजिए । भ्रूणपोष के परिवर्धन के महत्त्व का उल्लेख कीजिए ।

(b) 'पराग बैंक' का महत्त्व लिखिए । *3*

(a) Trace the development of an endosperm after fertilisation with reference to coconut. Mention the importance of endosperm development.

(b) Write the importance of 'pollen bank'.

**17.** PCR प्रक्रिया में ताप, प्राइमरों और जीवाणु *थर्मस एक्वेटिकस* की भूमिकाओं का वर्णन कीजिए । *3*

Describe the roles of heat, primers and the bacterium *Thermus aquaticus* in the process of PCR.

**18.** वाहित मल के द्वितीयक उपचार को जैविक उपचार भी कहते हैं । इस कथन की पुष्टि कीजिए तथा प्रक्रिया की व्याख्या कीजिए । *3*

Secondary treatment of the sewage is also called Biological treatment. Justify this statement and explain the process.

**19.** कृत्रिम इंसुलिन के उत्पादन में निहित विभिन्न चरणों की व्याख्या कीजिए । *3*

Explain the various steps involved in the production of artificial insulin.

**20.** उत्पादकता, सकल प्राथमिक उत्पादकता और शुद्ध उत्पादकता के बीच पारस्परिक संबंध का वर्णन कीजिए । *3*

Describe the inter-relationship between productivity, gross primary productivity and net productivity.

**21.** (a) कोई किसान अपनी गन्ने की फ़सल में कौन-से वांछित लक्षण देखना चाहता है ?

(b) वांछित लक्षणों वाला गन्ना उगाने में पादप प्रजनन तकनीकों ने उत्तरी भारत के किसानों की किस प्रकार मदद की ? *3*

(a) Write the desirable characters a farmer looks for in his sugarcane crop.

(b) How did plant breeding techniques help north Indian farmers to develop cane with desired characters ?

**22.** कंगारू चूहे और रेगिस्तानी पौधे अपने उग्र पर्यावास में जीवित बने रहने के लिए किस प्रकार अनुकूलित होते हैं ? समझाइए । *3*

How do kangaroo rats and desert plants adapt themselves to survive in their extreme habitat ? Explain.

## खण्ड D

## SECTION D

**23.** आमतौर पर यह देखा जाता है कि लैंगिकता और जनन के बारे में माता-पिता अपने किशोर बच्चों के साथ खुलकर चर्चा करने में उलझन महसूस करते हैं । माता-पिता की इस उलझन का परिणाम यह होता है कि बच्चे कभी-कभी भटक जाते हैं ।

(a) आपकी राय में इन विषयों के बारे में अपने बढ़ते बच्चों के साथ खुलकर चर्चा न करने के पीछे कुछ माता-पिताओं की उलझनों का क्या कारण है ? व्याख्या कीजिए ।

(b) एक स्थानीय पौधे और एक जंतु का उदाहरण देते हुए, आप इन माता-पिताओं की जनन और लैंगिकता के बारे में इन उलझनों से पार पाने में किस प्रकार सहायता करेंगे ? *4*

It is commonly observed that parents feel embarrassed to discuss freely with their adolescent children about sexuality and reproduction. The result of this parental inhibition is that the children go astray sometimes.

(a) Explain the reasons that you feel are behind such embarrassment amongst some parents to freely discuss such issues with their growing children.

(b) By taking one example of a local plant and animal, how would you help these parents to overcome such inhibitions about reproduction and sexuality ?

## खण्ड E

## SECTION E

**24.** (a) अक्षीय फूलों वाले मटर के पौधे को अंत्य (टर्मिनल) फूलों वाले मटर के पौधे के साथ क्रॉस किया गया । इस क्रॉस को अक्षीय फूलों वाले मटर के पौधे के जीनप्ररूपी को ज्ञात करने के लिए किया गया । इस क्रॉस का हल निकालिए ताकि आप जिन निष्कर्षों पर पहुँचे हैं वे स्पष्ट हो सकें ।

(b) वंशागति के मेन्डल के उस नियम का उल्लेख कीजिए जिसे सार्वत्रिक रूप से स्वीकार किया जाता है । *4+1=5*

**अथवा**

(a) संवर्धन माध्यम में लैक्टोज़ के न होने से *ई. कोलाई* में *लैक*-ओपेरॉन की अभिव्यक्ति प्रभावित हो जाती है । क्यों और कैसे ? व्याख्या कीजिए ।

(b) किन्हीं दो तरीकों को लिखिए जिनमें सुकेन्द्रकियों में जीन अभिव्यक्ति का नियमन किया जाता है । *4+1=5*

(a) A pea plant bearing axial flowers is crossed with a pea plant bearing terminal flowers. The cross is carried out to find the genotype of the pea plant bearing axial flowers. Work out the cross to show the conclusions you arrive at.

(b) State the Mendel's law of inheritance that is universally acceptable.

**OR**

(a) Absence of lactose in the culture medium affects the expression of a *lac*-operon in *E. coli*. Why and how ? Explain.

(b) Write any two ways in which the gene expression is regulated in eukaryotes.

**25.** (a) नारंगी के एक बीज को जब निचोड़ा जाता है, तब एक भ्रूण के स्थान पर अनेक भ्रूण देखे जाते हैं । समझाइए कि यह किस प्रकार संभव है ।

(b) क्या ये भ्रूण आनुवंशिक रूप से समान होते हैं अथवा भिन्न ? चर्चा कीजिए । *3+2=5*

**अथवा**

(a) एक मानव स्त्री के आर्तव चक्र की निम्नलिखित प्रावस्थाओं की व्याख्या कीजिए :

(i) आर्तव प्रावस्था

(ii) पुटकीय प्रावस्था

(iii) पीतपिंड (ल्यूटिअल) प्रावस्था

(b) आर्तव चक्र की सही-सही जानकारी परिवार नियोजन में अत्यधिक सहायता कर सकती है । क्या आप इस कथन से सहमत हैं ? अपने उत्तर के लिए कारण दीजिए । *4+1=5*

(a) When a seed of an orange is squeezed, many embryos, instead of one are observed. Explain how it is possible.

(b) Are these embryos genetically similar or different ? Comment.

**OR**

(a) Explain the following phases in the menstrual cycle of a human female :

(i) Menstrual phase

(ii) Follicular phase

(iii) Luteal phase

(b) A proper understanding of menstrual cycle can help immensely in family planning. Do you agree with the statement ? Provide reasons for your answer.

**26.** (a) किसी स्पीशीज़ की समष्टि वृद्धि के J-आकार और S-आकार मॉडलों की कारण बताते हुए तुलना कीजिए ।

(b) डार्विन द्वारा बताई गई "स्पीशीज़ की क्षमता" की व्याख्या कीजिए । *3+2=5*

**अथवा**

(a) पारिस्थितिकीय पिरैमिड क्या होता है ? ऊर्जा, जैव-संहति और संख्या के पिरैमिडों की तुलना कीजिए ।

(b) पारिस्थितिकीय पिरैमिडों की कोई दो सीमाएँ बताइए । *4+1=5*

(a) Compare, giving reasons, the J-shaped and S-shaped models of population growth of a species.

(b) Explain "fitness of a species" as explained by Darwin.

**OR**

(a) What is an ecological pyramid ? Compare the pyramids of energy, biomass and numbers.

(b) Write any two limitations of ecological pyramids.

# Question Paper Code 57/3

## SECTION – A

### Q. Nos. 1 - 5 are of one marks each

**1. An electrostatic precipitator in a thermal power plant is not able to generate high voltage of several thousands. Write the ecological implication because of it.**

Ans Air Pollution //
particulate matter / dust particles released in the air.

[1 Mark]

**2. Bt -toxins are released as inactive crystals in the bacterial body. What happens to it in the cotton boll worm body that it kills the boll worm.**

Ans: It is converted into an active protein (due to alkaline pH of the gut of the boll worm) , the toxin binds to midgut cells / create pores / causes cell swelling and lysis that kills the bollworm = ½ + ½

[1 Mark]

**3. State two postulates of Oparin and Haldane with reference to origin of life.**

Ans (i) First form of life could have come from pre-existing non-living organic molecules / RNA & Protein = ½

(ii) Formation of life was preceded by chemical evolution / formation of diverse organic molecules from inorganic constituents = ½

[1 Mark]

**4. Name the type of cross that would help to find the genotype of a pea plant bearing Violet flowers.**

Ans. Test cross =1

[1 Mark]

**5. A herd of cattle is showing reduced fertility and productivity. Provide one reason and one suggestion to overcome this problem.**

Ans Reason: Inbreeding depression / continuous inbreeding = ½
Suggestion: Should be mated with unrelated superior cattle of the same breed / out - breeding / out - crossing = ½

[1 Mark]

## SECTION B

### Q. Nos.6-10 are of two marks each.

**6. List four benefits to human life by eliminating the use of CFCs.**

Ans (i) Delay in aging of skin

(ii) Prevent damage to skin cells

(iii) Prevent skin cancer

(iv) Prevent snow blindness / inflammation of cornea

(v) Prevent cataract

(vi) Prevents ozone depletion

(vii) Prevents global warming

(viii) Reduces greenhouse effect

(ix) Reduces odd climatic changes or El Nino effect

**(Any Four )** = ½ × 4

[2 Marks]

**OR**

**Suggest two practices giving one example of each, that help protect rare or threatened species.**

Ans: (1) In situ conservation **,** biodiversity hotspot / biosphere reserve / national parks /sanctuaries / Ramsar sites / sacred groves **(Any one)** = ½ + ½

(2) Ex situ conservation **,** Zoological parks / botanical garden / wild life safari parks / cryopreservation techniques / Tissue culture / seed bank / pollen banks **(Any one)** = ½ + ½

[2 Marks]

**7. Give the binomials of two types of yeast and the commercial bioactive products they help to produce.**

Ans: *Saccharomyces cerevisiae*- ethanol / alcohol

*Monascus purpureus*- statin = 1 + 1

[2 Marks]

**8. Differentiate between the genetic codes given below:**

(a) **Unambiguous and Universal**

(b) **Degenerate and Initiator**

Ans:

| | |
|---|---|
| (a) **Unambiguous**:<br>One codon codes for only one amino acid = ½<br><br>(b)**Degenerate:**<br>More than one codon coding for the same amino acid. = ½ | **Universal**:<br>Genetic code / codons are(nearly) same for all organisms / from bacteria to human = ½<br><br>**Initiator:**<br>Start codon / AUG = ½ |

[2 Marks]

**9. How many cells are present in the pollen grains at the time of their release from anther ? Name the cells.**

Ans Pollen grain may be released at

2-celled stage , one vegetative and one generative cell ,

3-celled stage , one vegetative cell and two male gametes =½×4

[2 marks]

**10. Name the group of cells the HIV enters after getting into the human body. What happens in these cells and what are these cells subsequently referred to as ? Name the next group of cells the HIV attacks from here.**

Ans Macrophages , Reverse transcription , HIV Factory , helper T-lymphocytes ($T_H$) = ½ × 4

[2 marks]

## SECTION – C

### Q Nos. 11-22 are of three marks each

**11. Rearrange *Ramapithecus, Australopithecus* and *Homo habilis* in the order of thein evolution on the Earth. Comment on their evolutionary characteristics.**

Ans *Ramapithecus* $\rightarrow$ *Australopithecus* $\rightarrow$ *Homo habilis* = (1½ mark for correct sequence only)
*Ramapithecus* - hairy / walked like gorilla and chimpanzees / more man like = ½
*Australopithecus* - Hunted with stone weapons / ate fruit = ½
*Homo habilis* -Brain capacity 650- 800 cc / probably did not eat meat = ½

[3 Marks]

**12. (a) Explain the significance of 'palindromic nucleotide sequence' in the formation of recombinant DNA.**

**(b) Write the use of restriction endonuclease in the above process.**

Ans (a) Palindromic nucleotide sequence is the recognition (specific) sequence present both on the vector and on a desired / alien DNA for the action of the same(specific) restriction endonuclease to act upon = 1

(b) Same restriction endonuclease binds to both the vector and the foreign DNA , cut each of the two strands of the double helix at specific points in their sugar phosphate backbone of recognition sequence for restriction endonucleases / palindromic sequence of vector and foreign DNA , to cut strand a little away from the centre of the palindrome sites, creates overhanging stretches /sticky ends = ½ × 4

//

(b) If depicted diagramatically showing the above mentioned value points it can be accepted

[3 Marks]

**13. Name a human disease, its causal organism, symptoms (any three) and vector, spread by intake of water and food contaminated by human faecal matter.**

Ans Amoebiasis (Amoebic dysentery) **,** *Entamoeba histolytica* **,** constipation / abdominal pain / cramps / stools with excess mucus / blood clots **(Any three symptoms) ,** Housefly = ½ × 6

//

Ascariasis, *Ascaris* , internal bleeding / muscular pain / fever / anaemia / blockage of intestinal passage **(Any three symptoms)**, Housefly = ½ × 6

//

Typhoid, *Salmonella typhi*, high fever / weakness / stomach pain / constipation / headache / loss of appetite **(Any three symptoms)**, Housefly = ½ × 6

[3 Marks]

**OR**

**(a) Why is there a fear amongst the guardians that their adolescent wards may get trapped in drug/alcohol abuse ?**

**(b) Explain 'addiction' and 'dependence' in respect of drug/alcohol abuse in youth.**

Ans (a) Adolescents are easily affected by ( vulnerable to) peer pressure /adventure /curiosity / excitement / experimentation / media **(Any two)** = ½ + ½

(b) Addiction -Psychological attachment to certain effects such as Euphoria / temporary feeling of well-being =l
Dependence:- Tendency of the body to show withdrawal syndrome / symptoms if regular doses of drug / alcohol is abruptly discontinued = 1

[3 Marks]

**14. (a) List the two methodologies which were involved in human genome project. Mention how they were used.**

**(b) Expand 'YAC' and mention what was it used for.**

Ans (a) Expressed Sequence Tags **,** Identifying all the genes that are expressed as RNA = ½ + ½

Sequence Annotation **,** sequencing the whole set of genome coding or non coding sequences and later assigning different region with functions = ½ + ½

(b) Yeast Artificial Chromosome , used as cloning vectors (cloning / amplification ) = ½ + ½

[3 Marks]

**15. Both Haemophilia and Thalassemia are blood related disorders in humans. Write their causes and the difference between the two. Name the category of genetic disorder they both come under.**

Ans

| **Haemophilia** | **Thalassemia** |
|---|---|
| Single protein involved in the clotting of blood is affected = ½ | Defects in the synthesis of globin leading to formation of abnormal haemeoglobin = ½ |
| Sex linked recessive disorder = ½ | Autosomal recessive disorder= ½ |
| Blood does not clot = ½ | Results in anaemia = ½ |

**(Any two)** =½×4

Mendelian disorder = 1

[3 Marks]

**16. (a) Trace the development of an endosperm after fertilisation with reference to coconut. Mention the importance of endosperm development.**

**(b) Write the importance of 'pollen bank'.**

Ans (a) In coconut Primary Endosperm Nucleus (PEN-3n) undergoes successive nuclear divisions , give rise to free- nuclear endosperm known as coconut water , white kernel is the cellular endosperm , provides nourishment to the growing embryo.

=½ ×4

(b) Storage / cryopreservation ( storage in liquid nitrogen at - 196 $^{o}$C) , to use in crop breeding programmes =½ + ½

[3 Marks]

**17. Describe the roles of heat, primers and the bacterium *Thermus aquaticus* in the process of PCR.**

Ans Heat - Denaturation / separation of DNA into two strands =1

Primer- Enzyme DNA Polymerase extend the primers using the nucleotides provided in the reaction and the genomic DNA as template =1

*Thermus aquaticus* - source of thermostable DNA polymerase / Taq polymerase = 1

[3 Marks]

**18. Secondary treatment of the sewage is also called Biological treatment. Justify this statement and explain the process.**

Ans Involves biological organism such as aerobic and anerobic microbes / bacteria and fungi to digest / consume organic waste = 1

Primary effluent is passed into aeration tank where vigorous growth of aerobic microbes (flocs) take place, BOD reduced (microbes consume major part of organic matter), effluent is passed to settling tank where flocs sediment to produce activated sludge , sludge is pumped to anerobic sludge digester to digest bacteria and fungi = ½ × 4

[3 Marks]

**19. Explain the various steps involved in the production of artificial insulin.**

Ans Two DNA sequences corresponding to A and B polypeptide chains of human insulin were prepared , these were introduced into *E.coli* to produce A and B chains separately **,** these chains were extracted and combined by creating disulphide bonds =1+1+1

[3 Marks]

**20 . Describe the inter-relationship , between productivity, gross primary productivity and net productivity.**

Ans Productivity is the rate of biomass production per unit area over a period of time ,

Gross primary productivity is the rate of production of organic matter during photosynthesis in an ecosystem ,

Net productivity is the gross primary productivity minus respiration losses (R) = 1+1+1

[3 Marks]

**21. Write the desirable characters a farmer looks for in his sugarcane crop.**

**(b) How did plant breeding techniques help north Indian farmers to develop cane witbrdesired characters ?**

Ans (a) High yield , thick stem,high sugar content , ability to grow in their areas = ½ × 4

(b) By crossing *Saccharum officinarum* / south Indian variety having desired characteristics with *Saccharum barberi* / north Indian low yield variety = 1

[3 Marks]

**22. How do kangaroo rats and desert plants adapt themselves to survive in their extreme habitat ? Explain.**

Ans Kangaroo rats- internal fat oxidation where water is a byproduct , excretes concentrated urine =½+½

Desert Plants -thick cuticle / sunken stomata / leaves reduced to spines / deep roots /

Special photosynthetic pathway / CAM **( Any four)** = ½ × 4

[3 Marks]

## SECTION - D

### Q No. 23 is of four mark

**23. It is commonly observed that parents feel embarrassed to discuss freely with their adolescent children about sexuality and reproduction. The result of this parental inhibition is that the children go astray sometimes.**

**(a) Explain the reasons that you feel are behind such embarrassment amongst some parents to freely discuss such issues with then- growing children.**

**(b) By taking one example of a local plant and animal, how would you help these parents to overcome such inhibitions about reproduction and sexuality ?**

Ans: (a) Illiteracy / conservative attitude / misconceptions / social myths / any other relevant point **(Any two)** = 1 + 1

(b) If a student gives the clarity of the concept of reproduction and sexuality by taking any example of a plant and an animal with respect to reproductive organs, gamete formation, fertilization, sexual behaviour etc = l + 1 [4 Marks]

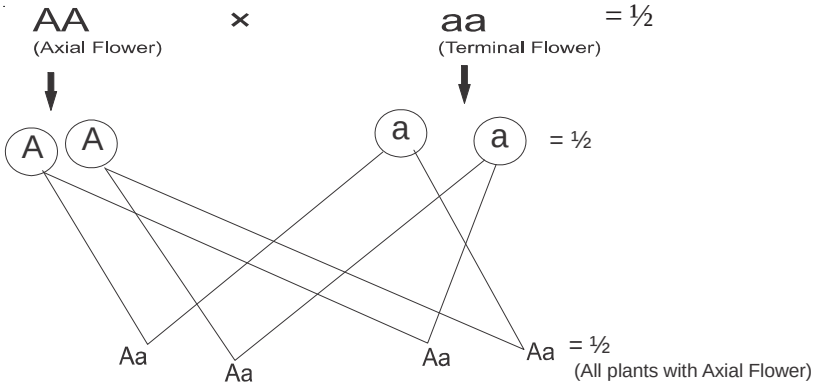
## SECTION - E

### Q Nos. 24-26 are of five marks each

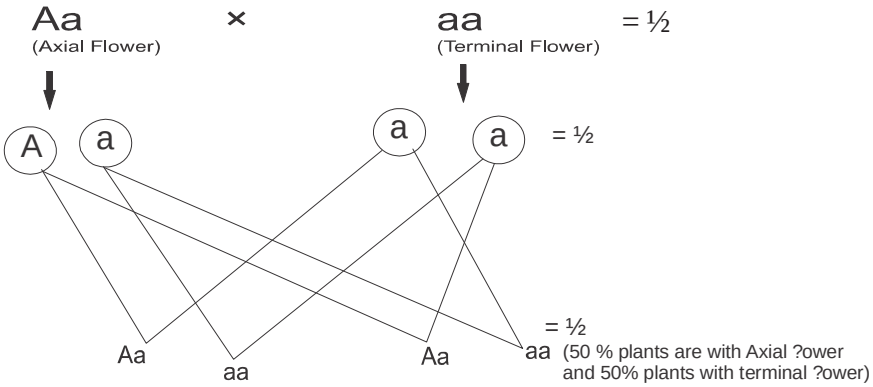
**24. (a) A pea plant bearing axial flowers is crossed with a pea plant bearing terminal flowers. The cross is carried out to find the genotype of the pea plant bearing axial flowers. Work out the cross to show the conclusions you arrive at.**

**(b) State the Mendel's law of inheritance that is universally acceptable.**

Ans (i) If the plants is homozygous for the dominant trait




(ii) If the plants is heterozygous for the dominant trait



Conclusion : If all progeny show axial flowers ( dominant) the plant is homozygous (AA) **,**
If 50 % of Progeny show Axial flower ( Dominant) and 50% Terminal flower ( Recessive) the plant is heterozygous = ½ + ½

(b) Law of Segregation , allelic pair segregate (separates) during gamete formation ( do not loose their identity ) = ½ + ½

[5 Marks]

**OR**

**(a) Absence of lactose in the culture medium affects the expression of a Lac-operon in *E. coli.* Why and how ? Explain.**

**(b) Write any two ways in which the gene expression is regulated in eukaryotes.**

Ans (a)
- Lactose acts as inducer thus absence of lactose switches off the operon
- Repressor protein produced by regulatory gene ( i-gene ) is free ( in the absence of inducer ) ,
- Repressor protein binds with the operator gene ( o-gene ) ,
- Preventing RNA polymerase to transcribe the structural gene and operon is switched off

= 1+ 1+1 +1

//

If the above mentioned points are properly represented with help of schematic diagram.

(b)
- Transcriptional level ( formation of primary transcripts )
- Processing level ( regulation of splicing )
- Transport of messengar RNA from nucleus to the cytoplasm
- Translational level **( Any two )** = ½+½

[5 Marks]

**25. (a) When a seed of an orange is squeezed, many embryos, instead of one are observed. Explain how it is possible.**

**(b) Are these embryos genetically similar or different ? Comment.**

Ans: (a) Polyembryony **,** nucellar cells surrounding embryosac start dividing **,** protrude into the embryo sac and develop into many embryos = 1+ 1+ 1

(b) These embryos are genetically similar, as produced from nucellar cells by mitotic division / formed without fertilisation (but different from the embryo formed by fertilization) = 1 + 1

[5 Marks]

**OR**

**(a) Explain the following phases in the menstrual cycle of" a human female:**

**(i) Menstrual phase**

**(ii) Follicular phase**

**(iii) Luteal phase**

**(b) A proper understanding of menstrual cycle can help immensely in family planning. Do you agree with the statement ? Provide reasons for your answer.**

Ans: (a) (i) Menstrual phase - first 3-5 days of the cycle where menstrual flow occurs due to break down of endometrial lining of uterus, if the released ovum is not fertilised = ½ +½

(ii) Follicular phase - from 5th to 14th day of the cycle where the primary follicles grow to become a fully mature Graafian follicle , endometrium of uterus regenerates , Graafian follicle ruptures to release ova (ovulation on 14th day) = ½ × 3

(iii) Luteal Phase - During 15th to 28th day remaining parts of graafian follicle transform into corpus luteum , secretion of progesterone (essential for maintenance of endometrium) = ½ × 2

All these phases are under the influence of varying concentrations of pituitary and ovarian hormone = ½

(b) Yes , can take appropriate precautions between 10th to 17th day of the menstrual cycle when the chances of fertilisation are high = ½ + ½

[5 Marks]

**26. (a) Compare, giving reasons, the J-shaped and S-shaped models of population growth of a species.**

**(b) Explain "fitness of a species" as mentioned by Darwin.**

Ans

| **J shaped - growth curve** | **S shaped- growth curve** |
|---|---|
| Resources are unlimited | Resources are limited |
| Growth is exponential | Logistic Growth |
| As resources are unlimited all individuals survive and reproduce | Fittest individual will survive and reproduce |
| Growth Equation dN/dt=Rn (If explained) | Growth Equation dN/dt=rN (k-N/K) (If explained) |

**(Any three)** = 1 + 1+ 1

Note - Marks to be awarded only if the corresponding difference is written.

(b) When resources are limited , Competition occurs between individuals , fittest will survive, who reproduce to leave more progeny = ½ × 4

[5 Marks]

**OR**

**(a) What is an ecological pyramid ? Compare the pyramids of energy, biomass and numbers.**

**(b) Write any two limitations of ecological pyramids.**

Ans: (a) Graphical representation of the relationship among the organisms at different trophic level =1

| Pyramid of Energy | Pyramid of Bio Mass | Pyramid of Numbers |
|---|---|---|
| Shows transfer of Energy from one tropic level to other | Shows transfer of amount of food/ biomass from one tropic level to other | Pyramid of Numbers shows numbers of organism at each tropic level. |
| Always upright | Mostly upright but can be inverted | Mostly upright can be inverted |

$= ½ \times 6$

(b) It does not accomodate the food web / does not take into account the same species belonging to two or more tropic levels , Saprophytes are not given any place= ½ + ½

[5 Marks]