

रोल नं.

Roll No.

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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 **30** 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 **30** questions.
- **Please write down the Serial Number of the question before attempting it.**
- 15 minutes 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

Time allowed : 3 hours

अधिकतम अंक : 70

Maximum Marks : 70

## सामान्य निर्देश :

- (i) सभी प्रश्न अनिवार्य हैं ।
- (ii) इस प्रश्न-पत्र में चार खण्ड **A, B, C** और **D** हैं । खण्ड **A** में 8 प्रश्न हैं जिनमें प्रत्येक का एक अंक है, खण्ड **B** में 10 प्रश्न हैं जिनमें प्रत्येक के दो अंक हैं, खण्ड **C** में 9 प्रश्न हैं जिनमें प्रत्येक के तीन अंक हैं तथा खण्ड **D** में 3 प्रश्न हैं जिनमें प्रत्येक के पाँच अंक हैं ।
- (iii) कोई समग्र चयन-विकल्प (ओवरऑल चॉइस) उपलब्ध 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 । ऐसे प्रश्नों में विद्यार्थी को केवल एक ही विकल्प का उत्तर देना है ।
- (iv) जहाँ भी आवश्यक हो, बनाए जाने वाले आरेख साफ़-सुथरे तथा समुचित रूप में नामांकित हों ।

## General Instructions :

- (i) *All questions are compulsory.*
- (ii) *This question paper consists of four Sections **A, B, C** and **D**. Section **A** contains 8 questions of **one** mark each, Section **B** is of 10 questions of **two** marks each, Section **C** is of 9 questions of **three** marks each and Section **D** is of 3 questions of **five** marks each.*
- (iii) *There is no overall choice. However, an internal choice has been provided in one question of 2 marks, one question of 3 marks and all the three questions of 5 marks weightage. A student has to attempt only one of the alternatives in such questions.*
- (iv) *Wherever necessary, the diagrams drawn should be neat and properly labelled.*

## खण्ड A

### SECTION A

1. नाभिकीय ऊर्जा के प्रदूषणकारी न होते हुए भी बिजली उत्पादन के लिए इसके इस्तेमाल पर भारी आशंकाएँ बनी हुई हैं, ऐसा क्यों ? 1  
In spite of being non-polluting, why are there great apprehensions in using nuclear energy for generating electricity ?
2. मॉन्ट्रीयल प्रोटोकॉल पर हस्ताक्षर करने का उद्देश्य बताइए । 1  
State the purpose of signing the Montreal Protocol.
3. उन एंजाइमों के नाम लिखिए जिनका इस्तेमाल क्रमशः जीवाणु कोशिकाओं के तथा कवक कोशिकाओं के DNA के पृथक्करण के लिए किया जाता है । 1  
Write the names of the enzymes that are used for isolation of DNA from bacterial and fungal cells respectively for Recombinant DNA Technology.
4. उन परपोषी कोशिकाओं का नाम लिखिए जिनके भीतर विजातीय DNA प्रवेश कराने के लिए सूक्ष्म अंतःक्षेपण तकनीक इस्तेमाल की जाती है । 1  
Name the host cells in which micro-injection technique is used to introduce an alien DNA.
5. कोहेन तथा बोयेर द्वारा रचित सबसे पहले कृत्रिम पुनर्योगज DNA अणु के दो घटकों के नाम लिखिए । 1  
Write the two components of the first artificial recombinant DNA molecule constructed by Cohen and Boyer.
6. मलेरिया संक्रमण के दौरान जब हीमोजोइन मानव रक्त में छोड़ी जाती है, तो वह मानव शरीर को किस प्रकार प्रभावित करती है ? 1  
How does haemozoin affect the human body when released in blood during malarial infection ?

7. दात्र कोशिका अरक्तता से पीड़ित किसी व्यक्ति में सामान्य लाल रक्त कोशिकाएँ लम्बी और दात्र आकृति की क्यों हो जाती हैं ? 1  
 Why do normal red blood cells become elongated sickle shaped structures in a person suffering from sickle cell anaemia ?
8. किसी आवृतबीजी के एक परिपक्व सूक्ष्मबीजाणु का आरेख बनाइए । इसके केवल कोशिकीय घटकों का नामांकन कीजिए । 1  
 Draw a diagram of a matured microspore of an angiosperm. Label its cellular components only.

### खण्ड B

### SECTION B

9. “अपनयन सिंड्रोम” किसे कहते हैं ? इसके कोई दो विशिष्ट रोगलक्षण लिखिए । 2  
 What is “withdrawal syndrome”? List any two symptoms it is characterised by.
10. मानव मादा के हीमोफीलिया से ग्रस्त होने की संभावना विरल क्यों होती है ? समझाइए । 2  
 Why is the possibility of a human female suffering from haemophilia rare ? Explain.
11. नीचे एक रूपदा रज्जुक दिया गया है । उसके अनुरूपी कोडीकरण और बन सकने वाले mRNA रज्जुकों को उनकी ध्रुवता सहित लिखिए । 2

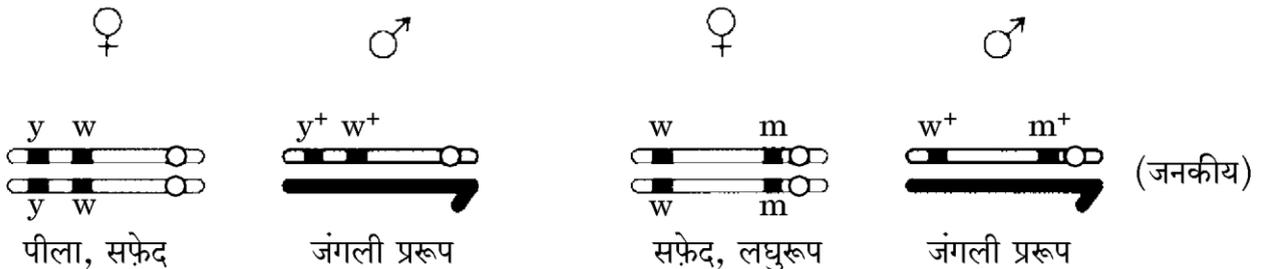
3' ATGCATGCATGCATGCATGC 5'

अथवा

नीचे दिए जा रहे चित्रों का अध्ययन कीजिए और पूछे जा रहे प्रश्न का उत्तर दीजिए : 2

**संकरण A**

**संकरण B**



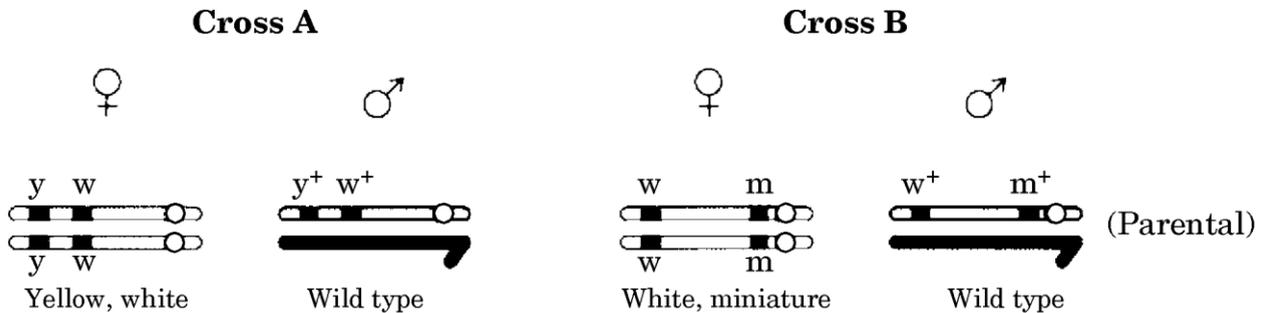
पहचानकर बताइए कि किस संकरण में जीनों के बीच की सहलग्नता शक्ति उच्चतर है । अपने उत्तर के समर्थन में कारण बताइए ।

A template strand is given below. Write down the corresponding coding strand and the mRNA strand that can be formed, along with their polarity.

3' ATGCATGCATGCATGCATGC 5'

OR

Study the figures given below and answer the question.



Identify in which of the crosses is the strength of linkage between the genes higher. Give reasons in support of your answer.

12. एक उदाहरण देते हुए जीन बहुप्रभाविता के विषय में समझाइए । 2  
Explain pleiotropy with the help of an example.
13. कुछ आवृतबीजी बीजों को 'एल्ब्यूमिनी' क्यों कहा जाता है, जबकि कुछ अन्य में पेरिस्पर्म (परिभ्रूण पोष) होता कहा जाता है । प्रत्येक को एक-एक उदाहरण की सहायता से समझाइए । 2  
Some angiosperm seeds are said to be 'albuminous', whereas few others are said to have a perisperm. Explain each with the help of an example.
14. फ़सली पौधों में कृत्रिम संकरण कराने में कौन-कौन से दो चरण अनिवार्य हैं, सूची बनाइए, और वे ऐसा क्यों हैं, यह भी लिखिए । 2  
List the two steps that are essential for carrying out artificial hybridization in crop plants and why.
15. केवल पौधों से एक-एक उदाहरण लेकर समझाइए कि सहभोजिता तथा सहोपकारिता (परस्परहितता) में क्या अंतर है । 2  
Differentiate between commensalism and mutualism by taking one example each from plants only.

16. बीसवीं शताब्दी के आरंभ में तथा अंत में भारत में वन आवरण की क्या-क्या प्रतिशतताएँ थीं, लिखिए । यह उससे किस प्रकार भिन्न है जिसकी हमारे देश की राष्ट्रीय वन नीति द्वारा सिफ़ारिश की गई है ? 2

Write what was the percentage of forest cover of India at the beginning and at the end of the twentieth century. How different is it from the one recommended by the National Forest Policy of our country ?

17. आण्विक कतरनियों को यह नाम क्यों दिया गया ? जैवप्रौद्योगिकी में इनका क्या उपयोग है, लिखिए । 2

Why are molecular scissors so called ? Write their use in biotechnology.

18. अपुनर्योगजों से पुनर्योगजों का विभेदन करने के लिए किसी एंजाइम का निवेशीय निष्क्रियकरण वरणात्मक चिह्नक के रूप में किस प्रकार इस्तेमाल किया जाता है ? 2

How is insertional inactivation of an enzyme used as a selectable marker to differentiate recombinants from non-recombinants ?

### खण्ड C

### SECTION C

19. प्राकृतिक वरण की उन तीन भिन्न विधियों का वर्णन कीजिए जिनके द्वारा किसी एक समष्टि में पाए जाने वाले वंशागतशील विशेषक की बारंबारता प्रभावित हो सकती है । 3

Describe the three different ways by which Natural Selection can affect the frequency of a heritable trait in a population.

20. मानव शुक्राणु का आरेख बनाइए । इसमें केवल उन भागों का नामांकन कीजिए एवं उन्हीं के कार्यों का वर्णन भी कीजिए, जो मादा युग्मक तक पहुँचने और उसमें प्रवेश करने में शुक्राणु की सहायता करते हैं । 3

Draw a diagram of a human sperm. Label only those parts along with their functions, that assist the sperm to reach and gain entry into the female gamete.

21. मानवों में शुक्राणुजनन का हॉर्मोन-नियंत्रण समझाइए । 3
- Explain the hormonal control of spermatogenesis in humans.

22. वायु-परागित तथा कीट-परागित फूलों में क्या-क्या भिन्नताएँ होती हैं, लिखिए । प्रत्येक प्रकार का एक-एक उदाहरण दीजिए । 3

Write the differences between wind-pollinated and insect-pollinated flowers. Give an example of each type.

23. इस समय दिल्ली की वायु की गुणवत्ता उससे कहीं ज़्यादा उन्नत हो गयी है जितनी कि 1997 से पहले हुआ करती थी । ऐसा होना बहुत ज़्यादा सचेतन मानव प्रयासों का परिणाम है । आपसे कहा जा रहा है कि आप अपनी बस्ती में एक जागरूकता कार्यक्रम चलाएँ जिसमें आप उन चरणों पर टिप्पणी करेंगे जो दिल्ली सरकार ने वायु गुणवत्ता को सुधारने के लिए उठाए थे । 3

- (a) अपनी कोई दो टिप्पणियाँ लिखिए ।  
(b) ऐसी कोई दो विधियों की सूची बनाइए जिन्हें आप अपने कार्यक्रम में शामिल करना चाहेंगे ताकि वायु की अच्छी गुणवत्ता बनाए रखना सुनिश्चित किया जा सके ।  
(c) ऐसे कोई दो मूल्य बताइए जिन्हें आपका कार्यक्रम आपकी बस्ती में रहने वाले लोगों में पैदा करेगा ।

Presently, air quality of Delhi has significantly improved in comparison to what existed before 1997. This is the result of a lot of conscious human efforts. You are being asked to conduct an awareness programme in your locality wherein you will comment on the steps taken by Delhi Government to improve the air quality.

- (a) Write any two of your comments.  
(b) List any two ways that you would include in your programme so as to ensure the maintenance of good quality of air.  
(c) State any two values your programme will inculcate in the people of your locality.
24. “जैव-प्रबलीकरण” किसे कहते हैं ? इसका महत्त्व बताइए । भारतीय कृषि अनुसंधान संस्थान का इसमें क्या योगदान रहा है, दो उदाहरणों की सहायता से इसे बताइए । 3

What is “biofortification” ? Write its importance. Mention the contribution of Indian Agricultural Research Institute towards it with the help of two examples.

25. (a) पौलीमरेज़ चैन रिऐक्शन (PCR) में निहित तीन चरण क्या-क्या हैं, सूची बनाइए ।  
 (b) Taq पौलीमरेज़ के स्रोत जीव का नाम लिखिए । PCR में इस एंज़ाइम की विशिष्ट भूमिका क्या है, समझाइए ।
- (a) List the three steps involved in Polymerase Chain Reaction (PCR).  
 (b) Name the source organism of Taq polymerase. Explain the specific role of this enzyme in PCR.

3

26. नीचे दी जा रही तालिका में a, b, c, d, e तथा f को पहचानिए, वे क्या हैं :

3

जीव का वैज्ञानिक नाम	बनाया गया उत्पाद	मानव कल्याण में उपयोग
स्ट्रेप्टोकोककस	स्ट्रेप्टोकाइनेज़ जिसे बाद में रूपांतरित किया गया	a
b	साइक्लोस्पोरिन A	c
मोनैस्कस परप्यूरियस	d	e
लेक्टोबैसिलस	f	दूध को दही में बदल देता है

Identify a, b, c, d, e and f in the table given below :

Scientific Name of the organism	Product produced	Use in human welfare
<i>Streptococcus</i>	Streptokinase that was later modified	a
b	Cyclosporin A	c
<i>Monascus purpureus</i>	d	e
<i>Lactobacillus</i>	f	sets milk into curd

27. प्लाज़्मोडियम के उस स्वरूप का नाम लिखिए जो मानव शरीर में प्रविष्ट हुआ करता है ।  
मानव शरीर में इसके जीवन-चक्र की विभिन्न अवस्थाएँ समझाइए ।

3

अथवा

- (a) कोलोस्ट्रम (नवस्तन्य) तथा टीकाकरणों से नवजात को प्रदान होने वाली प्रतिरक्षा के प्रकार का नाम लिखिए और कारण बताते हुए उसके विषय में समझाइए ।
- (b) निम्नलिखित में पाए जाने वाले ऐंटीबॉडी (प्रतिपिंड) के प्ररूप का नाम लिखिए :
- (i) कोलोस्ट्रम में पाए जाने वाले
- (ii) मानव शरीर में एलर्जनों की अनुक्रिया से बनने वाले

3

Name the form of *Plasmodium* that gains entry into the human body.  
Explain the different stages of its life-cycle in the human body.

OR

- (a) Name and explain giving reasons, the type of immunity provided to the newborn by the colostrum and vaccinations.
- (b) Name the type of antibody
- (i) present in colostrum
- (ii) produced in response to allergens in human body.

खण्ड D

SECTION D

28. (a) उन सूक्ष्मजीवों की श्रेणी का नाम लिखिए जो वाहित मल में प्राकृतिक रूप में हुआ करते हैं और मल-उपचार के दौरान उसे कम प्रदूषित बना देते हैं ।
- (b) वाहित मल के द्वितीयक उपचार के दौरान होने वाले विभिन्न चरणों के विषय में समझाइए ।

5

अथवा

- (a) मानवों में पाए जाने वाले किन्हीं चार लसीकाभ अंगों के नाम लिखिए एवं उनके विषय में समझाइए ।
- (b) नाम लिखे गए लसीकाभ अंगों को कारण बताते हुए प्राथमिक अथवा द्वितीयक लसीकाभ अंगों में वर्गीकृत कीजिए ।

5

- (a) Name the category of microbes occurring naturally in sewage and making it less polluted during the treatment.
- (b) Explain the different steps involved in the secondary treatment of sewage.

**OR**

- (a) Name and explain any four lymphoid organs present in humans.
- (b) Categorise the named lymphoid organs as primary or secondary lymphoid organs, giving reasons.

- 29.** (a) प्राथमिक तथा द्वितीयक पारिस्थितिक अनुक्रमणों में विभेद कीजिए ।
- (b) प्रकृति में होते रहने वाले शुष्कतारंभी अनुक्रमण के विभिन्न चरण समझाइए ।

5

**अथवा**

- (a) जैवविविधता के संरक्षण की क्यों आवश्यकता है ?
- (b) जैवविविधता के हास के लिए उत्तरदायी किन्हीं दो विधियों के नाम लिखिए और उनके विषय में समझाइए ।
- (a) Differentiate between primary and secondary ecological successions.
- (b) Explain the different steps of xerarch succession occurring in nature.

5

**OR**

- (a) Why is there a need to conserve biodiversity ?
- (b) Name and explain any two ways that are responsible for the loss of biodiversity.

30. मेसलसन तथा स्टाहल द्वारा किए गए प्रयोग का वर्णन कीजिए और लिखिए कि वे किस निष्कर्ष पर पहुँचे थे ।

5

**अथवा**

RNA के मुख्य प्ररूपों के नाम लिखिए और समझाइए कि किसी प्राक्केन्द्रकी में प्रोटीन संश्लेषण में उनकी क्या भूमिका होती है ।

5

Describe Meselson and Stahl's experiment and write the conclusion they arrived at.

**OR**

Name the major types of RNAs and explain their role in the process of protein synthesis in a prokaryote.

# Question Paper Code 57/2/2

## SECTION A

*Q.Nos.1-8 are of one mark each*

1. **In spite of being non-polluting why are there great apprehensions in using nuclear energy for generating electricity?**

Ans. Accidental leakages, safe disposal of radioactive waste =  $\frac{1}{2} + \frac{1}{2}$

[1 mark]

2. **State the purpose of signing the Montreal Protocol.**

Ans. To control the emission of ozone depleting substances.

[1 mark]

3. **Write the names of the enzymes that are used for isolation of DNA from bacterial and fungal cells respectively for Recombinant DNA Technology.**

Ans. Lysozyme for bacterial cells, chitinase for fungal cells =  $\frac{1}{2} + \frac{1}{2}$

[1 mark]

4. **Name the host cells in which micro-injection technique is used to introduce an alien DNA.**

Ans. Animal cell

[1 mark]

5. **Write the two components of the first artificial recombinant DNA molecule constructed by Cohen and Boyer.**

Ans. Restriction enzyme, Vector =  $\frac{1}{2} + \frac{1}{2}$

[1 mark]

6. **How does haemozoin affect the human body when released in blood during malarial infection?**

Ans. It causes chill and high fever, recurring every 3-4 days / in cyclic manner =  $\frac{1}{2} + \frac{1}{2}$

[1 mark]

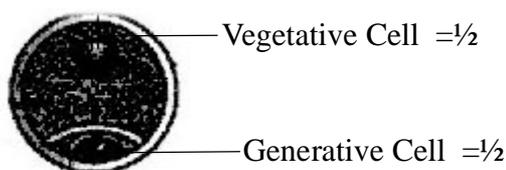
7. **Why do normal red blood cells become elongated sickle shaped structures in a person suffering from sickle cell anaemia?**

Ans. The mutant haemoglobin molecule (substitution of Glutamic acid by valine) undergoes polymerization, under low oxygen tension causing the change. =  $\frac{1}{2} + \frac{1}{2}$

[1 mark]

8. **Draw a diagram of micropore of an angiosperm. Label its cellular components only.**

Ans.



[1 mark]

## SECTION B

9. What is “withdrawal syndrome”? List any two symptoms it is characterized by.

**Ans.** Manifestation of unpleasant characteristic when a regular dose of drugs / alcohol is abruptly discontinued = 1

Unpleasant feeling , Anxiety , shakiness , nausea , sweating = 1+½+½

(Any two)

[2 marks]

10. Why is the possibility of human female suffering from haemophilia rare? Explain.

**Ans.**

$$\begin{array}{ccc} X X^h & \times & X^h Y & = \frac{1}{2} \\ & \searrow & \swarrow & \\ & X^h X^h & & \\ & \text{haemophilic female ,} & & = \frac{1}{2} \end{array}$$

rare because mother should be atleast carrier and father haemophilic (non viable at later stage) = 1

[2 marks]

11. A template strand is given below. Write down the corresponding coding strand and the mRNA strand that can be formed along with their polarity

3' ATGCATGCATGCATGCATGC5'

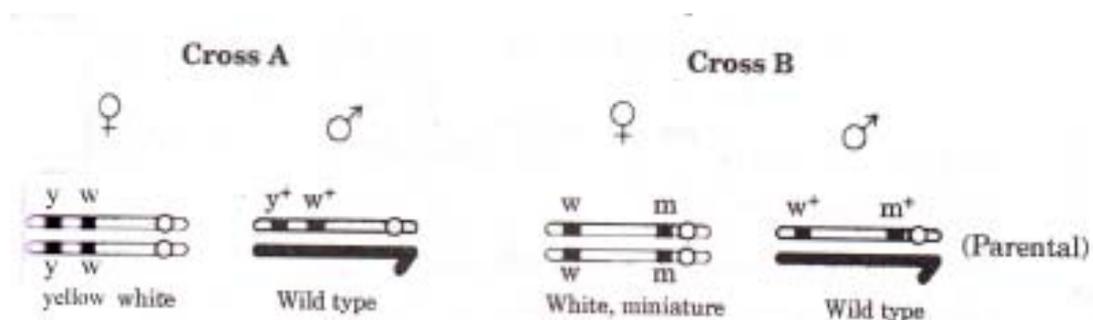
**Ans.** Coding strand-5' TACGTACGTACGTACGTACGTACG 3'

mRNA strand- 5' UACGUACGUACGUACGUACGUACG 3' = 1+1

[2 marks]

**OR**

Study the figures given below and answer the question.



Identify in which of the crosses is the strength of Linkage between the genes higher. Give reasons in support of your answer.

**Ans.** Cross A , because they are tightly linked / due to close physical association / they are closely located = 1+1

[2 marks]

12. Explain pleiotropy with the help of an example

**Ans.** Effect of single gene on multiple phenotypic expressions = 1

e.g. size of the starch grains produced and shape of the seeds in pea plant are controlled by a single gene // Phenylketonuria characterised by mental retardation and reduction in hair and skin pigmentation = 1

[2 marks]

**13. Some angiosperm seeds are said to be albuminous, whereas few others are said to have a perisperm .Explain each with the help of an example.**

- Ans.** - When mature seeds retain a part of endosperm it is an albuminous seed , example wheat / maize / barley / castor / sunflower
- When remnants of nucellus is retained in seeds it is said to have a perisperm , example black pepper / beat =  $\frac{1}{2} \times 4 = 2$

[2 marks]

**14. List the two steps that are essential for carrying out artificial hybridization in crop plants and why.**

- Ans.** Hybridization of pure lines , artificial selection =  $\frac{1}{2} + \frac{1}{2}$   
to produce plants with desirable traits. (high yield , nutrition and resistance to diseases) = 1

[1 + 1 = 2 marks]

**15. Differentiate between commensalism and mutualism by taking one example each from plants only.**

- Ans. Commensalism** - In this interaction one species is benefited and the other species is neither benefited nor harmed. =  $\frac{1}{2}$

e.g. an orchid growing as an epiphyte on the branch of a mango. =  $\frac{1}{2}$

**Mutualism**- In this interaction both the interacting species are benefited. =  $\frac{1}{2}$

e.g. Lichens exhibit mutualistic relationship between a fungus that absorbs water and nutrients from soil and photosynthesizing algae / cyanobacteria. =  $\frac{1}{2}$

[ $\frac{1}{2} \times 4 = 2$  marks]

**16. Write what was the percentage of forest cover of India at the beginning and at the end of the twentieth century. How different is it from the one recommended by the National Forest Policy of our country?**

- Ans.** Beginning of 20th century - 30%

End of 20th century - 19.4%

Recommendations were 33% for the plains and 67% for the hills (thus forest cover shrunk substantially) = 1

[2 marks]

**17. Why are molecular scissors so called ? Write their use in biotechnology.**

- Ans.** The restriction enzymes are known as molecular scissors as they cut the DNA at specific sites or locations = 1

They help ( in genetic engineering) to form recombinant molecules of DNA , which are composed of DNA from different genomes. =  $\frac{1}{2} + \frac{1}{2}$

[2 marks]

**18. How is insertional inactivation of an enzyme used as a selectable marker to differentiate recombinants from non – recombinants?**

**Ans.** The presence of chromogenic substrate gives blue coloured colonies, in presence of  $\alpha$ -galactosidase. Presence of an insert (recombinant DNA) results into inactivation of the enzyme, colonies with inactivation of  $\alpha$ -galactosidase do not produce any colour. =  $\frac{1}{2} \times 4$

[2 marks]

### SECTION C

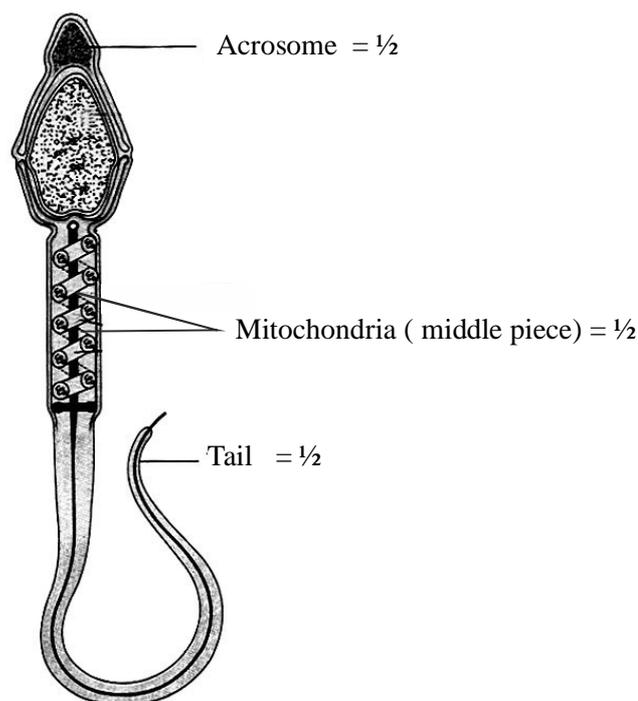
**19. Describe the three different ways by which Natural selection can affect the frequency of a heritable trait in population.**

- Ans.** - Stabilisation, in which more individuals acquire mean character value. =  $\frac{1}{2} + \frac{1}{2}$
- Directional, more individuals acquire value other than the mean character value =  $\frac{1}{2} + \frac{1}{2}$
- Disruptive, more individuals acquire peripheral character value at both ends of distribution curve. =  $\frac{1}{2} + \frac{1}{2}$

[1 + 1 + 1 = 3 marks]

**20. Draw a diagram of a human sperm. Label only those parts along with their functions that assist the sperm to reach and gain entry into the female gamete.**

**Ans.**



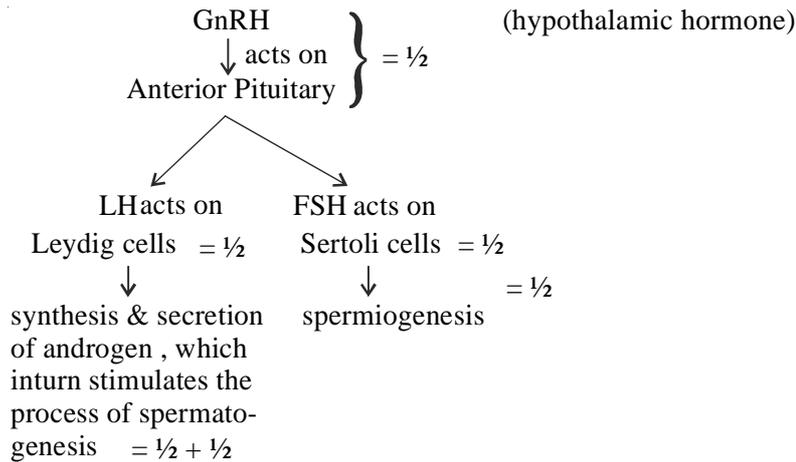
#### Functions :

- Acrosome : filled with enzymes that help enter the ovum =  $\frac{1}{2}$
- Mitochondria (middle piece) : energy source for movement of tail to reach ovum =  $\frac{1}{2}$
- Tail : for motility =  $\frac{1}{2}$

[3 marks]

**21. Explain the hormonal control of spermatogenesis in humans.**

Ans.



[3 marks]

22. Write the differences between wind –pollinated and insect –pollinated flowers. Give an example of each type

Ans. Wind pollinated – light and non sticky pollen grains / possess well exposed stamens / large and feathery stigma / not very colourful / do not produce nectar ,

eg.- Maize / wheat (Any other suitable example) = 1/2

**Insect pollinated**- large colorful fragrant flowers / rich in nectar / clustered into inflorescence when flowers are small / secrete foul odour.

(Any two corresponding differences) = 1 + 1

eg.Pansy = 1/2

(Any other suitable example)

[3 marks]

23. Presently , air quality of Delhi has significantly improved in comparison to what existed before 1997. This is the result of conscious human efforts .You are being asked to conduct an awareness programme in your locality wherein you will comment on the steps taken by Delhi Government to improve the air quality.

- (a) Write any two of your comments.
- (b) List any two ways that you would include in your programme so as to ensure the maintenance of good quality of air.
- (c) State any two values your programme will inculcate in the people of your locality.

Ans. (a) (i) Use of CNG as fuel encouraged in vehicles  
(ii) Improved public transport system like new fleet of DTC buses , Introduced Metro  
(iii) Pollution check of vehicles was made mandatory  
(iv) Availability of sulphur free fuel (Euro II norms)

(Any other suitable value) (Any two) = 1/2 + 1/2

(b) (i) Car pool essential

- (ii) Use of bicycle
- (iii) Get your car pollution checked regularly
- (Any other suitable example) (Any two) =  $\frac{1}{2} + \frac{1}{2}$
- (c) (i) Consciousness about the environment
- (ii) Concern for others
- (iii) Improving social skills
- (iv) Leadership quality
- (Any other suitable example) (Any two) =  $\frac{1}{2} + \frac{1}{2}$

[3 marks]

**24. What is “biofortification” ? Write its importance. Mention the contribution of Indian Agricultural Research Institute towards it with the help of two examples.**

**Ans.** Breeding crops with higher level of vitamins and minerals , higher proteins , healthier fats, to improve public health , =  $\frac{1}{2} \times 4$

IARI has released several vegetable crops that are rich in vitamins and minerals e.g. Vitamin A enriched carrots , spinach , pumpkin, vitamin C enriched bitter gourd , bathua, mustard , tomato, iron and calcium enriched spinach and bathua , protein enriched beans , lablab , French and garden pea

(Any two) =  $\frac{1}{2} + \frac{1}{2}$

[2 + 1 = 3 marks]

- 25. (a) List the three steps involved in Polymerase Chain reaction (PCR).**  
**(b) Name the source organism of Taq polymerase. Explain the specific role of this enzyme in PCR.**

**Ans.** (a) (i) Denaturation (ii) annealing (iii) Extension =  $\frac{1}{2} \times 3$

(b) *Thermus aquaticus* , it remains active during the high temperature , (induced to denature double stranded DNA) and catalyses polymerisation of DNA =  $\frac{1}{2} \times 3$

[1½ + 1½ = 3 marks]

**26. Identify a, b,c,d ,e and f in the table given below:**

Scientific Name of the organism	Product produced	Use in human welfare
<i>Streptococcus</i>	Streptokinase that was later modified	a
b	Cyclosporin A	c
<i>Monascus purpureus</i>	d	e
<i>Lactobacillus</i>	f	Sets milk into curd

**Ans.** a - clot buster for removing clots from blood vessels

b - *Trichoderma polysporum*

c - Immunosuppressive agent in organ transplant

- d - Statins
- e - Blood cholesterol lowering agent
- f - Lactic acid =  $\frac{1}{2} \times 6$

[3 marks]

**27. Name the form of *Plasmodium* that gains entry into the human body . Explain the different stages of its life –cycle in the human body.**

**Ans.** Sporozoites , Sporozoites reach the liver through blood, the parasite reproduces asexually in liver cells , the parasite reproduces asexually in red blood cells , bursting the RBCs and releasing into the blood, Gametocytes develop in RBCs =  $\frac{1}{2} \times 6 = 3$

[3 marks]

**OR**

- (a) **Name and explain giving reasons the type of immunity provided to the new born by colostrum and vaccinations.**
- (b) **Name the type of antibody**
  - I. Present in colostrum**
  - II. Produced in response to allergens in human body .**

**Ans.** (a) passive immunity , when readymade antibodies are directly given to protect the body against foreign agents =  $\frac{1}{2} + \frac{1}{2}$

Active immunity , when a host is exposed to antigens which may be forms of living or dead microbes or other proteins antibodies are produced in the host body. =  $\frac{1}{2} + \frac{1}{2}$

- (b) (i) IgA =  $\frac{1}{2}$
- (ii) IgE =  $\frac{1}{2}$

#### **SECTION D**

- 28. (a) Name the category of microbes occurring naturally in sewage and making it less polluted during the treatment.**
- (b) Explain the different steps involved in the secondary treatment of sewage.**

**Ans.** (a) Aerobic microbes =  $\frac{1}{2}$

- (b) Primary effluent passed into large aeration tank with air pumped into it allowing useful aerobic microbes to form flocs , these microbes consume major part of organic matter , and reduce BOD , once BOD reduced effluent is passed into settling tank , to allow flocs to sediment and form activated sludge , some of the activated sludge is sent to aeration tank as inoculum , and remaining is pumped to anaerobic sludge digesters , where bio gas is produced as a result of anaerobic digestion , the effluents from secondary treatment are released into natural water bodies. =  $\frac{1}{2} \times 9$

[ $\frac{1}{2} + 4\frac{1}{2} = 5$  marks]

**OR**

- (a) **Name and explain any four lymphoid organs present in humans.**

- (b) **Categorise the named Lymphoid organs as primary or secondary lymphoid, giving reasons.**

**Ans.** Bone marrow - blood cells - lymphocytes are produced and mature

Thymus - large at the time of birth but keep reducing in size with age. Lymphocytes are produced and mature

Spleen - Acts as a filter for microorganisms in blood and reservoir for RBCs

Lymph nodes - trap micro organisms or other antigens and activate lymphocytes and initiate immune system

*(Name and explanation together = 1/2)*

*(Any two) =  $4 \times \frac{1}{2} = 2$*

- (b) Primary lymphoid organs - bone marrow and thymus = 1/2

Immature lymphocytes differentiate into antigen sensitive lymphocytes = 1

Secondary lymphoid organ - spleen and lymph nodes = 1/2

Provide the site for interaction of lymphocytes with antigen, which proliferate to become effector cell = 1/2 + 1/2

[2 + 3 = 5 marks]

- 29. (a) Differentiate between primary and secondary ecological succession.**

- (b) Explain the different steps of xerarch succession occurring in nature.**

**Ans. (a) Primary Succession Secondary Succession**

- starts where no living organism existed previously

- starts where life existed earlier and got lost

- new biotic communities are formed on bare rock / lava and so it is slow

- some soil sediments with propagules present and so it is faster

1 mark each difference = 2

- (b) - Takes place in dry area hence progress from xeric to mesic condition = 1/2

- Pioneer species such as lichens secrete acids to break rocks, initiate rock formation = 1/2 + 1/2

- lichens pave way to bryophytes = 1/2

- which are succeeded by bigger plants ultimately, stable mesic community is formed = 1/2 + 1/2

[2 + 3 = 5 marks]

**OR**

- (a) Why is there a need to conserve biodiversity?**

- (b) Name and explain any two ways that are responsible for the loss of biodiversity**

**Ans. (a) 1.** to continue to get the products of human consumption

2. plays a major role in many eco system services that nature provides and that is invaluable
3. moral duty to pass on biological legacy in good order to future generations

(Any two) =  $(1 \times 2 = 2)$

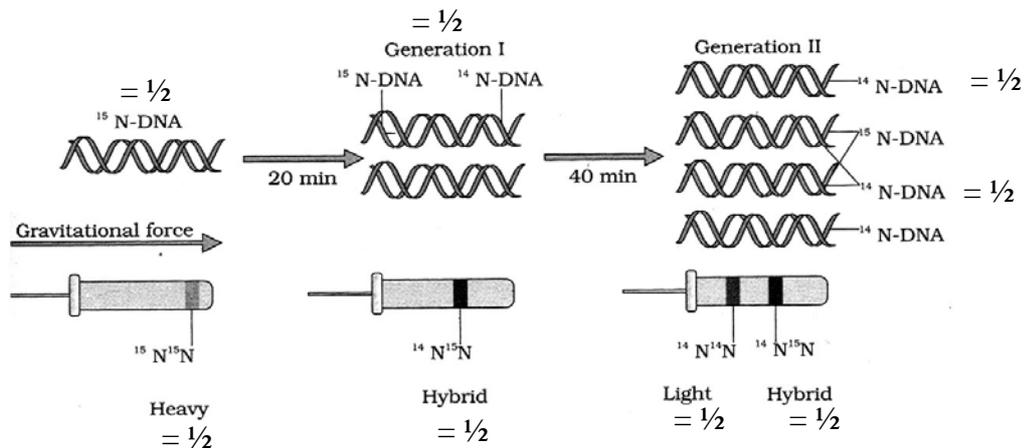
- (b)
1. Habitat loss and fragmentation- large habitats when broken lead to loss of habitat for animals needing large territories (are badly affected) – population decline
  2. Overexploitation- leading to extinction of many, especially commercially important species
  3. Alien species invasion - alien species when introduced may turn invasive causing decline and extinction of indigenous species // explain with an example.
  4. Coextinction- when one species become extinct , any other organism intimately associated also becomes extinct.

(any two)  $(1\frac{1}{2} \times 2)$

[2 + 3 = 5 marks]

**30. Describe Messelson and Stahl's experiment and write the conclusion they arrived at.**

**Ans.** They grew E.coli , in medium containing  $^{15}\text{NH}_4\text{Cl}$  for many generations to get  $^{15}\text{N}$  incorporated into DNA , then the cells are transferred into medium containing  $^{14}\text{NH}_4\text{Cl}$  , the extracted DNA are centrifuged in  $\text{CsCl}$  and measured to get their densities , DNA extracted from the culture after one generation (20 minutes) , showed intermediate hybrid density , DNA extracted after two generations (40 minutes) showed light DNA , and hybrid DNA =  $\frac{1}{2} \times 8 = 4 //$



A correctly labelled diagrammatic representation in lieu of the explanation of experiment = 4

The conclusion of the experiment is that DNA replication is semiconservative = 1

[5 marks]

**OR**

**Name the major types of RNAs and explain their role in the process of protein synthesis in prokaryote.**

**Ans.** 3 types of RNAs

mRNA , tRNA , rRNA =  $\frac{1}{2} \times 3 = 1\frac{1}{2}$

## Role

- mRNA - provide the template for protein synthesis , by bringing the genetic information from DNA to the site of protein synthesis / ribosome , also provides site to initiate and terminate the process of protein synthesis = 1½
- tRNA - its anti codon loop read the genetic code on mRNA , brings the corresponding the amino acid bound to its amino acid binding end on to the mRNA. = ½ + ½
- rRNA - forms a structural component of ribosome , (23SRNA) acts as a catalyst / ribozyme for the formation of peptide bond. = ½ + ½

[5 marks]