

रोल नं. 

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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 8 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 8 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 घंटे  
Time allowed : 3 hours

अधिकतम अंक : 70  
Maximum Marks : 70

सामान्य निर्देश :

- (i) प्रश्न-पत्र में पाँच खण्डों में 26 प्रश्न दिए गए हैं । सभी प्रश्न अनिवार्य हैं ।
- (ii) खण्ड – क में प्रश्न संख्या 1 से 5 अति लघु-उत्तरीय प्रश्न हैं, प्रत्येक प्रश्न 1 अंक का है ।
- (iii) खण्ड – ख में प्रश्न संख्या 6 से 10 लघु-उत्तरीय प्रश्न प्रकार I के हैं, प्रत्येक प्रश्न 2 अंकों का है ।
- (iv) खण्ड – ग में प्रश्न संख्या 11 से 22 लघु-उत्तरीय प्रश्न प्रकार II के हैं, प्रत्येक प्रश्न 3 अंकों का है ।

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- (v) खण्ड – घ में प्रश्न संख्या 23 मूल्य आधारित प्रश्न 4 अंकों का है ।
- (vi) खण्ड – ङ 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 total **26** questions in **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 **one** mark each.
- (iii) Section **B** contains questions number **6** to **10**, short answer type-**I** questions of **two** marks each.
- (iv) Section **C** contains questions number **11** to **22**, short answer type-**II** questions of **three** marks each.
- (v) Section **D** contains question number **23**, value based question of **four** marks.
- (vi) Section **E** contains questions number **24** to **26**, long answer type questions of **five** marks each.
- (vii) There is no overall choice in the question paper, however, an internal choice is provided in **one** question of **two** marks, **one** question of **three** marks and all the **three** questions of **five** marks. In these questions, an examinee is to attempt any **one** of the **two** given alternatives.

### **खण्ड – क**

### **SECTION – A**

1. मनुष्यों में सहज प्रतिरक्षा प्रदान करने के लिए एक-केंद्रकाणु (मोनोसाइट्स) किस प्रकार कोशिकीय रोध (सेल्युलर बैरियर) उत्पन्न करते हैं ? 1  
How do monocytes act as a cellular barrier in humans to provide innate immunity ?
2. ऐसे मानव का लिंग लिखिए जिसमें 22 अलिंग गुणसूत्र (क्रोमोसोम) के साथ xxy गुणसूत्र (क्रोमोसोम) होते हैं । उस विकार का नाम लिखिए जिससे यह मनुष्य पीड़ित है । 1  
Write the sex of a human having XXY chromosomes with 22 pairs of autosomes. Name the disorder this human suffers from.
3. पुष्पी पादपों के लिए अनुन्मील्य परागण का एक लाभ तथा एक हानि लिखिए । 1  
Write one advantage and one disadvantage of cleistogamy to flowering plants.
4. जेल वैद्युत संचलन (इलेक्ट्रोफोरेसिस) के दौरान डी एन ए खंड एनोड की ओर क्यों जाते (आकर्षित होते) हैं ? 1  
Why do DNA fragments move towards the anode during gel electrophoresis ?
5. ऐसे एक एमीनो अम्ल का नाम लिखिए जिसका कूट लेखन केवल एक प्रकूट द्वारा होता है । 1  
Name one amino acid, which is coded by only one codon.

**खण्ड – ख**

**SECTION – B**

6. बहिः प्रजनन तथा बहिः संकरण में विभेद कीजिए । 2

**अथवा**

स्पाइरुलाइना जैसे सूक्ष्मजीवों का वाणिज्यिक (व्यावसायिक) स्तर पर उत्पादन क्यों किया जा रहा है ? इसके दो लाभों का उल्लेख कीजिए ।

Differentiate between out-crossing and cross breeding.

**OR**

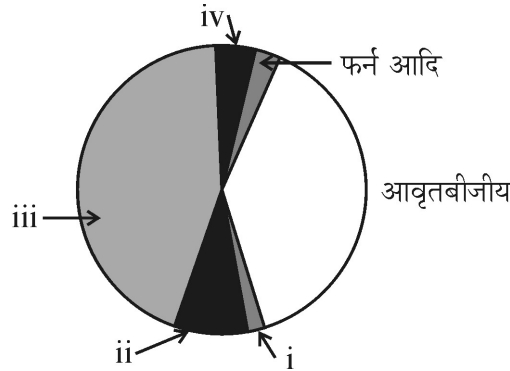
Why are microbes like Spirulina being produced on a commercial scale ? Mention its two advantages.

7. एक प्रतिरक्षी अणु की संरचना को  $H_2L_2$  के रूप में क्यों दर्शाया जाता है ? मानव शरीर में बनने वाले किन्हीं दो प्रकार के प्रतिरक्षी अणुओं के नाम लिखिए । 2

Why is the structure of an antibody molecule represented as  $H_2L_2$  ? Name any two types of antibodies produced in a human body.

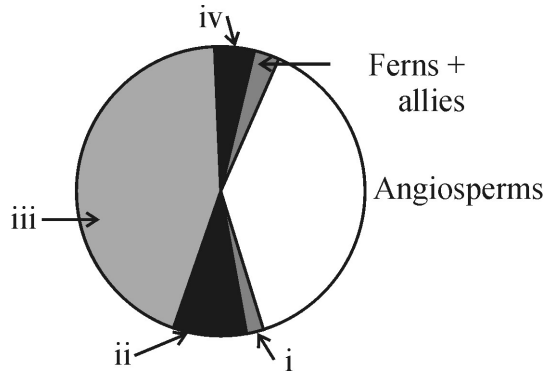
8. (a) शैवाल एवं कवक जैसे जीवों में अलैंगिक जनन विधि से लैंगिक जनन विधि में विस्थापन क्यों हुआ ? 2  
(b) जीवों में किशोर अवस्था क्या है ?  
(a) Why do organisms like algae and fungi shift from asexual mode of reproduction to sexual mode ?  
(b) What is a juvenile phase in organisms ?

9. पौधों के विभिन्न वर्गकों की अनुमानित संख्या के आधार पर नीचे दिए गए पाई चार्ट में जैव-विविधता को दर्शाया गया है । इसके नामांकित क्षेत्रों i, ii, iii एवं iv को पहचान कर लिखिए । 2



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Identify the areas labelled i, ii, iii and iv in the pie chart given below representing the biodiversity of plants showing their proportionate number of species of major taxa.



10. “एक हीमोफीलिया ग्रस्त पिता हीमोफीलिया के जीन अपने पुत्र को कभी भी वंशागत नहीं कर सकता।” व्याख्या कीजिए। 2

A hemophilic father can never pass the gene for hemophilia to his son. Explain.

### खण्ड – ग SECTION – C

11. (a) पारजीवी जंतु क्या हैं ? 3  
(b) वर्तमान में पाए जाने वाले सभी पारजीवी जंतुओं में से सर्वाधिक संख्या में पाए जाने वाले पारजीवी जंतु का नाम लिखिए।  
(c) उन तीन उद्देश्यों का उल्लेख कीजिए जिनके लिए इन पारजीवी जंतुओं का उत्पादन किया जाता है।  
(a) What are transgenic animals ?  
(b) Name the transgenic animal having the largest number amongst all the existing transgenic animals.  
(c) Mention any three purposes for which these animals are produced.
12. पॉलिमरेज शृंखला अभिक्रिया (पॉलिमरेज चेन रिएक्शन) में सम्मिलित तीन चरणों की व्याख्या कीजिए। 3  
Explain three steps involved in polymerase chain reaction.
13. सुकेन्द्रकी कोशिकाओं में पाए जाने वाले तीन प्रकार के आर एन ए पॉलिमरेज के नाम लिखकर उनके कार्यों का उल्लेख कीजिए। 3

#### अथवा

सुकेन्द्रकी कोशिका में hn-आर एन ए के पश्च अनुलेखन रूपांतरण की व्याख्या कीजिए।

Name the three RNA polymerases found in eukaryotic cells and mention their functions.

#### OR

Explain the post transcriptional modifications the hn-RNA undergoes in eukaryotic cell.

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14. जैव पुष्टिकरण क्या है ? किन्हीं दो उदाहरणों की सहायता से इस क्षेत्र में भारतीय कृषि अनुसंधान संस्थान के योगदान का उल्लेख कीजिए । 3  
What is biofortification ? Mention the contribution of Indian Agricultural Research Institute towards it with the help of any two examples.
15. आर एन ए अणु की अपेक्षा डी एन ए अणु को एक अच्छा आनुवंशिक पदार्थ क्यों माना गया है ? 3  
Why is DNA molecule considered as a better hereditary material than RNA molecule ?
16. बैक्यूलोवायरेसिस जैव नियंत्रण कारकों के अच्छे उदाहरण हैं । तीन कारणों का उल्लेख करते हुए कथन का औचित्य बताइए । 3  
Baculoviruses are good example of biocontrol agents. Justify giving three reasons.
17. यदि मक्का के पौधे के अर्धसूत्राणु (मायोसाइट) में 20-गुणसूत्र (क्रोमोसोम) होते हैं, तो मक्का के दाने के भ्रूणपोष तथा भ्रूण में पाए जाने वाले गुणसूत्रों की संख्या लिखिए । कारण सहित अपने उत्तर की पुष्टि कीजिए । 3  
If the meiocyte of a maize plant contains 20 chromosomes. Write the number of chromosomes in the endosperm and embryo of the maize grain and give reasons in support of your answer.
18. एली लिली नामक एक अमेरिकी कंपनी ने पुनर्योगज डी एन ए प्रौद्योगिकी द्वारा इंसुलिन का उत्पादन किस प्रकार किया ? 3  
Explain how Eli Lilly, an American company produced insulin by recombinant DNA technology.
19. हार्डी-वेनबर्ग साम्यता (संतुलन) किस प्रकार प्रभावित हो सकता है ? तीन कारण देते हुए व्याख्या कीजिए । 3  
How can Hardy-Weinberg equilibrium be affected ? Explain giving three reasons.
20. जैव-विविधता के बाह्य स्थाने संरक्षण की व्याख्या कीजिए । स्वस्थाने (इनसिटू) संरक्षण इससे किस प्रकार भिन्न है ? 3  
Explain the 'Ex-situ conservation' of Biodiversity. How is the in-situ conservation different from it ?
21. आपके विचार में क्या असंगजनन की तुलना अलैंगिक प्रजनन से की जा सकती है ? एक कारण की सहायता से अपने उत्तर की पुष्टि कीजिए । असंगजनन किसानों के लिए किस प्रकार लाभप्रद है ? व्याख्या कीजिए । 3  
Do you think apomixis can be compared with asexual reproduction ? Support your answer, giving one reason. How is apomixis beneficial to farmers ? Explain.

22. तीन सूक्ष्मजीवों की सूची नीचे दी गई है। प्रत्येक द्वारा उत्पादित एक-एक उत्पाद के नाम तथा उपयोग लिखिए।

3

- (a) ऐस्पेरजिलस नाइगर
- (b) ट्राइकोडर्मा पॉलिस्पोरम
- (c) मोनॉस्कस परप्यूरीअस

The three microbes are listed below. Name the product produced by each one of them and mention their use.

- (a) Aspergillus niger
- (b) Trichoderma polysporum
- (c) Monascus purpureus

**खण्ड – घ**

**SECTION – D**

23. एक राष्ट्रीय समाचार-पत्र में यह समाचार प्रकाशित हुआ कि एक महानगर का शहरी ठोस अपशिष्ट स्थल लगभग 50 मीटर ऊँचा सेनेटरी लैंडफिल अचानक ढह गया, जिससे उस क्षेत्र में भारी क्षति हुई। कुछ कारें, दो पहिया वाहन तथा मवेशी निकटवर्ती जलाप्लावित नहर में बह गए। एक छोटी लड़की सहित तीन लोग कचरे के ढेर से दब कर मर गए।

4

- (a) ऐसे कोई दो कारण लिखिए जो आपके विचार में इस लैंडफिल के ढहने का कारण बने।
- (b) नीतिगत ऐसे किन्हीं चार निरोधक उपायों का उल्लेख कीजिए जिनका पालन करके इस दुर्घटना को रोका जा सकता था।
- (c) भविष्य में ऐसी दुर्घटनाओं को रोकने के लिए कोई दो सुझाव लिखिए जो आप नागरिकों को देना चाहेंगे।

A national newspaper reported that a 50 metre high 'Sanitary landfill', the dumping site of city's garbage in one of the metro-cities crashed and caused heavy damage and disaster in and around the area. A couple of cars, two-wheelers and cattle were swept away in the nearby overflowing canal. Three persons including a young girl were crushed under the garbage and died.

- (a) Write any two points that in your opinion could have caused this landfill crash.
- (b) Mention any four preventive measures to be adhered to as a policy which could have avoided this accident.
- (c) Write any two suggestions that you would like to give to the citizens so as to help in preventing such a disaster in future.

**खण्ड – ड**

**SECTION – E**

24. (a) डी एन ए प्रतिक्रम प्रक्रम उसके पूर्ण लंबाई में एक साथ न होकर छोटे-छोटे प्रतिकृति द्विशाख द्वारा क्यों होता है ? 5
- (b) एक प्रतिकृति द्विशाख में डी एन ए प्रतिकृति प्रक्रम सतत् एवं असतत् क्यों होता है ?
- (c) प्रतिकृति द्विशाख में प्रतिकृति के प्रारंभन के महत्त्व की व्याख्या कीजिए ।

**अथवा**

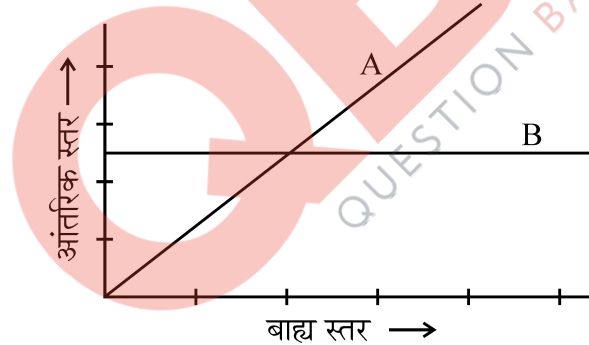
प्रचालेक (आपेरान) क्या है ? जब लैक प्रचालेक मुक्त अवस्था में होता है, उस अवस्था में इसकी कार्यविधि की व्याख्या कीजिए ।

- (a) Why does DNA replication occur in small replication forks and not in its entire length ?
- (b) Why is DNA replication continuous and discontinuous in a replication fork ?
- (c) State the importance of origin of replication in a replication fork.

**OR**

What is an operon ? Explain the functioning of lac operon when in an open state.

25. (a) निम्नलिखित ग्राफ पारिस्थितिक कारक के रूप में ताप के प्रति जीवों की अनुक्रिया को दर्शाता है : 5

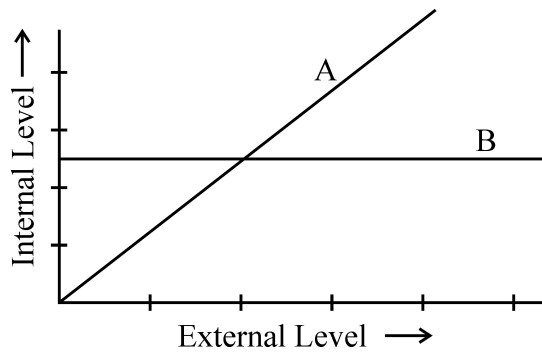


- (i) दोनों में से कौन सी रेखा संरूपण को प्रदर्शित करती है और क्यों ?
- (ii) ग्राफ में दूसरी (अन्य) रेखा क्या प्रदर्शित करती है और क्यों ?
- (b) अपने जीवन चक्र को परपोषी में सफलतापूर्वक चलाने के लिए परजीवियों द्वारा विकसित विभिन्न अनुकूलनों का उल्लेख कीजिए ।

**अथवा**

एक सागर और एक वन के जैवमात्रा पिरेमिडों का आरेख बनाइए । कारण बताते हुए व्याख्या कीजिए कि दोनों पिरेमिडों में अंतर क्यों है ?

- (a) The graph given below represents the organisms response to temperature as an environmental condition.



- (i) Which one of the two lines represents conformers and why ?  
(ii) What does the other line in the graph represent and why ?
- (b) Mention the different adaptations the parasites have evolved with, to be able to successfully complete their life cycles in their hosts.

**OR**

Draw the pyramids of biomass in sea and in a forest. Explain giving reasons why are the two pyramids different ?

26. (a) एक वयस्क स्त्री के जनन तंत्र का आरेखीय चित्र बनाइए तथा इसके निम्नलिखित भागों को नामांकित कीजिए :

5

- (i) अंडवाहिनी नलिका के विभिन्न भाग  
(ii) गर्भाशय भित्ति की विभिन्न परतें
- (b) मानव में अंडाणु के निषेचन की परिघटनाओं की व्याख्या कीजिए ।

**अथवा**

- (a) किसी एक आवृतबीजी के एक परागकोश की अनुप्रस्थ-काट का आरेखी चित्र बनाइए । इसकी भित्ति की विभिन्न परतों एवं लघु बीजाणु मातृकोशिका जनक उत्तक को नामांकित कीजिए ।  
(b) लघुबीजाणुजनन प्रक्रिया का लघुबीजाणु बनने तक की परिघटनाओं का वर्णन कीजिए ।  
(c) आवृतबीजी के परागकण में 'जनन छिद्र' के प्रकार्य लिखिए ।

- (a) Draw a diagram of the adult human female reproductive system and label the different :

- (i) parts of fallopian tube  
(ii) layers of uterus wall
- (b) Explain the events during fertilization of an ovum in humans.

**OR**

- (a) Draw a diagrammatic sketch of a transverse section of an anther of an angiosperm. Label its different walls and the tissue forming microspore mother cells.  
(b) Describe the process of microsporogenesis upto the formation of a microspore.  
(c) Write the function of 'germ pore' in a pollen grain of an angiosperm.



## Question Paper Code 57/2

### SECTION – A

*Q. Nos. 1 - 5 are of one mark each*

1. **How do monocytes act as a cellular barrier in humans to provide innate immunity ?**

Ans. Phagocytosis of microbes / destroy microbes

[1 mark]

2. **Write the sex of a human having XXY chromosomes with 22 pairs of autosomes. Name the disorder this human suffers from.**

Ans. Male , Klinefelter's syndrome =  $\frac{1}{2} + \frac{1}{2}$

[1 mark]

3. **Write one advantage and one disadvantage of cleistogamy to flowering plants.**

Ans. Advantage - Assured seed set / maintain purelines =  $\frac{1}{2}$

Disadvantage - No variation / only parental characters are preserved / it can lead to inbreeding depression =  $\frac{1}{2}$

[1 mark]

4. **Why do DNA fragments move towards the anode during gel electrophoresis ?**

Ans. DNA fragments are negatively charged

[1 mark]

5. **Name one amino acid, which is coded by only one codon.**

Ans. Methionine / Tryptophan

[1 mark]

### SECTION – B

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

6. **Differentiate between out-crossing and cross breeding.**

Ans. **Out-crossing**

- Mating of animals of same breed
- No common ancestors on either side upto 4 - 6 generations
- Helps to overcome inbreeding depression

**Cross breeding**

- Superior males of one breed are mated with superior females of another breed
- Progeny may have desirable characters of both parent
- Used for commercial production / obtaining improved characters

*Any two differences*

[1 + 1 = 2 marks]

OR

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Why are microbes like Spirulina being produced on a commercial scale ? Mention its two advantages.

Ans. As source of food protein , = 1

Reduces environmental pollution / solves problem of hunger and malnutrition / rich source of protein / low cost production = *Any two* = 1

[1 + 1 = 2 marks]

7. Why is the structure of an antibody molecule represented as  $H_2L_2$  ? Name any two types of antibodies produced in a human body.

Ans.  $L_2$  = Two light / small polypeptide chains ,  $H_2$  = two heavy / longer polypeptide chains =  $\frac{1}{2} \times 2$

IgA / IgM / IgE / IgG = *Any two* =  $\frac{1}{2} \times 2$

[2 marks]

8. (a) Why do organisms like algae and fungi shift from asexual mode of reproduction to sexual mode ?

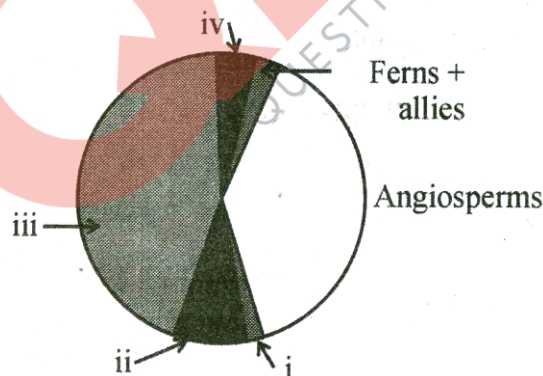
(b) What is a juvenile phase in organisms ?

Ans. (a) To tide over adverse conditions = 1

(b) A phase of growth and maturity , before organisms can reproduce sexually =  $\frac{1}{2} + \frac{1}{2}$

[1 + 1 = 2 marks]

9. Identify the areas labelled i, ii, iii and iv in the pie chart given below representing the biodiversity of plants showing their proportionate number of species of major taxa.



Ans. i - Lichen , ii - Algae , iii - Fungi , iv - Mosses =  $\frac{1}{2} \times 4$

[2 marks]

10. A haemophilic father can never pass the gene for haemophilia to his son. Explain.

Ans. It is a sex linked recessive disorder in which X-chromosome has the haemophilic gene = 1

Son inherits a Y chromosome from father and gene for haemophilia is not present on Y chromosome = 1

[1 + 1 = 2 marks]

**SECTION - C**

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

11. (a) What are transgenic animals ?  
(b) Name the transgenic animal having the largest number amongst all the existing transgenic animals.  
(c) Mention any three purposes for which these animals are produced.

Ans. (a) Animals that have had their DNA manipulated to possess and express an extra / foreign gene = 1

(b) Mice =  $\frac{1}{2}$

(c) (i) Normal physiology and development

(ii) Study of disease

(iii) Biological products

(iv) Vaccine safety

(v) Chemical safety testing (*Any three purposes* =  $\frac{1}{2} \times 3$ )

[1 +  $\frac{1}{2}$  +  $1\frac{1}{2}$  = 3 marks]

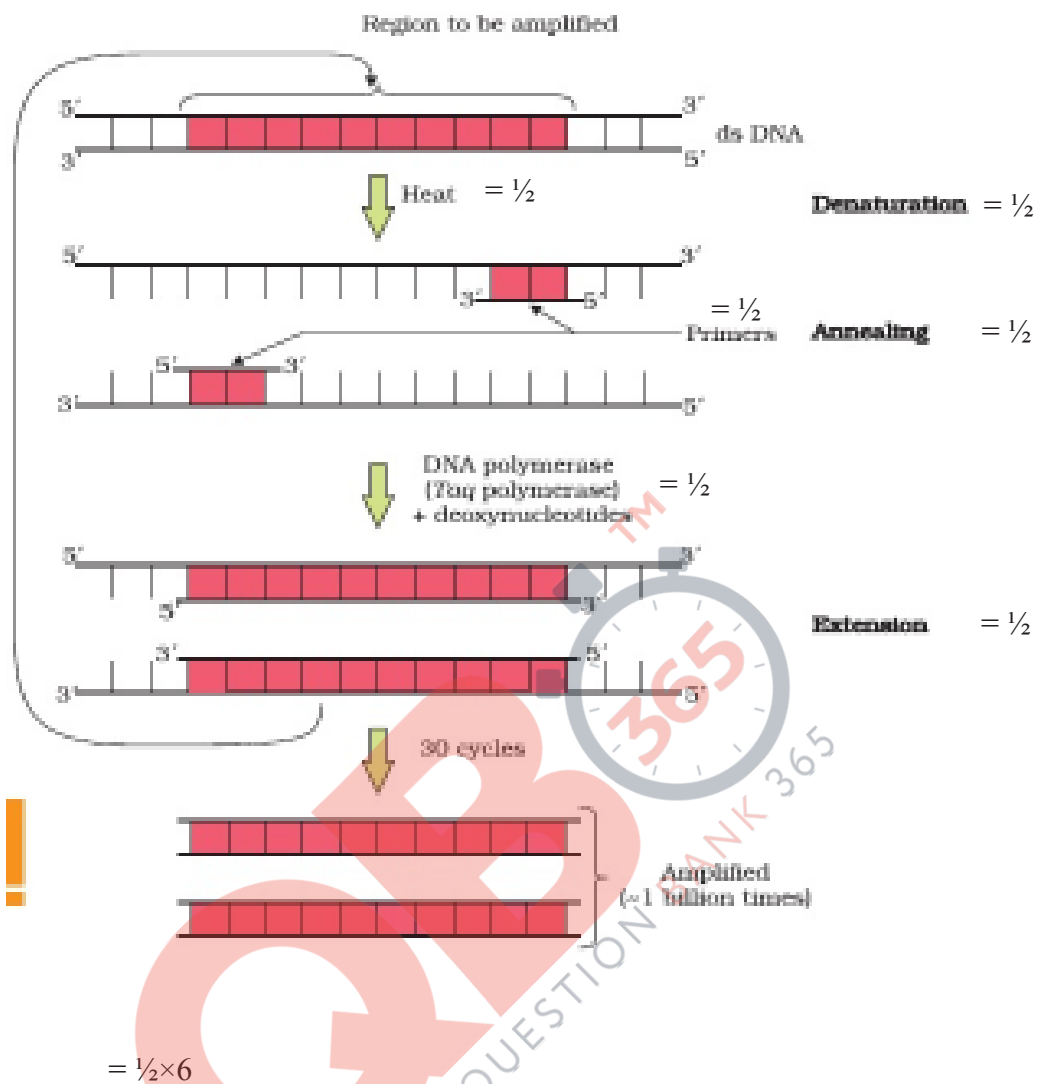
12. Explain three steps involved in polymerase chain reaction.

Ans. Denaturation , Two strands of DNA are separated by heating =  $\frac{1}{2} \times 2$

Annealing , Two sets of primers are attached / annealed to the separated DNA strands =  $\frac{1}{2} \times 2$

Extension , Taq polymerase catalyses the extension of primers using genomic DNA as template and nucleotides provided in the reaction =  $\frac{1}{2} \times 2$

(correctly labelled diagrams with polarity of strands to be accepted in lieu of explanation)



[3 marks]

**13 Name the three RNA polymerases found in eukaryotic cells and mention their functions.**

Ans. RNA polymerase - I , transcribes rRNAs (28S -18S and 5.8S ) = 1/2 × 2

RNA polymerase - II , transcribes precursor of mRNA / hnRNA / heterogeneous RNA = 1/2 × 2

RNA polymerase - III , transcribes tRNA / 5sr RNA / snRNA = 1/2 × 2

[3 marks]

**OR**

**Explain the post transcriptional modifications the hn-RNA undergoes in eukaryotic cell.**

Ans. Splicing , Introns are removed and exons are joined = 1/2 × 2

Capping , Methyl guanosine triphosphate /  $^mG_{ppp}$  is added to the 5' end of hnRNA = 1/2 × 2

Tailing , Polyadenylate residues are added to 3'-end in a template independent manner = 1/2 × 2

[3 marks]

**14. What is biofortification ? Mention the contribution of Indian Agricultural Research Institute towards it with the help of any two examples.**

Ans. Breeding crops with higher level of vitamins and minerals or higher protein and healthier fats  
=  $\frac{1}{2} \times 2$

Vitamin A enriched carrots / spinach / pumpkin

Vitamins C enriched bitter gourd / bathua / mustard / tomato

Iron and calcium enriched spinach / bathua

Protein enriched broad lablab / french & garden peas

*Any two examples* = 1 + 1

[1 + 2 = 3 marks]

**15 Why is DNA molecule considered as a better hereditary material than RNA molecule ?**

Ans. DNA molecule is a better hereditary material as

(i) It is more stable (due to presence of thymine and not uracil as in RNA)

(ii) Less reactive than RNA (as RNA has 2' - OH making it more reactive)

(iii) Being less reactive, DNA is not easily degradable (RNA being more reactive is easily degradable)

(iv) Rate of mutation is slow (Rate of mutation in RNA is faster)

*Any three* = 1 × 3

[3 marks]

**16. Baculoviruses are good example of biocontrol agents. Justify giving three reasons.**

Ans. i. Species specific / narrow spectrum insecticidal application = 1

ii. They have no negative impact on plants / mammals / birds / fish / non target insects = 1

iii. They are beneficial for IPM (Integrated Pest Management) / Pest Management Programme = 1

[3 marks]

**17. If the meiocyte of a maize plant contains 20 chromosomes, write the number of chromosomes in the endosperm and embryo of the maize grain and give reasons in support of your answer.**

Ans. Endosperm = 30, Embryo = 20 =  $\frac{1}{2} \times 2$

Diploid meiocyte (20 chromosomes) form haploid gametes (10 chromosomes) Two haploid gametes fuse to form diploid (20) zygote which develops into a (diploid = 20) embryo / syngamy of two haploid gametes to form a diploid zygote = 1

One haploid gamete (chromosome 10) fuses with two polar nuclei (chromosome 10 + 10) to form (triploid - 30) endosperm nuclei (which divides to form endosperm) / Triple fusion of three haploid nuclei (1 gamete + 2 polar nuclei) to form a triploid endosperm = 1

[1 + 1 + 1 = 3 marks]

**18. Explain how Eli Lilly, an American company produced insulin by recombinant DNA technology.**

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Ans. Prepared two DNA sequences, corresponding to A and B chains of (human) insulin, introduced in the plasmids of *E. coli*, to produce insulin chains, chains A and B were produced separately and extracted, and combined by creating disulphide bonds =  $\frac{1}{2} \times 6$

[3 marks]

**19. How can Hardy-Weinberg equilibrium be affected? Explain giving three reasons.**

Ans. Gene migration / gene flow: When migration of a section of population occurs to another place and, gene frequencies change in the original as well as in the new population =  $\frac{1}{2} + \frac{1}{2}$

Genetic drift: If the same change occurs by chance / new genes / alleles are added to the new population and these are lost from the old population =  $\frac{1}{2} + \frac{1}{2}$

Mutation: Pre-existing advantageous mutations when selected will result in new phenotypes =  $\frac{1}{2} + \frac{1}{2}$

Genetic recombination: Variation in characteristics will be there because of genetic recombination during meiosis and also due to random fusion of gametes =  $\frac{1}{2} + \frac{1}{2}$

Natural selection: Heritable variations enabling better survival enabled organisms to reproduce and leave greater number of progeny =  $\frac{1}{2} + \frac{1}{2}$

**Any three** =  $1 \times 3$

[3 marks]

**20. Explain the 'Ex-situ conservation' of Biodiversity. How is the in-situ conservation different from it?**

Ans. Ex-situ - Threatened animals and plants are taken out from their natural habitat and placed in special settings where they can be protected and given special care, by keeping the gametes of threatened species preserved in viable and fertile condition for long time =  $\frac{1}{2} + \frac{1}{2}$

Zoological parks / botanical gardens / wildlife safari parks / cryopreservation / eggs can be fertilised *in vitro* / tissue culture method / seed banks = **Any correct example explained** = 1

In-situ conservation, organisms are given protection in their natural habitat in which biodiversity is protected at all levels = 1

[3 marks]

**21. Do you think apomixis can be compared with asexual reproduction? Support your answer, giving one reason. How is apomixis beneficial to farmers? Explain.**

Ans. Yes, seeds are produced without fertilisation =  $\frac{1}{2} \times 2$

Production of hybrid seeds costly, if hybrids with desirable characteristics can be made into apomicts, there is no segregation of characters in the hybrid progeny, farmer can continue using hybrid seeds year after year and not buy new seeds =  $\frac{1}{2} \times 4$

[1 + 2 = 3 marks]

**22. The three microbes are listed below. Name the product produced by each one of them and mention their use.**

(a) **Aspergillus niger**

(b) **Trichoderma polysporum**

(c) **Monascus purpureus**

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- Ans. (a) *Aspergillus niger* - Citric Acid , natural preservative / flavouring agent =  $\frac{1}{2} + \frac{1}{2}$   
(b) *Trichoderma polysporum* - Cyclosporin A , immunosuppressive agent =  $\frac{1}{2} + \frac{1}{2}$   
(c) *Monascus purpureus* - Statin , blood cholesterol lowering agent =  $\frac{1}{2} + \frac{1}{2}$

[1 × 3 = 3 marks]

### SECTION - D

*Q. Nos. 23 is of four marks*

23. A national newspaper reported that a 50 metre high 'Sanitary landfill', the dumping site of city's garbage in one of the metro-cities crashed and caused heavy damage and disaster in and around the area. A couple of cars, two-wheelers and cattle were swept away in the nearby overflowing canal. Three persons including a young girl were crushed under the garbage and died.

- (a) Write any two points that in your opinion could have caused this landfill crash.  
(b) Mention any four preventive measures to be adhered to as a policy which could have avoided this accident.  
(c) Write any two suggestions that you would like to give to the citizens so as to help in preventing such a disaster in future.

- Ans. (a) Lack of proper waste management measures , overloading of landfill area =  $\frac{1}{2} + \frac{1}{2}$   
(b) Prevent overloading of any designated landfill , litter control through covering material / soil regularly , litter load should be compacted , create temporary / permanent fencing, regular monitoring of landfill area , engineers to design landfills habitat (any other appropriate points) *Any four* =  $\frac{1}{2} \times 4$   
(c) Reduce use of disposable material , recycle waste as much as possible , start making compost pile for food scraps , use reusable fabric shopping bags , avoid creating trash (any other appropriate measure) *Any two* =  $\frac{1}{2} \times 2$

[1 + 2 + 1 = 4 marks]

### SECTION - E

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

24. (a) Why does DNA replication occur in small replication forks and not in its entire length ?  
(b) Why is DNA replication continuous and discontinuous in a replication fork ?  
(c) State the importance of origin of replication in a replication fork.

- Ans. (a) DNA being very long , requires high energy for opening along its entire length = 1 + 1  
(b) DNA dependent DNA polymerase catalyse polymerisation only in one direction , i.e. 5' → 3' , =  $\frac{1}{2} + \frac{1}{2}$   
Two strands of DNA are anti parallel and have opposite polarity = 1  
(c) Site where replication originates = 1

[2 + 2 + 1 = 5 marks]

OR

**What is an operon ? Explain the functioning of lac operon when in an open state.**

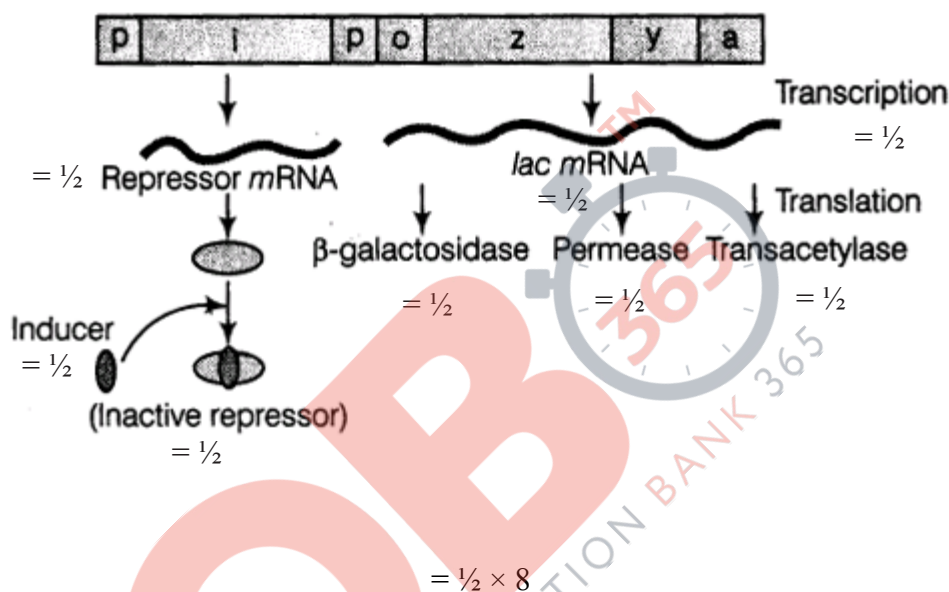


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Ans. The arrangement where a (Polycistronic) structural gene is regulated by a common promoter and regulatory genes = 1

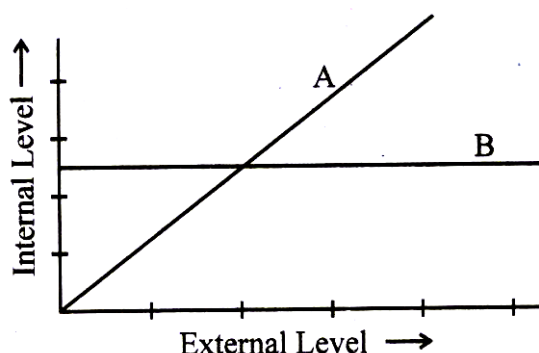
Lactose acts as inducer, binds with repressor protein, RNA polymerase freely moves over the structural genes, transcribes lac mRNA, which in turn produce enzymes - transacetylase, permease,  $\beta$ -galactosidase (by lac z), responsible for digestion of lactose =  $\frac{1}{2} \times 8$

// In lieu of above explanation the following diagram can be considered



[5 marks]

- 25 (a) The graph given below represents the organisms response to temperature as an environmental condition.



- (i) Which one of the two lines represents conformers and why ?  
 (ii) What does the other line in the graph represent and why ?
- (b) Mention the different adaptations the parasites have evolved with, to be able to successfully complete their life cycles in their hosts.



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Ans. (a) (i) A is a conformer =  $\frac{1}{2}$

Cannot maintain homeostasis / constancy of internal environment by physiological means / their body temperature (osmotic conc. of body fluids) changes with the ambient temperature = 1

(ii) Regulators =  $\frac{1}{2}$


Maintain homeostasis by physiological means / capable of thermo regulation / maintain a constant body internal environment = 1

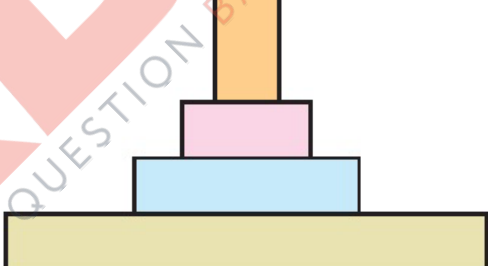
(b) Loss of unnecessary sense organs, presence of adhesive organs / suckers to cling on to the host, loss of digestive system, high reproductive capacity = **Any two** = 1 + 1

[3 + 2 = 5 marks]

**OR**

**Draw the pyramids of biomass in sea and in a forest. Explain giving reasons why are the two pyramids different ?**

Ans. Pyramid of biomass in Sea : PC  = 1

Pyramid of biomass in a Forest : TC  = 1

Sea - Inverted, because biomass of fish / other aquatic animals exceeds that of phytoplanktons // small standing crop of phytoplankton supports large standing crop of zooplankton =  $\frac{1}{2}$  + 1

Forest - Upright, because biomass of producers exceeds that of herbivores / carnivores // allows the sharp decrease in biomass at higher trophic levels =  $\frac{1}{2}$  + 1

[5 marks]

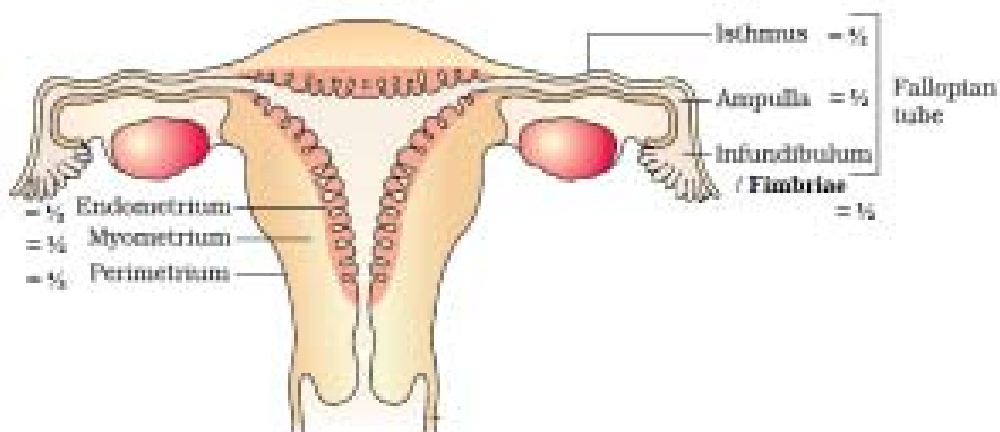
26. (a) **Draw a diagram of the adult human female reproductive system and label the different:**

(i) parts of fallopian tube

(ii) layers of uterus wall

(b) Explain the events during fertilization of an ovum in humans.

Ans. (a)



= 1/2 × 6

[3 marks]

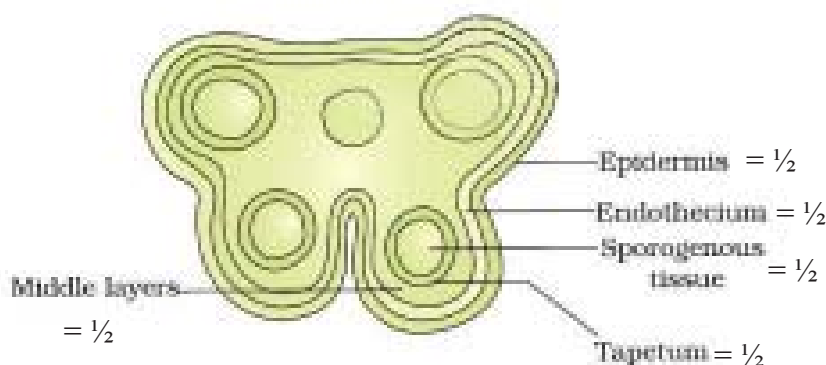
- (b) When a sperm comes in contact with Zona pellucida of ovum this induces changes in the membrane that blocks entry of additional sperm, secretions of acrosome helps sperm enter into the cytoplasm of ovum through zona pellucida and plasma membrane, this induces completion of meiotic division of secondary oocyte and formation of a haploid ootid / ovum (and a second polar body), haploid nucleus of ovum fuses with sperm nucleus to form diploid zygote (fertilization occurs) = 1/2 × 4

[3 + 2 = 5 marks]

OR

- (a) Draw a diagrammatic sketch of a transverse section of an anther of an angiosperm. Label its different walls and the tissue forming microspore mother cells.
- (b) Describe the process of microsporogenesis upto the formation of a microspore.
- (c) Write the function of 'germ pore' in a pollen grain of an angiosperm.

Ans. (a)



= 1/2 × 5 = 2 1/2

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- (b) Sporogenous tissue  $\xrightarrow{\text{Mitosis}}$  / Microspore mother cell  $\xrightarrow{\text{Meiosis}}$  microspore tetrad  
=  $\frac{1}{2}$  =  $\frac{1}{2}$  =  $\frac{1}{2}$
- (c) Germ pores allow the germinating / growing pollen tube with contents of the pollen grain / male gametes + vegetative cell to come out of the pollen grains = 1

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

