

**SET-2****Series SSO**कोड नं. **57/2**  
Code No.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 **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

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 **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 I प्रकार के हैं, प्रत्येक प्रश्न **2** अंकों का है ।
- (iv) खण्ड **C** में प्रश्न संख्या **11** से **22** लघु-उत्तरीय प्रश्न II प्रकार 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. मोटर-गाड़ियों में ईंधन के रूप में सीसा-रहित पेट्रोल का प्रयोग करने के दो लाभों को सूचीबद्ध कीजिए । 1

List two advantages of the use of unleaded petrol in automobiles as fuel.

2. रिट्रोवाइरसों में DNA नहीं होते । फिर भी, ग्रस्त परपोषी कोशिका में वाइरसी DNA होता है । यह किस प्रकार सम्भव है ? 1

Retroviruses have no DNA. However, the DNA of the infected host cell does possess viral DNA. How is it possible ?

3. ऐडीनोसीन डिऐमीनेज़ एंज़ाइम की न्यूनता का कारण बताइए । 1

State the cause of adenosine deaminase enzyme deficiency.

4. सिस्ट्रॉन (समपार) क्या होता है ? 1

What is a cistron ?

5. मधुमक्खी के पुंमधुपों (ड्रोन) में गुणसूत्रों की संख्या कितनी होती है ? इनमें शुक्राणुओं के उत्पादन के दौरान किस प्रकार का कोशिका-विभाजन होता है ? 1

How many chromosomes do drones of honeybee possess ? Name the type of cell division involved in the production of sperms by them.



## खण्ड B

### SECTION B

6. सहोपकारिता (म्यूच्युएलिज़्म) क्या होता है ? ऐसे कोई दो उदाहरण बताइए जिनमें सम्बद्ध जीव कृषि के क्षेत्र में व्यापारिक दृष्टि से प्रयुक्त किए जाते हैं । 2

अथवा

ऐसी कोई चार तकनीकों की सूची बनाइए जिनमें जैव-विविधता के *बाह्य स्थाने* (एक्स-सीटू) संरक्षण के नियम को प्रयुक्त किया जाता है । 2

What is mutualism ? Mention any two examples where the organisms involved are commercially exploited in agriculture.

OR

List any four techniques where the principle of *ex-situ* conservation of biodiversity has been employed.

7. (a) सूक्ष्म-प्रवर्धन द्वारा उत्पन्न पौधों को सोमाक्लोन क्यों कहते हैं ?  
(b) इस तकनीक के दो लाभ बताइए । 2

(a) Why are the plants raised through micropropagation termed as somaclones ?

(b) Mention two advantages of this technique.

8. प्राथमिक बहिःस्रावों के द्वितीयक उपचार की उस अवस्था तक की प्रक्रिया की व्याख्या कीजिए, जहाँ तक कि उसमें जैव ऑक्सीजन माँग के स्तर में महत्वपूर्ण परिवर्तन दिखाई देने लगे । 2

Explain the process of secondary treatment given to the primary effluent up to the point it shows significant change in the level of biological oxygen demand (BOD) in it.



9. (a) निम्नलिखित समुच्चयों में से समवृत्ति संरचनाओं को चुनिए :
- हेलों और चमगादड़ों के अग्रपाद
  - ऑक्टोपस और स्तनधारियों के नेत्र
  - शकरकंद और आलू के ट्यूबर
  - बोगेनविलिया* के काँटे और *कुकरबिटा* के टेन्ड्रिल (प्रतान)
- (b) बताइए ये किस प्रकार के विकास का निरूपण करते हैं । 2
- (a) Select the analogous structures from the combinations given below :
- Forelimbs of whales and bats
  - Eyes of octopus and mammals
  - Tuber of sweet potato and potato
  - Thorns of *Bougainvillea* and tendrils of *Cucurbita*
- (b) State the kind of evolution they represent.
10. मॉस नामक पौधा अपना जीवन-चक्र शुष्क पर्यावरण में पूरा नहीं कर सकता है । दो कारण बताइए । 2
- A moss plant is unable to complete its life-cycle in a dry environment. State two reasons.

### खण्ड C

### SECTION C

11. सड़क दुर्घटना में किसी घायल व्यक्ति के ज़ख्मों से तीव्र रक्त-प्रवाह हो रहा था तथा इलाज के लिए उसे एक नर्सिंग होम लाया गया । चिकित्सक ने एक गंभीर रोग से बचाने के लिए उसे तुरन्त एक इन्जेक्शन लगा दिया ।
- बताइए कि चिकित्सक ने रोगी के शरीर में किस दवा का इन्जेक्शन लगाया ।
  - आपके विचार से दवा का यह इन्जेक्शन रोग से उसकी किस प्रकार सुरक्षा करेगा ?
  - उस रोग का नाम बताइए जिससे बचाव के लिए उसे यह इन्जेक्शन लगाया गया और इससे किस प्रकार की प्रतिरक्षा प्राप्त होगी । 3



A heavily bleeding and bruised road accident victim was brought to a nursing home. The doctor immediately gave him an injection to protect him against a deadly disease.

- (a) Write what did the doctor inject into the patient's body.
- (b) How do you think this injection would protect the patient against the disease ?
- (c) Name the disease against which this injection was given and the kind of immunity it provides.

12. डी.एन.ए. फिंगरप्रिंटिंग तकनीक में अनुषंगी DNA के महत्त्व की व्याख्या कीजिए । 3  
Explain the significance of satellite DNA in DNA fingerprinting technique.

13. निम्नलिखित समीकरण किसका निरूपण करता है ? व्याख्या कीजिए । 3  
$$p^2 + 2 pq + q^2 = 1$$

What does the following equation represent ? Explain.

$$p^2 + 2 pq + q^2 = 1$$

14. मटर के लम्बे पौधों और बौने पौधों के बीच अलग-अलग दो एक-संकर क्रॉस (संकरण) कराए गए । पहले क्रॉस में लम्बे और बौने पौधों की संतति समष्टि समान संख्या में रही, जबकि दूसरे क्रॉस में यह संख्या अलग-अलग थी । इन क्रॉसों से उत्पन्न संततियों का हिसाब लगाइए, तथा संतति की समष्टियों के बीच अन्तर के कारण बताइए । 3

Two independent monohybrid crosses were carried out involving a tall pea plant with a dwarf pea plant. In the first cross, the offspring population had equal number of tall and dwarf plants, whereas in the second cross it was different. Work out the crosses, and explain giving reasons for the difference in the offspring populations.

15. बताइए असंगजनन क्या होता है । इसके महत्त्व पर टिप्पणी कीजिए । व्यावसायिक रूप से इसे किस प्रकार इस्तेमाल किया जा सकता है ? 3
- State what is apomixis. Comment on its significance. How can it be commercially used ?
16. स्ट्रेप्टोकोकस, मोनैस्कस और ट्राइकोडर्मा द्वारा उत्पन्न जैव-सक्रिय अणुओं और उनके औषधीय महत्त्व को बताइए । 3
- अथवा
- मीथेनोजेन जीवाणु क्या होते हैं ? ये बायोगैस उत्पादन में कैसे सहायता करते हैं ? 3
- State the medicinal value and the bioactive molecules produced by *Streptococcus*, *Monascus* and *Trichoderma*.
- OR
- What are methanogens ? How do they help to generate biogas ?
17. आनुवंशिक रूप से रूपान्तरित पादपों के किन्हीं तीन सम्भावित अनुप्रयोगों का वर्णन कीजिए । 3
- Describe any three potential applications of genetically modified plants.
18. अमेरिकी कम्पनी, एली लिली ने r-DNA प्रौद्योगिकी की जानकारी को मानव-इन्सुलिन उत्पादन में किस प्रकार प्रयुक्त किया ? 3
- How did an American Company, Eli Lilly use the knowledge of r-DNA technology to produce human insulin ?
19. परजीवियों और उनके परपोषियों के सन्दर्भ में सहविकास की व्याख्या कीजिए । ऐसे किन्हीं चार विशिष्ट अनुकूल लक्षणों की चर्चा कीजिए जो परजीवियों में उनकी जीवन-पद्धति के कारण विकसित हुए । 3
- Explain co-evolution with reference to parasites and their hosts. Mention any four special adaptive features evolved in parasites for their parasitic mode of life.

20. महत्त्वपूर्ण जैव-प्रौद्योगिकी अभिक्रिया को निष्पादित करने के लिए निम्नलिखित को उनके सही-सही क्रम में पुनर्व्यवस्थित कीजिए :

3

- (a) उपयोगी DNA की प्रतिकृतियों का पात्रे (इन विट्रो) संश्लेषण
- (b) ऑलिगोन्यूक्लियोटाइडों का रासायनिक संश्लेषण
- (c) DNA-पॉलिमरेज़ एंजाइम
- (d) DNA का सम्पूरक क्षेत्र
- (e) जीनोमिक DNA टेम्पलेट
- (f) मिलने वाले न्यूक्लियोटाइड
- (g) प्राइमर
- (h) तापस्थायी (थर्मोस्टेबल) DNA-पॉलिमरेज़ (थर्मस ऐक्वेटिकस से)
- (i) द्विलिङ्गीय-DNA का विकृतीकरण

Rearrange the following in the correct sequence to accomplish an important biotechnological reaction :

- (a) *In vitro* synthesis of copies of DNA of interest
- (b) Chemically synthesized oligonucleotides
- (c) Enzyme DNA-polymerase
- (d) Complementary region of DNA
- (e) Genomic DNA template
- (f) Nucleotides provided
- (g) Primers
- (h) Thermostable DNA-polymerase (from *Thermus aquaticus*)
- (i) Denaturation of ds-DNA





21. एक प्रवाह-चार्ट की सहायता से सुपोषण की घटनाओं को प्रदर्शित कीजिए । 3  
With the help of a flow-chart exhibit the events of eutrophication.
22. बेहतर तथा कारगर डेरी फ़ार्म प्रबन्धन की कोई छः मूलभूत प्रक्रियाओं की सूची बनाइए । 3  
Enumerate any six essentials of good, effective Dairy Farm Management Practices.

### खण्ड D

### SECTION D

- 23.\* शिक्षा विभाग द्वारा आपके विद्यालय को “जनन-स्वास्थ्य – समस्याएँ और पद्धतियाँ” पर एक अन्तर-विद्यालयी गोष्ठी का आयोजन और मेज़बानी करने के लिए चुना है । हालाँकि, अनेक माता-पिता अपने बच्चों के इस गोष्ठी में भाग लेने के इच्छुक नहीं हैं । उनका तर्क है कि गोष्ठी का विषय “बहुत संकोचजनक” है ।

विषय को अति आवश्यक और सामयिक बताते हुए चार तर्कों का उपयुक्त कारणों सहित स्पष्टीकरण कीजिए । 4

Your school has been selected by the Department of Education to organize and host an interschool seminar on “Reproductive Health – Problems and Practices”. However, many parents are reluctant to permit their wards to attend it. Their argument is that the topic is “too embarrassing”.

Put forth four arguments with appropriate reasons and explanation to justify the topic to be very essential and timely.

## खण्ड E

### SECTION E

24. (a) एक व्यष्टि जीव की नहीं वरन् एक समष्टि के विभिन्न गुणों की सूची बनाइए ।  
(b) समष्टि-घनत्व क्या होता है ? प्रत्येक का एक-एक उदाहरण देते हुए, किन्हीं तीन विभिन्न विधियों की व्याख्या कीजिए जिनसे समष्टि-घनत्व को मापा जा सकता है ।

5

#### अथवा

“प्रायः कहा जाता है कि ऊर्जा के पिरैमिड सीधे (आधार से ऊपर की ओर) होते हैं । दूसरी तरफ़ जैवमात्रा का पिरैमिड सीधा अथवा उल्टा दोनों ही प्रकार का हो सकता है ।” उदाहरणों और आरेखों की सहायता से व्याख्या कीजिए ।

5

- (a) List the different attributes that a population has and not an individual organism.  
(b) What is population density ? Explain any three different ways the population density can be measured, with the help of an example each.

#### OR

“It is often said that the pyramid of energy is always upright. On the other hand, the pyramid of biomass can be both upright and inverted.” Explain with the help of examples and sketches.

25. (a) एक ऐसे प्रयोग की योजना बनाइए और प्रयोग के विभिन्न चरणों का एक प्रवाह-चार्ट भी बनाइए, जिससे यह सुनिश्चित हो सके कि बीजों का निर्माण केवल वांछित समुच्चय वाले पराग कणों से हुआ है । आपने जो प्रयोग किया है उसके प्रकार का नाम बताइए ।  
(b) ऐसे प्रयोगों का महत्त्व भी बताइए ।

5

#### अथवा

स्त्री में होने वाले आर्तव चक्र के दौरान पीयूष तथा अंडाशयी हॉर्मोनों की भूमिका का वर्णन कीजिए ।

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- (a) Plan an experiment and prepare a flow chart of the steps that you would follow to ensure that the seeds are formed only from the desired sets of pollen grains. Name the type of experiment that you carried out.
- (b) Write the importance of such experiments.

**OR**

Describe the roles of pituitary and ovarian hormones during the menstrual cycle in a human female.

26. (a) वर्णांधता और थैलेसीमिया को मेंडेलीय विकार क्यों माना जाता है ? इन रोगों से ग्रस्त व्यक्तियों में दिखाई देने वाले इनके रोगलक्षण बताइए ।
- (b) मानवों में वर्णांधता रोग पुरुषों में लगभग 8% में पाया जाता है जबकि स्त्रियों में यह रोग केवल 0.4% में पाया जाता है । ऐसा क्यों होता है, इस तथ्य की व्याख्या कीजिए ।

5

**अथवा**

प्राक्केन्द्रकियों (प्रोकैरियोटों) में अनुलेखन (ट्रांसक्रिप्शन) की प्रक्रिया की व्याख्या कीजिए । बताइए कि यह प्रक्रिया सुकेन्द्रकियों में किस प्रकार भिन्न होती है ।

5

- (a) Why are colourblindness and thalassemia categorised as Mendelian disorders ? Write the symptoms of these diseases seen in people suffering from them.
- (b) About 8% of human male population suffers from colourblindness whereas only about 0.4% of human female population suffers from this disease. Write an explanation to show how it is possible.

**OR**

Explain the process of transcription in prokaryotes. How is the process different in eukaryotes ?



# Question Paper Code 57/2

## SECTION – A

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

1. List two advantages of the use of unleaded petrol in automobiles as fuel.

- Ans. (i) Allows the catalytic convertor to remain active =  $\frac{1}{2}$   
(ii) Reduces air pollution =  $\frac{1}{2}$

[1 Mark]

2. Retroviruses have no DNA. However, the DNA of the infected host cell does possess viral DNA. How is it possible?

- Ans. Reverse transcription of viral RNA into viral DNA, then integrates/ incorporates with the host DNA =  $\frac{1}{2} + \frac{1}{2}$

[1 Mark]

3. State the cause of adenosine deaminase enzyme deficiency.

- Ans. Deletion of gene for adenosine deaminase = 1

[1 Mark]

4. What is a cistron?

- Ans. A segment of DNA, Coding for a polypeptide =  $\frac{1}{2} + \frac{1}{2}$

[1Mark]

5. How many chromosomes do drones of honeybee possess? Name the type of cell division involved in the production of sperms by them.

- Ans. 16, Mitosis =  $\frac{1}{2} + \frac{1}{2}$

[1 Mark]

## SECTION B

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

6. What is mutualism? Mention any two examples where the organisms involved are commercially exploited in agriculture.

- Ans. Interaction between two species in which both are benefitted = 1
- i. *Rhizobium* in the roots (nodules) of legumes =  $\frac{1}{2}$   
ii. *Mycorrhiza / Glomus* with the roots of higher plants =  $\frac{1}{2}$

[2 Marks]

OR

List any four techniques where the principle of ex-situ conservation of biodiversity has been employed.

- Ans. Cryopreservation, in vitro fertilisation, micro propagation / tissue culture, sperm bank/ seed bank / gene bank =  $\frac{1}{2} \times 4$

[2 Marks]



7. (a) Why are the plants raised through micropropagation termed as somaclones?  
(b) Mention two advantages of this technique.

Ans. (a) Genetically identical = 1

(b) Large number of plants in short duration, Virus free plants =  $\frac{1}{2} + \frac{1}{2}$

[2 Marks]

8. Explain the process of secondary treatment given to the primary effluent up to the point it shows significant change in the level of biological oxygen demand (BOD) in it.

Ans. The primary effluent is passed into large aeration tanks where it is constantly agitated, mechanically pumping air into it, this allows vigorous growth of useful aerobic microbes into flocs, these microbes consumes the major part of organic matter in the effluent (this significantly reduces the BOD of the effluent) =  $\frac{1}{2} \times 4$

9. (a) Select the analogous structures from the combinations given below:

(i) Forelimbs of whales and bats

(ii) Eyes of octopus and mammals

(iii) Tubar of sweet potato and potato

(iv) Thorns of *Bougainvillea* and tendrils of *Cucurbita*

(b) State the kind of evolution they represent.

Ans. (a) (ii) & (iii) =  $\frac{1}{2} \times 2$

(b) Convergent evolution = 1

[2 Marks]

10. A moss plant is unable to complete its life-cycle in a dry environment. State two reasons.

Ans. Needs water for transfer of male gamete/antherozoids to the stationary female gamete, spores need sufficient moisture for germination = 1 + 1

[2 Marks]

## SECTION C

Q. Nos. 11 - 12 are of three marks each

11. A heavily bleeding and bruised road accident victim was brought to a nursing home. The doctor immediately gave him an injection to protect him against a deadly disease.

(a) Write what did the doctor inject into the patient's body.

(b) How do you think this injection would protect the patient against the disease?

(c) Name the disease against which this injection was given and the kind of immunity it provides.

Ans. (a) Tetanus antitoxins/Tetanus toxoid = 1

(b) The preformed antibody injected, act on the pathogen immediately to provide protection =  $\frac{1}{2} \times 2$

(c) Tetanus, passive immunity =  $\frac{1}{2} \times 2$

[3 Marks]



12. Explain the significance of satellite DNA in DNA fingerprinting technique.

- Ans. (i) They do not code for any proteins ,  
 (ii) They form large part of the human genome ,  
 (iii) They show high degree of polymorphism / Specific to each individual = 1 × 3

[3 Marks]

13. What does the following equation represent? Explain.

$$P^2+2pq+q^2=1$$

Ans. Hardy Weinberg's Principle / allele frequencies in a population are stable and is constant from generation to generation, 1 represents stable allelic frequency in a population, indicating no evolution occurring,  $p^2$  frequency of homozygous dominant / AA, 2 pq frequency of heterozygous / Aa,  $q^2$  frequency of homozygous recessive / aa =  $\frac{1}{2} \times 6$

Note : (if AA, Aa, aa have been indicated using any other alphabet correctly can be accepted)

[3 Marks]

14. Two independent monohybrid crosses were carried out involving a tall pea plant with a dwarf pea plant. In the first cross, the offspring population had equal number of tall and dwarf plants, whereas in the second cross it was different . Work out the crosses, and explain giving reasons for the difference in the offspring populations.

Ans.

<p style="text-align: center;">1st Cross</p> <p>parental generation <math>Tt \times tt</math></p> <p style="text-align: center;">↓                      ↓</p> <p>gametes <math>(T) (t)</math>                      <math>(t) (t)</math></p> <p style="text-align: center;">F<sub>1</sub> - <math>Tt : tt</math></p> <p style="text-align: center;">1 : 1 (50 % Tall : 50% dwarf)</p>	<p style="text-align: center;">2nd Cross</p> <p>parental generation <math>TT \times tt</math></p> <p style="text-align: center;">↓                      ↓</p> <p>gametes <math>(T) (T)</math>                      <math>(t) (t)</math></p> <p style="text-align: center;">F<sub>1</sub> - <math>Tt : Tt</math></p> <p style="text-align: center;">(Tall-100%) = 1 + 1</p>
--	--

Reason- In the first cross the tall parent plant is heterozygous for the trait , in second cross tall parent plant is homozygous for the trait =  $\frac{1}{2} + \frac{1}{2}$

[3 Marks]

15. State what is apomixis . Comment on its significance. How can it be commercially used?

Ans. Form of asexual reproduction producing seeds without fertilisation/type of asexual reproduction that mimics sexual reproduction to form seeds without fertilisation = 1

Parental characters are maintained in the progeny/offspring (as there is no meiosis/segregation of characters) = 1

If desired hybrid seeds are made apomictics the farmers can keep on using the hybrid seeds to raise new crops year after year = 1

[3 Marks]

16. State the medicinal value and the bioactive molecule produced by *Streptococcus*, *Monascus* and *Trichoderma*.

Ans. *Streptococcus* ; Streptokinase , clot buster / remove clot from the blood vessels =  $\frac{1}{2} + \frac{1}{2}$

*Monascus* ; Statin , blood cholesterol lowering agent / it inhibits the enzymes responsible for

synthesis of cholesterol =  $\frac{1}{2} + \frac{1}{2}$

*Trichoderma* ; cyclosporin A , immunosuppressive agents used in organ transplantation =  $\frac{1}{2} + \frac{1}{2}$

[3 Marks]

**OR**

**What are methanogens? How do they help to generate biogas?**

Ans. Anaerobic, methane producing bacteria =  $\frac{1}{2} \times 2$

methanogens generate biogas, when act on cellulose rich biowaste ( anaerobically) = 1 + 1

[3 Marks]

**17. Describe any three potential applications of genetically modified plants.**

Ans. More tolerant to abiotic stress, less dependence on chemical pesticides, reduces post harvest losses, increase efficiency of mineral usage by plants, enhance nutritional value of food. eg. Vitamin A enriched rice (any three) = 1+1+1

[3 Marks]

**18. How did an American Company, Eli Lilly use the knowledge of r-DNA technology to produce human insulin?**

Ans. Two chains of DNA sequence corresponding to A & B chains of human insulin prepared, introduced them into plasmids of *E.coli* to produce separate A & B chains, A & B chains extracted combined by creating disulphide bonds = 1 × 3

[3 Marks]

**19. Explain co-evolution with reference to parasites and their hosts. Mention any four special adaptive features evolved in parasites for their parasitic mode of life.**

Ans. If the host evolves special mechanism for rejecting or resisting the parasite

the parasite has to (simultaneously) evolve / co-evolve the mechanism to counter act and neutralise them. = 1

(a) Parasitic adaptation in Animals:

- (i) Loss of (unnecessary) sense organs in animals
- (ii) Presence of adhesive organs/suckers
- (iii) Loss of digestive system
- (iv) High reproductive capacity
- (v) Resemblance of eggs in the case of brood parasitism

(b) Parasitic adaptation in plants

- (vi) Haustoria in *Cuscuta*
- (vii) Loss of chlorophyll
- (viii) Loss of leaves / foliage

**Note :** ( Any four adaptations with correct reference Animal or Plant can be allotted marks)

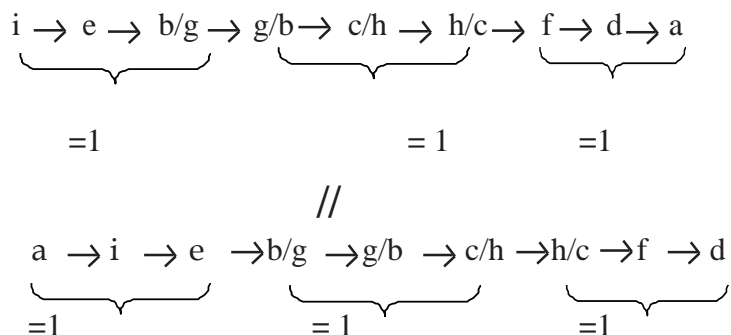
[ 3 Marks]



20. Rearrange the following in the correct sequence to accomplish an important biotechnological reactions :

- (a) *In vitro* synthesis of copies of DNA of interest
- (b) Chemically synthesized oligonucleotides
- (c) Enzyme DNA-polymerase
- (d) Complementary region of DNA
- (e) Genomic DNA template
- (f) Nucleotides provided
- (g) Primers
- (h) Thermostable DNA-polymerase (from *Thermus aquaticus*)
- (i) Denaturation of ds-DNA

Ans. Correct sequence is



**Note:** (Stop Marking where the sequence goes wrong)

[3 Marks]

21. With the help of a flow- chart exhibit the events of eutrophication.

Ans. Water in young lake is cold clear to support life



With time water is enriched with nutrients such as nitrogen and phosphorus by streams draining into it



As Lake's fertility increases plant and animal life increase/proliferates



Organic matter begins to be deposited at the bottom of the lake Silt and organic debris pile up and makes the lake shallower and warmer



Marsh plants develop roots and begin to fill the original lake basin





Eventually the lake gives way to large masses of floating plants finally converting it in to land (Natural aging) =  $\frac{1}{2} \times 6$

[3 Marks]

**22. Enumerate any six essentials of good ,effective Dairy Farm Management Practices.**

Ans. Selection of high yielding and diseases resistant breeds,housedwell,adequate water supply,maintained disease free,feeding in a scientific manner,regular visits by veteranary doctors,regular inspection and record keeping,cleanliness and hygiene while milking and transport

(any six) =  $\frac{1}{2} \times 6$

[3 Marks]

**SECTION D**

**Q No. 23 is of four mark**

**23. Your school has been selected by the Department of Education to organize and host an interschool seminar on “Reproductive Health –Problems and Practices”. However, many parents are reluctant to permit their wards to attend it. Their argument is that the topic is “too embarrassing”.**

**Put forth four arguments with appropriate reasons and explanation to justify the topic to be very essential and timely.**

- Ans. 1. The issue of puberty and adolescence need to be addressed effectively with the respective age group because many changes take place in the body during adolescence of which they are supposed to be aware of = 1
2. To bring in awareness about their reproductive health and its effect on their physical, emotional and social being = 1
3. To address the increase in sex abuse and sex crimes in our country = 1
4. Myths and misconceptions related to reproductive issues = 1

**Note:** (any other related or relevant argument with reasons may be accepted)

[4 Marks]

**SECTION E**

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

- 24. (a) List the different attributes that a population has and not an individual organism.**
- (b) What is population density? Explain any three different ways the population density can be measured, with the help of an example each .**

(a) Attributes of population

Birth rate , Death Rate , sex ratio,age pyramids/ age distribution (any two) =  $\frac{1}{2} \times 2$

(b) Population density -

Number of individuals per unit area at a given time / period = 1

1. Biomass / % Cover, e.g Hundred *Parthenium* plants and 1 huge banayan tree =  $\frac{1}{2} \times 2$
2. Relative Density , e.g Number of fish caught per trap from a lake =  $\frac{1}{2} \times 2$
3. Numbers , e.g Human population =  $\frac{1}{2} \times 2$
4. Indirect estimation , e.g without actually counting/seeing them e.g tiger census based on



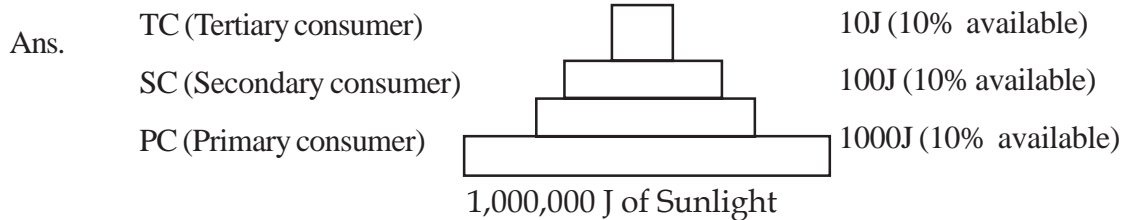
pugmarks and fecal pellets =  $\frac{1}{2} \times 2$

(Any three)

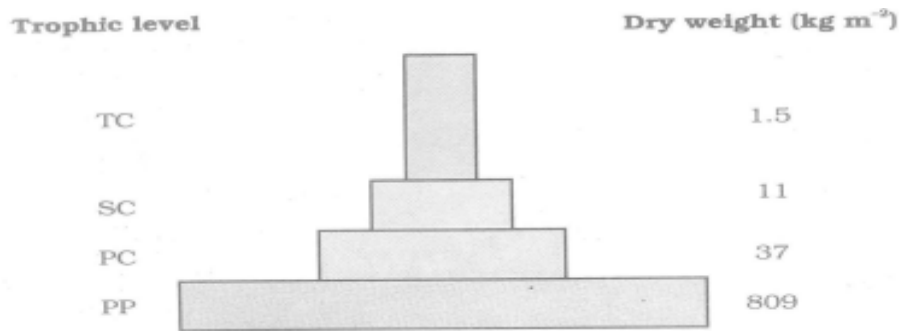
[ 5 Marks]

OR

“It is often said that the pyramid of energy is always upright. On the other hand the pyramid of biomass can be both upright and inverted.” Explain with the help of examples and sketches.



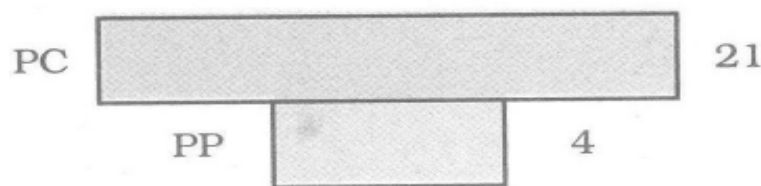
Upright Pyramid of Energy : e.g of any Grassland food chain depicting energy transfer at each trophic level = 1+1



Upright Pyramid of Biomass : e.g grassland food chain-grass → rabbit → fox → Tiger

(Any other relevant example) = 1 for Diagram +  $\frac{1}{2}$  for example

**Note:**(If only two trophic levels are drawn with dry weight mentioned correctly can be accepted)



Inverted Pyramid of Biomass: e.g aquatic ecosystem where small standing crop of phytoplanktons supports large standing crop of zooplanktons = 1 for Diagram +  $\frac{1}{2}$  for example

[5 Marks]

25. (a) Plan an experiment and prepare a flow chart of the steps that you would follow to ensure that the seeds are formed only from the desired sets of pollen grains. Name the experiment that you carried out .
- (b) Write the importance of such experiments.

Ans. (a) Selection of flowers from desired plants → emasculation → bagging → dusting of the pollens on the stigma of the flowers that were bagged → flower rebagged → fruit formed

=  $\frac{1}{2} \times 6$



Artificial Hybridisation = 1

(b) Production of superior/ improved varieties of plants = 1

[5 Marks]

OR

**Describe the roles of pituitary and ovarian hormones during the menstrual cycle in a human female.**

Ans. Pituitary hormones :

(When levels of FSH is high) FSH, induces follicular growth, secretion of estrogen by follicles, (when LH surge is there in the mid of the cycle) luteinising hormones/LH, along with FSH leads to ovulation, and then formation of corpus luteum =  $\frac{1}{2} \times 6$

Ovarian hormone:

Estrogen, repair/proliferation of endometrium,

Progesterone, maintains endometrium for implantation =  $\frac{1}{2} \times 4$

(Low level of progesterone leads to menstrual flow)

[5 Marks]

26. (a) **Why are colourblindness and thalassemia categorised as Mendelian disorders? Write the symptoms of these diseases seen in people suffering from them.**

(b) **About 8% of human male population suffers from colourblindness whereas only about 0.4% of human female population suffers from this disease. Write an explanation to show how it is possible.**

Ans. (a) Both are caused due to mutation/alteration in a single gene, and follow Mendelian inheritance =  $\frac{1}{2} \times 2$

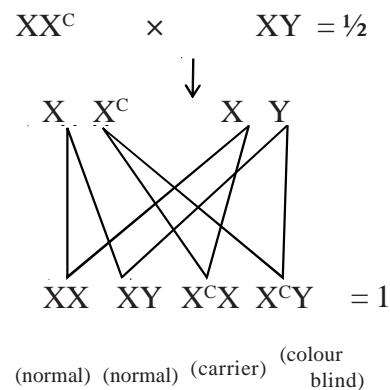
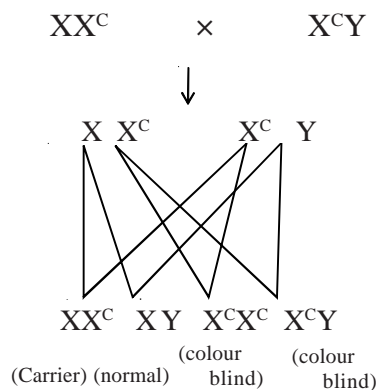
colour blindness - unable to discriminate between red and green colours = 1

thalassemia - (formation of abnormal haemoglobin resulting in) Anaemia = 1

(b) it is due to a recessive mutation in the X chromosomes =  $\frac{1}{2}$

Males have only one X chromosome and females have two, female will be colour blind only in a homozygous recessive state/ both X chromosomes carry the defective gene/  $X^c X^c$ , whereas male will be colour blind if they are  $X^c Y$ / heterozygous =  $\frac{1}{2} \times 3$

//



[5 Marks]

OR

**Explain the process of transcription in prokaryotes. How is the process different in eukaryotes ?**

Ans. Initiation, DNA dependent RNA polymerase associates with the Initiation factor/ $\sigma$  factor, and binds to the promoter site of DNA thus initiates transcription =  $\frac{1}{2} \times 3$

Elongation, The RNA polymerase using nucleoside triphosphates, polymerises in a template dependent fashion in 5' to 3' direction, following the rule of complementarity =  $\frac{1}{2} \times 3$

Termination, at the terminator region the enzyme associates with the rho ( $\rho$ ) and both the enzymes and the newly formed/nascent RNA fall off from the DNA =  $\frac{1}{2} \times 2$

**Note** : (Self Explanatory diagrams with correct labelling may be accepted)

Difference-

- (i) There are 3 different types of RNA polymerases in the nucleus of eukaryotes (polymerising the three different types of RNA molecules) but only 1 in prokaryotes
- (ii) Primary transcripts (hnRNA/precursor mRNA) undergoes splicing capping and tailing to give rise to functional RNA/mRNA (that moves out of the nucleus) this processing is absent in prokaryotes =  $\frac{1}{2} \times 2$

[5 Marks]

