

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 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 (सैद्धांतिक)

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. 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.

2. सिस्ट्रॉन (समपार) क्या होता है ? 1

What is a cistron ?

3. 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 ?

4. ऐडीनोसीन डिएमिनेज़ न्यूनता नामक रोग का एंज़ाइम-प्रतिस्थापन चिकित्सा-पद्धति द्वारा उपचार किए गए बच्चों के लिए समय-समय पर उपचार की क्यों आवश्यकता होती है ? 1

Why do children cured by enzyme-replacement therapy for adenosine deaminase deficiency need periodic treatment ?

5. 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.

खण्ड B

SECTION B

6. मॉस नामक पौधे बहुत अधिक मात्रा में नर युग्मक क्यों उत्पन्न करते हैं ? एक कारण बताइए । इन युग्मकों को क्या कहते हैं ? 2

Why do moss plants produce very large number of male gametes ? Provide one reason. What are these gametes called ?

7. (a) निम्नलिखित समुच्चयों में से समजात संरचनाएँ चुनिए :
- ह्वेलों और चमगादड़ों के अग्रपाद
 - आलू और शकरकंद के ट्यूबर
 - ऑक्टोपस और स्तनधारियों के नेत्र
 - बोगेनविलिया के काँटे और कुकरबिटा के टेन्ड्रिल (प्रतान)
- (b) बताइए ये किस प्रकार के विकास को निरूपित करते हैं । 2
- (a) Select the homologous structures from the combinations given below :
- Forelimbs of whales and bats
 - Tuber of potato and sweet potato
 - Eyes of octopus and mammals
 - Thorns of *Bougainvillea* and tendrils of *Cucurbita*
- (b) State the kind of evolution they represent.
8. (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.
9. वाहित मल की प्राथमिक उपचार प्रावस्था के दौरान निहित विभिन्न चरणों की व्याख्या कीजिए । 2
- Explain the different steps involved during primary treatment phase of sewage.

10. 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.

खण्ड C

SECTION C

11. 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 ?

12. मटर के एक बौने पौधे और एक लम्बे पौधे के बीच एक-संकर (मोनोहाइब्रिड) संकरण कराने पर पौधों की संतति समष्टियाँ समान अनुपात में बौनी और लम्बी प्राप्त हुईं । इस संकरण का आरेखी प्रतिरूपण बनाइए ताकि स्पष्ट हो सके कि उपर्युक्त परिणाम किस प्रकार प्राप्त हुए । 3

During a monohybrid cross involving a tall pea plant with a dwarf pea plant, the offspring populations were tall and dwarf in equal ratio. Work out a cross to show how it is possible.

13. डी.एन.ए. फिंगरप्रिंटिंग तकनीक में अनुषंगी DNA के महत्त्व की व्याख्या कीजिए । 3

Explain the significance of satellite DNA in DNA fingerprinting technique.

14. निम्नलिखित समीकरण किसका निरूपण करता है ? व्याख्या कीजिए ।

3

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

What does the following equation represent ? Explain.

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

15. 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 ।

- (a) बताइए कि चिकित्सक ने रोगी के शरीर में किस दवा का इन्जेक्शन लगाया ।
- (b) आपके विचार से दवा का यह इन्जेक्शन रोग से उसकी किस प्रकार सुरक्षा करेगा ?
- (c) 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.

16. 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.

17. 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 ?

18. 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 सम्पूर्ण क्षेत्र
- (e) जीनोमिक DNA टेम्पलेट
- (f) मिलने वाले न्यूक्लियोटाइड
- (g) प्राइमर
- (h) तापस्थायी (थर्मोस्टेबल) DNA-पॉलिमरेज़ (थर्मस ऐक्वेटिक्स 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

19. आनुवंशिक रूप से रूपान्तरित पादपों के किन्हीं तीन सम्भावित अनुप्रयोगों का वर्णन कीजिए । 3

Describe any three potential applications of genetically modified plants.

20. 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 ?

21. प्रतिकूल परिस्थितियों में जीवित बने रहने के लिए घोंघे, बीज, भालू, जूँप्लैक्टन, कवक और जीवाणु (बैक्टीरिया) अपने-आप को किस प्रकार अनुकूलित कर लेते हैं ? 3

How do snails, seeds, bears, zooplanktons, fungi and bacteria adapt to conditions unfavourable for their survival ?

22. जलीय खाद्य शृंखला में DDT की जैव-आवर्धन परिघटना को एक प्रवाह-चार्ट की सहायता से दर्शाइए ।

3

With the help of a flow chart, show the phenomenon of biomagnification of DDT in an aquatic food chain.

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 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 ।

5

- (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.

- 25.** (a) थैलेसीमिया और हीमोफीलिया को मेंडेलीय विकारों की श्रेणी में क्यों रखा जाता है ? इनके रोगलक्षण बताइए । मानवों में इनकी वंशागति के पैटर्न की व्याख्या कीजिए ।
- (b) हीमोफीलिया से ग्रस्त पुत्र को पैदा करने वाले सामान्य माता-पिता का जीनप्ररूप लिखिए ।

5

अथवा

m-RNA, t-RNA और राइबोसोम ट्रांसलेशन (स्थानांतरण) में किस प्रकार सहायता करते हैं ?

5

- (a) Why are thalassemia and haemophilia categorized as Mendelian disorders ? Write the symptoms of these diseases. Explain their pattern of inheritance in humans.
- (b) Write the genotypes of the normal parents producing a haemophilic son.

OR

How do m-RNA, t-RNA and ribosomes help in the process of translation ?

- 26.** (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.

Question Paper Code 57/1

SECTION – A

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

- 1. 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]

- 2. What is a cistron ?**

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

[1Mark]

- 3. 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]

- 4. Why do children cured by enzyme-replacement therapy for adenosine deaminase deficiency need periodic treatment ?**

Ans. As this therapy does not cure the disease completely = 1

[1 Mark]

- 5. 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]

SECTION B

Q Nos. 6-10 are of two marks each

- 6. Why do moss plant produce very large number of male gametes? Provide one reason. What are these gametes called ?**

Ans. To compensate the loss of male gametes during their transport(to the non-motile female gamete) through water/ to increase chances of fertilisation , antherozoids = 1 + 1

[2 Marks]

- 7. (a) Select the homologous structure from the combinations given below:**

(i) Forelimbs of whales and bats

(ii) Tuber of potato and sweet potato

(iii) Eyes of octopus and mammals

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

(b) State the kind of evolution they represent.

- Ans. (a) (i) Forelimbs of whales and bats = $\frac{1}{2}$
(iv) Thorns of *Bougainvillea* and tendrils of *Cucurbita* = $\frac{1}{2}$
(b) Divergent Evolution = 1

[2 Marks]

8. (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]

9. Explain the different steps involved during primary treatment phase of sewage.

- Ans. Physical removal of particles (large and small), by filtration and sedimentation, forming primary sludge/sedimented solids, forming effluent (supernatant) for secondary treatment = $\frac{1}{2} \times 4$

[2 Marks]

10. 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]

SECTION C

Q Nos. 11-22 are of three marks each

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

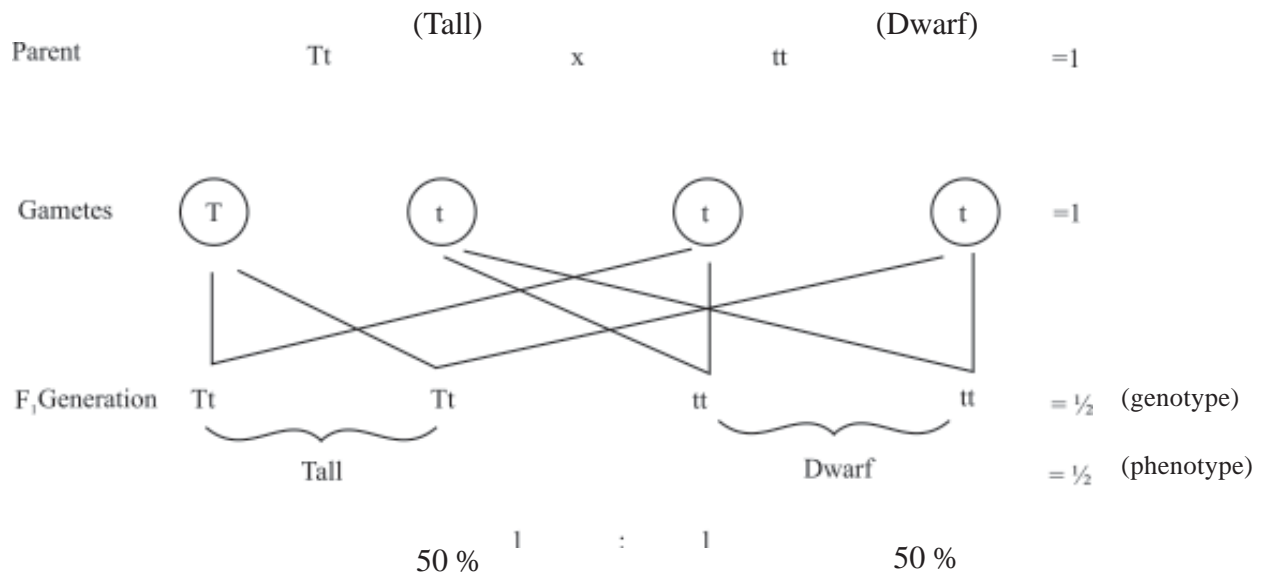
- Ans. Form of asexual reproduction producing seeds without fertilisation/type of asexual reproduction that mimics sexual reproduction to form seeds without fertilisation = 1

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]

12. During a monohybrid cross involving a tall pea plant with a dwarf pea plant, the offspring populations were tall and dwarf in equal ratio. Work out a cross to show how it is possible.



Note: (Similar cross shown in a Punnett square to be accepted)

[3 Marks]

13. 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]

14. 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, $2pq$ 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]

15. 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]

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

Ans. Selection of high yielding and diseases resistant breeds, housed well, adequate water supply, maintained disease free, feeding in a scientific manner, regular visits by veterinary doctors, regular inspection and record keeping, cleanliness and hygiene while milking and transport
(any six) = $\frac{1}{2} \times 6$

[3 Marks]

17. 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]

18. 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 oligonucleotide
- (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

$$\underbrace{i \rightarrow e \rightarrow b/g}_{=1} \rightarrow \underbrace{g/b \rightarrow c/h \rightarrow h/c}_{=1} \rightarrow \underbrace{f \rightarrow d \rightarrow a}_{=1}$$

$$\underbrace{a \rightarrow i \rightarrow e}_{=1} \rightarrow \underbrace{b/g \rightarrow g/b \rightarrow c/h}_{=1} \rightarrow \underbrace{h/c \rightarrow f \rightarrow d}_{=1}$$

Note: (Stop Marking where the sequence goes wrong)

[3 Marks]

19. 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]

20. 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]

21. How do snails, seeds, bears, zooplanktons, fungi and bacteria adapt to condition unfavorable for their survival?

Ans. Snail-aestivation = $\frac{1}{2}$

Seeds-dormancy/suspended metabolic activities = $\frac{1}{2}$

Bear-Hibernation = $\frac{1}{2}$

Zooplankton- diapause/suspended development = $\frac{1}{2}$

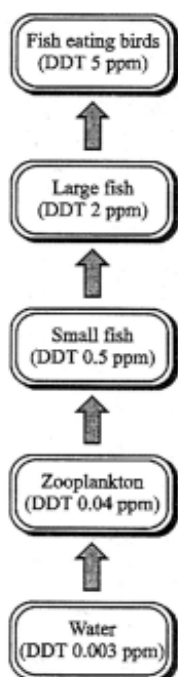
Fungi-Spore/Zygospore = $\frac{1}{2}$

Bacteria-Cyst/spore = $\frac{1}{2}$

[3 Marks]

22. With help of a flow chart, show the phenomenon of biomagnifications of DDT in an aquatic food chain.

Ans.



5 stages- $\frac{1}{2}$ Mark each ($\frac{1}{2} \times 5$) the flow chart should show arrows in correct direction with increasing levels of DDT = ($\frac{1}{2}$)

[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) 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.

- 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]

25. (a) **Why are thalassemia and haemophilia categorized as Mendelian disorders? Write the symptoms of these diseases .Explain their pattern of inheritance in humans.**
- (b) **Write the genotypes of the normal parents producing a hemophilic son.**

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

symptoms

thalassemia -anaemia (caused due to defective/abnormal Hb),

haemophilia -non stop bleeding even in minor injury = $\frac{1}{2} \times 2$

pattern of inheritance-

thalassemia autosomal recessive inheritance pattern, inherited from heterozygous/parent carrier
= $\frac{1}{2} \times 2$

haemophilia- X linked recessive inheritance, inherited from a haemophilic father/carrier mother
(females are rarely haemophilic) = $\frac{1}{2} \times 2$

(b) $X^h X$ -Mother = $\frac{1}{2}$

XY-Father = $\frac{1}{2}$

[5 Marks]

OR

How do m-RNA , t-RNA and ribosomes help in the process of translation?

Ans. mRNA provides a template,with codons for specific amino acids to be linked to form a polypeptide/protein = $\frac{1}{2} + \frac{1}{2}$

tRNA brings amino acid to the ribosomes, reads the genetic code with the help of its anti-codons, initiator tRNA is responsible for starting polypeptide formation in the ribosomes, tRNAs are specific for each amino acid = $\frac{1}{2} \times 4$

Ribosomes-(Cellular factories for proteins synthesis) its smaller sub unit binds with mRNA to initiate protein synthesis at the start codon/AUG , in its larger sub unit there are two sites present which brings two amino acids close to each other helping them to form peptide bond, ribosomes moves from codon to codon along mRNA, amino acids are added one by one to form polypeptide/protein
= $\frac{1}{2} \times 4$

[5 Marks]

26. (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 = $\frac{1}{2} \times 2$

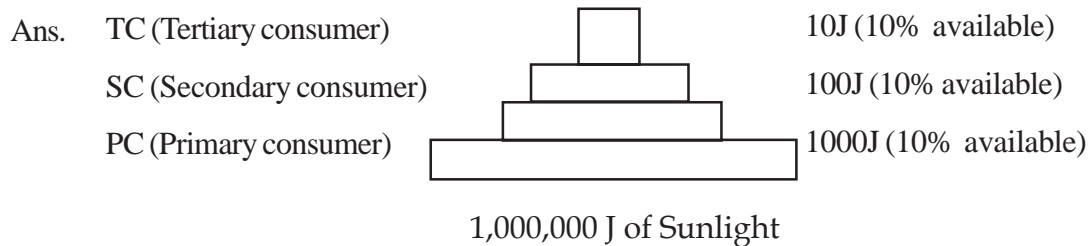
4. Indirect estimation , e.g without actually counting/seeing them e.g tiger census based on pugmarks and fecal pellets = $\frac{1}{2} \times 2$

(Any three)

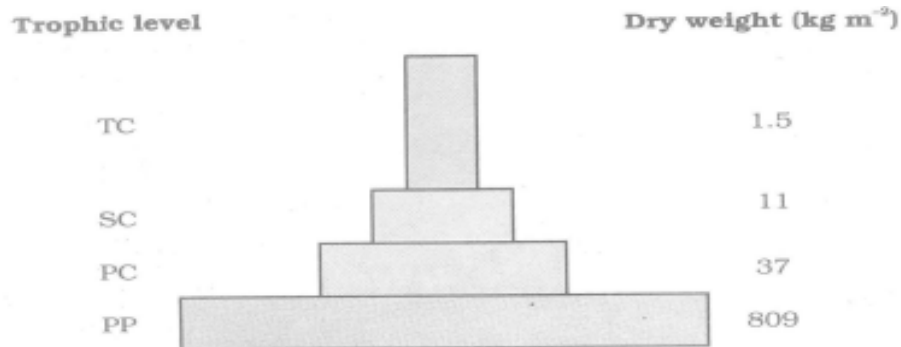
[5 Marks]

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.



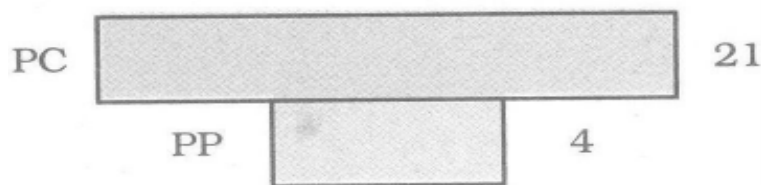
Upright Pyramid of Energy : e.g of any Grassland food chain depicting energy transfer at each trophic level = 1+1



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]