

Series ONS

SET-1

कोड नं. **57/1**
Code No.

रोल नं.

--	--	--	--	--	--	--

Roll No.

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

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

- कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ 11 हैं।
- प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए कोड नम्बर को छात्र उत्तर-पुस्तिका के मुख-पृष्ठ पर लिखें।
- कृपया जाँच कर लें कि इस प्रश्न-पत्र में 26 प्रश्न हैं।
- कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, प्रश्न का क्रमांक अवश्य लिखें।
- इस प्रश्न-पत्र को पढ़ने के लिए 15 मिनट का समय दिया गया है। प्रश्न-पत्र का वितरण पूर्वाह्न में 10.15 बजे किया जाएगा। 10.15 बजे से 10.30 बजे तक छात्र केवल प्रश्न-पत्र को पढ़ेंगे और इस अवधि के दौरान वे उत्तर-पुस्तिका पर कोई उत्तर नहीं लिखेंगे।
- Please check that this question paper contains 11 printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains 26 questions.
- **Please write down the Serial Number of the question before attempting it.**
- 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

जीव विज्ञान (सैद्धान्तिक)

BIOLOGY (Theory)

निर्धारित समय : 3 घण्टे
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 प्रकार I के हैं, प्रत्येक प्रश्न 2 अंकों का है।
- (iv) खण्ड C में प्रश्न संख्या 11 से 22 लघु-उत्तरीय प्रश्न प्रकार II के हैं, प्रत्येक प्रश्न 3 अंकों का है।
- (v) खण्ड D में प्रश्न संख्या 23 मूल्य आधारित प्रश्न 4 अंकों का है।
- (vi) खण्ड E में प्रश्न संख्या 24 से 26 दीर्घ-उत्तरीय प्रश्न हैं, प्रत्येक प्रश्न 5 अंकों का है।
- (vii) प्रश्न-पत्र में समग्र पर कोई विकल्प नहीं है, फिर भी 2 अंकों वाले एक प्रश्न में, 3 अंकों वाले एक प्रश्न में और 5 अंकों वाले सभी तीनों प्रश्नों में भीतरी चयन-विकल्प दिए गए हैं। प्रत्येक परीक्षार्थी को ऐसे प्रश्नों के दो विकल्पों में से कोई एक प्रश्न हल करना है।

General Instructions :

- (i) There are a total of 26 questions and five sections in the question paper. All questions are compulsory.
- (ii) Section A contains questions number 1 to 5, very short-answer type questions of 1 mark each.
- (iii) Section B contains questions number 6 to 10, short-answer type I questions of 2 marks each.
- (iv) Section C contains questions number 11 to 22, short-answer type II questions of 3 marks each.
- (v) Section D contains question number 23, value based question of 4 marks.
- (vi) Section E contains questions number 24 to 26, long-answer type questions of 5 marks each.
- (vii) There is no overall choice in the question paper, however, an internal choice is provided in one question of 2 marks, one question of 3 marks and all the three questions of 5 marks. In these questions, an examinee is to attempt any one of the two given alternatives.

खण्ड - A
SECTION - A

1. नर मधुमक्खी में 16 गुणसूत्र होते हैं जबकि उसकी मादा में 32 गुणसूत्र होते हैं। एक कारण बताइए। 1

A male honeybee has 16 chromosomes whereas its female has 32 chromosomes.
Give one reason.

2. MOET में 'आनुवंशिक माँ' की भूमिका की चर्चा कीजिए। 1

Mention the role of 'genetic mother' in MOET.

3. "जैव चोरी" क्या होती है? 1

What is biopiracy ?

4. मोटर गाड़ियों के ईंधन में डीजल के स्थान पर CNG को वरीयता दिए जाने के दो लाभ बताइए। 1

Mention two advantages for preferring CNG over diesel as an automobile fuel.

5. होमो हैबिलिस और होमो इरेक्टस की आहार-प्रवृत्तियों में संभावी अंतर बताइए। 1

Write the probable differences in eating habits of *Homo habilis* and *Homo erectus*.

खण्ड - B
SECTION - B

6. आपके रसोई-उद्यान में मटर के एक एकल पौधे में जीवनक्षम बीजों की फ़लियाँ उगती हैं, किंतु पपीते के एकल पौधे में ऐसा नहीं होता। व्याख्या कीजिए। 2

A single pea plant in your kitchen garden produces pods with viable seeds, but the individual papaya plant does not. Explain.

7. नीचे आनुवंशिक कोडों के लक्षण दिए गए हैं। इनमें से प्रत्येक किसका संकेत देता है? 2

रोध कोडोन, असंदिग्ध कोडोन, अपह्रासित कोडोन, सार्वभौमिक कोडोन।

Following are the features of genetic codes. What does each one indicate ?

Stop codon; Unambiguous codon; Degenerate codon; Universal codon.

8. पारम्परिक पादप-प्रजनन प्रौद्योगिकी द्वारा रोग-प्रतिरोधी पौधे को उत्पाद करने के चार महत्वपूर्ण चरणों का सुझाव दीजिए। 2

Suggest four important steps to produce a disease resistant plant through conventional plant breeding technology.

9. बैक्यूलोवायरस के जीनस का नाम बताइए। इन्हें उत्तम जैवनियंत्रक कारक क्यों माना जाता है? 2

Name a genus of baculovirus. Why are they considered good biocontrol agents ?

10. समतापमंडल में CFC's और ओजोन के बीच परस्पर संबंध की व्याख्या कीजिए। 2

अथवा

पवित्र उपवन अत्यधिक रक्षित क्यों होते हैं ?

Explain the relationship between CFC's and Ozone in the stratosphere.

OR

Why are sacred groves highly protected ?

खण्ड - C
SECTION - C

11. (a) उस कार्बनिक पदार्थ का नाम बताइए जो पराग-कण के बाह्यचोल का निर्माण करता है। 3
यह पदार्थ पराग-कण के लिए किस प्रकार उपयोगी है?
- (b) हालांकि यह देखा जाता है कि यह पदार्थ पराग-कण के चारों तरफ़ एक सतत परत नहीं बनाता। कारण बताइए।
- (c) 'पराग बैंक' किस प्रकार उपयोगी होती हैं?

अथवा

- (a) उन समस्याओं की चर्चा कीजिए जिनका समाधान जनन एवं शिशु-स्वास्थ्य कल्याण कार्यक्रम के द्वारा किया जाता है।
- (b) उल्वबेधन क्या होता है? इस पर वैधानिक प्रतिबंध क्यों लगाया गया है?
- (a) Name the organic material exine of the pollen grain is made up of . How is this material advantageous to pollen grain ?
- (b) Still it is observed that it does not form a continuous layer around the pollen grain. Give reason.
- (c) How are 'pollen banks' useful ?

OR

- (a) Mention the problems that are taken care of by Reproduction and Child Health Care programme.
- (b) What is amniocentesis and why there is a statutory ban on it ?

12. परीक्षार्थ क्रॉस क्या होता है? इससे पौधे की विषमयुग्मजता का पता निश्चय रूप से किस प्रकार लगाया जा सकता है? 3

What is a test cross ? How can it decipher the heterozygosity of a plant ?

13. (a) मानव जीनोम परियोजना (HGP) में इस्तेमाल किए जाने वाले 'YAC' और 'BAC' में 'Y' और 'B' किसके लिए प्रयुक्त होते हैं? परियोजना में उनकी भूमिका बताइए। 3

(b) सकल मानव जीनोम की प्रतिशतता लिखिए जो प्रोटीनों का कूटलेखन (कोडन) करती है और खोजे गए उन जीनों की प्रतिशतता भी बताइए। जिनके कार्य भी विदित हैं, जैसे कि HGP के दौरान देखे गए।

(c) HGP में वैज्ञानिकों द्वारा पहचाने गए 'SNP' का पूरा-पूरा नाम लिखिए।

(a) What do 'Y' and 'B' stand for in 'YAC' and 'BAC' used in Human Genome Project (HGP). Mention their role in the project.

(b) Write the percentage of the total human genome that codes for proteins and the percentage of discovered genes whose functions are known as observed during HGP.

(c) Expand 'SNPs' identified by scientists in HGP.

14. समजातता और समवृत्तता में अंतर बताइए। दोनों का एक-एक उदाहरण दीजिए। 3

Differentiate between homology and analogy. Give one example of each.

15. (a) यह सामान्य रूप से देखा जाता है कि जिन बच्चों को उनके बचपन में छोटी माता का संक्रमण हो जाता है, हो सकता है कि उनकी वयस्कावस्था में यह रोग नहीं हो। किसी व्यक्ति में ऐसी प्रतिरक्षा के आधार का कारण बताते हुए व्याख्या कीजिए। इस प्रकार के प्रतिरक्षा का नाम बताइए। 3

(b) इंटरफ़ेरॉन क्या होते हैं? उनकी भूमिका बताइए।

(a) It is generally observed that the children who had suffered from chicken - pox in their childhood may not contract the same disease in their adulthood. Explain giving reasons the basis of such an immunity in an individual. Name this kind of immunity.

(b) What are interferons ? Mention their role.

16. (a) उन परम्परागत प्रजनन तकनीकों की दो सीमाएँ बताइए जो सूक्ष्म प्रवर्धन को बढ़ावा देती हैं। 3
 (b) सूक्ष्म प्रवर्धन के दो लाभ बताइए।
 (c) दो उदाहरण दीजिए जहाँ इस विधि को व्यापारिक स्तर पर अपनाया जाता है।
 (a) Write the two limitations of traditional breeding technique that led to promotion of micro propagation.
 (b) Mention two advantages of micro propagation.
 (c) Give two examples where it is commercially adopted.
17. (a) जैव किसान पीढ़ियों का नियंत्रण किस प्रकार करते हैं? दो उदाहरण दीजिए। 3
 (b) परंपरागत पीढ़ी-नियंत्रण विधियों और उपरोक्त किसानों के उपागम में अंतर बताइए।
 (a) How do organic farmers control pests ? Give two examples.
 (b) State the difference in their approach from that of conventional pest control methods.
18. (a) क्लोनिंग वेक्टर (संवाहक) pBR322 में वरण योग्य चिह्नक का नाम बताइए। इनकी भूमिका की भी चर्चा कीजिए। 3
 (b) ऊपर बताए गए चिह्नों की तुलना में एंजाइम β गैलैक्टोसाइडेज के कोडिंग अनुक्रम का एक वरण योग्य चिह्नक माना जाता है, क्यों?
 (a) Name the selectable markers in the cloning vector pBR322 ? Mention the role they play.
 (b) Why is the coding sequence of an enzyme β -galactosidase a preferred selectable marker in comparison to the ones named above ?
19. (a) जैवप्रौद्योगिकी के प्रयोगों में कोशिका को “सक्षम” बनाया जाता है। ऐसा करने में कैल्सियम आयन किस प्रकार सहायता करता है? 3
 (b) जैवप्रौद्योगिकी प्रयोगों में “जैवप्राक्षेपिक (जीन) गन” की भूमिका बताइए।
 (a) Why must a cell be made ‘competent’ in biotechnology experiments ? How does calcium ion help in doing so ?
 (b) State the role of ‘biolistic gun’ in biotechnology experiments.

20. ऐडेनोजीन डिऐमीनेज़ न्यूनता के उपचार में एंजाइम-प्रतिस्थापन चिकित्सा की व्याख्या कीजिए। 3
 इस विधि के दो नुकसान बताइए।
 Explain enzyme-replacement therapy to treat adenosine deaminase deficiency.
 Mention two disadvantages of this procedure.
21. मिक्सोराइजा में पाए जाने वाले तथा पशु ईग्रेट और पशु के बीच पाए जाने वाली पारस्परिक 3
 क्रिया का नाम बताइए तथा इस प्रकार के संबंध की व्याख्या भी कीजिए।
 Name and explain the type of interaction that exists in mycorrhizae and
 between cattle egret and cattle.
22. प्राथमिक और द्वितीयक अनुक्रम में अंतर बताइए। दोनों का एक-एक उदाहरण भी दीजिए। 3
 Differentiate between primary and secondary succession. Provide one example
 of each.

खण्ड - D SECTION - D

23. दुनिया भर में ऐसे अनेक विवाहित दंपति हैं जो निःसंतान हैं। यह जानकर दुःख होता है कि 4
 भारतवर्ष में दंपति के निःसंतान होने के लिए स्त्री को ही दोषी ठहराया जाता है।
- (a) भारतवर्ष में इन परिस्थितियों में प्रायः स्त्री को ही दोषी क्यों माना जाता है? अपना मत प्रस्तुत कीजिए। ऐसे कोई दो मूल्य बताइए जो एक जीव विज्ञान छात्र होने के नाते आप इस सामाजिक बुराई को दूर करने के लिए प्रोत्साहित करेंगे।
- (b) अनुर्वरता के लिए उत्तरदायी कोई दो कारण बताइए।
- (c) उन परिस्थितियों में जहाँ पुरुष दोषी है, एक तकनीक का सुझाव दीजिए जिससे दंपति को संतति प्राप्त करने में सहायता मिल सके।

A large number of married couples the world over are childless. It is shocking to know that in India the female partner is often blamed for the couple being childless.

- (a) Why in your opinion the female partner is often blamed for such situations in India ? Mention any two values that you as a biology student can promote to check this social evil.
- (b) State any two reasons responsible for the cause of infertility.
- (c) Suggest a technique that can help the couple to have a child where the problem is with the male partner.

खण्ड - E
SECTION - E

24. (a) स्त्री में आर्तव प्रावस्था की व्याख्या कीजिए। इस प्रावस्था के दौरान अंडाशयी और पिट्यूटरी हार्मोनों के स्तरों की चर्चा कीजिए। 5
- (b) आर्तव-चक्र की पुटकीय प्रावस्था को प्रचुरोद्भवनी प्रावस्था भी क्यों कहते हैं? व्याख्या कीजिए।
- (c) अंडोत्सर्ग के समय और उसके बाद ग्राफी पुटक में होने वाली घटनाओं की व्याख्या कीजिए।
- (d) ग्राफी पुटक का आरेख बनाइए तथा उसमें गह्वर (antrum) तथा द्वितीयक अंडक का नामांकन कीजिए।

अथवा

- (a) जीव विज्ञान के एक वरिष्ठ विद्यार्थी होने के नाते आपको कहा गया है कि आप अपने स्कूल के सेकेन्डरी स्तर के छात्रों को उन क्रियाविधियों का निदर्शन करें जिनसे उन्हें एक उभयलिंगी फूल में पर-परागण स्पष्टतः समझ में आ जाए। आपके द्वारा सुझाए गए विभिन्न चरणों की सूची बनाइए तथा उनमें से प्रत्येक चरण के लिए कारण भी बताइए।
- (b) एक आवृत्तबीजी पौधे के गुरु बीजाणु धानी की काट का आरेख बनाइए, तथा उसमें फ्यूनिकुलस, सूक्ष्मद्वार, भ्रूणकोष और गुरुबीजाणु द्वितीयक (न्यूसेलस) का नामांकन कीजिए।
- (a) Explain the menstrual phase in a human female. State the levels of ovarian and pituitary hormones during this phase.
- (b) Why is follicular phase in the menstrual cycle also referred as proliferative phase ? Explain.
- (c) Explain the events that occur in a graafian follicle at the time of ovulation and thereafter.
- (d) Draw a graafian follicle and label antrum and secondary oocyte.

OR

- (a) As a senior biology student you have been asked to demonstrate to the students of secondary level in your school, the procedure(s) that shall ensure cross-pollination in a hermaphrodite flower. List the different steps that you would suggest and provide reasons for each one of them.
- (b) Draw a diagram of a section of a megasporangium of an angiosperm and label funiculus, micropyle, embryo sac and nucellus.

25. सन् 1958 में *E.Coli* पर मेसेल्स एवं स्टाल द्वारा किए गए प्रयोग का वर्णन कीजिए। प्रयोग के बाद वे जिस निष्कर्ष पर पहुँचे उसे लिखिए। 5

अथवा

- (a) बैक्टीरिया में होने वाली प्रतिकृतियन-प्रक्रिया का वर्णन कीजिए।
(b) सुकेन्द्रकियों में क्रियात्मक mRNA बनने से पहले hnRNA को जिस प्रक्रिया से होकर गुजरना पड़ता है उसे लिखिए।

Describe Meselson and Stahl's experiment that was carried in 1958 on *E.Coli*. Write the conclusion they arrived at after the experiment.

OR

- (a) Describe the process of transcription in bacteria.
(b) Explain the processing the hnRNA needs to undergo before becoming functional mRNA in eukaryotes.

26. (a) उन दो वृद्धि मॉडलों के नाम बताइए जो समष्टि वृद्धि का निरूपण करते हैं, तथा इन मॉडलों द्वारा क्रमशः निरूपित वृद्धि वक्रों का आरेख बनाइए। 5
(b) इन वक्रों की आकृति में आने वाले अंतर का आधार बताइए।
(c) आज मानव जनसंख्या वृद्धि का निरूपण उपरोक्त दो वक्रों में से कौन-से वक्र द्वारा होता है? आप क्या सोचते हैं कि क्या यह वक्र लंबी अवधि तक बना रह सकता है? अपने उत्तर के समर्थन में कारण बताइए।

अथवा

- (a) छोटे-से तालाब के उदाहरण की सहायता से व्याख्या कीजिए कि पारितंत्र के चार घटक एक इकाई की भांति कैसे कार्य करते हैं?
(b) तालाब में पायी जाने वाली खाद्य-शृंखला की किस्म का नाम लिखिए।

- (a) Name the two growth models that represent population growth and draw the respective growth curves they represent.
- (b) State the basis for the difference in the shape of these curves.
- (c) Which one of the curves represent the human population growth at present ? Do you think such a curve is sustainable ? Give reason in support of your answer.

OR

- (a) Taking an example of a small pond, explain how the four components of an ecosystem function as a unit.
- (b) Name the type of food chain that exists in a pond.

Question Paper Code 57/1

SECTION – A

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

1. A male honeybee has 16 chromosomes whereas its female has 32 chromosomes. Give one reason.

Ans Male Honey bee develops from unfertilized female gamete / unfertilised egg / Parthenogenesis of female gamete (16 chromosomes), female develops by fertilization / fertilised egg (32 chromosomes) = $\frac{1}{2} + \frac{1}{2}$

[1 Mark]

2. Mention the role of 'genetic mother' in MOET.

Ans Genetic mother is used to produce many eggs / for superovulation // 6-8 eggs (under the influence of FSH)

[1 Mark]

3. What is biopiracy ?

Ans Biopiracy is the use of bioresources by multinational companies and other organization without proper authorization/compensation payment to the concern country /organisation.

[1 Mark]

4. Mention two advantages for preferring CNG over diesel as an automobile fuel.

Ans Advantages of CNG-

- i) burns efficiently / less unburnt residues.
- ii) Cheaper than petrol / diesel.
- iii) Causes less pollution.
- iv) cannot be adulterated.
- v) cannot be siphoned by thieves. (any two) = $\frac{1}{2} \times 2$

[1 Mark]

5. Write the probable differences in eating habits of *Homo habilis* and *Homo erectus*.

Ans *Homo habilis* did not eat meat / vegetarian

Homo erectus ate meat (meat eater) = $\frac{1}{2} \times 2$

[1 Mark]

SECTION - B

Q Nos. 6-10 are of two marks each

6. A single pea plant in your kitchen garden produces pods with viable seeds, but the individual papaya plant does not. Explain.

Ans Pea- flowers of pea plants are bisexual , monoecious / self pollinated (to produce pods with viable seeds) = $\frac{1}{2} + \frac{1}{2}$

Papaya-Dioecious plant / unisexual plant bearing male and female flowers on separate plants, unable to produce viable seeds as there is no cross pollination / it could be a male plant which is unable to produce fruit and seeds = $\frac{1}{2} + \frac{1}{2}$

[1+1=2 Marks]

7. Following are the features of genetic codes. What does each one indicate ?

Stop codon; Unambiguous codon; Degenerate codon; Universal codon.

Ans Stop codon - does not code for any amino acid / terminates the synthesis of polypeptide chain

Unambiguous codon - one codon codes for one amino acid only

Degenerate codon - some amino acid are coded by more than one codon

Universal codon - genetic code is same for all organisms (bacteria to humans) = $\frac{1}{2} \times 4$

[2 Marks]

8. Suggest four important steps to produce a disease resistant plant through conventional plant breeding technology.

Ans Steps for producing disease resistant plants-

i) Screening of germplasm (for resistance sources)

ii) Hybridization of selected parents

iii) Selection and evaluation of hybrids

iv) Testing and release of new varieties = $\frac{1}{2} \times 4$

[2 Marks]

9. Name a genus of baculovirus. Why are they considered good biocontrol agents ?

Ans Nucleopolyhedrovirus = $\frac{1}{2}$

Species specific, narrow spectrum insecticidal application , no negative impact on non target organisms = $\frac{1}{2} \times 3$

[$\frac{1}{2} + 1\frac{1}{2} = 2$ Marks]

10. Explain the relationship between CFC's and Ozone in the stratosphere.

Ans UV rays act on CFC's , release Cl atom , which act on ozone to release O_2 , resulting in ozone layer depletion / causing ozone hole = $\frac{1}{2} \times 4$

[2 Marks]

OR

Why are sacred groves highly protected ?

Ans Sacred groves are highly protected - because of religious and cultural traditions , refuges for large number of rare and threatened plants / ecologically unique and biodiversity rich regions = 1+1

[2 Marks]

SECTION - C

Q Nos. 11-22 are of three marks each

11. (a) Name the organic material exine of the pollen grain is made up of. How is this material advantageous to pollen grain ?

(b) Still it is observed that it does not form a continuous layer around the pollen grain. Give reason.

(c) How are 'pollen banks' useful ?

Ans (a) Sporopollenin = $\frac{1}{2}$

Most resistant to high temperature / strong acids / alkali / no enzymes can degrade it (**any one**) = $\frac{1}{2}$

(b) (Germs pores) to allow pollen tube to emerge out / pollen germination = 1

(c) Helps in storing pollen grains for years / for crop breeding programmes = 1

[3 Marks]

OR

(a) **Mention the problems that are taken care of by Reproduction and Child Health Care programme.**

(b) **What is amniocentesis and why there is a statutory ban on it ?**

Ans (a) Uncontrolled population growth / social evil like sex abuse / sex related crime / STDs (**any two**) = $\frac{1}{2} \times 2$

(b) Foetal sex determination tests based on chromosomal pattern in the amniotic fluid / to study chromosomal abnormalities in the foetus = 1

Banned to legally check female foeticide = 1

[3 Marks]

12. What is a test cross ? How can it decipher the heterozygosity of a plant ?

Ans. - A cross to analyse whether genotype of dominant individual is homozygous or heterozygous = 1

- On crossing with a recessive parent , if 50% of progeny have dominant trait and 50% have recessive trait then the plant is said to be heterozygous = 1 + 1

//

The above value points can be considered with the help of a test cross = 1 + 1

[3 Marks]

13. (a) What do 'Y' and 'B' stand for in 'YAC' and 'BAC' used in Human Genome Project (HGP). Mention their role in the project.

(b) **Write the percentage of the total human genome that codes for proteins and the percentage of discovered genes whose functions are known as observed during HGP.**

(c) **Expand 'SNPs' identified by scientists in HGP.**

Ans. (a) - Y = Yeast = $\frac{1}{2}$

B = Bacterial = $\frac{1}{2}$

- Used as vector for cloning foreign DNA = $\frac{1}{2}$

(b) (<) 2% , (<) 50% = $\frac{1}{2} + \frac{1}{2}$

(c) Single Nucleotide Polymorphism = $\frac{1}{2}$

[3 Marks]

14. Differentiate between homology and analogy. Give one example of each.

Ans.	Homology	Analogy
	- Organisms having the same structure developed along different directions due to adaptations / different functions - Result of divergent evolution - Indicates common ancestry - Anatomically same structures	- Different structures having the same function (in different organisms) - Result of convergent evolution - Does not indicate common ancestry - Anatomically different structures

(Any two difference) = 1 + 1

Example

Forelimbs of whale - bats - cheetah - human //

Thorns of Bougainvillea - tendrils of cucurbits

Example

Wings of butterfly and birds //

Sweet potato and potato

(Any other correct example) = $\frac{1}{2} \times 2$

[3 Marks]

15. (a) It is generally observed that the children who had suffered from chicken - pox in their childhood may not contract the same disease in their adulthood. Explain giving reasons the basis of such an immunity in an individual. Name this kind of immunity.

(b) What are interferons ? Mention their role.

Ans. (a) The first infection of chicken pox produce a primary response and antibodies are generated against chicken pox virus , subsequent encounter with the same virus elicits a highly intensified secondary response , due to the memory cells formed during the first encounter , active immunity = $\frac{1}{2} \times 4$

(b) Proteins secreted by viral infected cells , which protects non infected cells from viral infection / when α - interferon is given to cancer patient (it activates immune system) , destroys tumour = $\frac{1}{2} \times 2$

[3 Marks]

16. (a) Write the two limitations of traditional breeding technique that led to promotion of micro propagation.

(b) Mention two advantages of micro propagation.

(c) Give two examples where it is commercially adopted.

Ans. (a) Failed to keep pace with demand , failed to provide fast and efficient system of crop improvement = $\frac{1}{2} \times 2$

(b) Large number of plants can be developed in a short duration / production of genetically identical plants / somaclones / healthy plants can be recovered from diseased plants

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

(c) Tomato / banana / apple **(Any two) = $\frac{1}{2} \times 2$**

[3 Marks]

17. (a) How do organic farmers control pests ? Give two examples.

(b) State the difference in their approach from that of conventional pest control methods.

Ans. (a) Natural predation / biological control = 1

Examples - lady bird used to kill aphids // dragon flies used to kill mosquitoes // *Bacillus thuringiensis* used to kill cotton bollworm / caterpillar / butterfly caterpillar

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

(b) Conventional Pest Control

- use of chemical insecticides & pesticides
- Harmful to non target organisms
- Cause environmental pollution

Organic farming based pest control

- No chemical used.
- Not harmful to non target organisms
- No adverse impact on environment

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

[3 Marks]

18. (a) Name the selectable markers in the cloning vector pBR322 ? Mention the role they play.

(b) Why is the coding sequence of an enzyme (β -galactosidase) a preferred selectable marker in comparison to the ones named above ?

Ans. (a) amp^R / ampicillin resistance genes , tet^R / tetracycline resistance gene = $\frac{1}{2} \times 2$

They help in identifying and eliminating non-transformants / non recombinants and selectively permitting the growth of the transformants / recombinants = 1

(b) Simpler process / less cumbersome , in the presence of chromogenic substrate recombinants are colourless and non recombinants are blue in colour = $\frac{1}{2} \times 2$

[3 Marks]

19. (a) Why must a cell be made 'competent' in biotechnology experiments ? How does calcium ion help in doing so ?

(b) State the role of 'biolistic gun' in biotechnology experiments.

Ans. (a) - To take up the (hydrophilic) DNA from the external medium = 1

- Divalent calcium ions increase the efficiency of DNA entering the cell through pores in the cell wall = 1

(b) To introduce alien DNA into the plant cell by bombarding them with high velocity microparticles (gold or tungsten coated with DNA) = 1

[3 Marks]

20. Explain enzyme-replacement therapy to treat adenosine deaminase deficiency. Mention two disadvantages of this procedure.

Ans. Functional adenosine deaminase is given to the patient by injection = 1

Disadvantages

- Therapy is not completely curative , periodic infusion of enzyme required = 1 + 1

[3 Marks]

21. Name and explain the type of interaction that exists in mycorrhizae and between cattle egret and cattle.

Ans. - Mutualism = $\frac{1}{2}$

Association between fungi and the root of higher plants, fungus absorbs essential nutrients from the soil and plant provides the fungi with energy yielding carbohydrates (both benefitted) = $\frac{1}{2} \times 2$

- Commensalism = $\frac{1}{2}$

Cattle stir up and flush out insects from the vegetation on which the egret feed, cattle is neither harmed nor benefitted / not effected = $\frac{1}{2} \times 2$

[3 Marks]

22. Differentiate between primary and secondary succession. Provide one example of each.

Ans.	Primary Succession	Secondary Succession
-	It begins with areas where no living organisms ever existed	- It begins in areas where natural biotic communities have been destroyed
-	Establishment of a biotic community is very slow	- Establishment of a biotic community is faster = 1×2
	<u>Example</u>	<u>Example</u>
	Newly cooled lava / bare rocks / newly created ponds or reservoir	- Abandoned farm lands / burnt or cut forests / lands that have been flooded = $\frac{1}{2} \times 2$

[3 Marks]

SECTION - D

Q No. 23 is of four mark

23. A large number of married couples the world over are childless. It is shocking to know that in India the female partner is often blamed for the couple being childless.

- (a) **Why in your opinion the female partner is often blamed for such situations in India ? Mention any two values that you as a biology student can promote to check this social evil.**
- (b) **State any two reasons responsible for the cause of infertility.**
- (c) **Suggest a technique that can help the couple to have a child where the problem is with the male partner.**

Ans. (a) Female partner is blamed due to social mind set / inequality of sexes / lack of awareness / male dominated society / any other relevant point **(Any two)** = $\frac{1}{2} \times 2$

- Awareness to be created that abnormality can occur in both male and females and infertility issues with suitable examples
 - Mutual respect towards both the partners in case of the problem and to find the remedy from medical experts instead of visiting quacks
 - Educate them to find the reason and not believe in superstitions **(Any two)** = $\frac{1}{2} \times 2$
- (b) Physical (abnormality in reproductive system), congenital, immunological or psychological **(Any two)** = $\frac{1}{2} \times 2$

- (c) Intra cytoplasmic sperm injection (ICSI) / artificial insemination (AI) / Intra uterine insemination (IUI) = 1

[4 Marks]

SECTION - E

Q Nos. 24-26 are of five marks each

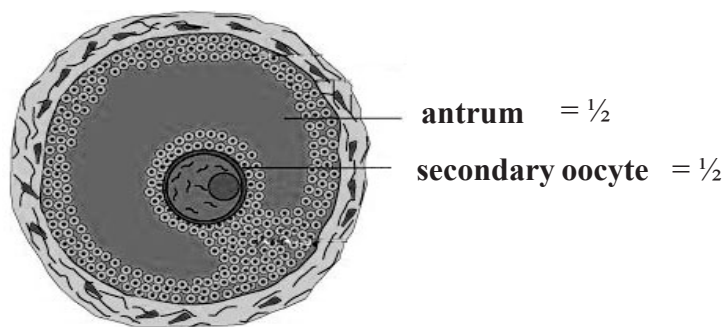
24. (a) Explain the menstrual phase in a human female. State the levels of ovarian and pituitary hormones during this phase.
- (b) Why is follicular phase in the menstrual cycle also referred as proliferative phase ? Explain.
- (c) Explain the events that occur in a graafian follicle at the time of ovulation and thereafter.
- (d) Draw a graafian follicle and label antrum and secondary oocyte.

Ans. (a) Menstrual phase occurs when released ovum not fertilised , break down of endometrial lining (of the uterus) and its blood vessel form the liquid that comes out through the vagina , lasts for 3 to 5 days = $\frac{1}{2} \times 3$

Level of ovarian and pituitary hormones fall = $\frac{1}{2}$
//

graphically represented

- (b) Primary follicle grows into graafian follicle under the influence of LH & FSH , regeneration of endometrium (under the influence of estrogen) = $\frac{1}{2} \times 2$
- (c) Graafian follicle ruptures to release the ovum (secondary oocyte) , remaining parts of the Graafian follicle transform into corpus luteum = $\frac{1}{2} \times 2$
- (d)



[5 Marks]

OR

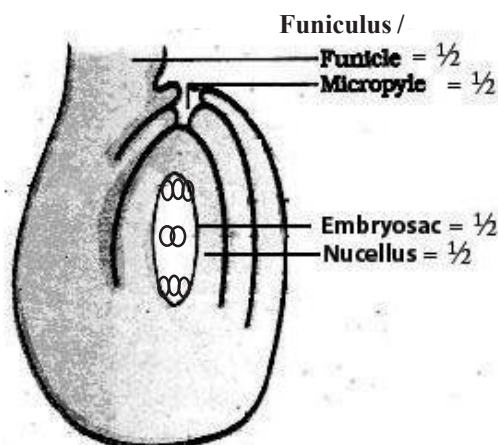
- (a) As a senior biology student you have been asked to demonstrate to the students of secondary level in your school, the procedure(s) that shall ensure cross-pollination in a hermaphrodite flower. List the different steps that you would suggest and provide reasons for each one of them.
- (b) Draw a diagram of a section of a megasporangium of an angiosperm and label funiculus, micropyle, embryo sac and nucellus.

Ans. (a) Emasculation , removal of anthers from the flower bud before the anther dehisce to avoid self pollination = $\frac{1}{2} + \frac{1}{2}$

Bagging , to prevent contamination of its stigma with unwanted pollen grains = $\frac{1}{2} + \frac{1}{2}$

Rebagging , the stigma of the mature ovary are dusted with desired pollen grains and rebagged to allow the fruit to develop = $\frac{1}{2} + \frac{1}{2}$

(b)

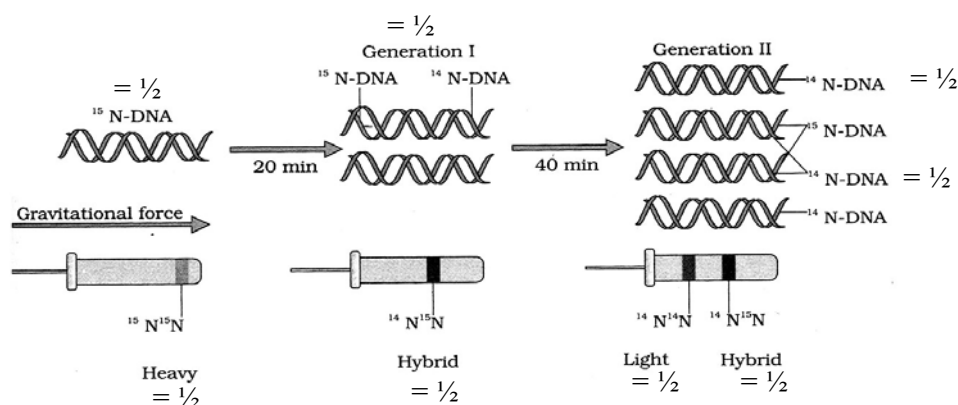


[5 Marks]

25. Describe Meselson and Stahl's experiment that was carried in 1958 on *E. coli*. Write the conclusion they arrived at after the experiment.

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

//



A correctly labelled diagrammatic representation in lieu of the explanation of experiment = $\frac{1}{2} \times 8$
DNA replication is semi conservative in nature = 1

OR

(a) Describe the process of transcription in bacteria.

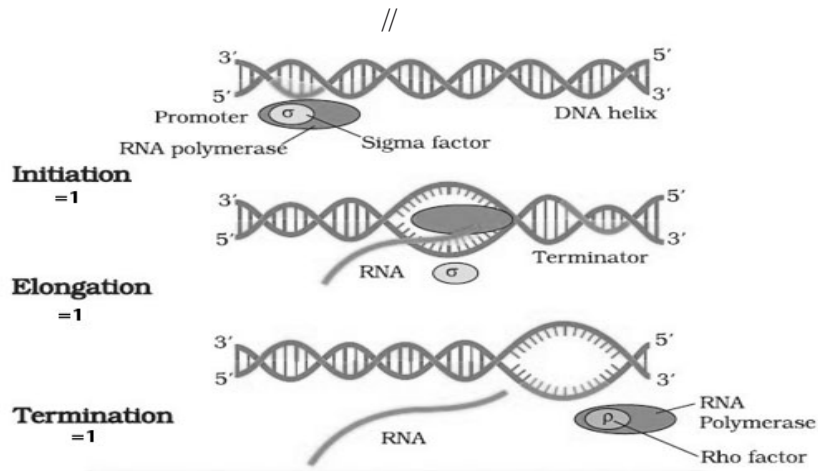
(b) Explain the processing the hnRNA needs to undergo before becoming functional mRNA in eukaryotes.

Ans. (a) Initiation : Enzyme(DNA dependent RNA polymerase)RNA polymerase binds with sigma factor (σ) and attaches to the promoter site ie 5' site of the DNA = 1

Elongation : When RNA polymerase moves from promoter to the terminator site it causes the polymerisation of nucleoside triphosphates / Nucleotides resulting in the formation of RNA (in

the 5'-3' direction)=1

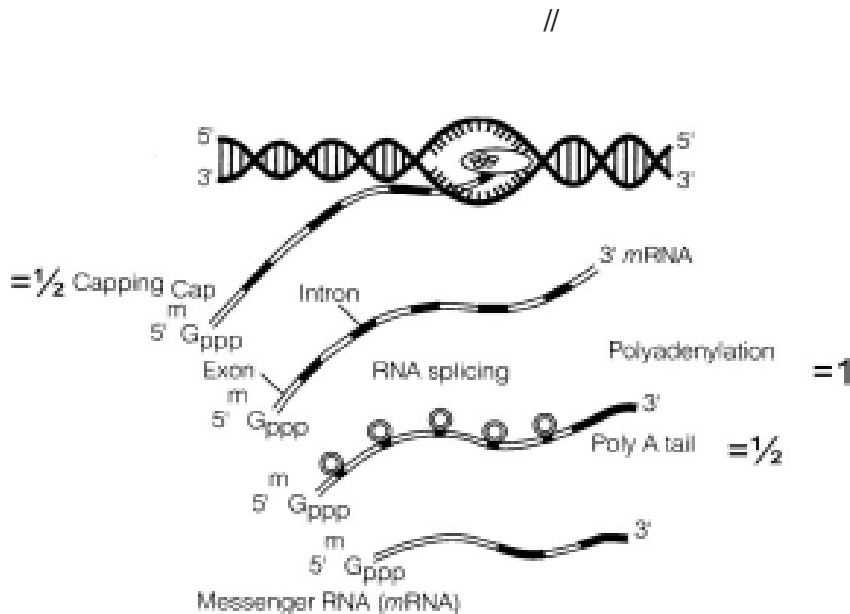
Termination : RNA Polymerase on reaching the terminator site binds to ρ factor and the (nascent transcribed) RNA falls off along with RNA polymerase=1



- (b) hnRNA undergoes splicing where introns are removed and exons are joined in a defined order = 1

hnRNA undergoes additional processing i.e capping (addition of methyl guanosine triphosphate to the 5'end) , tailing (200-300 poly adenylate residue are added to the 3' end.)

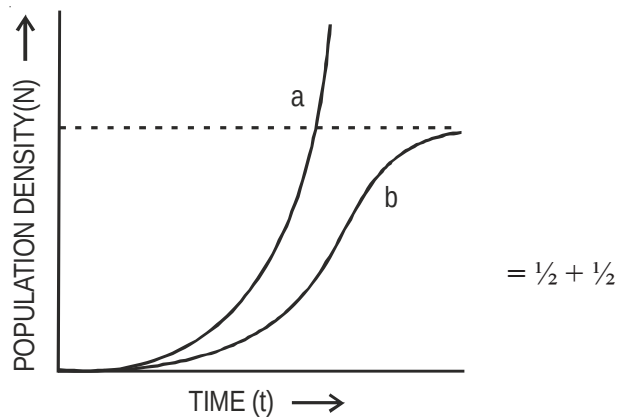
= $\frac{1}{2}$ + $\frac{1}{2}$



[5 Marks]

26. (a) Name the two growth models that represent population growth and draw the respective growth curves they represent.
- (b) State the basis for the difference in the shape of these curves.
- (c) Which one of the curves represent the human population growth at present ? Do you think such a curve is sustainable ? Give reason in support of your answer.

Ans (a) Exponential growth curve , logistics growth curve = $\frac{1}{2} + \frac{1}{2}$



a - exponential growth curve b - logistic growth curve

(b) Exponential growth - food resources and space unlimited ,

Logistic growth - food resources and space limited = $\frac{1}{2} + \frac{1}{2}$

(c) Exponential growth = 1

not sustainable , as resources are limited / carrying capacity. = $\frac{1}{2} + \frac{1}{2}$

[5 Marks]

OR

(a) Taking an example of a small pond, explain how the four components of an ecosystem function as a unit.

(b) Name the type of food chain that exists in a pond.

(a) Productivity - conversion of inorganic substances into organic material with the help of radiant energy / sunlight by the autotrophs / producers (phytoplankton , algae , floating ,submerged plants) =1

Decomposition - decomposers (fungi , bacteria , flagellates) breakdown dead decayed organic matter into simpler compounds =1

Energy Flow - Unidirectional movement of energy towards higher trophic levels (producer to consumer) and its dissipation and loss as heat to the environment =1

Nutrient cycle- Mineralisation of dead matter to release them back for reuse of autotrophs =1

(b) Grazing food chain / detritus food chain =1

[5 Marks]