SET – 3

Series : SSO/1

कोड नं.
Code No. 57/1/3

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 **8** हैं ।
- प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए कोड नम्बर को छात्र उत्तर-पुस्तिका के मुख-पृष्ठ पर लिखें ।
- कृपया जाँच कर लें कि इस प्रश्न-पत्र में **26** प्रश्न हैं ।
- **कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, प्रश्न का क्रमांक अवश्य लिखें ।**
- इस प्रश्न-पत्र को पढ़ने के लिए 15 मिनट का समय दिया गया है । प्रश्न-पत्र का वितरण पूर्वाह्न में 10.15 बजे किया जायेगा । 10.15 बजे से 10.30 बजे तक छात्र केवल प्रश्न-पत्र को पढ़ेंगे और इस अवधि के दौरान वे उत्तर-पुस्तिका पर कोई उत्तर नहीं लिखेंगे ।
- Please check that this question paper contains **8** printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains **26** questions.
- **Please write down the Serial Number of the question before attempting it.**
- 15 minutes time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

जीव विज्ञान (सैद्धान्तिक)

BIOLOGY (Theory)

निर्धारित समय : 3 घंटे] *[अधिकतम अंक : 70*

Time allowed : 3 hours] *[Maximum Marks : 70*

सामान्य निर्देश :

(i) *प्रश्न-पत्र में **पाँच** खण्डों में **26** प्रश्न दिए गए हैं । **सभी** प्रश्न अनिवार्य हैं ।*

(ii) *खण्ड – **क** में प्रश्न संख्या **1** से **5** अति लघुत्तर प्रश्न हैं । प्रत्येक प्रश्न **एक** अंक का है ।*

(iii) *खण्ड – **ख** में प्रश्न संख्या **6** से **10** लघुत्तर प्रश्न **I** प्रकार के हैं । प्रत्येक प्रश्न **दो** अंक का हैं ।*

(iv) *खण्ड – **ग** में प्रश्न संख्या **11** से **22** लघुत्तर प्रश्न **II** प्रकार के हैं । प्रत्येक प्रश्न **तीन** अंक का हैं ।*

(v) *खण्ड – **घ** में प्रश्न संख्या **23** मूल्याधारित प्रश्न **चार** अंकों का हैं ।*

(vi) *खण्ड – **ङ** में प्रश्न संख्या **24** से **26** दीर्घ उत्तर प्रश्न हैं, प्रत्येक प्रश्न **पाँच** अंक का है ।*

(vii) *प्रश्न-पत्र में कोई समग्र पर विकल्प नहीं है, फिर भी दो अंक के एक प्रश्न, तीन अंक के एक प्रश्न और पाँच अंकों के तीन प्रश्नों के भीतरी विकल्प दिए गए हैं । प्रत्येक परीक्षार्थी को ऐसे प्रश्नों के दो विकल्पों में से 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 question number **1** to **5**, Very Short Answer type questions of **one** mark each.*

(iii) *Section **B** contains question number **6** to **10**, Short Answer type **I** questions of **two** marks each.*

(iv) *Section **C** contains question number **11** to **22**, Short Answer type **II** questions of **three** marks each.*

(v) *Section **D** contains question number **23**, Value Based Question of **four** marks.*

(vi) *Section **E** contains question number **24** to **26**, Long Answer type questions of **five** marks each.*

(vii) *There is no overall choice in the question paper, however, an internal choice is provided in **one** question of **two** marks, **one** question of **three** marks and all **three** questions of **five** marks. An examinee is to attempt any **one** of the questions out of the **two** given in the question paper with the same question number.*

खण्ड – क

SECTION – A

1. केन्द्रक में क्रोमैटिन के अनुलेखन रूप से सक्रिय क्षेत्र का नाम बताइए । **1**

   Name the transcriptionally active region of chromatin in a nucleus.

2. जीवधारियों में पाए जाने वाली विविधताओं और वंशागति के प्रतिमानों के अध्ययन में दिलचस्पी रखने वाला एक आनुवंशिकीविद् अपने प्रयोगों के लिए ऐसे जीवों को वरीयता देता है जिनका जीवन-चक्र अपेक्षाकृत कम अवधि में पूरा हो जाता है । कारण बताइए । **1**

   A geneticist interested in studying variations and patterns of inheritance in living beings prefers to choose organisms for experiments with shorter life cycle. Provide a reason.

3. जैव (संपदा) चोरी (बायोपाइरेसी) क्या है ? **1**

   What is Biopiracy ?

4. इंग्लैंड में औद्योगिकीकरण काल के दौरान वृक्षों के तने पर पाए लाइकेनों की कमी होने के फलस्वरूप गहरे रंग के शलभों की समष्टि में वृद्धि हो जाने का कारण बताइए । **1**

   State a reason for the increased population of dark coloured moths coinciding with the loss of lichens (on tree barks) during industrialization period in England.

5. X-रे आदि का प्रयोग करते हुए बिना सोचे-विचारे की जाने वाली नैदानिक पद्धतियों से बचना चाहिए । कोई एक कारण बताइए । **1**

   Indiscrimate diagnostic practices using X-rays etc., should be avoided. Give one reason.

खण्ड – ख
SECTION – B

6. 'ZZ' और 'XY' प्रकार की लिंग-निर्धारण प्रक्रियाओं में अंतर बताइए । **2**

Differentiate between 'ZZ' and 'XY' type of sex-determination mechanisms.

7. एक बंध्य दंपति को "टेस्ट ट्यूब बेबी" कार्यक्रम अपनाने की सलाह दी गयी है । इस प्रकार की तकनीकों में प्रयुक्त दो प्रमुख क्रियाविधियों का वर्णन कीजिए । **2**

An infertile couple is advised to adopt test-tube baby programme. Describe two principle procedures adopted for such technologies.

8. अनेक अलवण जलीय जंतु समुद्री वातावरण में जीवित नहीं रह पाते । व्याख्या कीजिए । **2**

अथवा

उत्पादकता, सकल उत्पादकता, शुद्ध प्राथमिक उत्पादकता और द्वितीयक उत्पादकता में परस्पर क्या संबंध है ?

Many fresh water animals can not survive in marine environment. Explain.

OR

How are productivity, gross productivity, net primary productivity and secondary productivity interrelated ?

9. जैव-पुष्टिकरण (बायोफॉर्टिफिकेशन) प्रक्रिया द्वारा मानव जनसंख्या के स्वास्थ्य-संबंधी लाभों के लिए विभिन्न फसलों की पोषण-गुणवत्ता को बेहतर बनाने के लिए किन्हीं चार उद्देश्यों की चर्चा कीजिए । **2**

Enumerate four objectives for improving the nutritional quality of different crops for the health benefits of the human population by the process of "Biofortification".

10. निम्नलिखित सूक्ष्मजीवियों में से प्रत्येक की सहायता से मानव-कल्याण के लिए प्राप्त एक-एक उत्पाद की चर्चा कीजिए :

(a) LAB
(b) सैकैरोमाइसीज़ सेरेविसिआई
(c) प्रोपिओनिबैक्टीरियम शर्मानिआई
(d) ऐस्पर्जिलस नाइगर **2**

Mention a product of human welfare obtained with the help of each one of the following microbes :

(a) LAB
(b) Saccharomyces cerevisiae
(c) Propionibacterium sharmanii
(d) Aspergillus niger

खण्ड – ग
SECTION – C

11. मानव में प्रसव प्रक्रिया का वर्णन कीजिए । **3**

Describe the process of Parturition in humans.

12. एक ऐंजिओस्पर्मी पौधे में दोहरे निषेचन के बाद एंडोस्पर्म (भ्रूणपोष) के परिवर्धन का वर्णन कीजिए । भ्रूणपोष का परिवर्धन युग्मज के परिवर्धन से पहले क्यों होता है ? **3**

Describe the development of endosperm after double fertilization in an angiosperm. Why does endosperm development preceeds that of zygote ?

13. गैलापैगोस द्वीप पर छोटे आकार के काले पक्षियों की विविध किस्मों को देखने पर चार्ल्स डार्विन द्वारा की गयी व्याख्या को समझाकर बताइए । **3**

Explain the interpretation of Charles Darwin when he observed a variety of smallblack birds on Galapagos Islands.

14. एक अध्यापक अपने विद्यार्थियों से उनके स्कूल में उग रहे बैंगनी रंग के पुष्पों वाले मटर के पौधों का जीनप्ररूप ज्ञात करने को कहते हैं । उस संकरण का नाम बताइए तथा उसकी व्याख्या भी कीजिए जिसके द्वारा यह संभव किया जा सके । **3**

A teacher wants his/her students to find the genotype of pea plants bearing purple coloured flowers in their school garden. Name and explain the cross that will make it possible.

15. (a) DNA के एक खंड में कुल 2,000 न्यूक्लियोटाइड हैं, जिनमें से 520 पर ऐडनिन लगे हैं । DNA के इस खंड में कितने प्यूरीन बेस विद्यमान हैं ? **3**

(b) अपने उत्तर की पुष्टि के लिए DNA-खंड के इस भाग का एक आरेखी चित्र बनाइए ।

(a) A DNA segment has a total of 2,000 nucleotides, out of which 520 are adenine containing nucleotides. How many purine bases this DNA segment possesses ?

(b) Draw a diagrammatic sketch of a portion of DNA segment to support your answer.

16. औषधिविज्ञान के क्षेत्र में पुनर्योगज DNA-प्रौद्योगिकी का बहुत महत्त्व है । एक प्रवाह चार्ट की सहायता से बताइए कि यह प्रौद्योगिकी आनुवंशिकत: निर्मित मानव इंसुलिन के निर्माण में किस प्रकार प्रयुक्त की जाती है । **3**

Recombinant DNA-technology is of great importance in the field of medicine. With the help of a flow chart, show how this technology has been used in preparing genetically engineered human insulins.

17. दंड विलोडक हौज बायोरिएक्टर (स्पार्जड-स्टिर्ड-टैंक बायोरिक्टर) का एक नामांकित आरेख बनाइए । इसका अनुप्रयोग भी बताइए । **3**

Draw a labelled sketch of sparged-stirred-tank bioreactor. Write its application.

18. दो रेलगाड़ियों में भिड़ंत होने के कारण बड़ी संख्या में यात्रियों की मृत्यु हो गयी । इनमें से अधिकांश यात्रियों की पहचान भी संभव नहीं थी । अधिकारीगण मृत व्यक्तियों को उनके परिजनों को सौंपना चाहते हैं । इसके लिए एक आधुनिक वैज्ञानिक विधि का नाम बताइए और उस क्रियाविधि को भी लिखिए जिससे रिश्तेदारों की पहचान में सहायता मिल सके । **3**

Following the collision of two trains a large number of passengers are killed. A majority of them are beyond recognition. Authorities want to hand over the dead to their relatives. Name a modern scientific method and write the procedure that would help in the identification of kinship.

19. विद्यार्थियों की एक टीम अंतरस्कूली खेल-प्रतियोगिता में भाग लेने की तैयारी कर रही है । एक अभ्यास-सत्र के दौरान आपको कुछ ऐसी शीशियाँ मिलती हैं जिन पर कुछेक कैनाबिनॉइड रसायनों के लेबल लगे हैं ।

(a) क्या आप इस बात की रिपोर्ट अधिकारियों से करेंगे ? क्यों ? **1**

(b) उस पौधे का नाम बताइए जिससे इस प्रकार के रसायन प्राप्त किए जाते हैं । **1**

(c) मानव शरीर पर इन रसायनों के प्रभावों के बारे में लिखिए । **1**

A team of students are preparing to participate in the interschool sports meet. During a practice session you find some vials with labels of certain cannabionoids.

(a) Will you report to the authorities ? Why ?

(b) Name a plant from which such chemicals are obtained.

(c) Write the effect of these chemicals on human body.

20. मानव जाति के अविवेकी प्रयोग से वन्य स्थलों के अभाव के कारण अनेक पादप एवं जंतु स्पीशीज़ें विलुप्त होने की कगार पर हैं । जीवविज्ञान के एक विद्यार्थी होने के नाते उस विधि का सुझाव दीजिए जो ऐसी संकटग्रस्त स्पीशीजों को विलुप्त होने से रोकने में उपयोगी हो । **3**

अथवा

"बायोलोजिकल ऑक्सीजन डिमांड (B.O.D.) को मापकर जल-निकाय की गुणवत्ता के आकलन में मदद मिल सकती है ।" व्याख्या कीजिए ।

Many plant and animal species are on the verge of their extinction because of loss of forest land by indiscriminate use by the humans. As a biology student what method would you suggest along with its advantages that can protect such threatened species from getting extinct ?

OR

"Determination of Biological Oxygen Demand (BOD) can help in suggesting the quality of a water body." Explain.

21. पशुओं के अंत:प्रजनन में निहित विभिन्न चरणों की सूची तैयार कीजिए । इस व्यवहार की दो हानियाँ सुझाइए । **3**

Enlist the steps involved in inbreeding of cattle. Suggest two disadvantages of this practice.

22. विभिन्न कारणों से आजकल कार्बनिक खेती का बहुत चलन है । निम्नलिखित में से तीन सूक्ष्मजीवों को छांटिये जो इस प्रकार की खेती के लिए उपयुक्त है । चुने गए सूक्ष्मजीवों में से प्रत्येक का एक-एक अनुप्रयोग भी बताइए ।

माइकोराइज़ा, मोनैसकस, ऐनाबीना, राइज़ोबियम, मीथैनोबैक्टीरियम, ट्राइकोडर्मा । **3**

Choose any three microbes, from the following which are suited for organic farming which is in great demand these days for various reasons. Mention one application of each one chosen.

Mycorrhiza; Monascus; Anabaena; Rhizobium; Methanobacterium; Trichoderma.

खण्ड – घ

SECTION – D

23. अक्तूबर 2, सन् 2014 से हमारे देश में "स्वच्छ भारत अभियान" आरंभ किया गया है । **4**

(a) इस अभियान का औचित्य बताते हुए उस पर अपने विचार स्पष्ट कीजिए ।

(b) एक जीववैज्ञानिक होने के नाते उन दो समस्याओं के नाम बताइए जिनका आप अपनी कॉलोनी में इस कार्यक्रम को लागू करने में सामना कर सकते हैं ।

(c) इन समस्याओं पर विजय प्राप्त करने के लिए दो प्रतिकारी विधियों का सुझाव दीजिए ।

Since October 02, 2014 "Swachh Bharat Abhiyan" has been launched in our country.

(a) Write your views on this initiative giving justification.

(b) As a biologist name two problems that you may face while implementing the programme in your locality.

(c) Suggest two remedial methods to overcome these problems.

खण्ड – ङ
SECTION – E

24. मानव जनसंख्या में रुधिर के वर्गीकरण के आनुवंशिक आधार की व्याख्या कीजिए । **5**

अथवा

हर्शे और चेस ने किस प्रकार स्पष्ट किया कि DNA वायरस से बैक्टीरिया में प्रवेश कर जाता है ?

Explain the genetic basis of blood grouping in human population.

OR

How did Hershey and Chase established that DNA is transferred from virus to bacteria ?

25. "मानव जनसंख्या के आयु-पिरैमिडों के विश्लेषण से दीर्घकालिक योजना-कार्यनीतियाँ निर्धारित करने के लिए महत्त्वपूर्ण निवेश मिल जाते हैं ।" व्याख्या कीजिए । **5**

अथवा

पारितंत्रों को स्वस्थ बनाए रखने से प्राप्त होने वाले लाभों का वर्णन कीजिए ।

"Analysis of age-pyramids for human population can provide important inputs for long-term planning strategies." Explain.

OR

Describe the advantages for keeping the ecosystems healthy.

26. लैंगिक जनन की प्रक्रिया के पश्चात् टमाटर के पौधे के एक पुष्प में 200 अंकुरणक्षम बीज उत्पन्न हुए । कारण बताते हुए निम्नलिखित प्रश्नों के उत्तर दीजिए । **5**

(a) परागण से पहले स्त्रीकेसर में बीजांड़ों की कम-से-कम संख्या कितनी रही होगी ?

(b) परागकणों की आवश्यक संख्या को उत्पन्न करने के लिए कम-से-कम कितनी सूक्ष्मबीजाणु जनक कोशिकाओं की आवश्यकता पड़ी होगी ?

(c) कम-से-कम कितने परागकणों ने अंडप को परागित किया होगा ?

(d) इन 200 अंकुरणक्षम बीजों को उत्पन्न करने के लिए कितने नर युग्मक इस्तेमाल हुए होंगे ?

(e) इस प्रक्रिया में कितने गुरुबीजाणु जनक कोशिकाओं की आवश्यकता पड़ी होगी ?

अथवा

स्त्री में भ्रूणीय अवस्था से लेकर अंडोत्सर्ग तक द्वितीयक अंडक (अंडाणु) के परिवर्धन की व्याख्या कीजिए । इस प्रक्रिया में निहित विभिन्न हॉर्मोनों के नाम बताइए ।

A flower of tomato plant following the process of sexual reproduction produces 200 viable seeds.

Answer the following questions giving reasons :

(a) What would have been the minimum number of ovules present in pre-pollinated pistil ?

(b) How many microspore mother cells would minimally be required to produce requisite number of pollen grains ?

(c) How many pollen grains must have minimally pollinated the carple ?

(d) How many male gamets would have used to produce these 200 viable seeds ?

(e) How many megaspore mother cells were required in this process ?

OR

Explain the development of a secondary oocyte (ovum) in a human female from the embryonic stage upto its ovulation. Name the hormones involved in this process.

Question Paper Code 57/1/3

SECTION – A

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

1. Name the transcriptionally active region of chromatin in a nucleus.

Ans. Euchromatin / Exon

[1 Mark]

2. A geneticist interested in studying variations and patterns of inheritance in living beings prefers to choose organisms for experiments with shorter life cycle. Provide a reason.

Ans. Many generations can be obtained (in a short time)

// variations can be exhibited / selected faster

[1 Mark]

3. What is Biopiracy ?

Ans. Illegal / non-authorized / non-compensated use of bioresources by organisations (MNC)

[1 Mark]

4. State a reason for the increased population of dark coloured moths coinciding with the loss of lichens (on tree barks) during industrialization period in England.

Ans. Natural selection / survival of fittest / escaped predators due to camouflage

[1 Mark]

5. Indiscriminate diagnostic practices using X-rays etc., should be avoided. Give one reason.

Ans. (Act as) Carcinogen / (harmful) mutation / chromosomal aberration / damage to DNA / normal cells converted to neoplastic

[1 Mark]

SECTION-B

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

6. Differentiate between 'ZZ' and 'XY' type of sex-determination mechanisms.

Ans. ZZ - males (birds) homogametic (females heterogametic) , sex is determined by the type of egg getting fertilised = ½ + ½

XY male (human being) heterogametic (females homogametic) , sex is determined by the type of sperm fertilising the ovum = ½ + ½

[2 Marks]

7. An infertile couple is advised to adopt test-tube baby programme. Describe <u>two</u> principle procedures adopted for such technologies.

Ans. IVF / In vitro fertilisation - Fertilisation outside the body in almost similar conditions as that in the

body /

ICSI / Intra cytoplasmic sperm injection- A sperm is directly injected in to the ovum , = 1

ET / Embryo transfer - Embryo is transferred into reproductive tract or uterus /

ZIFT / Zygote intra fallopian transfer - Zygote or early embryos (upto eight blastomeres) transferred into fallopian tube /

IUT / Intra uterine insemination - Early embryos (with more than eight blastomeres) transferred into uterus =1

[2 Marks]

8. Many fresh water animals can not survive in marine environment. Explain.

Ans. High salt concentration outside / hypertonic surroundings = 1

Loss of water from body / exosmosis from animal body / animal suffers osmotic problems = 1

[2 Marks]

OR

How are productivity, gross productivity, net primary productivity and secondary productivity interrelated ?

Ans. Productivity is rate of biomass production = ½

GPP - R = NPP = 1

NPP - biomass available to consumers for secondary productivity = ½

[½ + 1 +½ = 2 Marks]

9. Enumerate four objectives for improving the nutritional quality of different crops for the health benefits of the human population by the process of "Biofortification".

Ans. Improving protein content and quality , oil content and quality , vitamin content and quality , micronutrient or mineral content = ½ × 4

[2 Marks]

10. Mention a product of human welfare obtained with the help of each one of the following microbes:

(a) LAB

(b) Saccharomyces cerevisiae

(c) Propionibacterium sharmanii

(d) Aspergillus niger

Ans. a) Milk to curd = ½

b) Bread / ethanol / alcoholic drinks / whiskey / brandy / beer / rum = ½

c) Swiss cheese = ½

d) Citric acid = ½

[½ × 4 =2 Marks]

SECTION - C

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

11. Describe the process of Parturition in humans.

Ans. - Signals originate from the fully developed foetus and placenta ,

- Induce mild uterine contractions (foetal ejection reflex) ,
- Triggers release of oxytocin (from maternal pituitary) ,
- Oxytocin acts on uterine muscles and cause stronger uterine contractions ,
- Stimulatory reflex between the uterine contraction and oxytocin secretion continues resulting in stronger and stronger contraction
- Expel the baby from the uterus = ½ × 6

[3 Marks]

12. Describe the development of endosperm after double fertilization in an angiosperm. Why does endosperm development precedes that of zygote ?

Ans. Following fertilisation the PEN (primary endosperm nucleus) divides repeatedly to give rise to free nuclei, subsequent cell wall formation leading to formation of endosperm = 1 + 1

Cells of endosperm are filled with reserved food materials to be used for nutrition of the developing embryo / for providing food to the developing embryo = 1

[3 Marks]

13. Explain the interpretation of Charles Darwin when he observed a variety of small black birds on Galapagos Islands.

Ans. Darwin conjectured that all varieties are evolved on the Galapagos island itself , from original seed eating features , many other forms with altered beaks arose , became insectivorous , and vegetarian finches , adaptive radiation = ½ × 6

[3 Marks]

14. A teacher wants his/her students to find the genotype of pea plants bearing purple coloured flowers in their school garden. Name and explain the cross that will make it possible.

Ans. Test cross = 1

Purple flower to be crossed with white (homozygous recessive) flower = 1

If all flowers of F_1 are purple then genotype is homozygous dominant / PP = ½

If 50% are purple and 50% are white then genotype is heterozygous dominant / Pp = ½

or (same thing can be shown with the help of crosses)

[3 Marks]

15. (a) A DNA segment has a total of 2,000 nucleotides, out of which 520 are adenine containing nucleotides. How many purine bases this DNA segment possesses ?

(b) Draw a diagrammatic sketch of a portion of DNA segment to support your answer.

Ans. (a) 1000 purines = ½

(i) Calculation

A = T , A = 520 hence T = 520

A + T = 520 + 520 = 1040

so G + C = 2000 - 1040 = 960

G = C , so C = $\frac{960}{2}$ = 480

so pyrimidines = C + T

= 480 + 520 = 1000

(ii) Purine A and G always pair with T and C respectively

iii) $\frac{A}{G} = \frac{T}{C} = 1$ (Chargaff rule)

= ½

(b)

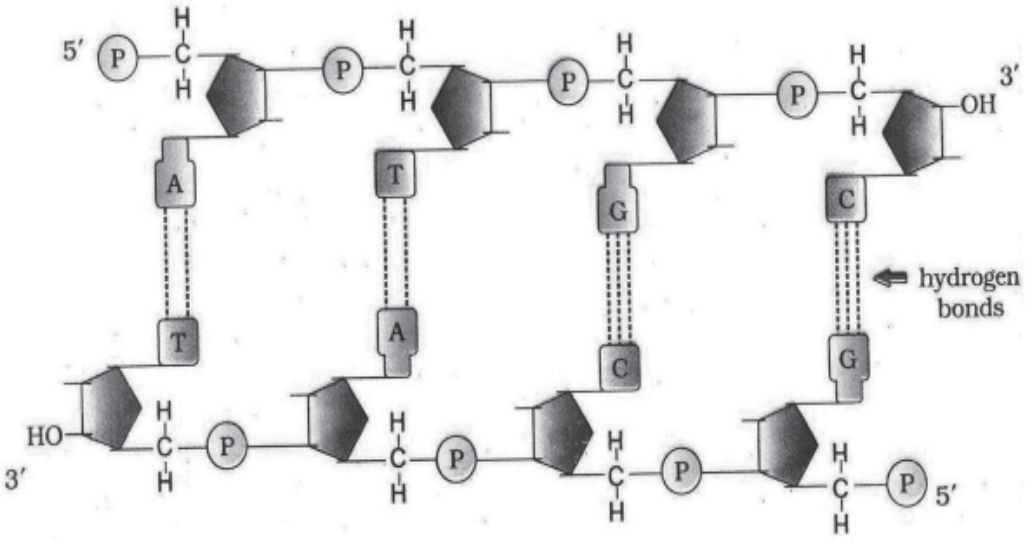


Diagram showing polarity = ½

N- base = ½

H - bond = ½

Deoxyribose sugar = ½

[1 + 2 = 3 Marks]

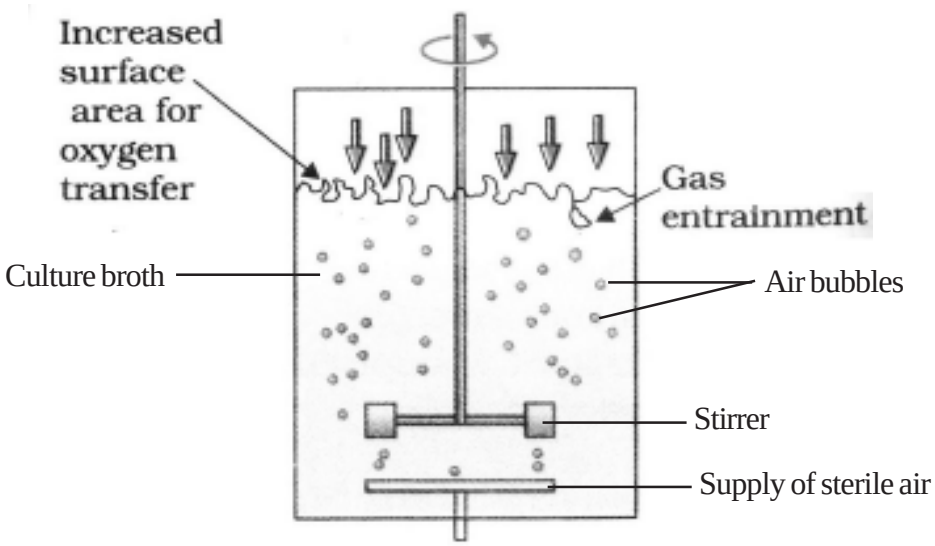
16. Recombinant DNA-technology is of great importance in the field of medicine. With the help of a flow chart, show how this technology has been used in preparing genetically engineered human insulins.

Ans. Insulin consists of two (short) polypeptide chains (A and B) , linked by disulphide bonds , two DNA sequences corresponding to chain A and B prepared (by Eli Lily company) , introduced them into plasmids of E. coli , chain A and B produced separately , extracted and combined by creating disulphide bonds = ½ × 6

[3 Marks]

17. Draw a labelled sketch of sparged-stirred-tank bioreactor. Write its application.

Ans.



Correct diagram = 1

Any two correct labellings = ½ + ½

Application = Produces larger biomass leading to higher yields of desired protein / recombinant protein / processing large volume of culture / conversion of raw materials into specific product biologically = 1

[3 Marks]

18. Following the collision of two trains a large number of passengers are killed. A majority of them are beyond recognition. Authorities want to hand over the dead to their relatives. Name a modern scientific method and write the procedure that would help in the identification of kinship.

Ans. DNA fingerprinting (analysis) = ½

- Isolation and digestion of DNA by restriction endonuclease
- Separation of DNA fragments by electrophoresis and transferring them to synthetic membranes / nitrocellulose / nylon
- Hybridisation using labelled VNTR probe
- Detection of hybridised DNA fragments by autoradiography
- Matching banding pattern of DNA / DNA fingerprints / autoradiograms of the passengers killed and that of relatives = ½ × 5

[3 Marks]

19. A team of students are preparing to participate in the interschool sports meet. During a practice session you find some vials with labels of certain cannabinoids.

(a) Will you report to the authorities ? Why ?

(b) Name a plant from which such chemicals are obtained.

(c) Write the effect of these chemicals on human body.

Ans. (a) Yes = ½

May be abused by sports person = ½

(b) *Cannabis (sativa)* /any other relevant plant = 1

(c) Effects cardiovascular system of the body = 1

[1+ 1 + 1 = 3 Marks]

20. Many plant and animal species are on the verge of their extinction because of loss of forest land by indiscriminate use by the humans. As a biology student what method would you suggest along with its advantages that can protect such threatened species from getting extinct ?

Ans. Ex-situ conservation = 1

Threatened animals and plants are taken out from their natural habitat and placed in special setting where they can be protected and given special care = 1

Botanical garden / tissue culture / micro propagation / seed bank = ½

Zoological park / wild life safari park / cryopreservation = ½

[3 Marks]

OR

"Determination of Biological Oxygen Demand (BOD) can help in suggesting the quality of a water body." Explain.

Ans. High BOD of a water body indicates more number of micro-organisms in water , resulting in bad quality of water / death of aquatic creatures , more polluting potential 1 × 3

// Lower BOD of water body indicates less number of micro-organisms in water , good quality of water / aquatic life flourishes , less polluting potential = 1 × 3

[3 Marks]

21. Enlist the steps involved in inbreeding of cattle. Suggest two disadvantages of this practice.

Ans. Inbreeding involves mating of closely related individuals within the same breed for 4-6 generations = ½

Superior males and superior females are identified and mated in pairs , the progeny are evaluated , superior males and females among them are selected for further mating = ½ × 3

Disadvantages : Inbreeding depression , reduction in fertility , reduction in productivity (any two) = ½ × 2

[3 Marks]

22. Choose any three microbes, from the following which are suited for organic farming which is in great demand these days for various reasons. Mention one application of each one chosen. Mycorrhiza; Monascus; Anabaena; Rhizobium; Methanobacterium; Trichoderma.

Ans. Mycorrhiza : (Fungal symbiont of the association) Abosrb phosphorus from soil

Anabaena : Fix atmospheric nitrogen / Adds organic matter to the soil

Rhizobium : Fix atmospheric nitrogen (in leguminous plants)

Methanobacterium : They digest cellulosic material and the product / spent slurry can be used as fertiliser

Trichoderma : Biocontrol agent for several plant pathogens

(Any 3 microbes = ½ × 3 = 1½)

(Any 3 corresponding roles = ½ × 3 = 1½)

[3 Marks]

SECTION - D

Q. Nos. 23 is of four marks

23. Since October 02,2014 "Swachh Bharat Abhiyan" has been launched in our country.

(a) Write your views on this initiative giving justification.

(b) As a biologist name two problems that you may face while implementing the programme in your locality.

(c) Suggest two remedial methods to overcome these problems.

Ans. (a) Value point conveying importance of clean environment / surrounding = 1

(b) Social attitude / co-ordination / financial issues / disposal of collected garbage / separation of biodegradable and non-degradable waste / lack of awareness / any other relevant problem (any two) = 1 + 1

(c) Campaigning / creating awareness / organising competitions / giving incentives / provision of imposing penalty / complaining to appropriate authority / publicity through mass media / using masks or gloves for separation and disposal of various categoriers of garbage or any other relevant point (Any two) = ½ + ½

[1 + 2 + 1 = 4 Marks]

SECTION-E

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

24. Explain the genetic basis of blood grouping in human population.

Ans. (i) Blood group in human population determined by gene ' I ' , which has three allele I^A and I^B and i (multiple allelism) =½ + ½

(ii) I^A I^B are dominant allele (codominance) each forming different type of sugar polymer on the surface of RBC , while allele ' i ' is recessive and does not produce any sugar = ½ + ½

I^A I^A , I^A i — A group = ½

$I^B I^B$, $I^B i$ — B group = ½

$I^A I^B$ —— AB group = ½

ii — O group = ½

(iii) Since humans are diploid / each person possesses any two of three ' I ' gene alleles , resulting into six different genotypic combination and four phenotypic expression = ½ + ½

[5 Marks]

OR

How did Hershey and Chase established that DNA is transferred from virus to bacteria ?

Ans. • Some bacteriophage were grown in a medium that contained ^{32}P / radioactive phosphorus , while some were grown in a medium that contained ^{35}S / radioactive sulphur = ½ × 2

• the labelled bacteriophage from both media were allowed to infect E. coli = 1

• In both the cases viral coats were removed from the bacteria by agitating them in a blender = 1

• The virus particles were separated from the bacteria by spinning them in a centrifuge = 1

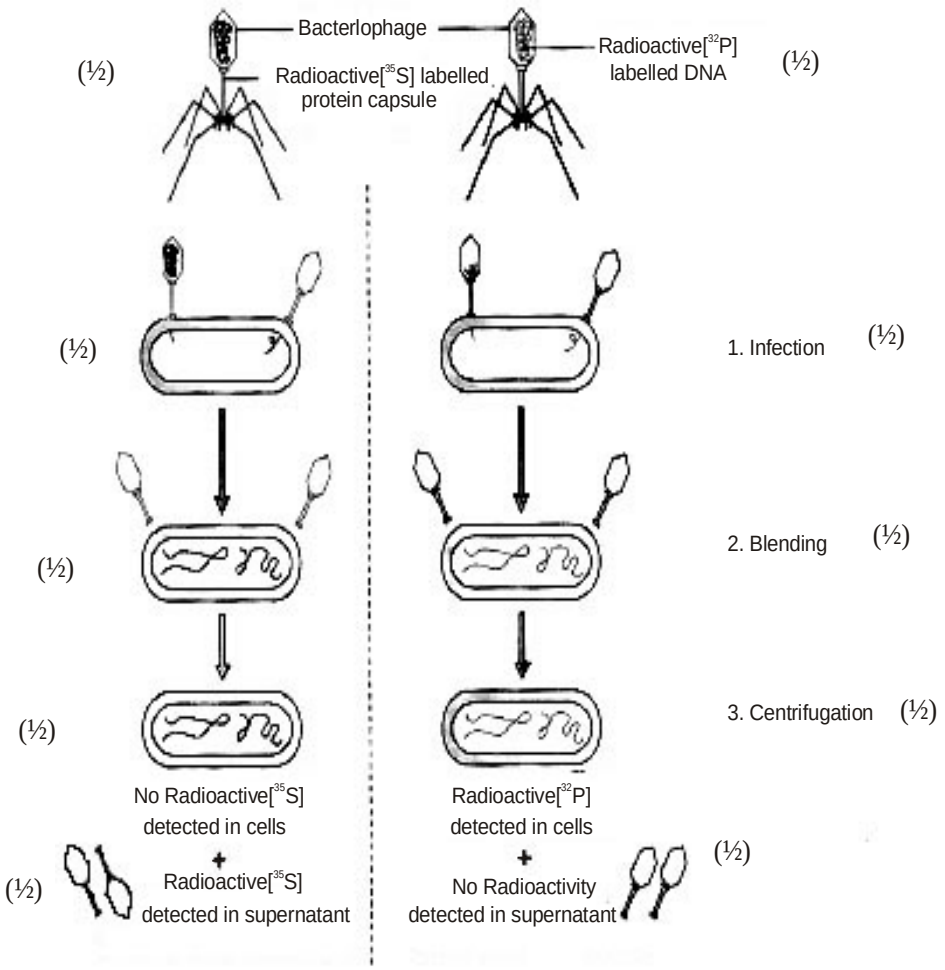
• No radioactivity was detected in cells (E. coli) but detected in supernatant in case where bacteriophage were labelled with radioactive sulphur = ½

• Radioactivity detected in cells (E. coli) while no radioactivity detected in supernatant in another case where bacteriophage were labelled with radioactive phosphorus = ½

(Phosphorus being a constituent of DNA indicates that DNA is the genetic material that is passed from virus to bacteria)

[5 Marks]

// **The following diagrammatic representation can be considered in lieu of the above explanation.**



[½ × 10 = 5 Marks]

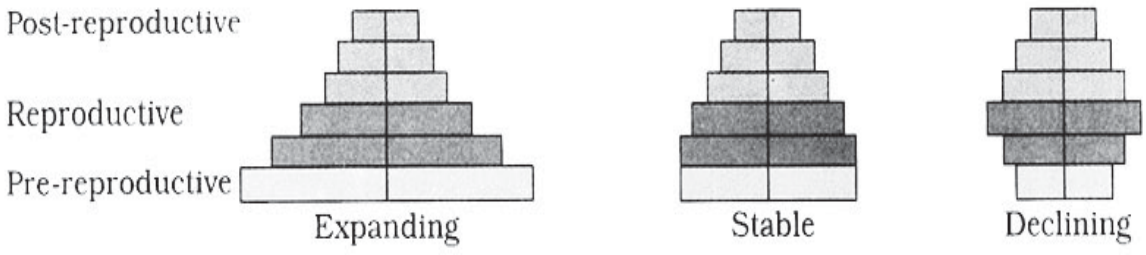
25. "Analysis of age-pyramids for human population can provide important inputs for long-term planning strategies." Explain.

Ans. Age pyramids show age distribution of males and females in a combined diagram = 1

The shape of the pyramid reflects the growth status of the population whether it is growing or stable or declining = 1

Pyramids also indicate the ratio of pre-reproductive , reproductive and post reproductive indidviduals in a population =1

//



= 1 = 1 = 1

Planing of health / education / transport / infra-structure / finance / food / employment can depend on the age-pyramid analysis of a population / any other relevant point. (Any two with proper explanation) = 1 + 1

[5 Marks]

OR

Describe the advantages for keeping the ecosystems healthy.

Ans. (i) Purify air / purify water

(ii) Mitigates drought / mitigates flood

(iii) Cycle nutrients

(iv) Generate fertile soil

(v) Provide wildlife habitat

(vi) Maintain biodiversity

(vii) Pollinate crop

(viii) Provide storage site for carbon

(ix) Provide aesthetic value / provide cultural value / provide spiritual value

(x) Provide stable food chain

(xi) Provide economically useful forest produces

(xii) Provide sustainable biological legacy to future generations

(Description of any five advantages) = 1 × 5

[5 Marks]

26. A flower of tomato plant following the process of sexual reproduction produces 200 viable seeds.

Answer the following questions giving reasons :

(a) What would have been the minimum number of ovules present in pre-pollinated pistil ?

(b) How many microspore mother cells would minimally be required to produce requisite number of pollen grains ?

(c) How many pollen grains must have minimally pollinated the carpel ?

(d) How many male gametes would have used to produce these 200 viable seeds ?

(e) How many megaspore mother cells were required in this process ?

Ans. (a) 200 , one ovule after fertilisation forms one seed = ½ + ½

(b) 50 , each microspore mother cell meiotically divides to form four pollen grains (200 /4 = 50) = ½ + ½

(c) 200 , one pollen grain participates in fertilisation of one ovule = ½ + ½

(d) 400 , each pollen grain carries two male gametes which (participate in double fertilisation) (200 × 2 = 400) = ½ + ½

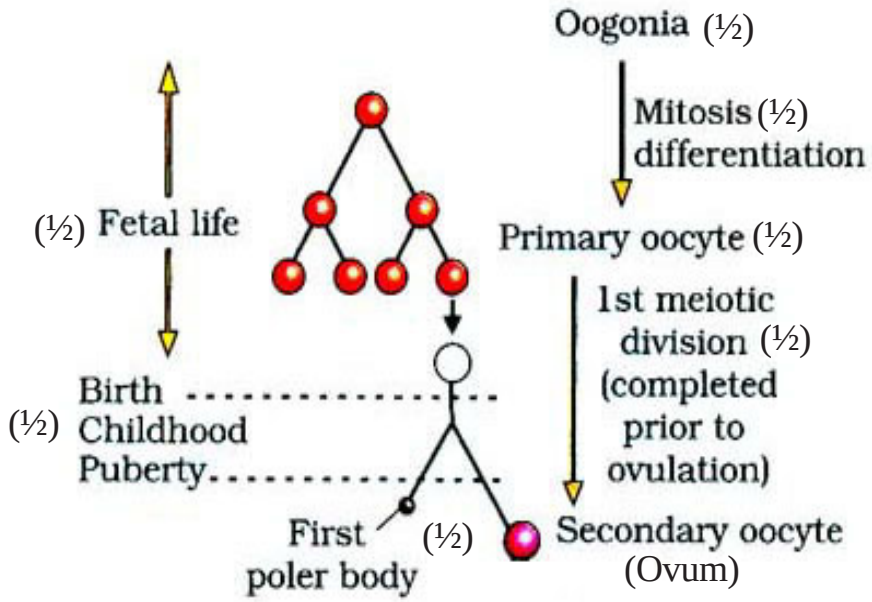
(e) 200 , each MMC forms four megaspores out of which only one remains functional = ½ + ½

[1 × 5 = 5 Marks]

OR

Explain the development of a secondary oocyte (ovum) in a human female from the embryonic stage upto its ovulation. Name the hormones involved in this process.

Ans.



(½ × 7 = 3½)

Hormones :
- LH / Luteinising hormone = ½
- FSH / Follicle stimulating hormone = ½
- Estrogen = ½

[3½ + 1½ = 5 Marks]