SET – 2

Series : SSO/1

कोड नं.
Code No. 57/1/2

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

   What is Biopiracy ?

2. 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.

3. 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.

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

   Name the transcriptionally active region of chromatin in a nucleus.

5. 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.

खण्ड – ख
SECTION – B

6. 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 ?

7. ज्वार की दो सामान्य भारतीय फसलों के नाम बताइए । ज्वार की उस एक विशिष्टता की चर्चा कीजिए जिसे संकर-प्रजनन के द्वारा बेहतर बना लिया गया है, ताकि ज्वार की उच्च उत्पादन वाली फ़सलें उत्पन्न की जा सके । **2**

Name any two common Indian millet crops. State one characteristic of millets that has been improved as a result of hybrid breeding so as to produce high yielding millet crops.

8. 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

9. पक्षियों में लिंग-निर्धारण प्रक्रिया की व्याख्या कीजिए । **2**

Explain mechanism of sex-determination in birds.

10. एक स्वस्थ दंपति की संक्षिप्त डॉक्टरी जाँच करने पर उन्हें ज्ञात हुआ वे दोनों ही क्रियात्मक युग्मक उत्पन्न करने में सक्षम नहीं हैं, और उन्हें 'ART' (सहायक जनन तकनीकों) की मदद लेनी चाहिए । इस दंपति को बच्चा प्राप्त करने में सहायक 'ART' का नाम बताइए तथा उसमें निहित विधि का सुझाव दीजिए । **2**

After a brief medical examination a healthy couple came to know that both of them are unable to produce functional gametes and should look for an 'ART' (Assisted Reproductive Technique). Name the 'ART' and the procedure involved that you can suggest to them to help them bear a child.

खण्ड – ग

SECTION – C

11. अनुकूली विकिरण क्या होता है ? अनुकूली विकिरण को कब अभिसारी विकास कहते हैं ? उदाहरण दीजिए । **3**

What is adaptive radiation ? When can adaptive radiation be referred to as convergent evolution ? Give an example.

12. 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.

13. (a) DNA के एक खंड में कुल 1,500 न्यूक्लियोटाइड हैं, जिनमें से 410 ग्वानिनधारी न्यूक्लियोटाइड हैं । बताइए कि इस खंड में पिरिमिडीन बेस कितने होंगे ।

(b) अपने उत्तर की पुष्टि के लिए DNA खंड के एक भाग का आरेखी चित्र बनाइए । **3**

(a) A DNA segment has a total of 1,500 nucleotides, out of which 410 are Guanine containing nucleotides. How many pyrimidine bases this segment possesses ?

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

14. मानव-भ्रूण की उस अवस्था का नाम बताइए जो अंतर्रोपित होती है । अंतर्रोपण की प्रक्रिया की व्याख्या कीजिए । **3**

Name the stage of human embryo at which it gets implanted. Explain the process of implantation.

15. जीव-विज्ञान से अनभिज्ञ एक व्यक्ति को यह जानकर अचंभा हुआ कि सेब आभासी फल है, आम वास्तविक फल है और केला बीजरहित फल है । जीव-विज्ञान के एक विद्यार्थी होने के नाते आप इस व्यक्ति की संतुष्टि किस प्रकार करेंगे ? **3**

A non biology person is quite shocked to know that apple is a false fruit, mango is a true fruit and banana is a seedless fruit. As a biology student how would you satisfy this person ?

16. 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.

17. 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.

18. 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.

19. 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.

20. 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.

21. 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.

22. 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.

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 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.

25. लैंगिक जनन की प्रक्रिया के पश्चात् बैंगन के पौधे के एक पुष्प में 360 अंकुरणक्षम बीज उत्पन्न हुए । कारण बताते हुए निम्नलिखित प्रश्नों के उत्तर लिखिए : **5**

(a) इस प्रक्रिया में कम-से-कम कितने बीजांड निहित होंगे ?

(b) इस प्रक्रिया में कितनी गुरुबीजाणु जनक कोशिकाएँ (मेगास्पोर मदर सेल) शामिल होंगी ?

(c) परागण के लिए वर्तिकाग्र पर कम-से-कम कितनी संख्या में परागकण गिरे होंगे ?

(d) इस उदाहरण में नर युग्मकों की कितनी संख्या शामिल होगी ?

(e) उपरोक्त प्रक्रिया में परागकोश के स्फुटन से पूर्व कितने लघुबीजाणुओं में न्यूनकारी विभाजन हुए होंगे ?

अथवा

स्त्री के जनन-चक्र के दौरान अंडाशयों और गर्भाशय में होने वाले परिवर्तनों का वर्णन कीजिए ।

A flower of brinjal plant following the process of sexual reproduction produces 360 viable seeds.

Answer the following questions giving reasons :

(a) How many ovules are minimally involved ?

(b) How many megaspore mother cells are involved ?

(c) What is the minimum number of pollen grains that must land on stigma for pollination ?

(d) How many male gametes are involved in the above case ?

(e) How many microspore mother cells must have undergone reduction division prior to dehiscence of anther in the above case ?

OR

Describe the changes that occur in ovaries and uterus in human female during the reproductive cycle.

26. 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 ?

Question Paper Code 57/1/2

SECTION – A

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

l. What is Biopiracy ?

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

[1 Mark]

2. 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]

3. 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]

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

Ans. Euchromatin / Exon

[1 Mark]

5. 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]

SECTION-B

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

6. 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]

7. Name any two common Indian millet crops. State one characteristic of millets that has been improved as a result of hybrid breeding so as to produce high yielding millet crops.

Ans. Maize , jowar , bajra (Any two) = ½ + ½

Resistant to water stress = 1

[2 Marks]

8. 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

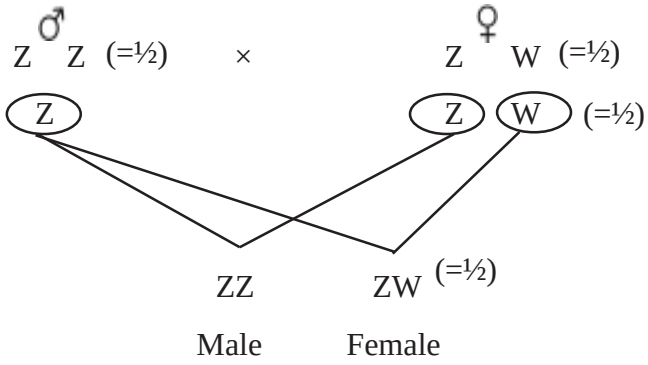
d) Citric acid = ½

[½ × 4 =2 Marks]

9. Explain mechanism of sex-determination in birds.

Ans. Females have one Z sex chromosome and one W sex chromosome , males have a pair of Z sex chromosome , if Z sperm fertilises Z ovum a male offspring is produced , if Z sperm fertilises W ovum a female offspring is produced = ½ × 4

//



[2 Marks]

10. After a brief medical examination a healthy couple came to know that both of them are

unable to produce functional gametes and should look for an 'ART' (Assisted Reproductive Technique). Name the 'ART' and the procedure involved that you can suggest to them to help them bear a child.

Ans. Test tube baby programme = ½

Collection of ova and sperm from donor = ½

(Corresponding procedure correctly explained)= ½ + ½

Explanation:

IVF - Fertilisation outside the body in almost similar conditions as that in the body

ICSI - Sperm is directly injected into the ovum

ET - Embryo is transferred into reproductive tract / uterus

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

IUT - Early embryos (with more than eight blastomeres) transferred into uterus

[2 Marks]

SECTION - C

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

11. What is adaptive radiation ? When can adaptive radiation be referred to as convergent evolution ? Give an example.

Ans. Adaptive Radiation - The process of evolution of different species in a given geographical area starting from a point and literally radiating to other geographical areas (habitats) , = 1

When more than one adaptive radiation appeared to have occurred in an isolated geographical area (representing different habitats) , then this can referred to as convergent evolution = 1

Example :	Placental mammals	Australian marsupials
	Wolf	Tasmanian wolf
	Mole	Marsupial mole
	Anteater	Numbat (anteater)
	Mouse	Marsupial mouse
	Lemur	Spotted cuscus
	Flying squirrel	Flying phalanger
	Bobcat	Tasmanian tiger cat

Any one pair of example = 1

[3 Marks]

12. 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]

13. (a) A DNA segment has a total of 1,500 nucleotides, out of which 410 are Guanine containing nucleotides. How many pyrimidine bases this segment possesses ?

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

Ans. (a) 750 = ½

(i) Calculation

G = C , G = 410 hence C = 410

G + C = 410 + 410 = 820

so A + T = 1500 - 820 = 680

A = T , so T = $\frac{680}{2} = 340$

so pyrimidines = C + T

= 410 + 340 = 750

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

(iii) $\frac{A}{G} = \frac{T}{C} = 1$ (Chargaff rule) = ½

(b)

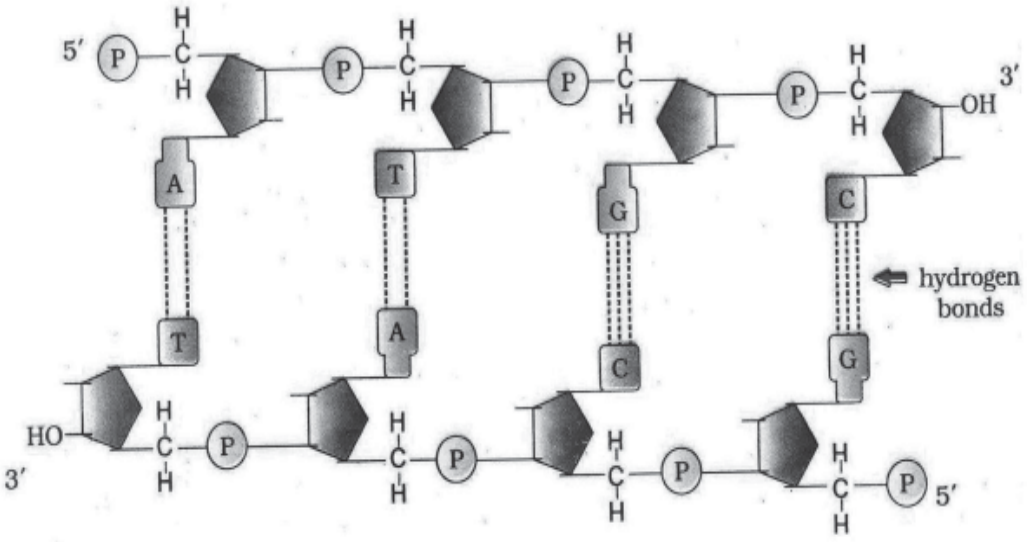


Diagram showing polarity = ½

A-T = ½

G-C= ½

H-bond = ½

[1 + 2 = 3 Marks]

14. Name the stage of human embryo at which it gets implanted. Explain the process of implantation.

Ans. Blastocyst = 1

The trophoblast layer of the blastocyst get attached to the endometrium and the inner cell mass gets differentiated as the embryo , after attachment the uterine cell , divide rapidly and covers the blastocyst , as a result the blastocyst become embedded in the endometrium of the uterus = ½ × 4 = 2

[3 Marks]

15. A non biology person is quite shocked to know that apple is a false fruit, mango is a true fruit and banana is a seedless fruit. As a biology student how would you satisfy this person ?

Ans. Apple - Thalamus (along with ovary) contribute to fruit = 1

Mango - Develops only from the ovary = 1

Banana - Develops from ovary but without fertlization / Parthenocarpy = 1

[3 Marks]

16. 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]

17. 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

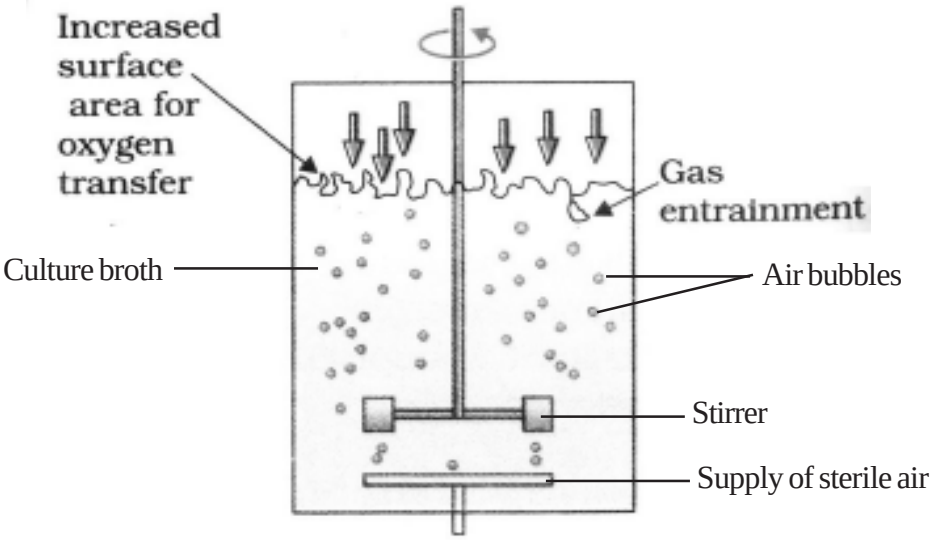
(Any 3 microbes = ½ × 3 = 1½)

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

[3 Marks]

18. 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]

19. 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]

20. 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]

21. 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]

22. 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]

SECTION - D

Q. Nos. 23 is 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

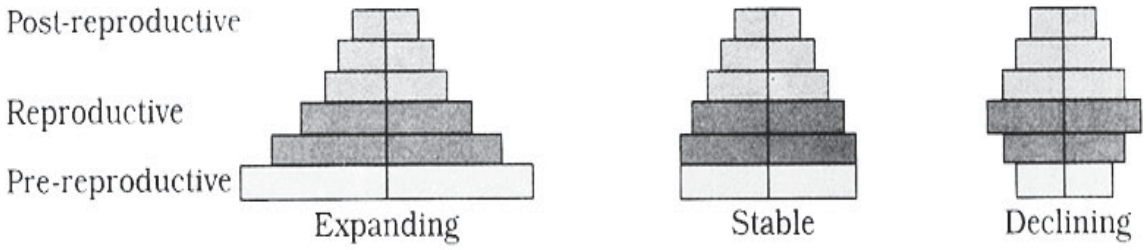
24. "Analysis of age-pyramids for human population can provide important inputs for long-term planning strategies." Explain.

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]

25. A flower of brinjal plant following the process of sexual reproduction produces 360 viable seeds.

Answer the following questions giving reasons :

(a) How many ovules are minimally involved ?

(b) How many megaspore mother cells are involved ?

(c) What is the minimum number of pollen grains that must land on stigma for pollination ?

(d) How many male gametes are involved in the above case ?

(e) How many microspore mother cells must have undergone reduction division prior to dehiscence of anther in the above case ?

Ans. (a) 360 , one ovule after fertilisation forms one seed = ½ + ½

(b) 360 , each MMC forms four megaspores out of which only one remains functional = ½ + ½

(c) 360 , one pollen grain participates in fertilisation of one ovule = ½ + ½

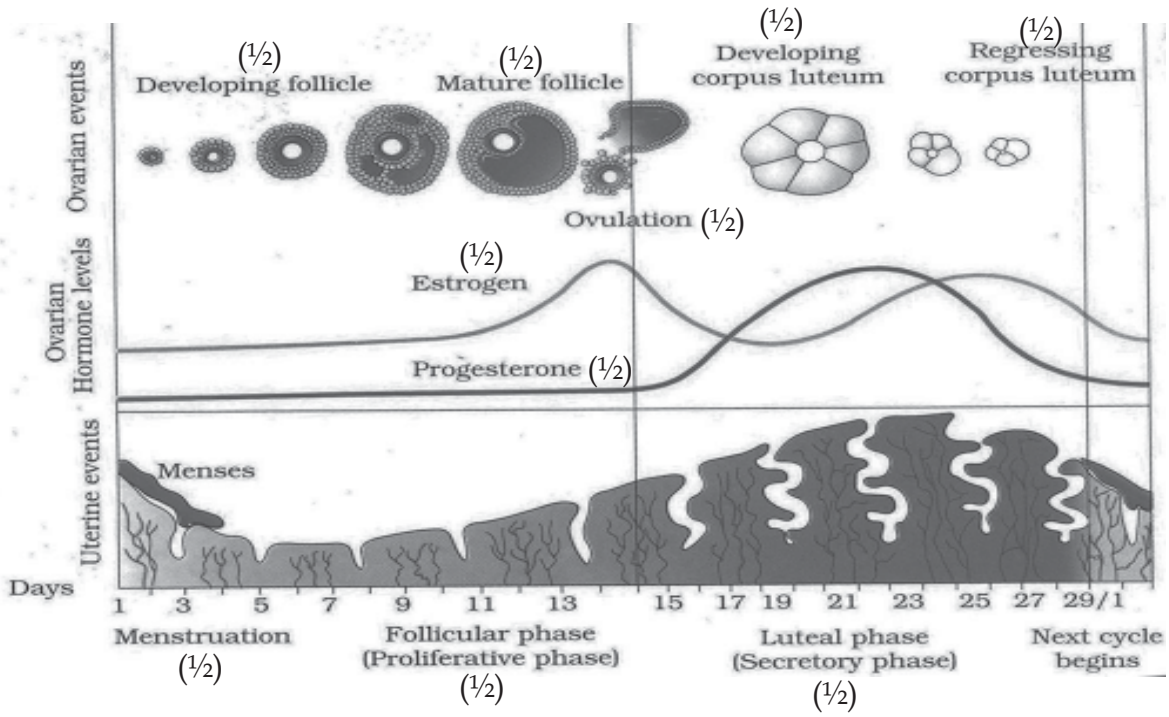
(d) 720 , each pollen grain carries two male gametes (which participate in double fertilisation) (360 × 2 = 720) = ½ + ½

(e) 90 , each microspore mother cell meiotically divides to form four pollen grains (360 /4 = 90) = ½ + ½

OR

Describe the changes that occur in ovaries and uterus in human female during the reproductive cycle.

Ans.



Same value points described in an explanation = ½ × 10

[5 Marks]

26. 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

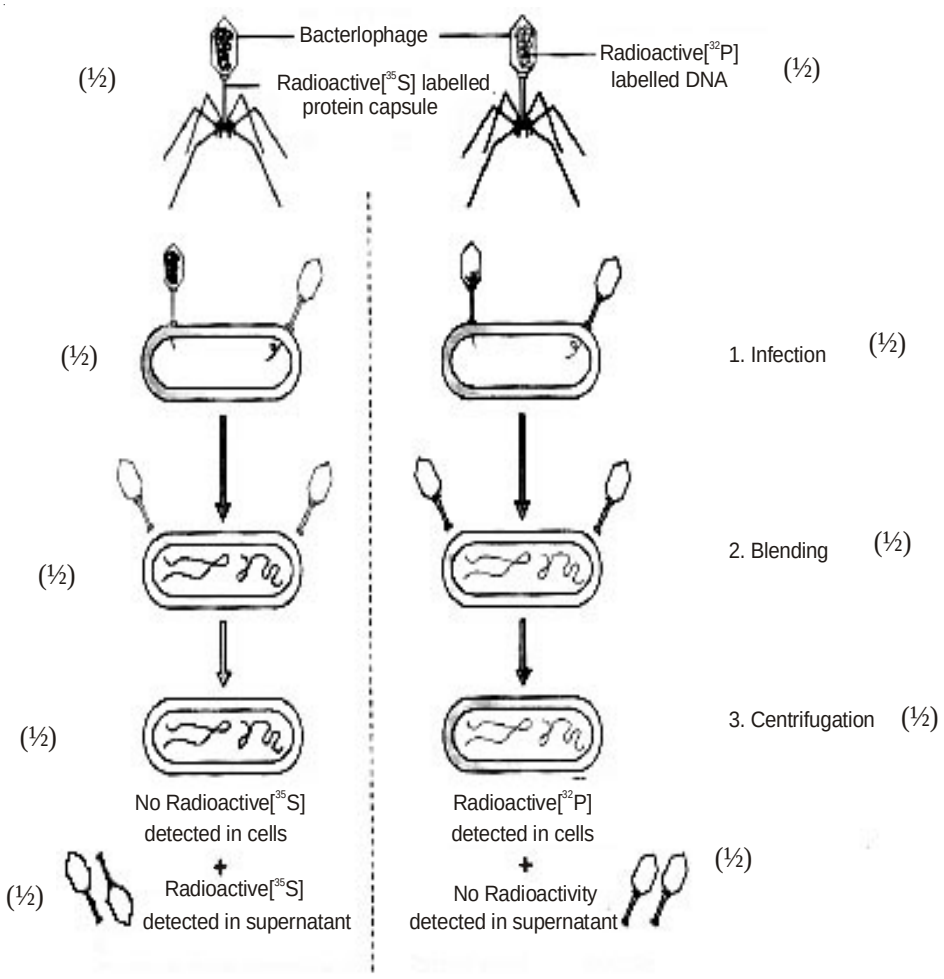
• the labelled bacteriophage from both media were allowed to infect E. coli = 1

- 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]