Series RRSS2/2

SET-3

प्रश्न-पत्र कोड
Q.P. Code **57/2/3**

रोल नं.
Roll No. 1 4 7 6 5 6 1 3

परीक्षार्थी प्रश्न-पत्र कोड को उत्तर-पुस्तिका के मुख-पृष्ठ पर अवश्य लिखें ।
Candidates must write the Q.P. Code on the title page of the answer-book.

नोट

(I) कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ **23** हैं ।

(II) कृपया जाँच कर लें कि इस प्रश्न-पत्र में **33** प्रश्न हैं ।

(III) प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए प्रश्न-पत्र कोड को परीक्षार्थी उत्तर-पुस्तिका के मुख-पृष्ठ पर लिखें ।

(IV) **कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, उत्तर-पुस्तिका में प्रश्न का क्रमांक अवश्य लिखें ।**

(V) 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 ।

NOTE

(I) Please check that this question paper contains **23** printed pages.

(II) Please check that this question paper contains **33** questions.

(III) Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.

(IV) **Please write down the serial number of the question in the answer-book before attempting it.**

(V) 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 *अधिकतम अंक : 70*

Time allowed : 3 hours *Maximum Marks : 70*

General Instructions :

Read the following instructions carefully and follow them :

(i) *This question paper contains **33** questions. **All** questions are **compulsory**.*

(ii) *Question paper is divided into **five** sections – Sections **A, B, C, D** and **E**.*

(iii) ***Section A** – questions number **1** to **16** are multiple choice type questions. Each question carries **1** mark.*

(iv) ***Section B** – questions number **17** to **21** are very short answer type questions. Each question carries **2** marks.*

(v) ***Section C** – questions number **22** to **28** are short answer type questions. Each question carries **3** marks.*

(vi) ***Section D** – questions number **29** and **30** are case-based questions. Each question carries **4** marks. Each question has subparts with internal choice in one of the subparts.*

(vii) ***Section E** – questions number **31** to **33** are long answer type questions. Each question carries **5** marks.*

(viii) *There is no overall choice. However, an internal choice has been provided in Sections B, C and D of the question paper. A candidate has to write answer for only **one** of the alternatives in such questions.*

(ix) *Kindly note that there is a separate question paper for Visually Impaired candidates.*

(x) *Wherever necessary, neat and properly labelled diagrams should be drawn.*

SECTION A

*Questions no. **1** to **16** are Multiple Choice type Questions, carrying **1** mark each.* *16×1=16*

1. The pyramid of biomass in sea is generally inverted because in sea :

(A) Biomass of fishes exceeds that of phytoplankton.

(B) Number of phytoplanktons is more.

(C) Number of phytoplanktons is less.

(D) Large fishes feed on small fishes.

2. Which one of the following is ***not*** used as a vector for rDNA technology ?

(A) Plasmid (B) Bacterial cell

(C) Bacteriophage (D) Retrovirus

3. Which one of the following pairs is ***not*** correctly matched ?

(A) *Clostridium butylicum* – Butyric acid

(B) *Trichoderma polysporum* – Cyclosporin A

(C) *Monascus purpureus* – Citric Acid

(D) *Streptococcus* – Streptokinase

4. Allergic reactions are countered by the administration of :

(A) Glucagon (B) Insulin

(C) Antihistamine (D) Oxytocin

5. Match the items in Column I with those in Column II and select the correctly matched option from those given below :

	Column I *Cross*		*Column II* *Phenotypic Ratio*
1.	Mendelian monohybrid	(i)	1 : 2 : 1 (F_2)
2.	Mendelian dihybrid	(ii)	1 : 1
3.	Incomplete dominance	(iii)	3 : 1 (F_2)
4.	Test cross (monohybrid)	(iv)	9 : 3 : 3 : 1 (F_2)

Options :

(A) 1–(ii), 2–(iv), 3–(i), 4–(iii)

(B) 1–(iii), 2–(i), 3–(iv), 4–(ii)

(C) 1–(iii), 2–(iv), 3–(i), 4–(ii)

(D) 1–(ii), 2–(i), 3–(iv), 4–(iii)

6. The expected phenotypic ratio amongst the progeny of 60 individuals, obtained from a cross between heterozygous tall pea plant and dwarf pea plant is :

(A) 45 tall and 15 dwarf
(B) 40 tall and 20 dwarf
(C) 30 tall and 30 dwarf
(D) 35 tall and 25 dwarf

7. In humans, the secondary oocyte completes meiotic division when :

(A) it gets implanted in the uterine endometrium.
(B) it is released from the matured Graafian follicle.
(C) it is penetrated by the sperm cell.
(D) acrosomal enzymes break down the zona pellucida.

8. A population is in genetic equilibrium/Hardy-Weinberg equilibrium for a gene with 2 alleles (dominant allele is 'A' and recessive allele 'a'). If the frequency of allele 'A' is 0·6, then the frequency of genotype 'Aa' is :

(A) 0·21
(B) 0·42
(C) 0·48
(D) 0·32

9. Which one of the following statements is ***not*** true ?

(A) Flippers of whales and dolphins are homologous organs.
(B) Homologous organs have similar anatomical structure, but perform different functions.
(C) Homology indicates common ancestry.
(D) Homologous structures are a result of convergent evolution.

10. In the absence of fertilization, *corpus luteum* :

(A) degenerates

(B) produces more oestrogen

(C) produces more progesterone

(D) produces both oestrogen and progesterone in equal amount

11. In the double helical structure of DNA molecule, the strands are :

(A) identical and complementary

(B) identical and non-complementary

(C) anti-parallel and complementary

(D) anti-parallel and non-complementary

12. In a 'transcription unit', the 'terminator' is located towards the :

(A) 3′ end of the template strand

(B) 5′ end of the template strand

(C) 5′ end of the coding strand

(D) 3′ end of the coding strand

For Questions number 13 to 16, two statements are given — one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is ***not*** the correct explanation of the Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

13. *Assertion (A) :* Virus-infected cells produce interferons.

Reason (R) : Interferons can cause inflammation of virus-infected cells.

14. *Assertion (A) :* Loss of biodiversity can occur due to overexploitation of resources.

Reason (R) : Introduction of *Clarias gariepinus* in Indian rivers has led to a decline in native Indian fishes.

15. *Assertion (A) :* RNA is unstable and can mutate at a faster rate.

Reason (R) : The presence of 2′ – OH group in every nucleotide of RNA makes it labile and easily degradable.

16. *Assertion (A) :* A recombinant DNA which is inserted within the coding sequence of β-galactosidase does not produce blue coloured colonies when treated with a chromogenic substrate.

Reason (R) : Insertional inactivation occurs when a recombinant DNA is introduced in the coding sequence of the enzyme.

SECTION B

17. Although Haemophilia and sickle cell anemia are two blood related Mendelian disorders, yet, they differ in their pattern of inheritance. State any two differences. 2

18. Identify A, B, C and D in the following table : 2

	Scientific name of the plant	Drug	Effect on the human body/human system
(a)	*Papaver somniferum*	A	Depressant/slows down body function
(b)	*Cannabis sativa*	Cannabinoids	B
(c)	*Erythroxylum coca*	C	D

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24. The first clinical gene therapy was given in 1990 to a 4-year-old girl with ADA deficiency.

(a) Mention the cause of this disorder.

(b) List the possible treatments available for this disorder.

(c) How can this disorder be cured permanently ? *3*

25. Describe any three assisted reproductive techniques practised to treat infertility. *3*

26. (a) (i) Write the karyotype and the genetic disorder of an individual who has developed from a zygote formed from an 'XX' egg fertilised by a 'Y' sperm. *1*

(ii) Mention any two symptoms of this genetic disorder. *1*

(iii) Write the possible reason that leads to the formation of this 'XX' egg. *1*

OR

(b) In case of any dispute, a very small sample of tissue or even a drop of blood can help us to determine the paternity of a child. Provide a scientific explanation to substantiate the statement. *3*

27. (a) List the salient features of Darwin's theory of natural selection.

(b) Microbes have proved to be suitable examples to study evolution by natural selection. Justify giving reasons. *3*

28. (a) Differentiate between humoral immune response and cell-mediated immune response.

(b) Draw a schematic diagram of an antibody molecule and label any four parts. *3*

SECTION D

Questions No. ***29*** *and* ***30*** *are case-based questions. Each question has* ***3*** *subparts with internal choice in one subpart.*

29. Read the following passage and answer the questions that follow. *4*

In 1981, the health workers of United States of America had become aware of the increased frequency of Kaposi's sarcoma, cancer of the skin and blood vessels and another disease pneumocystis pneumonia, a respiratory infection caused by a protozoan. Both these diseases were very rare in the general population, but occurred frequently in more severely "immunosuppressed" individuals. This led to the recognition of the immune system disorder that was named Acquired Immune Deficiency Syndrome (AIDS).

In 1983, virologists working in the USA and France had identified a causative agent for 'AIDS', now known as Human Immunodeficiency Virus (HIV). 'HIV' follows a set path to attack the human body to cause the disease.

(a) Name the group of cells the HIV attacks after gaining entry into the human body and write the various events that occur within this cell. *1*

(b) Write the expanded form of the diagnostic test used for detecting AIDS. Write the possible treatment available for the disease at present. *1*

(c) Mention any two steps suggested by WHO for preventing the spread of this disease. *2*

OR

(c) "A patient suffering from AIDS does not die of this disease but from some other infection." Justify the statement. *2*

30. Read the following passage and answer the questions that follow. 4

Spermatogenesis is an important primary sex characteristic in humans and all other vertebrates. The process is coordinated and controlled under the influence of hormones. It starts with the onset of puberty in humans and thereafter continues. The primordial cells within the embryonic testis which differentiate into spermatogonia are the precursors of the sperms. These are located at the outer walls of the seminiferous tubules where the process of spermatogenesis proceeds.

(a) State the site of action of FSH in the testes and describe its action thereafter. 2

OR

(a) Describe the role of LH in the process of spermatogenesis. 2

(b) Name the cells and their products which undergo : 1

(i) Mitosis and Differentiation

(ii) Meiosis I and Meiosis II

during the process of spermatogenesis.

(c) Name the accessory ducts that the sperms travel through from seminiferous tubules to reach the epididymis. 1

SECTION E

31. Answer the following questions that are based on "Hershey and Chase" experiment using *E. coli* and bacteriophage :

(a) (i) Why did they use radioactive sulphur ^{35}S and radioactive phosphorus ^{32}P in their respective culture media for growing *E. coli* population which subsequently were infected by bacteriophage ?

(ii) State the purpose of their using the following :

(1) Blender

(2) Centrifuge

(iii) Write the observations they made during the course of their experiment.

(iv) Based on the results, write the conclusion they arrived at the end of their experiment. 5

OR

(b) (i) Describe the process of transcription in prokaryotes with respect to initiation, elongation and termination.

(ii) Write how many types of RNA polymerases are used in transcription in

(1) Prokaryotes,

(2) Eukaryotes. 5

32. (a) (i) Why should a cell be made competent to take up an alien DNA ? How can a bacterial cell be made competent using calcium ions ? Explain. 2

(ii) (1) State the importance of gel electrophoresis in biotechnology.

(2) Explain the principle on which this technique works.

(3) Mention why ethidium bromide is used in this technique. 3

OR

(b) 'Bt cotton', the genetically modified crop, has greatly helped the cotton farmers to increase their crop yield.

(i) How was Bt cotton plant made resistant to bollworm ? Explain. 2

(ii) Describe the mechanism that leads to the death of bollworms feeding on Bt cotton plants. 3

33. (a) (i) Explain the process of double fertilization in an angiosperm starting from the germination of pollen grains on the stigma, mentioning the ploidy of the end products formed at the end. State the role of synergids during the course of the process. 4

(ii) Why does the development of endosperm precede that of the embryo ? 1

OR

(b) (i) Mention the site where fertilisation of the ovum occurs in a human female. Explain the process of fertilization and mention how polyspermy is prevented. 3

(ii) Name the embryonic stage that gets implanted in the uterus. Explain the process of implantation in a human female. 2