



SET-3

Series RP5PS/5

प्रश्न-पत्र कोड
Q.P. Code 57/5/3

रोल नं.

Roll No.

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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 परीक्षार्थी 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 candidates 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

57/5/3/22

229 C

1



P.T.O.



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 – Section **A, B, C, D** and **E**.*
- (iii) *Section **A** – question number **1** to **16** are multiple choice type questions. Each question carries **1** mark.*
- (iv) *Section **B** – question number **17** to **21** are very short answer type questions. Each question carries **2** marks.*
- (v) *Section **C** – question number **22** to **28** are short answer type questions. Each question carries **3** marks.*
- (vi) *Section **D** – question 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** – question 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 section **B, C** and **D** of 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

Question Nos. 1 to 16 are Multiple Choice type Questions, carrying 1 mark each. **16 × 1 = 16**

1. A person with trisomy of 21st chromosome shows **1**

- (i) Furrowed tongue (ii) Characteristic palm crease
(iii) Rudimentary ovaries (iv) Gynaecomastia

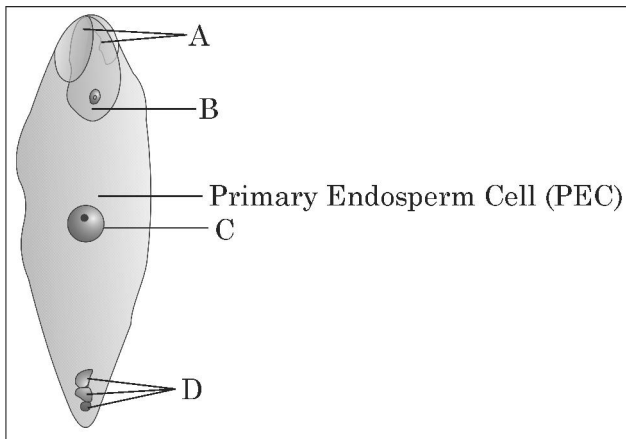
Select the correct option, from the choices given below :

- (A) (ii) and (iv) (B) (i), (ii) and (iv)
(C) (ii) and (iii) (D) (i) and (ii)

2. Which one of the following chromosomal event will not result in genetic variation amongst the offsprings ? **1**

- (A) Independent assortment (B) Crossing over
(C) Linkage (D) Mutation

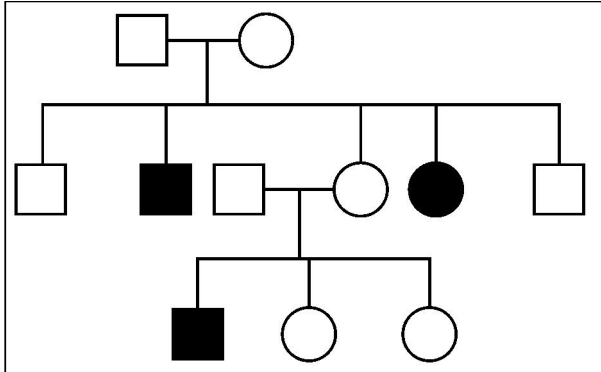
3. Identify the correct labellings in the figure of a fertilised embryo sac of an angiosperm given below : **1**



- (A) A – zygote, B – degenerating synergids, C – degenerating antipodals, D – PEN
(B) A – degenerating synergids, B – zygote, C – PEN, D – degenerating antipodals
(C) A – degenerating antipodals, B – PEN, C – degenerating synergids, D – zygote
(D) A – degenerating synergids, B – zygote, C – degenerating antipodals, D – PEN



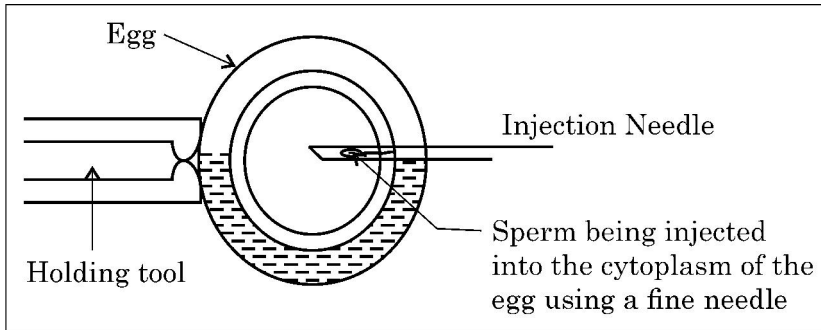
4. Study the pedigree chart of a family showing the inheritance pattern of a certain disorder. Select the option that correctly identifies the nature of the trait depicted in the pedigree chart. 1



- (A) Dominant X-linked
(B) Recessive X-linked
(C) Autosomal dominant
(D) Autosomal recessive
5. Which one of the following statements is correct in the context of observing DNA separation by agarose gel electrophoresis ? 1
- (A) DNA can be seen in visible light.
(B) DNA can be seen without staining in visible light.
(C) Ethidium bromide stained DNA can be seen in visible light
(D) Ethidium bromide stained DNA can be seen under UV light.
6. A phenomenon where a male insect mistakenly identified the patterns of a orchid flower as the female insect partner, and tries to copulate and thereby pollinates the flower is said to be : 1
- (A) Pseudocopulation (B) Pseudopollination
(C) Pseudoparthenocarpy (D) Pseudofertilisation



7. Observe the schematic representation of assisted reproductive technology given below : 1



Identify the most appropriate technique depicted in the above diagram.

- (A) IUT (B) IUI
(C) ICSI (D) ZIFT
8. The source of 'Smack' is : 1
(A) Leaves of *Cannabis sativa*
(B) Flowers of *Datura*
(C) Fruits of *Erythroxylum coca*
(D) Latex of *Papaver somniferum*
9. The first antibiotic was discovered accidentally by A while working on B. 'A' and 'B' are 1
(A) A – Waksman; B – *Streptococcus*
(B) A – Fleming; B – *Penicillium notatum*
(C) A – Waksman; B – *Bacillus brevis*
(D) A – Fleming; B – *Staphylococci*
10. If the sequence of nitrogen bases of the coding strand in a transcription unit is 5' – ATGAATG – 3', the sequence of bases in its RNA transcript would be 1
(A) 5' – AUGAAUG – 3'
(B) 5' – UACUUAC – 3'
(C) 5' – CAUUCAU – 3'
(D) 5' – GUAAGUA – 3'



11. Match the following genes of the lac operon listed in column 'A' with their respective products listed in column 'B' : 1

A		B	
Gene		Products	
a.	'i' gene	(i)	β -galactosidase
b.	'z' gene	(ii)	lac permease
c.	'a' gene	(iii)	repressor
d.	'y' gene	(iv)	transacetylase

Select the correct option :

Options :

- | | | | | |
|-----|-------|-------|------|------|
| | a | b | c | d |
| (A) | (i) | (iii) | (ii) | (iv) |
| (B) | (iii) | (i) | (ii) | (iv) |
| (C) | (iii) | (i) | (iv) | (ii) |
| (D) | (iii) | (iv) | (i) | (ii) |

12. The human chromosome with the highest and least number of genes in them are respectively : 1
- (A) Chromosome 21 and Y. (B) Chromosome 1 and X.
(C) Chromosome 1 and Y. (D) Chromosome X and Y.

Question number **13** to **16** consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below :

- (A) Both (A) and (R) are true and (R) is the correct explanation of (A).
(B) Both (A) and (R) are true, but (R) is not the correct explanation of (A).
(C) (A) is true, but (R) is false.
(D) (A) is false, but (R) is true.

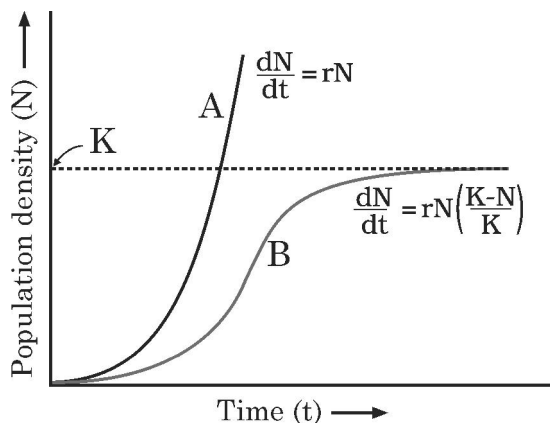
13. **Assertion (A) :** In birds the sex of the offspring is determined by males. 1
Reason (R) : Males are homogametic while females are heterogametic.



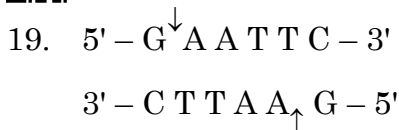
14. **Assertion (A)** : “Biodiversity hotspots” are the regions which possess high levels of species richness, high degree of endemism. **1**
Reason (R) : Total number of biodiversity hotspots in the world is 22 with two of these hotspots found in India.
15. **Assertion (A)** : AIDS is a syndrome caused by HIV. **1**
Reason (R) : HIV is a virus that damages the immune system with DNA as its genetic material.
16. **Assertion (A)** : In molecular diagnosis, single stranded DNA or RNA tagged with radioactive molecule is called a probe. **1**
Reason (R) : A probe always searches and hybridises with its complementary DNA in a clone of cells.

SECTION – B

17. If the base adenine constitutes 31% of an isolated DNA fragment, then write what will be the expected percentage of the base cytosine in it. Explain how did you arrive at the answer given. **2**
18. Observe the population growth curve and answer the questions given below :



- (a) State the conditions under which growth curve ‘A’ and growth curve ‘B’ plotted in the graph are possible. **1**
- (b) Mention what does ‘K’ in the graph represent. **1**



- (a) Name the restriction enzyme that recognises the given specific sequence of bases. What are such sequence of bases referred to as ? 1
- (b) What are the arrows in the given figure indicating ? Write the result obtained thereafter. 1

20. List the events that reduce the Biochemical Oxygen Demand (BOD) of a primary effluent during sewage treatment. 2

21. (a) "Farmers prefer apomictic seeds to hybrid seeds." Justify giving two reasons. 2

OR

(b) Mention one advantage and one disadvantage of amniocentesis. 2

SECTION – C

22. Explain the processing of heterogeneous nuclear RNA (hnRNA) into a fully functional mRNA in eukaryotes. Where does this processing occur in the cell ? 3

23. (a) "Mother's milk is considered very essential for the new born infant." Justify. 1

(b) What is a 'vaccine' ? Explain the principle on which it works. 2

24. (a) Tropical regions harbour more species than the temperate regions. How have biologists tried to explain this in their own ways ? Explain. 3

OR



- (b) (i) What does an ecological pyramid represent ?
- (ii) The Ecological pyramids may have an 'upright' or an 'inverted' shape. Justify with the help of suitable examples. **3**

25. State why plant breeders are interested in artificial hybridisation programme. How do they carry out this process ? **3**

26. (a) What are transgenic animals ?
- (b) Name the transgenic animal having the largest number amongst all the existing transgenic animals.
- (c) State any 3 reasons for which these types of animals are being produced. **3**

27. (a) Construct a pyramid of biomass in sea with phytoplankton and fishes. Explain giving reasons about the characteristic of the constructed pyramid.
- (b) In which condition will the pyramid remain always upright ? **3**

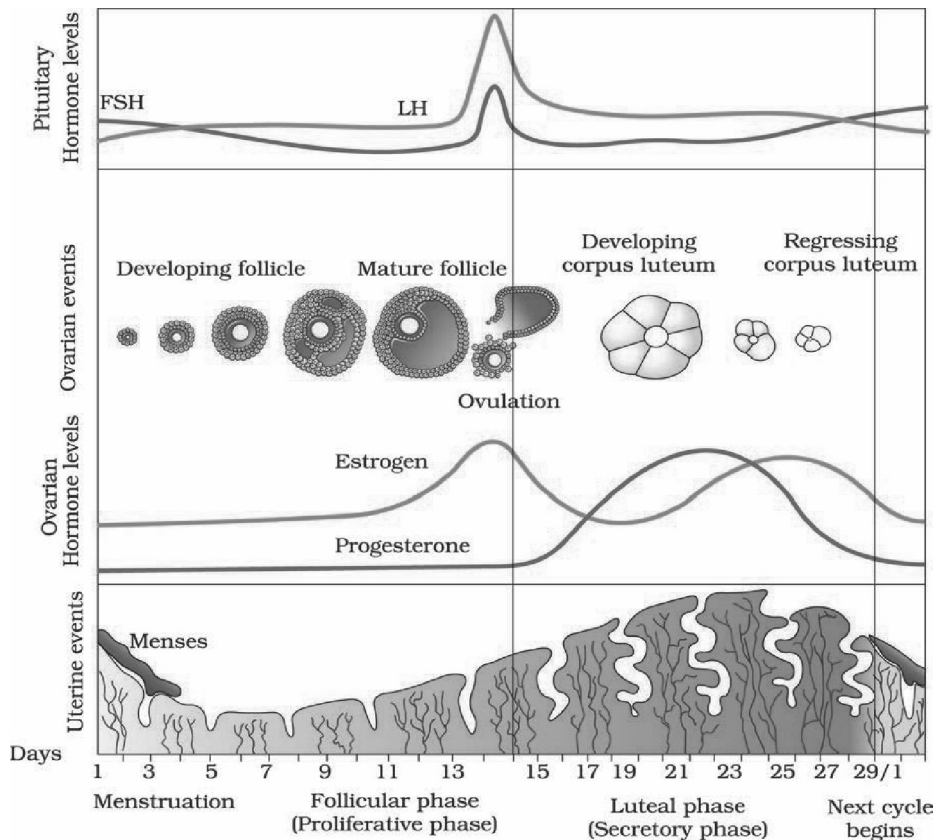
28. (a) Why does DNA replication occur within a replication fork and not in its entire length simultaneously ?
- (b) "DNA replication is continuous and discontinuous on the two strands within the replication fork." Explain with the help of a schematic representation. **3**



SECTION – D

Q. No. 29 and 30 are case based questions. Each question has 3 sub-questions with internal choice in one sub-question.

29. In a human female, the reproductive phase starts on the onset of puberty and ceases around middle age of the female. Study the graph given below regarding menstrual cycle and answer the questions that follow :



- (a) Name the hormones and their source organ, which are responsible for menstrual cycle at puberty. 1
- (b) For successful pregnancy, at what phase of the menstrual cycle an early embryo (upto 3 blastomeres) should be Implanted in the Uterus (IUT) of a human female who has opted for Assisted Reproductive Technology (ART) ? Support your answer with a reason. 1
- (c) Name the hormone and its source organ responsible for the events occurring during proliferative phase of menstrual cycle. Explain the event. 2

OR

- (c) In a normal human female, why does menstruation only occurs if the released ovum is not fertilised ? Explain. 2



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

“Mosquitoes are drastically affecting the human health in almost all the developing tropical countries. Different species of mosquitoes cause very fatal diseases so much so that many humans loose their life and if they survive, are unable to put in productive hours to sustain their life. With the result the health index of the country goes down.”

- (a) Name the form in which *Plasmodium* gains entry into (i) human body (ii) the female *Anopheles* body. 1
- (b) Why do the symptoms of malaria not appear in a person immediately after being bitten by an infected female *Anopheles* ? Give one reason. Explain when and how do the symptoms of the disease would appear. 2

OR

- (b) Explain the events which occur within a female *Anopheles* mosquito after it has sucked blood from a malaria patient. 2
- (c) Name a species of mosquito other than female *Anopheles* and the disease, for which it carries the pathogen. 1

SECTION – E

31. (a) (i) Draw a diagram of a human sperm. Label any four parts and write their functions. 4
- (ii) In a human female, probability of an ovum to get fertilized by more than one sperm is impossible. Give reason. 1

OR

- (b) (i) With the help of labelled diagram **only**, show the different stages of embryo development in a dicot plant. 4
- (ii) Endosperm development precedes embryo development. Justify. 1



32. (a) (i) Draw a schematic diagram of the cloning vector pBR 322 and label (1) Bam HI site (2) gene for ampicillin resistance (3) 'ori' (4) 'rop' gene.
- (ii) State the role of 'rop' gene.
- (iii) A cloning vector does not have a selectable marker. How will it affect the process of cloning ?
- (iv) Why is insertional inactivation preferred over the use of selectable markers in cloning vectors ?

5

OR

- (b) (i) Name the nematode (scientific name) that infects the roots of tobacco plant and reduces its yield.
- (ii) Name the vector that is used to introduce nematode-specific genes into the host plant (tobacco).
- (iii) How do sense and anti-sense RNAs function ?
- (iv) Why could parasite not survive in a transgenic tobacco plant ?

5

33. (a) Work out a dihybrid cross upto F_2 generation between pea plants bearing violet coloured axial flowers and white coloured terminal flowers using Punnet's square. Give their F_2 phenotypic ratio. State the Mendel's law of inheritance that was derived from such a cross.

5

OR

- (b) Explain the process of transcription in prokaryotes. How is it different from transcription in eukaryotes ?

5

