Series SSJ/1

Set No. 4

प्रश्न-पत्र कोड
Question Paper Code 057/1/4

अनुक्रमांक
Roll No.

2	2	6	7	0	6	6	6

छात्र प्रश्न-पत्र कोड को OMR शीट में आबंटित जगह में लिखें ।

Candidates must write the Question Paper Code in the space allotted in the OMR Sheet.

नोट / NOTE :	
(i)	कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ **31** हैं । Please check that this question paper contains **31** printed pages.
(ii)	प्रश्न-पत्र में ऊपरी दाहिने हाथ की ओर दिए गए प्रश्न-पत्र कोड को छात्र OMR शीट में उपयुक्त स्थान पर लिखें । Question Paper Code given on the top right hand side of the question paper should be written in the appropriate place in the OMR Sheet by the candidate.
(iii)	कृपया जाँच कर लें कि इस प्रश्न-पत्र में **60** बहुविकल्पीय प्रश्न (MCQs) हैं । Please check that this question paper contains **60** Multiple Choice Questions (MCQs).
(iv)	परीक्षा शुरू होने के वास्तविक समय से पहले इस प्रश्न-पत्र को पढ़ने के लिए 20 मिनट का अतिरिक्त समय आबंटित किया गया है । 20 minute additional time has been allotted to read this question paper prior to actual time of commencement of the examination.

जीव विज्ञान (सैद्धांतिक)

BIOLOGY (Theory)

Term-I

निर्धारित समय : 90 मिनट

Time allowed : 90 minutes

अधिकतम अंक : 35

Maximum Marks : 35

General Instructions :

(i) *The question paper contains* ***three*** *sections : Section* ***A, B*** *and C.*

(ii) *Section A has* ***24*** *questions. Attempt any* ***20*** *questions.*

(iii) *Section B has* ***24*** *questions. Attempt any* ***20*** *questions.*

(iv) *Section C has* ***12*** *questions. Attempt any* ***10*** *questions.*

(v) *All questions carry equal marks.*

(vi) *There is* ***no*** *negative marking.*

SECTION A

Section A consists of ***24*** *questions. Attempt any* ***20*** *questions from this section. The first* ***20*** *questions attempted would be evaluated.*

1. Enclosed within the integuments of a typical anatropous ovule is a diploid mass of cellular tissue known as :

(a) Megaspore mother cell
(b) Nucellus
(c) Synergids
(d) Embryo sac

2. Researchers the world over are trying to transfer apomictic genes to hybrid varieties as hybrid characters in the progeny :

(a) do not segregate
(b) segregate
(c) develop genetic variations
(d) will remain unexpressed

3. The aquatic plant having long and ribbon like pollen grains is :

(a) *Vallisneria* (b) *Hydrilla* (c) *Eicchornia* (d) *Zostera*

4. In a typical dicotyledonous embryo, the portion of embryonal axis above the level of cotyledons is :

(a) Plumule (b) Coleoptile (c) Epicotyle (d) Hypocotyle

5. To overcome incompatible pollinations so as to get desired hybrids, a plant breeder must have the knowledge of _____.

(a) pollen – nucellar interaction
(b) pollen – egg cell interaction
(c) pollen – pistil interaction
(d) pollen – embryo sac interaction

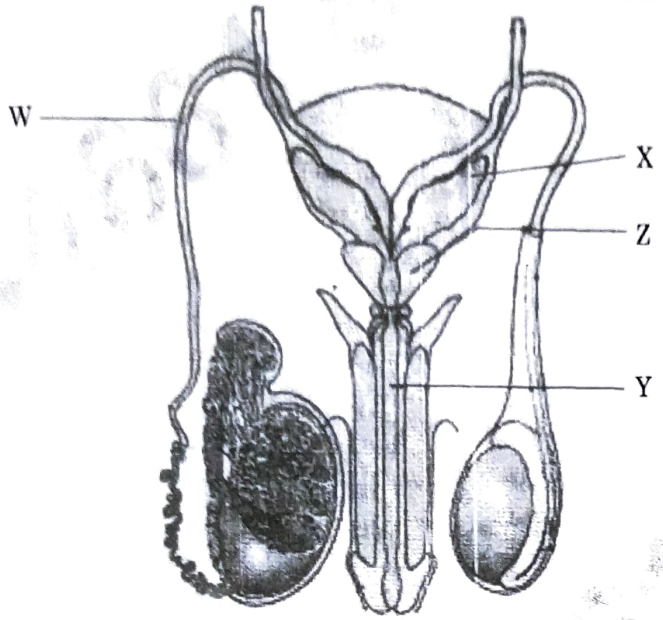
6. Pollen grains retain viability for months in plants belonging to different families given below :

(i) Solanaceae
(ii) Leguminosae
(iii) Gramineae
(iv) Rosaceae
(v) Liliaceae

The correct option is :

(a) (i), (ii) and (v)
(b) (i), (ii) and (iv)
(c) (ii), (iv) and (v)
(d) (i), (iii) and (v)

7. Given below is a diagramatic view of the human male reproductive system :



Identify the correct labelling for W, X, Y and Z and choose the correct option from the table below :

	W	X	Y	Z
(a)	Epididymis	Prostrate Gland	Glans Penis	Bulbourethral Gland
(b)	Bulbourethral Gland	Glans Penis	Prostrate Gland	Epididymis
(c)	Vas deferens	Seminal Vesicle	Urethra	Prostrate Gland
(d)	Rete testis	Bulbourethral Gland	Epididymis	Glans Penis

8. During human embryonic development, the heart in the embryo is formed after :

(a) 15 days of pregnancy

(b) 30 days of pregnancy

(c) 45 days of pregnancy

(d) 60 days of pregnancy

9. The uterus opens into the vagina through a narrow :

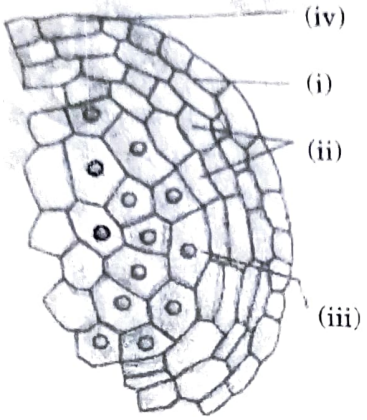
(a) Ampulla

(b) Isthmus

(c) Cervix

(d) Infundibulum

10. In the transverse section of a young anther shown below, identify the correct sequence of wall layers from outside to inside :



	(i)	(ii)	(iii)	(iv)
(a)	Middle layers	Endothecium	Epidermis	Tapetum
(b)	Tapetum	Middle layers	Endothecium	Epidermis
(c)	Epidermis	Endothecium	Middle layers	Tapetum
(d)	Endothecium	Middle layers	Tapetum	Epidermis

11. Floral reward/s provided by insect pollinated flowers to sustain animal visit is/are :

(a) nectar and fragrance
(b) nectar and pollen grains
(c) pollen grains and fragrance
(d) fragrance and bright colour

12. The cause of Klinefelter's syndrome in humans is :

(a) Absence of Y-chromosome
(b) Absence of X-chromosome
(c) Extra copy of an autosome
(d) Extra copy of an X-chromosome

13. Select the ***incorrect*** pair :

(a) Polygenic inheritance : Haemophilia
(b) Linkage : *Drosophila*
(c) Incomplete dominance : *Antirrhinum*
(d) Pleiotropy : Phenylketonuria

14. According to Mendel, the nature of the unit factors that control the expression of traits were :

(a) Stable
(b) Blending
(c) Stable and discrete
(d) Discrete

15. Which of the following animals exhibit male heterogamety ?

(i) Fruit fly
(ii) Fowl
(iii) Human
(iv) Honey bee

(a) (i) and (iii) (b) (ii) and (iv) (c) (ii) and (iii) (d) (i) and (iv)

16. The probability of all possible genotypes of offsprings in a genetic cross can be obtained with the help of :

(a) Test cross (b) Back cross (c) Punnett square (d) Linkage cross

17. The number of different type of gametes that would be produced from a parent with genotype AABBCc is :

(a) 1 (b) 2 (c) 3 (d) 4

18. Select the important goals of HGP from the given options :

(i) Store the information for data analysis
(ii) Cloning and amplification of human DNA
(iii) Identify all the genes present in human DNA
(iv) Use of DNA information to trace human history

(a) (i) and (ii) (b) (ii) and (iii) (c) (i) and (iii) (d) (ii) and (iv)

19. A codon is a 'triplet of bases' was suggested by :

(a) Marshall Nirenberg
(b) Har Gobind Khorana
(c) George Gamow
(d) Francis Crick

20. The correct feature of Double-helical structure of DNA as given by Watson and Crick is :

(a) Right-handed helix, pitch is 3·4 nm
(b) Left-handed helix, pitch is 3·8 nm
(c) Right-handed helix, pitch is 3·8 nm
(d) Left-handed helix, pitch is 3·4 nm

21. Charging of tRNA during translation is necessary for :

(a) Binding of anticodons of tRNA to the respective codons of mRNA
(b) Peptide bond formation between two amino acids
(c) Movement of ribosomes from codon to codon
(d) Binding of ribosomes to the mRNA

22. If *E. coli* were allowed to grow in the culture medium for 80 minutes by Matthew Meselson and Franklin Stahl in their experiments, the proportion of light and hybrid density DNA molecule would have been :

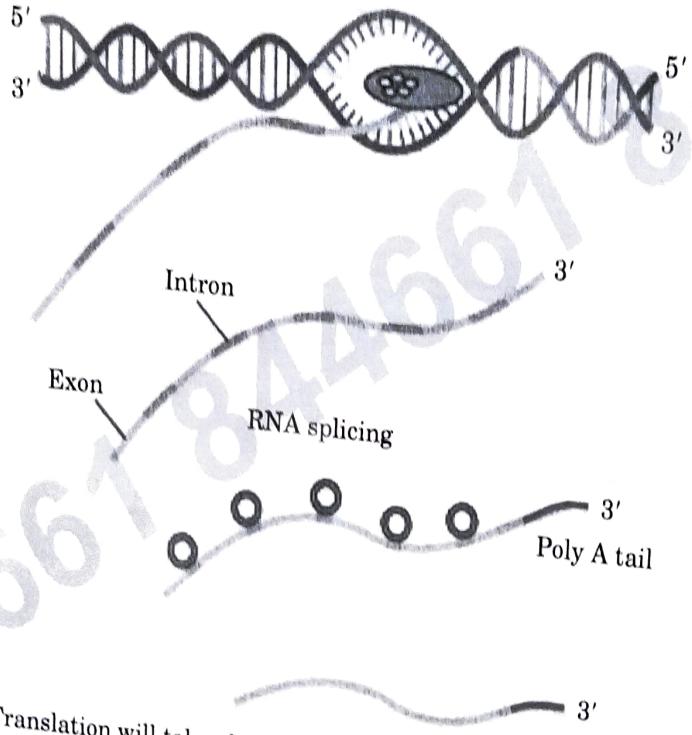
(a) 87·5% of light density DNA and 12·5% of hybrid density DNA

(b) 75·0% of light density DNA and 25% of hybrid density DNA

(c) 50% of light density DNA and 50% of hybrid density DNA

(d) 12·5% of light density DNA and 87·5% of hybrid density DNA

23. A diagramatic illustration of the process of transcription by RNA polymerase-II in eukaryote is given below. Choose the most appropriate statement with respect to the fate of the precursor of mRNA transcribed that will be :



(a) Translation will take place once the precursor of mRNA leaves the nucleus.

(b) Translation on mRNA will not take place once the precursor of mRNA leaves the nucleus.

(c) Translation will take place in the nucleus.

(d) The precursor of mRNA has to be processed further in next step before being translated.

24. Identify the correct pair of codon with its corresponding pair of amino acid :

(a) UAA : Leucine

(b) UGA : Serine

(c) AUG : Histidine

(d) UUU : Phenylalanine

SECTION B

Section B consists of ***24*** *questions. Attempt any* ***20*** *questions from this section. The first* ***20*** *questions attempted would be evaluated.*

Question Nos. 25 to 28 consists of two statements – Assertion (A) and Reason (R). **Answer these questions selecting the appropriate option given below :**

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

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

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

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

25. *Assertion (A) :* Very often persons suffering from Sexually Transmitted Diseases (STD) do not go for timely detection and proper treatment.

Reason (R) : Absence or less significant symptoms in the early stages of STDs and the social stigma attached to the disease.

26. *Assertion (A) :* Vasectomy is a sterilisation procedure advised for females as a terminal method.

Reason (R) : In vasectomy, a small part of the vas deferens is removed or tied by blocking gamete transport therefore preventing conception.

27. *Assertion (A) :* Interstitial spaces outside the seminiferous tubule have blood vessels and sertoli cells.

Reason (R) : Sertoli cells provide nutrition to the germ cells.

28. *Assertion (A) :* Accumulation of phenylalanine in the brain results in mental retardation in Phenylketonuria.

Reason (R) : The affected person lacks phenylalanine which is therefore not converted to tyrosine.

29. Choose the correct option for the features of functional mammary gland of all female mammals from the statements below :

(i) Glandular tissue with variable amount of fat.

(ii) Mammary lobes, 30 – 40 in number called alveoli.

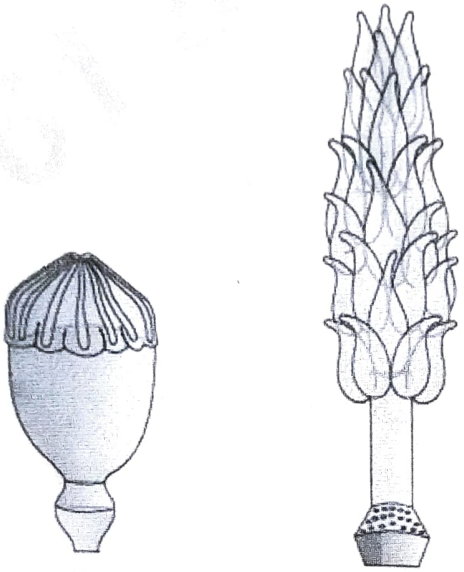
(iii) Mammary ducts joining to form mammary tubules.

(iv) Mammary ampulla connected to lactiferous duct.

(a) (i) and (iii) (b) (ii) and (iii) (c) (i) and (iv) (d) (ii) and (iv)

P.T.O.

30. Which condition of gynoecium (pistil) is shown the figures (i) and (ii) ?



(i) (ii)

(a) (i) multicarpellary apocarpous, (ii) multicarpellary syncarpous

(b) (i) multicarpellary syncarpous, (ii) multicarpellary apocarpous

(c) (i) bicarpellary apocarpous, (ii) bicarpellary syncarpous

(d) (i) bicarpellary syncarpous, (ii) bicarpellary apocarpous

31. An IUD recommended to promote the cervix hostility to the sperms is :

(a) CuT (b) Multiload-375

(c) LNG-20 (d) Cu7

32. Identify the disease which is ***not*** a sexually transmitted disease :

(a) Gonnorhoea (b) Syphilis

(c) Amoebiasis (d) Chlamydiasis

33. The nature of meiotic division during oogenesis in a human female is :

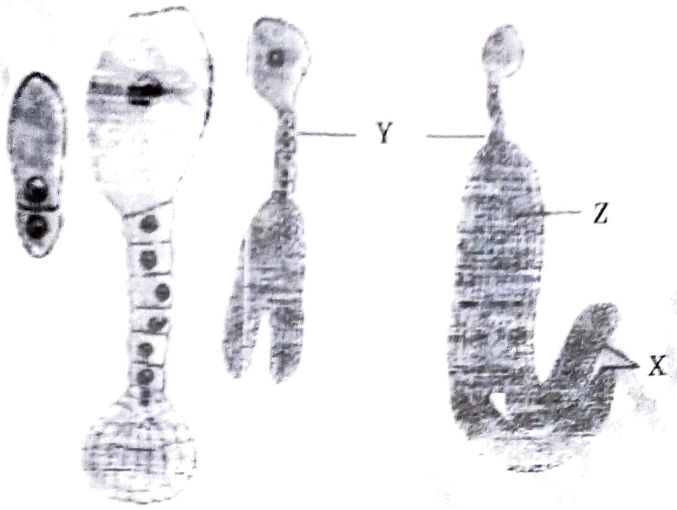
(a) equal cell division

(b) suspended cell division

(c) continuous cell division

(d) rapid cell division

34. Choose the correct labellings for the parts X, Y and Z in the given figure of the stages in embryo development in a dicot :



(a) X is suspensor, Y is radicle and Z is cotyledon

(b) X is radicle, Y is cotyledon and Z is suspensor

(c) X is cotyledon, Y is suspensor and Z is radicle

(d) X is zygote, Y is radicle and Z is cotyledon

35. Which of the following outbreeding devices are used by majority of flowering plants to prevent inbreeding depression ?

(i) Pollen release and stigma receptivity are not synchronised.

(ii) Different positions of anther and stigma.

(iii) Production of different types of pollen grains.

(iv) Formation of unisexual flowers along with bisexual flowers.

(v) Preventing self-pollen from fertilising the ovules by inhibiting pollen germination.

(a) (i), (ii) and (v)

(b) (ii), (iii) and (v)

(c) (i), (iii) and (v)

(d) (iii), (iv) and (v)

36. Histone proteins that help in forming the nucleosomes in the nucleus are rich in basic amino acids such as :

(a) Arginine and tyrosine

(b) Lysine and histidine

(c) Arginine and lysine

(d) Histidine and tryptophan

37. In *Pisum sativum*, the flower position may be axial (allele A) or terminal (allele a). What would be the percentage of the offspring with respect to axial flower position, if a cross is made between parents Aa × aa ?

(a) 25%

(b) 50%

(c) 75%

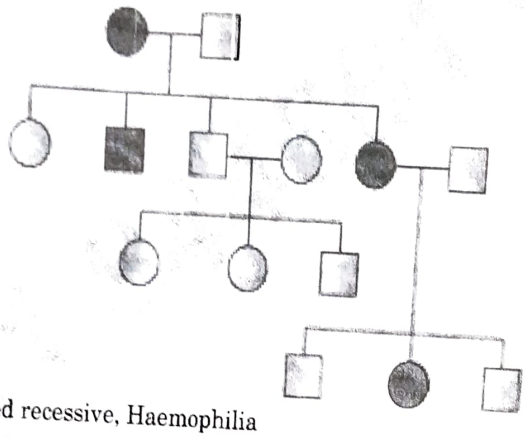
(d) 100%

38. In humans rolling of tongue is an autosomal dominant trait (R). In a family both the parents have the trait of rolling tongue but their daughter does not show the trait, whereas the sons have the trait of rolling of tongue.

The genotypes of the family would be :

	Mother	Father	Daughter	Son
(a)	Rr	Rr	rr	rr
(b)	Rr	Rr	rr	RR
(c)	rr	Rr	RR	rr
(d)	RR	rr	Rr	Rr

39. Study the pedigree analysis of human given below and identify the type of inheritance along with an example :



(a) Sex-linked recessive, Haemophilia
(b) Sex-linked dominant, Vitamin D resistant rickets
(c) Autosomal recessive, Sickle-cell anaemia
(d) Autosomal dominant, Myotonic Dystrophy

40. Possibility of the blood groups of the children in a family where the father is heterozygous for blood group 'A' and the mother is heterozygous for blood group 'B', would be :

(a) Blood groups 'A', 'B'
(b) Blood groups 'A', 'B', 'O'
(c) Blood group 'AB', 'O'
(d) Blood groups 'A', 'B', 'AB', 'O'

41. The correct statement with respect to Thalassemia in humans is :

(a) α-Thalassemia is controlled by a single gene HBB.
(b) The gene for α-Thalassemia is located on chromosome-16.
(c) β-Thalassemia is controlled by two closely linked genes HBA-1 and HBA-2.
(d) In β-Thalassemia the production of α-globin chain is affected.

42. A region of coding strand of DNA has the following nucleotide sequence :

5′ – TACGCCG – 3′

The sequence of bases on mRNA transcribed by this would be :

(a) 5′ – UACGCCG – 3′
(b) 3′ – UACGCCG – 3′
(c) 5′ – ATGCGGC – 3′
(d) 3′ – ATGCGGC – 3′

43. A DNA molecule is 160 base pairs long. If it has 20% adenine, how many cytosine bases are present in this DNA molecule ?

(a) 48 (b) 64 (c) 96 (d) 192

44. A template strand in a bacterial DNA has the given base sequence :

5′ – AGGTTTAACG – 3′

What would be the RNA sequence transcribed from this template strand ?

(a) 5′ – CGUUAAACCU – 3′
(b) 5′ – AGGUUUUUCG – 3′
(c) 5′ – TCCAAATTGC – 3′
(d) 5′ – AGGTTTAACG – 3′

45. In the presence of allolactose, the lac repressor in the operon of *E. coli* :

(a) binds to the operator
(b) cannot bind to the operator
(c) binds to the promoter
(d) binds to the regulator

46. Taylor and colleagues performed experiments on _____ using radioactive _____ to prove that the DNA in chromosomes replicate semi-conservatively.

(Select the correct option for the blanks)

(a) *Vicia faba*, Uridine
(b) *E. coli*, Uridine
(c) *Vicia faba*, Thymidine
(d) *E. coli*, Thymidine

47. The reactive hydroxyl group in the nucleotide of RNA is :

(a) 5′ OH (b) 4′ OH (c) 3′ OH (d) 2′ OH

48. Given below are the pairs of contrasting traits in *Pisum Sativum* as studied by Mendel. Identify the ***incorrect*** pair of traits :

	Character	Dominant	Recessive
(a)	Stem height	Tall	Dwarf
(b)	Seed shape	Round	Wrinkled
(c)	Pod colour	Yellow	Green
(d)	Flower position	Axial	Terminal

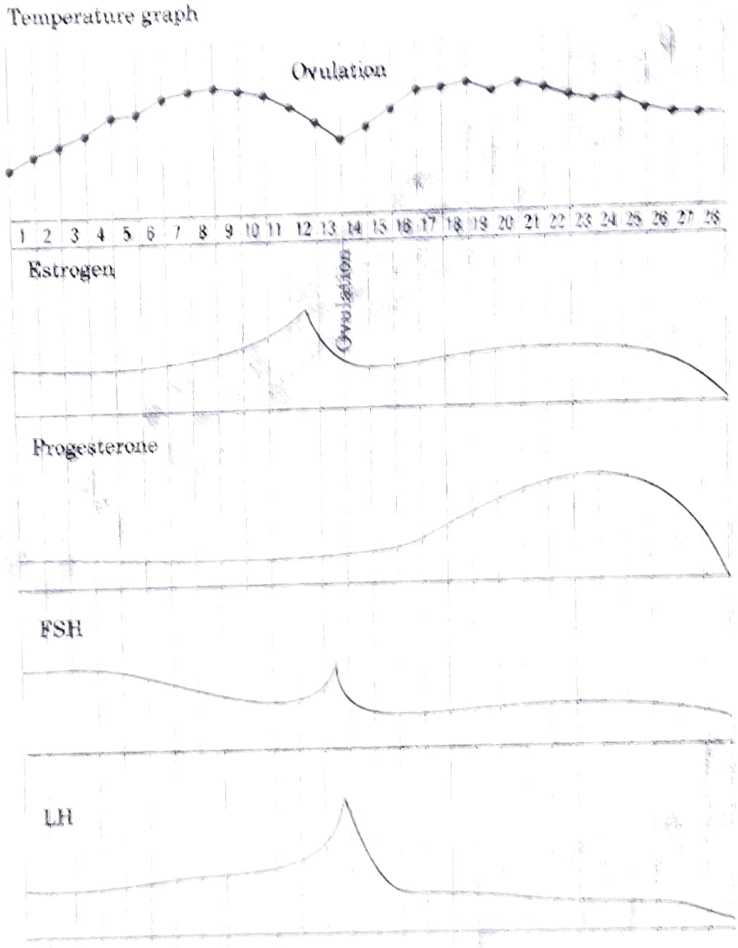
SECTION C

Section C consists of one case followed by 6 questions. Besides this 6 more questions are given. Attempt any 10 questions from this section. The first 10 questions attempted would be evaluated.

CASE

A group of medical students carried out a detailed study on the impact of various factors on the different hormones during the menstrual cycle in a human female. They collected the data with different factors. Given below is the graph plotted from the data collected showing the morning temperature and concentration of hormones FSH, LH, estrogen and progesterone during normal menstrual cycle in a woman.

Temperature graph



Study the graph and answer the given questions (Question nos. 49 – 54) :

49. The early morning recording of temperature in the graph during actual menstruation and during ovulation respectively are :

(a) low, high (b) high, low (c) low, low (d) high, high

50. The time of ovulation is of importance in cases of :

(i) couples having difficulty in conception.

(ii) to know the safe period for prevention of pregnancy.

(iii) to inhibit the process of ovulation.

(iv) to stimulate ovarian follicular development.

(a) (i) and (iv) (b) (ii) and (iv) (c) (i) and (ii) (d) (iii) and (iv)

51. The increase in the level of progesterone is maximum under the influence of LH during :

(a) Secretory phase (b) Follicular phase

(c) Menstruation (d) Proliferative phase

52. Which of the following hormone/hormones is/are showing rapid surge leading to changes in Graafian follicle just before ovulation ?

(a) LH (b) FSH

(c) FSH and Estrogen (d) FSH and LH

53. The human corpus luteum starts regressing _____ days after ovulation. (Identify the correct choice for the blank).

(a) 10 – 11 (b) 14 – 15 (c) 16 – 17 (d) 18 – 20

54. As per the data plotted in the graph, in which period of the menstrual cycle is the chance of fertilisation very high in human female ?

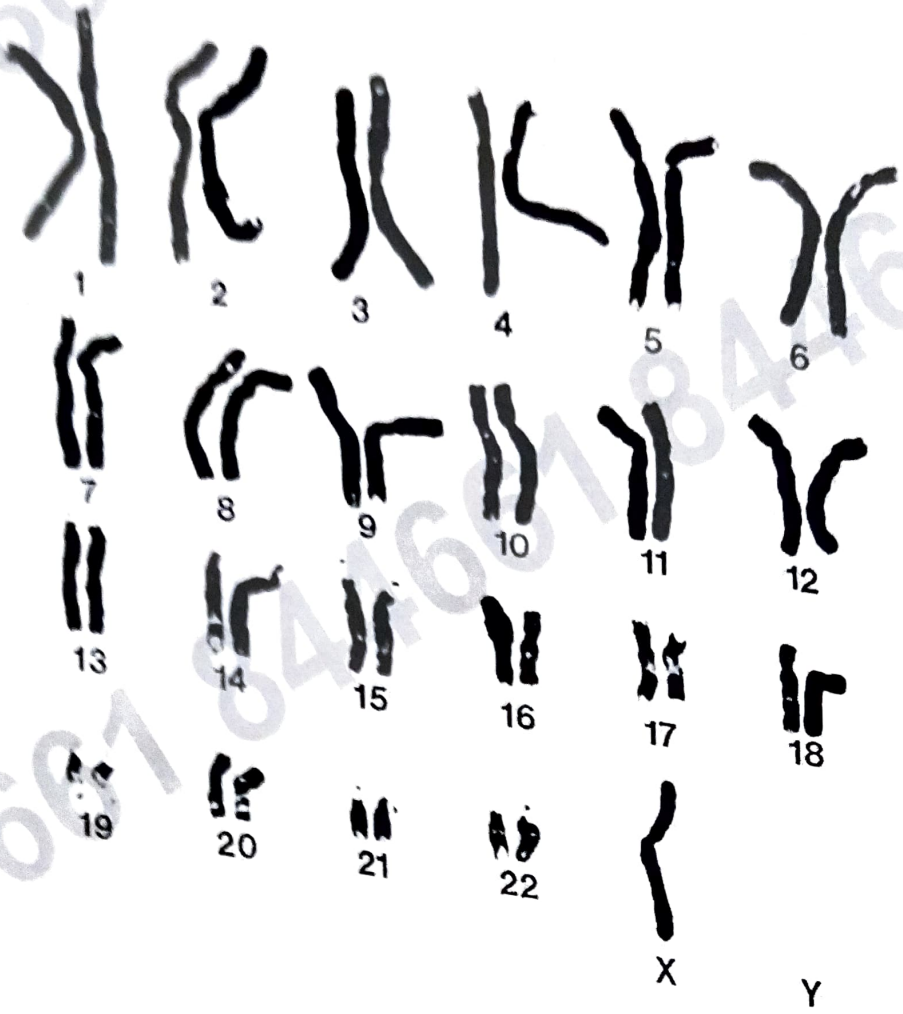
(a) 3^{rd} – 9^{th} days (b) 10^{th} – 17^{th} days

(c) 18^{th} – 23^{th} days (d) 23^{rd} – 28^{th} days

55. A plant breeder crossed a pure bred tall plant having white flowers with a pure bred dwarf plant having blue flowers. He obtained 202 F_1 progeny and found that they are all tall having blue flowers. Upon selfing these F_1 plants he obtained a progeny of 2160 plants. Approximately how many of these are likely to be short having blue flowers ?

(a) 1215 (b) 405 (c) 540 (d) 135

34. Given below is a Karyotype of a human foetus obtained for screening to find any probable genetic disorder.



Based on the Karyotype, the chromosomal disorder detected in unborn foetus and the consequent symptoms the child may suffer from are :

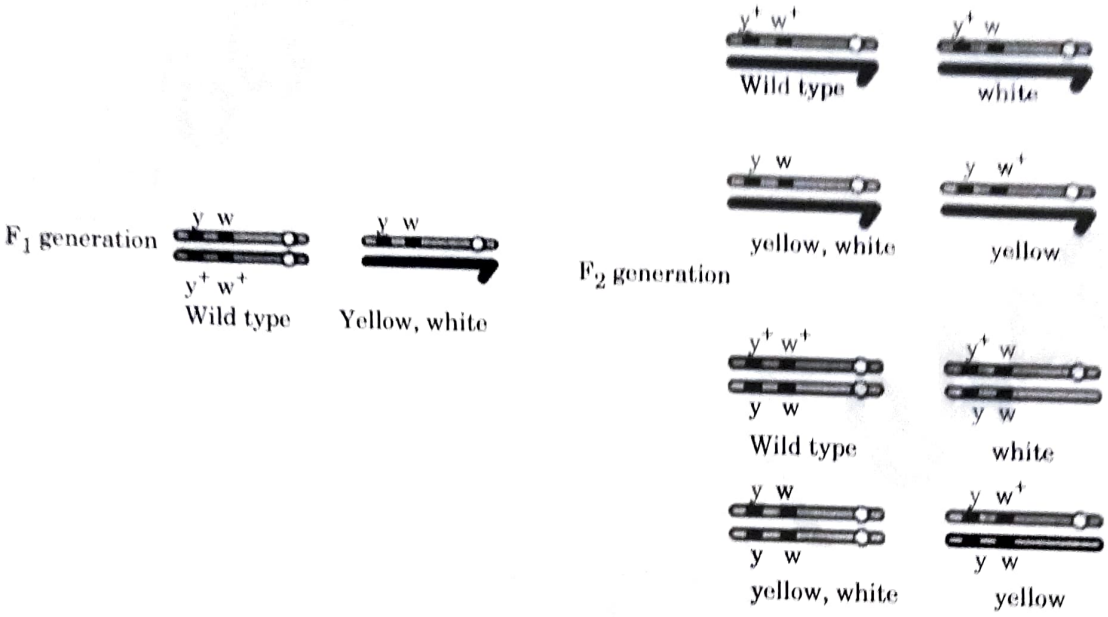
(a) Turner's syndrome : Sterile ovaries, short stature

(b) Down's syndrome : Gynaecomastia, overall masculine stature

(c) Turner's syndrome : Small round head, flat back of head

(d) Down's syndrome : Furrowed tongue, short stature

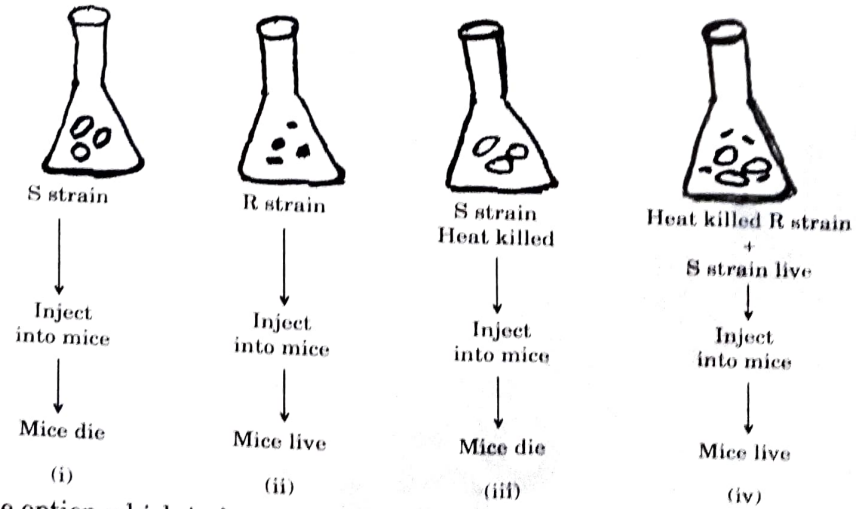
57. In the dihybrid cross that was conducted by Morgan involving mating between parental generation for genes yellow bodied, white eyed female *Drosophila* and wild type male *Drosophila*, upto F_2 generation is given below :



Study the result obtained of the F_2 progeny. Select the correct option from the given choices for the F_2 progeny.

(a) Parental type, 1·3% : Strength of linkage high
(b) Recombinant types, 1·3% : Strength of linkage low
(c) Parental type 98·7% : Strength of linkage high
(d) Recombinant types, 98·7% : Strength of linkage low

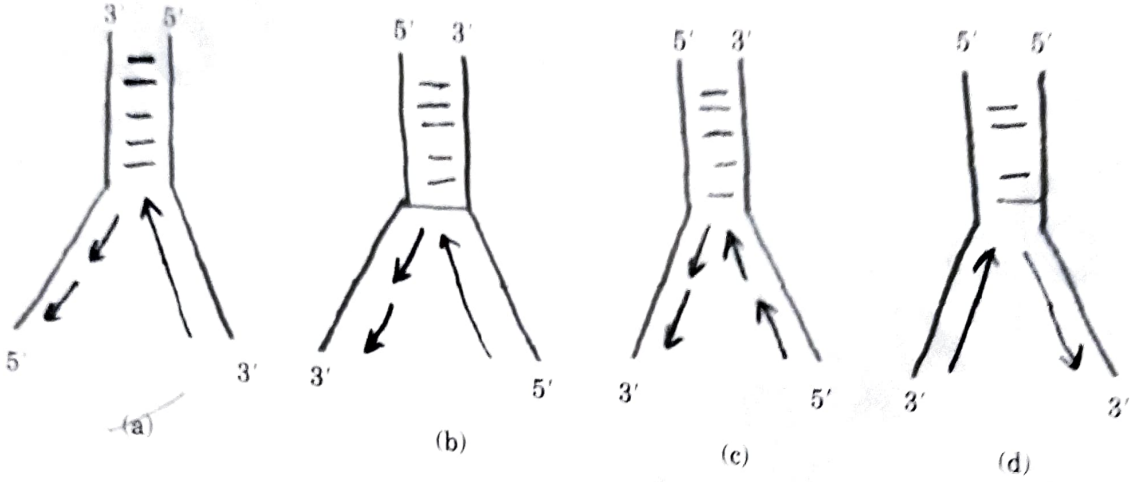
58. Study the given diagrammatic representation of Griffith's experiment to demonstrate transformation in bacteria :



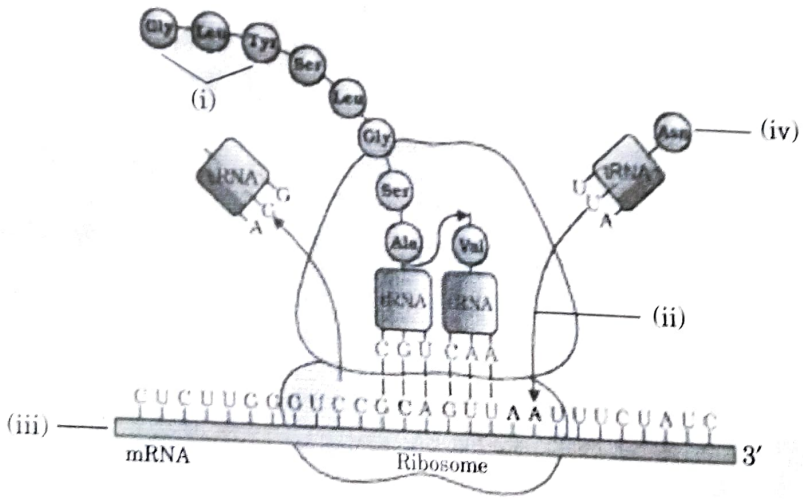
Select the option which is ***incorrectly*** representing the experiment :

(a) (i) and (iii) (b) (ii) and (iii) (c) (iii) and (iv) (d) (ii) and (iv)

59. Which one of the following diagram correctly represents DNA replication in eukaryotes ?



60. In the given figure of translation machinery of eukaryotes, select the correct labellings for (i), (ii), (iii) and (iv) :



(a) (i) Codon, (ii) Anticodon, (iii) tRNA, (iv) 3′ end of mRNA

(b) (i) Anticodon, (ii) Codon, (iii) 3′ end of mRNA, (iv) 5′ end of mRNA

(c) (i) Polypeptide chain, (ii) Large subunit of ribosome, (iii) 5′ end of mRNA, (iv) tRNA

(d) (i) Ribozyme, (ii) Polypeptide chain, (iii) tRNA, (iv) 5′ end of tRNA