THE VILLAGE
INTERNATIONAL SCHOOL
"We Nurture Dreams"

Date :06/12/2024 **Grade:12**	**MODEL EXAM-1** **Biology (044)**	**Time : 3 Hours** **MARKS :70**

General Instructions:

1.All questions are compulsory.
2.The question paper has five sections and 33 questions. All questions are compulsory.
3.Section—A has 16 questions of 1 mark each; Section—B has 5 questions of 2 marks each; Section—C has 7 questions of 3 marks each: Section—D has 2 case-based questions of 4 marks each; and Section—E has 3 questions of 5 marks each.
4.There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
5.Wherever necessary, neat and properly labelled diagrams should be drawn.

Qn. No		
	SECTION A	
1	Lysergic Acid Diethylamide (LSD) is obtained from a)Bark of Cinchona b)Ergot fungus c)Flowers of Datura d) Alkaloids of Erythroxylum coca	1
2	The wall layer of microsporangium which nourishes the pollen grain is: a) epidermis b) endothecium c) middle layers d)tapetum	1

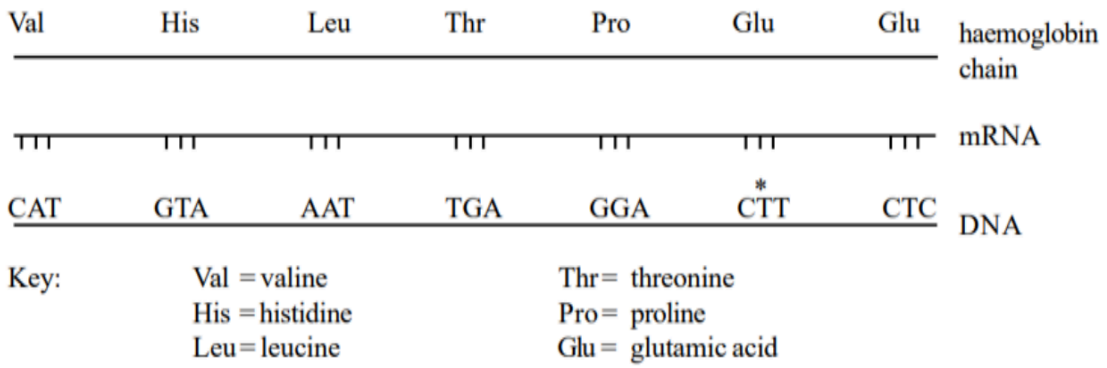
3	Non-sense codons participate in a)Releasing t-RNA from polynucleotide chain b)Formation of unspecified amino acids c)Terminating message of gene-controlled protein synthesis d)Conversion of sense DNA into non-sense DNA	1
4	In a certain species of insects, some have 13 chromosomes, and the others have 14 chromosomes. The 13 and 14 chromosome bearing organisms are a) males and females, respectively b) females and males, respectively c) all males d) all females	1
5	At a particular locus, the frequency of allele A is 0.8 and that of allele a is 0.2. What would be the frequency of heterozygotes in a random mating population at equilibrium? a) 0.32 b) 0.16 c) 0.24 d) 0.48	1
6	Which type of selection is industrial melanism observed in moth, Biston betularia? (a) Stabilising (b) Directional (c) Disruptive (d) Artificial	1
7	What is the smallest part of a DNA molecule that can be changed by a point mutation? a) Oligonucleotide b) Codon c) Gene d) Nucleotide	1
8	A colour blind son born from normal parents, what would be the genotype of the maternal grandfather:- a. X' Y b. X'Y' c. XY d. None of the above	1

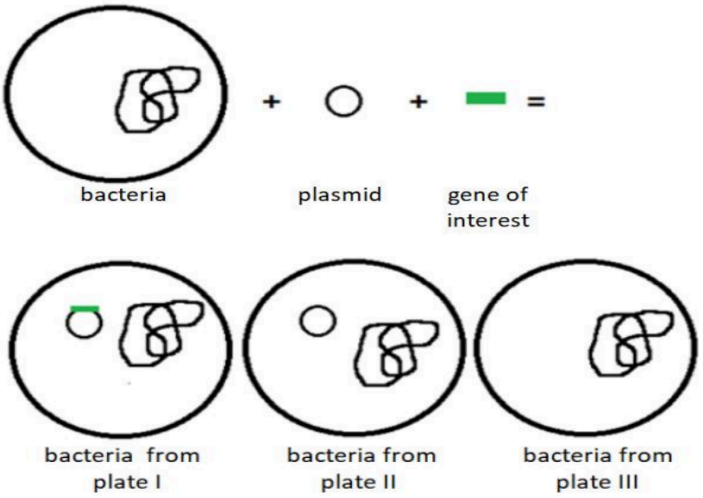
9	A patient was advised to have a kidney transplant. To suppress the immune reaction, the doctor would administer him: a) statins produced from Monascus purpureus b) statins produced from Streptococcus thermophilus c) cyclosporin A produced from Trichoderma polysporum d) cyclosporin A produced from Clostridium butylicum	1
10	Discontinuous synthesis of DNA occurs on one strand because a) DNA molecule being synthesized is very long b) DNA dependent DNA polymerase catalyses polymerisation only in one direction (5-3‘) c) It is a more efficient process d) DNA ligase has to have some role	1
11	**Which of the following are not examples of analogous structures?** a)Wings of bat and butterfly b)Wings of bat and forelimb of cattle. c)Thorn and spine d)Gloriosa tendril and Lathyrus tendril	1
12	Which is not the characteristic of a population? a)Natality b)Mortality c)Stratification d)Sex ratio	1

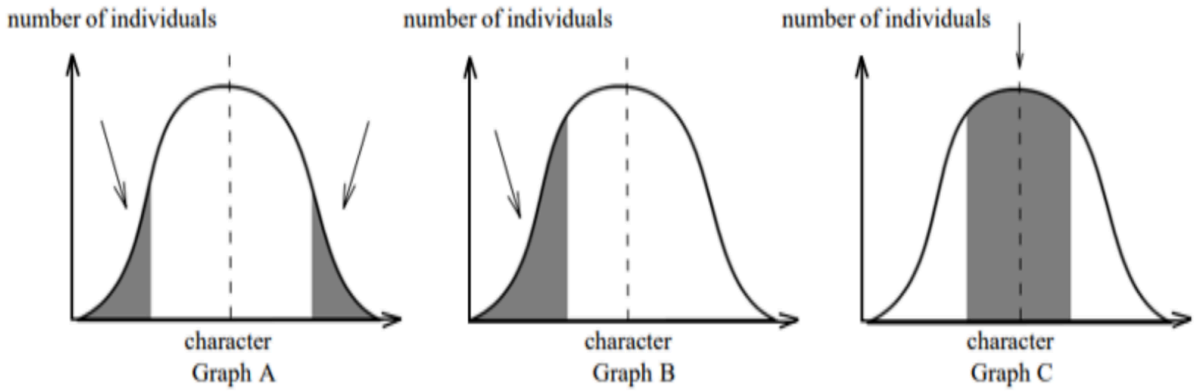
DIRECTION:Q. No. 13-16: Consist of two statements— Assertion (A) and Reason (R).Answer these questions selecting the appropriate option given below:

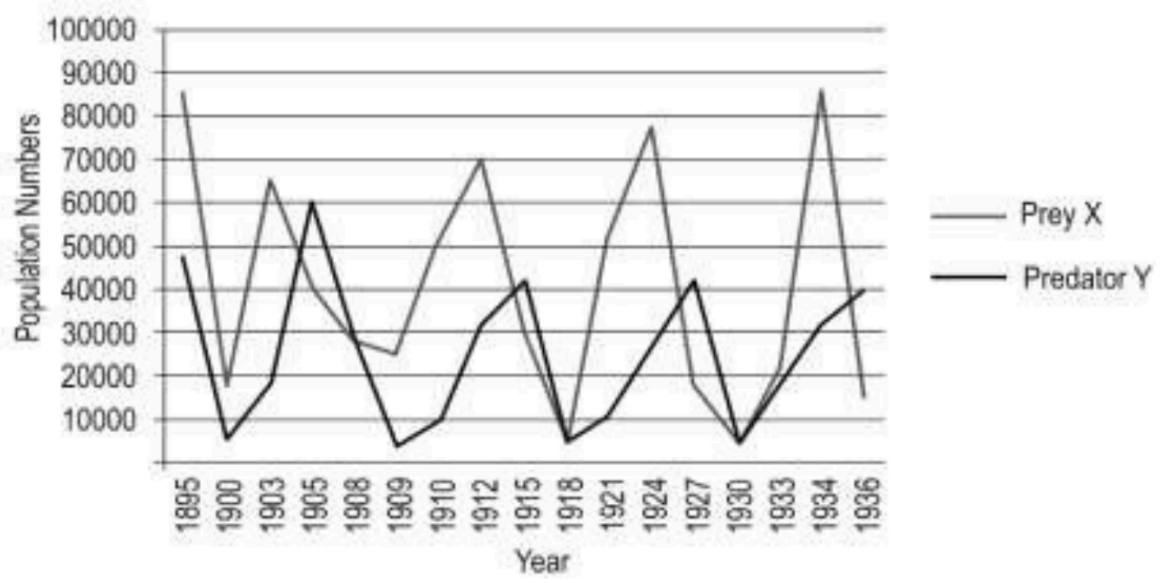
(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true and 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: Primary endosperm nucleus is diploid. Reason: It is the product of double fertilisation	1
14	Assertion:Ribosomal RNA is synthesised in the nucleus of the cell. Reason: It is translated with the enzyme RNA polymerase III	1
15	Assertion: Smoking can raise blood pressure and increase heart rate. Reason: Nicotine stimulates adrenal glands to release adrenaline and noradrenaline into the blood circulation, both of which raise blood pressure and increase heart rate.	1
16	Assertion: PCR is a powerful technique to identify genetic disorders. Reason: PCR can detect mutations in low amounts of DNA.	1
	Section—B	
17	Explain the process of hormonal regulation of spermatogenesis.	2
18	The diagram below shows the sequence of amino acids in part of a haemoglobin molecule.  a) If the base T* was substituted with A, how would it affect the haemoglobin chain? b) Name the condition and the effects associated with the above substitution.	2
19	A child gets colostrum and polio drop both as an infant .Compare their mode of action with respect to our immune system.	2

20	The image below shows the result of plating bacteria in chromogenic medium after incorporating the gene of interest in plasmid. Some plates had blue colonies; some plates had white colonies. A single bacterium extracted from Plate I,II,III is shown below:  On the basis of your observations a) Identify the plate(s) which is/are white. Give a reason. b) Identify the plate(s) which is/are blue. Give a reason.	2
21	Linkage and crossing over of genes are alternatives to each other. Justify with the help of an example?	2
	Section—C	
22	A biologist sees the following cells in a cross-section of the seminiferous tubule and its surrounding tissues and counts the number of various kinds of cells. Spermatozoa, Spermatid, Primary spermatocyte, Secondary spermatocyte, Leydig cells, Sertoli cells, Spermatogonium. From these cells, identify the cells: (a) that are diploid. (b) that can produce hormones and their names	3
23	Answer the following questions based on Meselson and Stahl's experiment on E.coli. (i) Write the name of the chemical substance used as the only source of nitrogen in the experiment. (ii) Why did they allow the synthesis of the light and the heavy DNA molecules in the organism? (iii) How did they distinguish the heavy DNA molecules from the light DNA molecules?	3

24	A pregnant human female was advised to undergo MTP. It was diagnosed that the fetus she was carrying had developed from a zygote having 45 chromosomes with only one X chromosome. a) What is this condition called and how does it arise? b) Why was she advised to undergo MTP?	3
25	The graphs below show three types of natural selection. The shaded areas marked with arrows show the individuals in the population which are not selected. The dotted vertical lines show the statistical means.  a) What names are given to the types of selection shown in graphs A, B and C. b)Explain the different types of natural selection with examples?	3
26	(a) Mention any four strategies adopted by flowering plants to prevent self pollination. (b) Why is geitonogamy also referred to geneticalautogamy ?	3
27	A farmer grew 2 varieties of corn crop in field A and B. He grew normal corn crops in field A and GM corn crops in field B. He observed corn borers attacked only in field A. To control it, spores of Bt were sprayed in field A. a) Name the gene in the spores responsible for the control of this pest. b) What effect will the spores of Bt have on the insect pest? c) How has field B developed resistance against this pest?	3
28	How does the gene 'I' control ABO blood groups in humans ? Write the effect the gene has on the structure of red blood cells.	3
	Section—D	
29	**Question 1:Read the following and answer any four questions from (i) to (iv) given below:** Predator Y shown in the image below is a type of wild cat that inhabits the forests and preys primarily on prey X which are herbivores. Shown below is data on their respective populations over time.	4



(a) What is the likely cause for the pattern seen in the prey and predator populations through the years?

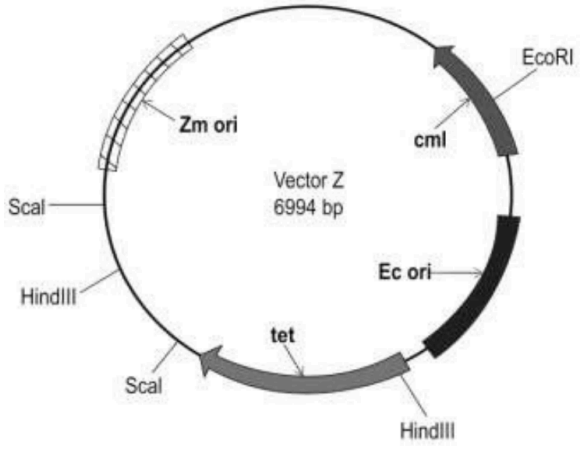
(b) Hypothetically, if all the predators of the forests become extinct, what will happen to the vegetation of the forest?

(c) Consider a situation where another similar species of predator immigrates to the forest. What is likely to happen over time and why?

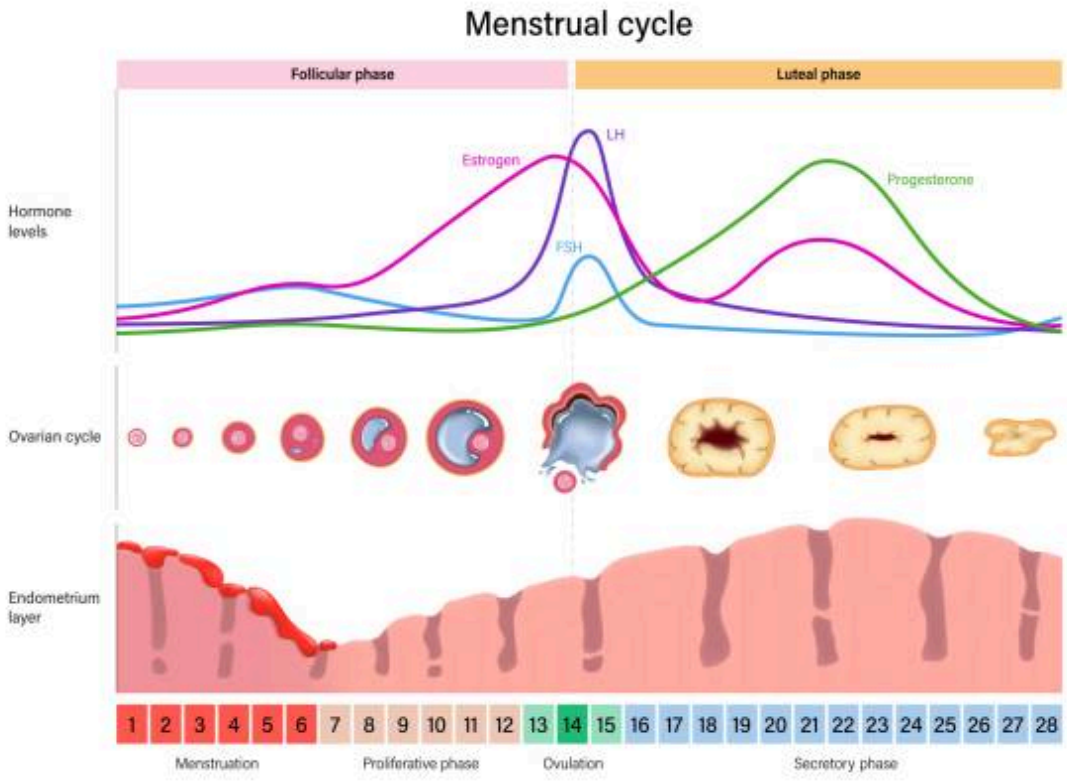
30

Shown below is a cloning vector 'Z' that Kamla wants to use to create a recombinant vector with her gene of interest.

The vector consists of sites for three restriction enzymes - ScaI, HindIII and EcoRI. Restriction sites for the same enzymes are also present in the gene of interest. There are two 'ori' sequences - one allows it to replicate in Escherichia coli and another allows replication in Zymomonas mobilis. Apart from this, the vector consists of two antibiotic resistance genes - one against tetracycline (tet) and another against chloramphenicol (cml).



4

	(a) What is the advantage of having two 'ori' sequences in the same vector? Give a situation in which this would be particularly useful (b) The lac z gene has many recognition sites. Study the segment of DNA given below and answer the questions 5'... ATC GTA AAG CTT CAT…3' 3'... TAG CAT TTC GAA GTA…5' i) Applying your knowledge of palindrome sequences identify and mark the possible region where the restriction enzyme X will act. ii) Restriction enzyme Y was used to extract gene of interest from a plant. This gene needs to be inserted in the given DNA segment which has been treated with restriction enzyme X. Will there be a successful recombination? Explain with a reason.	
Section—E		
31	 Read the graph given above and correlate the uterine events that take place according to the hormonal levels on (i) 6 – 15 days (ii) 16 – 25 days (iii) 26 – 28 days (if ovum is not fertilized)	5

<table>
<tr><td></td><td>(b) Specify the sources of the hormones mentioned in the graph.

Or

Given below are certain situations. Analyse the situation and suggest the name of suitable contraceptive device along with mode of action.

<table>
<tr><th>Situation</th><th>Requirement of contraceptive for -</th><th>Name of contraceptive device</th><th>Mode of action</th></tr>
<tr><td>1</td><td>blocking the entry of sperms through cervix</td><td></td><td></td></tr>
<tr><td>2</td><td>spacing between children</td><td></td><td></td></tr>
<tr><td>3</td><td>effective emergency contraceptive</td><td></td><td></td></tr>
<tr><td>4</td><td>terminal method to prevent any more pregnancy in female</td><td></td><td></td></tr>
<tr><td>5</td><td>sterilization in male</td><td></td><td></td></tr>
</table>
</td><td></td></tr>
<tr><td>32</td><td>(a) Do you agree with the perception in our society that the woman is responsible for the gender of the offspring? Substantiate your answer scientifically.
(b) How did Morgan explain linkage of genes?
Or
(a) Draw a schematic representation of the structure of a transcription unit and show the following in it:
(i) Direction in which the transcription occurs
(ii) Polarity of the two strands involved
(iii) Template strand
(iv)Terminator gene
(b) Mention the function of promoter gene in transcription.</td><td>5</td></tr>
<tr><td>33</td><td>It is commonly observed that parents feel embarrassed to discuss freely with their adolescent children about sexuality and reproduction. The result of this parental inhibition is that the children go astray sometimes.
(i) Explain the reasons that you feel are behind such embarrassment amongst some parents to freely discuss such issues with their growing children.</td><td>5</td></tr>
</table>

	(ii) By taking one example of a local plant and animal, how would you help these parents to overcome such inhibitions about reproduction and sexuality? Or Explain the role of Primary and Secondary Lymphoid organs with the help of suitable examples.	