BK BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
SENIOR SECONDARY CO-ED DAY CUM BOYS' RESIDENTIAL SCHOOL
PRE-BOARD-I 2024-25
BIOLOGY (044)

Class: XII | Duration: 3 Hr
Date: 22/11/2024 | Max. Marks: 70

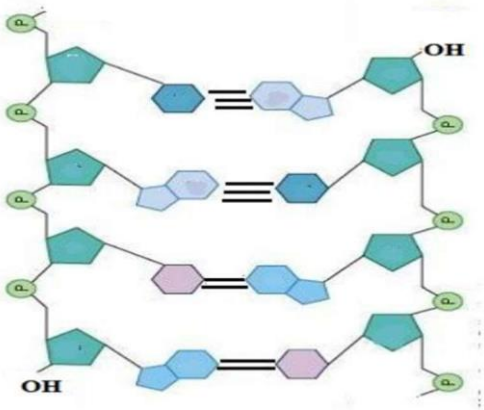
General Instructions:

(i) All questions are compulsory.
(ii) The question paper has five sections and 33 questions.
(iii) 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.
(iv) 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.
(v) Wherever necessary, neat and properly labeled diagrams should be drawn.

SECTION-A

Q. No. 1 to 12 are multiple choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.

1. In nature cleistogamous flowers are: 1
   a) Wind pollinated b) Bird pollinated
   c) Self-pollinated d) Insect pollinated
2. Which among the following has 23 chromosomes? 1
   a) Spermatogonia b) Zygote
   c) Secondary oocyte d) Oogonia
3. If the percentage of cytosine is 24%, then the percentage of adenine will be – 1
   a) 52% b) 32%
   c) 24% d) 26%
4. Observe the schematic diagram that depicts a small section of nucleic acid. The bases in two strands are paired through hydrogen bonds that are shown by the dark lines. Identify the correct sequence of nucleotide in the 5'-3' direction. 1



a) GCAT b) CGTA

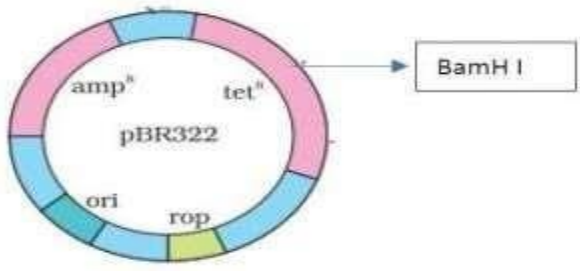
c) TAGC d) ATCG

5. Analogous organs arise due to 1
a) divergent evolution
b) artificial selection
c) genetic drift
d) Convergent evolution.

6. Which of the following water samples in the table given below, will have a higher concentration of organic matter? 1

Water Sample	Level of pollution	Value of BOD
A.	High	High
B.	Low	Low
C.	Low	High
D.	High	Low

7. The figure below shows the structure of a plasmid. 1



A foreign DNA was ligated at BamH1. The transformants were then grown in a medium containing antibiotics tetracycline and ampicillin.
Choose the correct observation for the growth of bacterial colonies from the given table.

	Medium with Tetracycline	Medium with Ampicillin
A.	Growth	No growth
B.	No growth	Growth
C.	No growth	No growth
D.	Growth	Growth

8. If the length of a DNA molecule is 1.1 metres, what will be the approximate number of base pairs? 1
a) 3.3×10^9 bp
b) 6.6×10^9 bp
c) 3.3×10^6 bp
d) 6.6×10^6 bp

9. How many types of gametes would be produced if the genotype of a parent is AaBB? 1
A. 1 B. 2 C. 3 D. 4

10. Which of the following statements indicates parallelism in genes and chromosomes? 1
i) They occur in pairs
ii) They segregate during gamete formation
iii) They show linkage
iv) Independent pairs segregate independently
A. (i) and (iii)
B. (ii) and (iii)
C. (i), (ii) and (iii)
D. (i), (ii) and (iv)

11. Select the correct statement from the following 1

(a) Biogas is produced by the activity of aerobic bacteria on animal waste

(b) *Methanobacterium* is an aerobic bacterium found in rumen of cattle

(c) Biogas, commonly called gobar gas, is pure methane

(d) Activated sludge-sediment in settlement tanks of sewage treatment plant is a rich source of aerobic bacteria.

12. Match the following list of bacteria and their commercially important products: 1

Bacterium	Product
A. Aspergillus niger	i. Lactic acid
B. Acetobacter aceti	ii. Butyric acid
C. Clostridium butylicum	iii. Acetic acid
D. Lactobacillus	iv. Citric acid

Choose the correct match:

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

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

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

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

Question No. 13 to 16 consist of two statements – Assertion (A) and Reason (R). Answer these questions by 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 (A): Some fruits are seedless or contain empty or non-viable seeds. 1
Reason (R): They are produced without fertilisation.

14. Assertion (A): *Streptococcus thermophilus* increases nutritional value of milk. 1
Reason(R): Curd and yoghurt have higher vitamin content than milk.

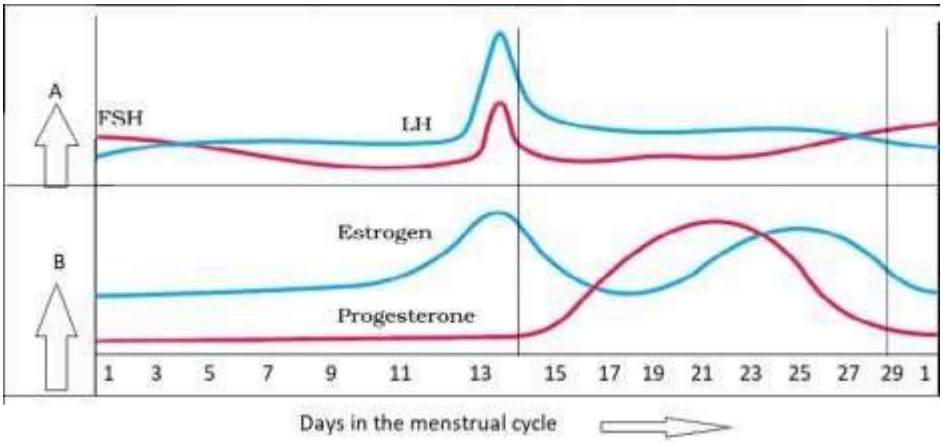
15. Assertion (A): GEAC has been set up to keep a check on GM research. 1
Reason(R): Genetic modification of organisms can have unpredictable results

16. Assertion (A): Restriction endonucleases are also called 'molecular scissors'. 1
Reason(R): When fragments generated by restriction endonucleases are mixed, they join together due to their sticky ends.

SECTION-B

17. Attempt either option A or B. 2

A. In the figure given below, parts A and B show the level of hormones which influence the menstrual cycle. Study the figure and answer the questions that follow:



i) Name the organs which secrete the hormones represented in parts A and B.
ii) State the impact of the hormones in part B on the uterus of the human female during 6 to 15 days of menstrual cycle?

OR

B. Explain in detail the various developmental stages of the zygote until implantation with suitable diagrams.

18. Attempt either option A or B 2

The map distance in certain organism between genes A & B is 4 units, between B & C is units, &between C &D is 8 units which one of these gene pairs will show more recombination frequency? Give reason.

OR

. Given below is a schematic representation of a mRNA strand.

5' mRNA 3'

A G G A G G U A U G A U C U C G U A A A A U A A A

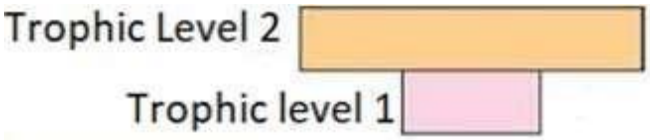
(i) In the above sequence identify the translational unit in mRNA.
(ii) Where are UTRs found and what is their significance?

19. During a field trip, one of your friend in the group suddenly became unwell, she started sneezing and had trouble in breathing. Name and explain the term associated with such sudden responses. What would the doctor recommend for relief? 2

20. CTTAAG 2
GAATTC
a) What are such sequences called? Name the enzyme used that recognizes such nucleotide sequences.
b) What is their significance in biotechnology?

21. Attempt either option A or B. 2

A. i) Given below is a pyramid of biomass in an ecosystem where each bar represents the standing crop available in the trophic level. With the help of an example explain the conditions where this kind of pyramid is possible in nature?



ii) Will the pyramid of energy be also of the same shape in this situation? Give reason for your response.

OR

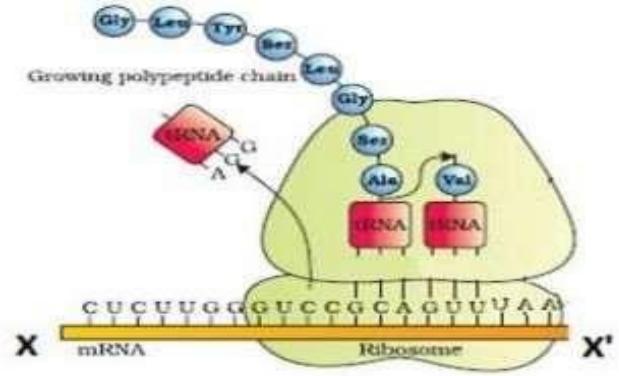
B. i) Draw a pyramid of numbers where a large number of insects are feeding on the leaves of a tree. What is the shape of this pyramid?
ii) Will the pyramid of energy be also of the same shape in this situation? Give reason for your response.

SECTION-C

22. Draw the different stages of the development of Graffian follicle diagrammatically. 3

23. i) Why is tender coconut considered as a healthy source of nutrition? 3
ii) How are pea seeds different from castor seeds with respect to endosperm?
iii) What is meant by emasculation?

24. a)Identify the polarity of x to x' in the diagram below and mention how many more amino acids are expected to be added to this polypeptide chain. 3



b) Mention the codon and anticodon for alanine.
c) Why are some untranslated sequences of bases seen in mRNA coding for a polypeptide? Where exactly are they present on mRNA?

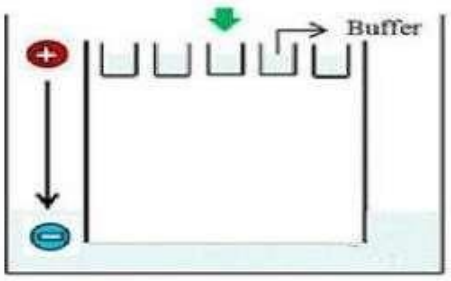
25. Describe the steps that are followed during secondary treatment of sewage. 3

OR

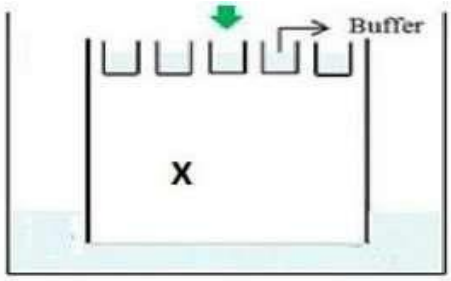
Effluent from the primary treatment of the sewage is passed through large aeration tanks for biological treatment. Explain the complete process that follows till the water is ready to be released into the natural water bodies.

26. Explain the process by which a bacterial cell can be made 'competent'. Why is it essential to make bacterial cells 'competent' in recombinant DNA technology? 3

27. Carefully observe the given picture. A mixture of DNA with fragments ranging from 200 base pairs to 2500 base pairs was electrophoresed on agarose gel with the following arrangement. 3



(a) What result will be obtained on staining with ethidium bromide? Explain with reason.
(b) The above set-up was modified and a band with 250 base pairs was obtained at X.



What change(s) were made to the previous design to obtain a band at X? Why did the band appear at the position X?

28. a) In a pond there were 200 frogs. 40 more were born in the year. Calculate the birth rate of the population. 3
b) Population in terms of number is not always a necessary parameter to measure population density. Justify with two examples.

SECTION-D

29. (a) State any FOUR phenomena in which the Hardy-Weinberg theorem may not hold true. 1

(b) A population of 100 individuals has a frequency of allele A of 0.3 and a frequency of allele a of 0.7. The frequency of the heterozygous genotype (Aa) is 0.49. Is this population in Hardy-Weinberg equilibrium? Justify. 2

Attempt either subpart C or D

(c) How is Hardy-Weinberg's expression "(p2+ 2pq+q 2) = 1"derived? 1

OR

(d) Describe one example of adaptive radiation. 1

30. The data below shows the concentration of nicotine smoked by a smoker taking 10 puffs/ minute.

1

2

1

(a) With reference to the above graph explain the concentration of nicotine in blood at 10 minutes. 1

(b) How will this affect the concentration of carbon monoxide and haembound oxygen at 10 minutes?

Attempt either subpart C or D.

(c) How does cigarette smoking result in high blood pressure and increase in heart rate?

OR

(d) How does cigarette smoking result in lung cancer and emphysema?

SECTION-E

31. A. A large number of married couples in the world are childless. It is shocking to know that in India the female partner is often blamed for the couple being childless. 5

a) State any two reasons responsible for the cause of infertility in case of male and female.

b) Suggest a technique that can help the couple to have a child where the problem is with male.

c) Name any two copper releasing IUDs.Explain how do they act as effective contraceptives in human females.

d) Amniocentesis for sex determination is banned in our country. Is this ban necessary? Comment.

OR

B. Cryptorchidism is a condition in which the testes fail to descend into the scrotum. It can also lead to compromised Sertoli cell function andhas an impact on Leydig cell function.

(i) Identify at least 3 parameters of male fertility which get affected due to cryptorchidism.

(ii) Which process will be affected if mature spermatids are not released from Sertoli cells?

(iii) Name and explain one assisted reproductive technology (ART process) in which the sperm/semen is used to assist fertilization.

(iv) Name and explain the assisted reproductive technology that should be used to complete the development of embryos I and II shown in the figure given below.

Embryo I Embryo II

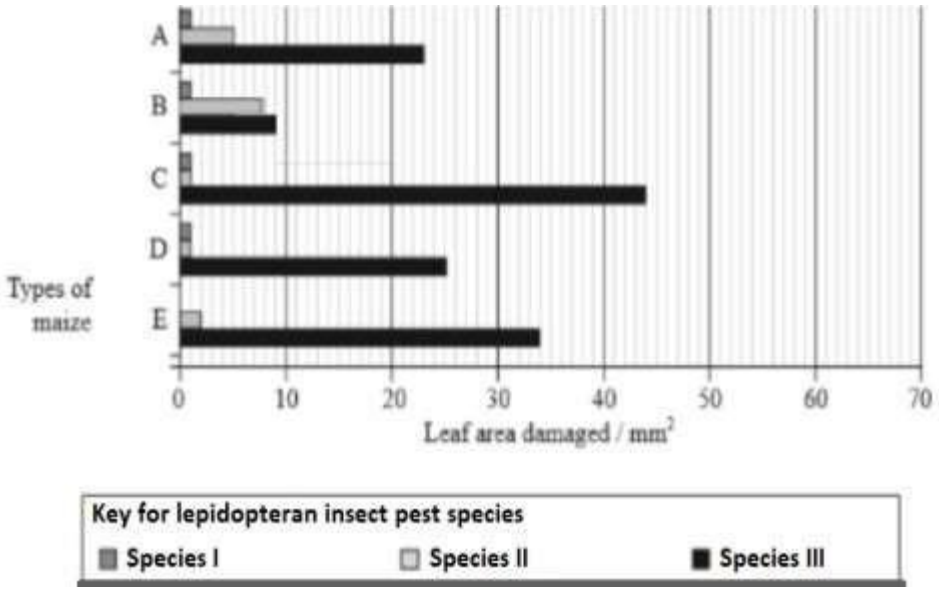
32. (a) What are the two types of desirable approaches to conserve biodiversity? Explain with examples bringing out the difference between the two types. 5
(b) What is the association between the bumble bee and its favourite orchid Ophrys? How would extinction or change of one would affect the other?
(c) "India has greater ecosystem diversity than Norway." Do you agree with the statement? Give reasons in support of your answer.

33. Oil spill is a major environmental issue. It has been found that different strains of *Pseudomonas* bacteria have genes to break down the four major groups of hydrocarbons in oil. Trials are underway to use different biotechnological tools to incorporate these genes and create a genetically engineered strain of *Pseudomonas* -a '*super-bug'*, to break down the four major groups of hydrocarbons in oil. Such bacteria might be sprayed onto surfaces polluted with oil to clean thin films of oil. 5

a) List two advantages of using bacteria for such biotechnological studies?
b) For amplification of the gene of interest PCR was carried out. The PCR was run with the help of polymerase which was functional only at a very low temperature. How will this impact the efficiency of the PCR? Justify.
c) If such bacteria are sprayed on water bodies with oil spills, how will this have a positive or negative effect on the environment? Discuss.

OR

Insects in the Lepidopteran group lay eggs on maize crops. The larvae on hatching feed on maize leaf and tender cob. In order to arrest the spread of three such Lepidopteran pests, Bt maize crops were introduced in an experimental field.
A study was carried out to see which of the three species of lepidopteran pests was most susceptible to Bt genes and its product. The lepidopteran pests were allowed to feed on the same Bt-maize crops grown on 5 fields (A-E).
The graph below shows the leaf area damaged by these three pests after feeding on maize leaves for five days.



Insect gut pH was recorded as 10, 8 and 6 respectively for Species I, II and III respectively.

a) Evaluate the efficacy of the Bt crop on the feeding habits of the three species of stem borer and suggest which species is least susceptible to Bt toxin.

b) Which species is most susceptible to Bt-maize, explain why?

c) Using the given information, suggest why similar effect was not seen in the three insect species?

**********END OF THE PAPER**********