DELHI PUBLIC SCHOOL, BHILAI (C.G.)

DATE : **Time : 3 Hours**

CLASS : XII **BIOLOGY** **M.M : 70**

General Instructions :

1) This question paper contains 33 questions. All questions are compulsory.
2) This question paper is divided into 5 sections – A,B, C, D and E.
3) In Section A – Questions no.1 to 16 are multiple choice (MCQ) type questions, carrying 1 mark each.
4) In Section B – Questions no.17 to 21 are very short answer (VSA) type questions, carrying 2 marks each.
5) In Section C – Questions no.22 to 28 are short answer type (SA) type questions, carrying 3 marks each.
6) In Section D – Questions no.29 and 30 are case-based questions carrying 4 marks each. Each question has subparts with internal choice in one subpart.
7) In Section E – Questions no. 31 to 33 are long answer (LA) type questions carrying 5 marks each.
8) There is no overall choice. However, an internal choice has been provided in 1 question in Section B, 1 question in Section C, 2 questions in Section D and 3 questions in Section E. A candidate has to attempt only one of the alternatives in such questions.
9) Wherever necessary, neat and properly labelled diagram should be drawn.

SECTION A

1) Which of the following factors has a negative effect on the population growth rate? (1)
(a) Emigration (b) Immigration (c) Natality (d) Both (b) and (c)

2) Match column I with column II and select the correct option from the codes given below.

	COLUMN I		COLUMN II
A.	Mutation	(i)	Change in allele frequency in a population due to chance alone
B.	Gene flow	(ii)	Differences in survival and reproduction among variant individuals
C.	Natural selection	(iii)	Immigration, emigration change allele frequencies
D.	Genetic drift	(iv)	Random and directionless

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

3) In which organ does the sexual stage (gameotocytes) of *Plasmodium* form? (1)
(a) Salivary glands of mosquito (b) Human RBC
(c) Intestine of mosquito (d) Human liver

4) Single step large mutation leading to speciation is called (1)
(a) founder effect (b) saltation (c) branching descent (d) natural selection

5) Rate of decomposition depends upon? (1)
(a) chemical composition of detritus (b) temperature
(c) soil moisture and soil pH (d) all of these

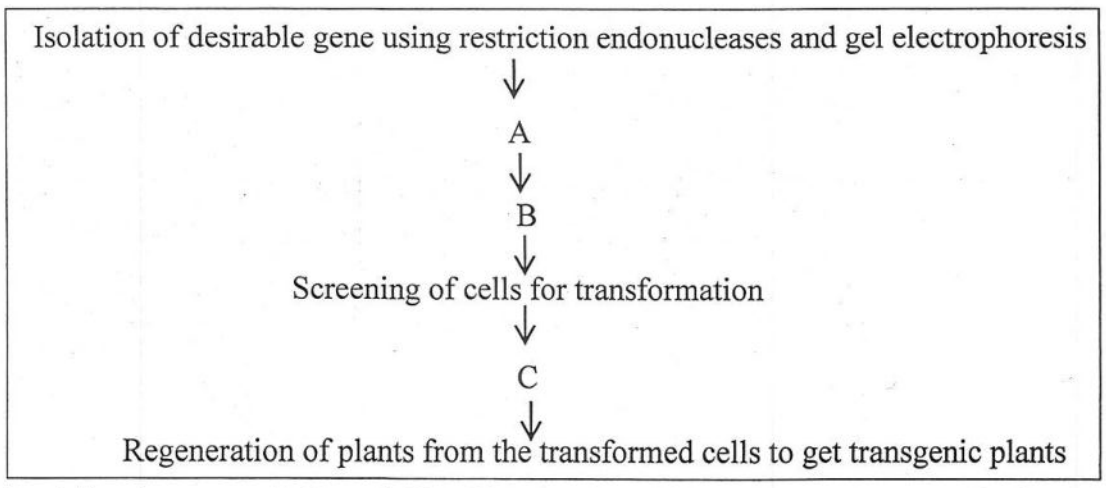
6) Which of the following diseases are treated by antibiotics? (1)
(i) Plague (jj) Diphtheria (iii) Leprosy (iv) Whooping cough
(a) (i), (ii) and (iii) (b) (i), (iii) and (iv) (c) (ii), (iii) and (iv) (d) (i), (ii), (iii) and (iv)

7) Match column I with column II and select the correct option from the codes given below.

	COLUMN I		COLUMN II
A.	Statins	(i)	*Methanobacterium*
B.	Biogas	(ii)	*Saccharomyces cerevisiae*
C.	Ethanol production	(iii)	*Monascus purpureus*
D.	Converts milk to curd	(iv)	*Lactobacillus*

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

8) The given flow chart depicts the steps to transfer a desirable gene of interest into a plant. (1)



Identify the following steps (A,B and C) with regard to following statements and select the correct option. (1)

(i) Joining of desirable gene to a suitable cloning vector using ligases to create a recombinant D molecule.

(ii) Selection of transformed cells.

(iii) Transferring the recombinant DNA molecules to the target cells.

	A	B	C
(a)	(i)	(ii)	(iii)
(b)	(i)	(iii)	(ii)
(c)	(ii)	(iii)	(i)
(d)	(iii)	(i)	(ii)

9) Tubectomy is a method of sterilization in which (1)

(a) small part of the fallopian tube is removed or tied up

(b) ovaries are removed surgically

(c) small part of vas deferens is removed or tied up

(d) uterus is removed surgically.

10) If a recombinant DNA bearing gene for resistance to antibiotic ampicillin is transferred to *E.coli* cells, host cells become transformed into ampicillin resistant cells. If such bacteria are transferred on agar plate containing ampicillin, only transformants will grow and the untransformed recipient cells will die ampicillin resistant gene in this case is called as (1)

(a) selectable marker (b) recombinant protein (c) cloning site (d) chemical scalpels

11) 'Verhulst – Pearl's is associated with the equation (1)

(a) $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$ (b) $\frac{dN}{dt} = tN\left(\frac{K-N}{N}\right)$ (c) $\frac{dN}{dt} = rN\left(\frac{K-N}{N}\right)$ (d) (b) $\frac{dN}{dt} = tN\left(\frac{K-N}{K}\right)$

12) Which type of pyramid is always upright? (1)

(a) Number (b) Biomass (c) Weight (d) Energy

Question nos. 13 to 16 consists of two statements, Assertion (A) and Reason (R). Answer these questions selecting the appropriate options given below

(a) If both A and R are true and R is the correct explanation of A

(b) If both A and R are true, but R is not the correct explanation of A.

(c) If A is true, but R is false.

(d) If both A and R are false.

13) **Assertion (A)** : In plants, apomixis is a form of asexual reproduction that mimics sexual reproduction. (1)

Reason (R) : Apomixis involves the production of seeds without the fusion of gametes.

14) **Assertion (A)** : Prolonged intraspecific competition causes an increase in the size of the niche of a population. (1)

Reason (R) : In such a population, use of a new type of resource will increase through the generations.

15) **Assertion (A)** : E.coli having pBR322 with DNA insert at BamHI site cannot grow in medium containing tetracycline. (1)

Reason (R) : Recognition site for BamHI is present in tet^R region of pBR322.

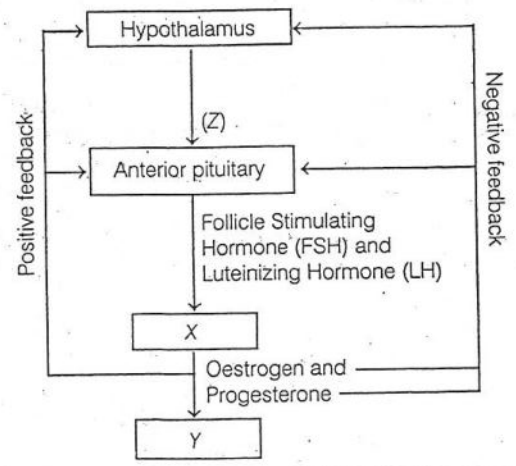
16) **Assertion (A)** : Earliest organisms that appeared on the earth were non-green and presumably anaerobes. (1)

Reason (R) : The first autotrophic organisms were the chemoautotrophs that never released oxygen. (1)

SECTION B

17) A man with colourblind father marries a woman whose father was also colourblind. What are the chances that their first born girl child would have colour blindness? (2)

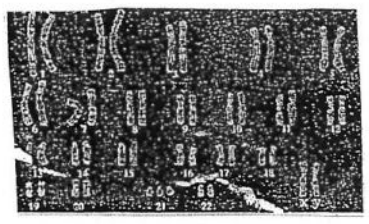
18) Gametogenesis is the process by which haploid gametes are formed in male and female gonads. Given below is a flowchart showing hormonal regulation of the process of gametogenesis. Observe it carefully and answer the questions that follows. (2)



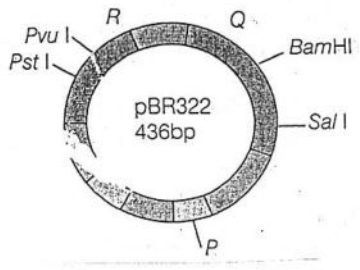
(i) Identify X and Y in the flowchart. Which process is shown under the hormonal control?

(ii) Explain the function of different hormone indicated by Z.

19) The given below karyotype shows some abnormality in child. Interpret the karyotype and explain about the disorder through which the child is suffering. (2)



20) In the artificially constructed pBR322 vector, (2)



(i) Why the recombinant molecule will not be formed if the 'P' is missing from the above vector?

(ii) In what way does the absence of R and Q will affect the selection of transformed cells? Discuss.

21) About 1,80,000 J of energy is received. Assuming that draw a food chain in a terrestrial ecosystem depicting the transfer of energy at all 4 trophic levels. (2)

Also mention why the food chain cannot be longer than 4-5 trophic levels.

(OR)

In a botanical garden of a city there is a huge banyan tree growing, on which hundreds of birds and thousands of insects live.

(i) Draw the pyramid of number by this community. Comment giving reason.

(ii) If the pyramid of energy is drawn for same situation, what will be its shape? Justify your answer.

SECTION C

22) Given below is a figure of a plant which is used to obtain 'X' drug. (3)

(i) Name the plant whose flowering branch is shown above.

(ii) Many secondary metabolites of plants have medicinal properties. It is their misuse that creates problem. Justify the statements.

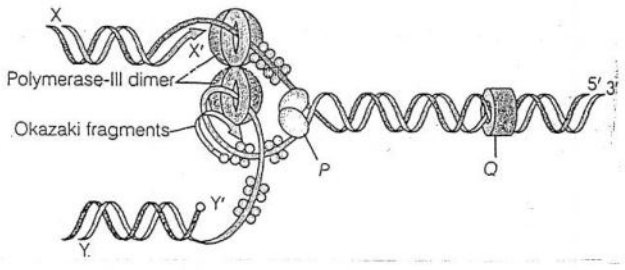
23) Microbes can be used to decrease the use of chemical fertilisers and pesticides. Explain how this can be accomplished. (3)

24) In evolutionary theory, organisms that possesses traits bridge the gap between two different groups are referred to as connecting link. These species provide as proof of the groupings shared evolutionary history and shows how they could have descended from a common ancestor. (3)

(i) How do you justify that the Archaeopteryx is a connecting link between two specific groups of organisms?

(ii) Two fossils A and B have been found. Which fossil is older?
Also mention why the food chain cannot be longer than 4-5 trophic levels.

25) Observe the diagram below of a DNA showing replication and answer the questions that follows? (3)



(i) Identify the polarity of the strand. (a) X-X' (b) Y-Y'

(ii) The unwinding of DNA impose tension on the distal end of DNA molecule. Which protein, P or Q help to relieve this? Also what is the function of remaining protein?

26) As a senior biology student you have been asked to demonstrate to the students of secondary level in your school, the procedure(s) that shall ensure cross-pollination in a hermaphrodite flower. List the different steps that you would suggest and provide reasons for each one of them. (3)

27) A farmer grows two varieties of crop in fields 'A' and 'B'. He grew normal tobacco plant in field A and GM crops in field B. He observed that nematode attacked only in field A whereas crops to field B remain unaffected. (3)

(i) Name the nematode responsible for affecting the crops of field 'A'.

(ii) How did the crops of field 'B' remain unaffected?

(iii) Name the vector used to introduce specific genes into the host plant.

(OR)

In recombinant technology the desired genes for administration is/are selected, followed by selecting a perfect vector into which the desired gene is to be integrated and rDNA formed. (3)
The recombinant cells can be multiplied in large scale using a continuous culture system and can be achieved by using a bioreactor. These are large vessels, 100-1000L in which raw materials are biologically converted into specific products individual enzymes, etc. using microbial plant, animal or human cells.

A bioreactor provides optimum conditions for the growth of the desired product. These conditions include temperature, pH, substrate etc.

(i) (a) Which conditions apart from the temperature, pH and substrate are provided by the bioreactor?

(b) Name the components of a bioreactor.

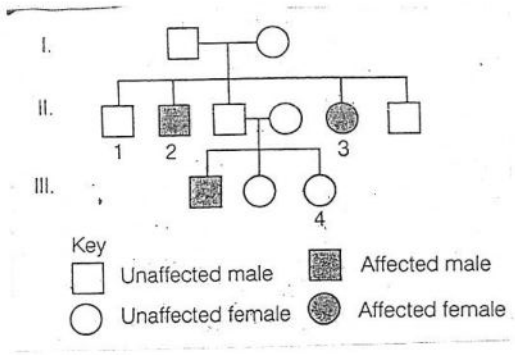
(ii) What happens in a continuous culture system?

28) Why some species are generally at a greater risk of extinction when compared to others? List any three reasons. (3)

SECTION D

Q.Nos. 29 and 30 are case-based questions. Each question has 3 subparts with internal choice in one subpart.

29) Study the pedigree chart given below : (4)



Answer the following questions :

(i) On the basis of the inheritance pattern represented by this pedigree chart, what is your conclusion with respect to the given disease/trait? (1)

(OR)

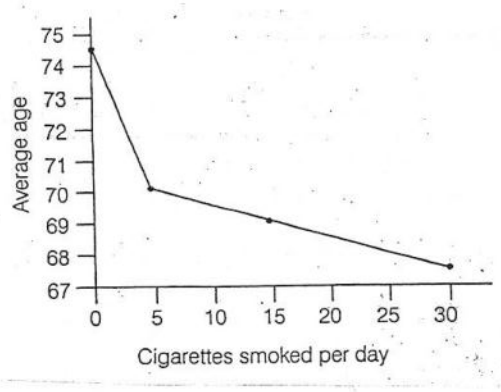
(i) What will happen to the female who is homozygous for this trait?

(ii) (a) To a couple where the female is unaffected and the male is affected, what will be the genotype of the offspring they have? Show the same by using a genetic cross. (1)

(b) If a carrier female marry an affected male then what would be the genotype of the offspring (1)

(iii) What would happen to the male children of the couple where woman is a carrier for this trait and man is normal? Explain with the help of a cross. (1)

30) The graph shows the relationship between the average age at death and the number of cigarettes smoked per day. (4)



(i) What conclusion can you draw from the graph? (1)

(ii) How does tobacco smoking relate to oxygen deficiency in the blood. (1)

(iii) Why is tobacco smoking associated with rise in blood pressure and emphysema. Explain. (2)

(OR)

Why are adolescents advised not to smoke?

SECTION E

31) Male and female gametes in human beings differ from each other in terms of both structure and function. Enumerate some major differences between the two, along with their diagrams. (5)

(OR)

Plan an experiment and prepare flowchart of the steps that you would follow to ensure that the seeds are formed only from the desired sets of pollen grains. Name the type of experiment that you carried out. Also write the importance of such experiments.

32) Explain the role of different genes in a *lac operon*, when in a 'switched on' state. (5)

(OR)

(a) Why is hameophilia generally observed in human males? Explain the conditions under which a human female can be haemophilic.

(b) A pregnant human female was advised to undergo MTP. It was diagnosed by her doctor that the foetus she is carrying has developed from a zygote formed by an XX-egg fertilized by an Y-carrying sperm. Why was she advised to undergo MTP?

33) (a) Depending upon the chemical nature of the template (DNA or RNA) and the nature of nucleic acids synthesized from it (DNA or RNA), list the types of nucleic acid polymerases. (5)

(b) Why is the Human Genome Project called a mega project?

(OR)

How do mRNA, tRNA and ribosomes help in the process of translation?

****