CBSE (AI) EXAMINATION PAPER—2019
BIOLOGY

Time : 3 hrs.   *Max. Marks : 70*

GENERAL INSTRUCTIONS:
  (*i*) *This paper is divided into three sections: A, B and C. All the sections are* **compulsory.**
 (*ii*) *Separate instructions are given with each section and question, wherever necessary. Read these instructions very carefully and follow them faithfully.*
(*iii*) *Do not exceed the prescribed word limit while answering the questions.*

Set–I

SECTION A—(Reading)

1. State from where do the signals for parturition originate in human females. **(1)**
2. Name the pattern of inheritance where F_1 phenotype
   (*a*) resembles only one of the two parents.
   (*b*) does not resemble either of the two parents and is in between the two. **(1)**
3. According to the Hardy-Weinberg principle, the allele frequency of a population remains constant. How do you interpret the change of frequency of alleles in a population? **(1)**

OR

Coelacanth was caught in South Africa. State the significance of discovery of *Coelacanth* in the evolutionary history of vertebrates. **(1)**

4. State the functions of mast cells in allergy response. **(1)**

OR

State the function of interpherous.

5. What is the cell that receives a recombinant gene called? **(1)**

SECTION B

6. Name a disorder a human suffers from as a result of monosomy of the sex chromosome. Give the karyotype and write the symptoms. **(2)**
7. In the T.S. of a mature anther given below, identify "*a*" and "*b*" and mention their functions. **(2)**
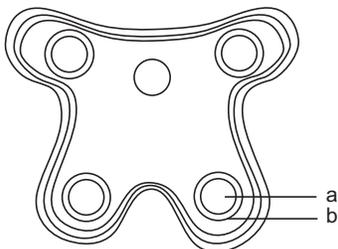
OR

What is cleistogamy? Write one advantage and one disadvantage of it, to the plant. **(2)**

8. State the role of thymus as a lymphoid organ. Name the cells that are released from it and mention their function. **(2)**

9. "Artificial insemination helps overcome several problems of normal mating in cattle". Do you agree? Support your answer with any three reasons. **(2)**

10. Name and explain the interaction that is seen between clownfish and sea anemones. **(2)**

11. Write the relationship between productivity, gross primary productivity, net primary productivity and secondary productivity. **(2)**

12. Justify the need for signing of 'Montreal Protocol' by the participating nations in 1987. **(2)**

OR

Write the effective remedy found by Ahmed Khan of Bengaluru for the efficient use of the plastic waste generated by big cities. **(2)**

SECTION C

13. Emasculation and bagging are the two important steps carried during artificial hybridisation to obtain superior varieties of desired plants. Explain giving reasons, in which types of flowers and at what stages are the two processes carried out. **(3)**

OR

State what is apomixis. Write its significance. How can it be commercially used? **(3)**

14. (*a*) Draw a sectional view of human ovary. Label the following parts:

(*i*) Primary follicle   (*ii*) Secondary oocyte

(*iii*) Graafian follicle   (*iv*) Corpus luteum

(*b*) Name the hormones influencing follicular development of corpus luteum. **(3)**

OR

(*a*) Draw an L.S. of pistil showing pollen tube entering into the embryo sac. Label the following:

(*i*) Nucellus   (*ii*) Antipodals

(*iii*) Synergids   (*iv*) Micropyle

(*b*) Write the functions of the following: **(3)**

(*i*) Synergids   (*ii*) Micropyle

15. Given below is the representation of a relevant part of amino acid composition of the β-chain of haemoglobin, related to the shape of human red blood cells. **(3)**


HbA Peptide
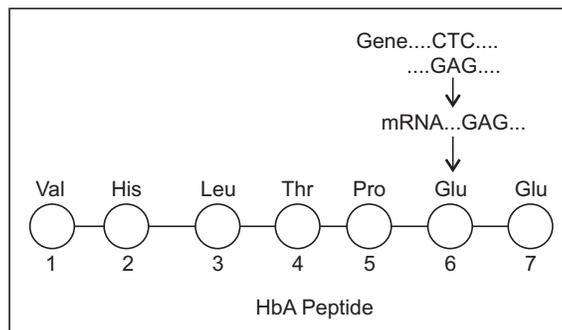
(*a*) Is this representation of the sequence of amino acids indicating a normal human or a sufferer from a certain blood related genetic disease? Give reason in support of your answer.

(*b*) Why is the disease referred to as a Mendelian disorder? Explain. **(3)**

OR

Name the kind of diseases/disorders and any two symptoms that are likely to occur in humans if

(*a*) Mutation in the gene that codes for an enzyme phenylalanine hydroxylase occurs.

(*b*) The karyotype is XXY. **(3)**

16. Name the technique and the property of plant cells that can help to grow somaclones of certain desired variety of apple. Explain how somaclones of apple can be obtained in the lab so as to get the desired variety on a large scale. **(3)**

17. Study the graph given below and answer the questions that follow: **(3)**
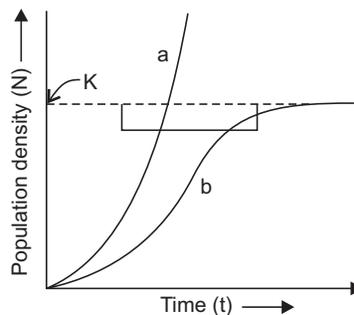
(*i*) The curve '*b*' is described by the following equation:

$$\frac{dN}{dt} = rN\left\{\frac{K-N}{K}\right\}$$

What does 'K' stand for in this equation? Mention its significance.

(*ii*) Which one of the two curves is considered a more realistic one for most of the animal populations?

(*iii*) Which curve would depict the population of a species of deer if there are no predators in the habitat? Why is it so?

18. "A very small sample of tissue or even a drop of blood can help determine paternity." Provide a scientific explanation to substantiate how it is possible. **(3)**

19. Explain the phenomena of dominance, multiple allelism and co-dominance taking human ABO blood group as an example. **(3)**

20. Name the genus to which baculoviruses belong. Describe their role in the integrated pest management programmes. **(3)**

21. Give reasons why: **(3)**

(*a*) DNA cannot pass into a host cell through the cell membrane.

(*b*) Proteases are added during isolation of DNA for genetic engineering.

(*c*) Single cloning site is preferred in a vector.

22. State the medicinal value and the bioactive molecules produced by *Penicillium notatum, Monascus perpureus* and *Trichoderma polysporum*. **(3)**

23. Describe the roles of (*a*) high temperature, (*b*) primers, and (*c*) bacterium *Thermus aquaticus* in carrying the process of polymerase chain reaction. **(3)**

OR

How does β-galactosidase coding sequence act as a selectable marker?

Why is it a preferred selectable marker to antibiotic resistance genes? Explain. **(3)**

24. Answer the following questions based on Meselson and Stahl's experiment on *E. coli*: **(3)**

(*a*) Write the name of the chemical substance used as the only source of nitrogen in the experiment.

(*b*) Why did they allow the synthesis of the light and the heavy DNA molecules in the organism?

(*c*) How did they distinguish the heavy DNA molecules from the light DNA molecules? Explain.

(*d*) Write the conclusion the scientists arrived at, at the end of the experiment.

SECTION D

25. Describe the process of megasporogenesis upto fully developed embryo sac formation in an angiosperm. **(5)**

OR

Given below is the diagram of a human ovum surrounded by a few sperms. Study the diagram and answer the following questions: **(5)**
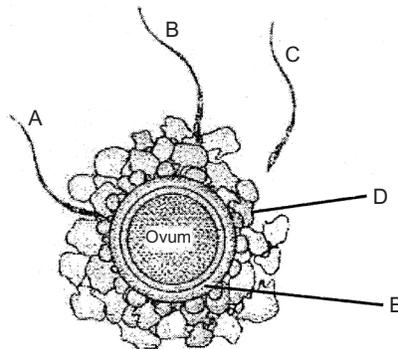
(*a*) Which one of the sperms would reach the ovum earlier?

(*b*) Identify 'D' and 'E'. Mention the role of 'E'.

(*c*) Mention what helps the entry of sperm into the ovum and write the changes occurring in the ovum during the process.

(*d*) Name the specific region in the female reproductive system where the event represented in the diagram takes place.

26. Study the schematic representation of the genes involved in the *lac* operon given below and answer the questions that follow: **(5)**

p	*i*	*p*	*o*	*z*	*y*	*a*
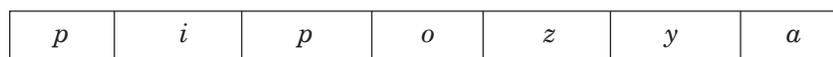
(*a*) Identify and name the regulatory gene in this operon. Explain its role in 'switching off' the operon.

(*b*) Why is the *lac* operon's regulation referred to as negative regulation?

(*c*) Name the inducer molecule and the products of the genes '*z*' and '*y*' of the operon. Write the functions of these gene products.

OR

(*a*) How does the Hardy-Wienberg equation explain genetic equilibrium?

(*b*) Describe how this equilibrium is disturbed that may lead to founder effect. **(5)**

27. (*a*) Study the flow chart given below and complete the equation that follows by identifying 1, 2, 3 and 4.
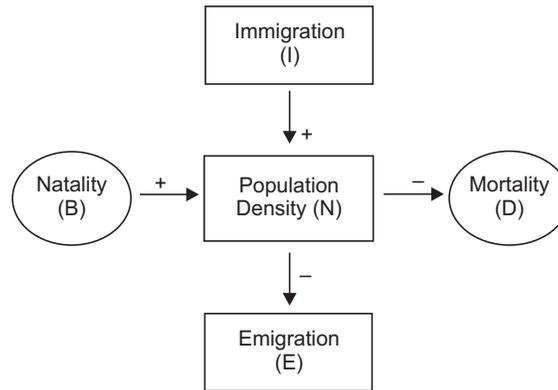
$$N_{t+1} = N_t + \{(1 + 2) - (3 + 4)\}$$

(*b*) Mention the different ways by which the population density of different species can be measured. **(5)**

OR

(*a*) 'The pyramid of energy is always upright.' Explain.

(*b*) Explain with the help of labelled diagrams, the difference between an upright pyramid of biomass and an inverted pyramid of biomass. **(5)**

Set–II

Questions are different from Set I.

SECTION A—(Reading)

5. Write the specific point in the palindrome and the bond that is cut by EcoRI. **(1)**

SECTION B

6. Explain polygenic inheritance with the help of an example. **(2)**

8. Write the scientific name of the source from where cocaine is obtained. How does its use affect the human body? **(2)**

10. How is an alien species invasion considered as one of the causes of biodiversity loss? Support your answer with the help of an example. **(2)**

SECTION C

19. 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. **(3)**

20. Expand 'BAC' and 'YAC'. What are they and what is the purpose for which they are used? **(3)**

21. (*a*) Mention the importance of gel-electrophoresis in biotechnology.

(*b*) Explain the process of this technique. **(3)**

SECTION D

25. (*a*) Why and how must the ozone layer in the stratosphere be protected? Explain.

(*b*) How do deforestation and green house gases negatively affect our environment? Explain. **(4 + 1)**

OR

Biomagnification and accelerated eutrophication are both caused due to indiscriminate use of chemicals and irresponsible human activities. Do you agree? Support your answer with explanation and an example of each. **(5)**

Set–III

Questions are different from Set I and Set II.

SECTION A—(Reading)

5. Write the two specific 'cry' genes that encode the proteins which control cotton bollworms. **(1)**

SECTION B

6. Write the genotype of the parents of a child suffering from thalassemia. State the cause of this disease. **(2)**

8. List any four common approaches for treatment of cancer. **(2)**

10. State Gause's 'Competitive Exclusion Principle'. How have the recent studies modified this principle? **(2)**

SECTION C

19. Explain the phenomenon of evolution by natural selection as supported by the variations observed in white winged and dark winged moth populations in England between 1850 – 1920. **(3)**

20. Explain 'mutation breeding' as a method of developing disease resistant crop plants. Give an example of a pulse crop where this technique has helped. **(3)**

21. Explain how 'sticky ends' are obtained in a DNA segment. Write their importance in DNA technology. **(3)**

SECTION D

27. (*a*) Work out the crosses so as to obtain the phenotypic ratios given below:

(*i*) 1 : 2 : 1 (in F_2 generation)   (*ii*) 3 : 1 (in F_2 generation)

(*iii*) 1 : 1 (in F_1 generation)

(*b*) Differentiate between pleiotropy and polygenic inheritance patterns. **(5)**

OR

(*a*) Describe the process of amino acylation.

(*b*) "Process of transcription and translation are coupled in prokaryotes, but not in eukaryotes." Explain. **(5)**