COMMON PRE BOARD EXAMINATION 2022-23

Subject : BIOLOGY (044)

Date:

Max. Marks: 70

Time: 3 Hours

General Instructions:

(i) All questions are compulsory.

(ii) The question paper has five sections and 33 questions. All questions are compulsory.

(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 labelled diagrams should be drawn.

SECTION A

1. Which of the following is not a characteristic of an ideal contraceptive ? 1

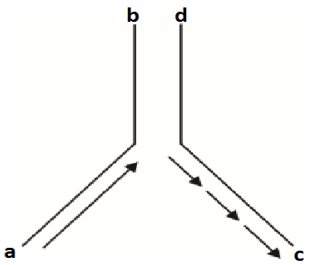
(a) User-friendly
(b) Irreversible
(c) Easily available
(d) Least side-effects

2. Match Column I with Column II and select the correct option from the codes given below 1

	Column I		Column II
A.	Copper releasing IUD	(i)	LNG-20
B.	Hormone releasing IUD	(ii)	Lippes loop
C.	Non-medicated IUD	(iii)	Saheli
D.	Mini pills	(iv)	Multiload 375

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

3. Mention the polarity of the DNA strands a—b and c—d shown in the replicating fork given below. 1



(a) a--- b has polarity 5'------> 3' and c---- d has polarity 5'------> 3'
(b) a--- b has polarity 3'------> 5' and c---- d has polarity 3'------> 5'
(c) a--- b has polarity 5'------> 3' and c---- d has polarity 3'------> 5'
(d) a--- b has polarity 3'------> 5' and c---- d has polarity 5'------> 3'

4. A gene locus has two alleles A, a. If the frequency of dominant allele A is 0.4, then what will be the frequency of homozygous dominant, heterozygous and homozygous recessive individuals in the population? 1
(a) 0.16 (AA); 0.36 (Aa); 0.48 (aa)
(b) 0.36 (AA); 0.48 (Aa); 0.16 (aa)
(c) 0.16 (AA); 0.24 (Aa); 0.36 (aa)
(d) 0.16 (AA); 0.48 (Aa); 0.36 (aa)

5. MALT constitutes about _____ percent of the lymphoid tissue in human body. 1
(a) 20%
(b) 70%
(c) 100%
(d) 50%

6. Short-lived immunity acquired from mother to foetus across placenta or through mother's milk to the infant is categorised as 1
(a) active immunity
(b) passive immunity
(c) cellular immunity
(d) innate non-specific immunity

7. Find the correct option based on the following table 1

	Column I		Column II
A.	*Spirulina*	(i)	Butyric acid
B.	*Aspergillus niger*	(ii)	Cyclosporin - A
C.	*Clostridium acetobutylicum*	(iii)	SCP
D.	*Trichoderma polysporum*	(iv)	Citric acid

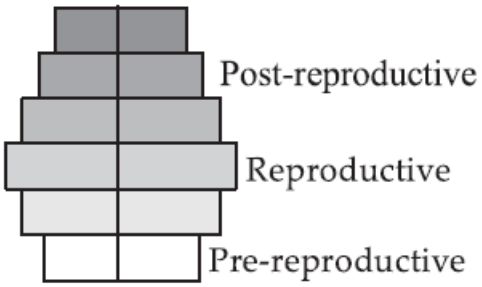
(a) A-(iii) , B-(ii), C-(i), D-(iv)
(b) A-(iv) , B-(i), C-(iii), D-(ii)
(c) A-(iii) , B-(iv), C-(i), D-(ii)
(d) A-(iv) , B-(i), C-(ii), D-(iii)

8. Use of bioresources by multinational companies and organisations without authorisation from the concerned country and its people is called 1
(a) bio-infringement
(b) biopiracy
(c) biodegradation
(d) bioexploitation.

9. Which one of the following is most appropriately defined? 1
(a) Host is an organism which provides only food to another organism.
(b) Amensalism is a relationship in which one species is benefitted whereas the other is unaffected.
(c) Predator is an organism that catches and kills other organism for food.

(d) Parasite is an organism which always lives inside the body of other organism and may kill it.

10. What type of human population is represented by the following age pyramid? 1



(a) Vanishing population
(b) Stable population
(c) Declining population
(d) Expanding population

11. In relation to Gross primary productivity and Net primary productivity of an ecosystem, which one of the following statements is correct? 1
(a) Gross primary productivity is always less than Net primary productivity.
(b) Gross primary productivity is always more than Net primary productivity.
(c) Gross primary productivity and Net primary productivity are one and same.
(d) There is no relationship between Gross primary productivity and Net primary productivity.

12. The meiocyte of rice has 24 chromosomes. How many chromosomes are present in its endosperm? 1
(a) 24 Chromosomes
(b) 36 Chromosomes
(c) 48 Chromosomes
(d) 30 Chromosomes

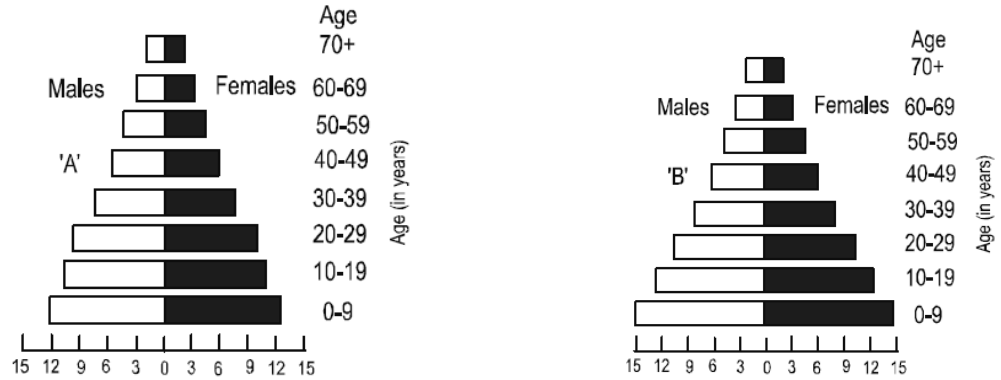
Question No. 13 to 16 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:
A. Both A and R are true and R is the correct explanation of A.
B. Both A and R are true and R is not the correct explanation of A.
C. A is true but R is false.
D. A is False but R is true.

13. **Assertion:** Megaspore mother cell undergoes meiosis to produce four megaspore, 1
Reason: Megaspore mother cell and megaspore both are haploid.

14. **Assertion:** ABO blood group system is a good example of pleiotropic genes**.** 1
Reason: In ABO blood group system, when I^A and I^B alleles are present together, both express themselves.

15. **Assertion:** cryI Ac and cryII Ab provide resistance to cotton plants against lepidopterans. 1
Reason: cryI Ab provide resistance to corn plants against lepidopterans.

16. A country with a high rate of population growth took measures to reduce it. The figure below shows age-sex pyramids of populations A and B twenty years apart. 1



Assertion: Pyramid "A" is more recent than Pyramid "B".
Reason: Pyramid "A" shows slight reduction in the growth rate.

SECTION B

17. Mention the sites of action of the hormone GnRH and FSH during spermatogenesis in human males .Give one function of each of the hormones. 2

18. What is aneuploidy? Name a chromosomal disorder in humans caused due to 2
    (a) Gain of an autosome
    (b) Loss of a sex chromosome in females

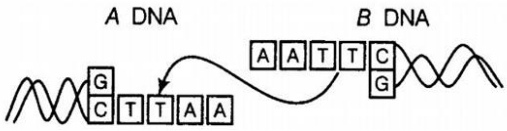
19. (a)State the function of mast cells in allergy response. 2
    (b) List any two emergent circumstances, when a medical doctor would recommend injection of a pre-formed antibody into the body of a patient and why?

20. Explain the dual function of AUG codon. Give the sequence of bases it is transcribed from and its anticodon 2

21. Name the source organism from which Ti plasmid is isolated. Explain the use of this plasmid in biotechnology. 2

OR

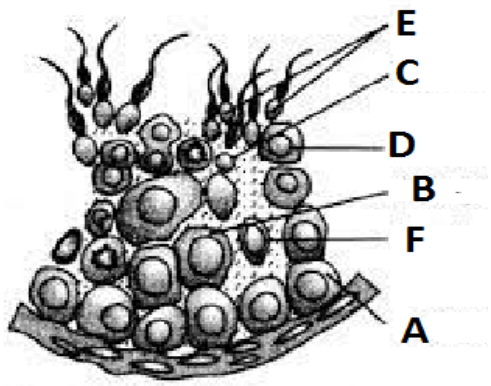
Study the linking of DNA fragments shown below



(a)Name 'A' DNA and 'B' DNA.
(b)Name the restriction enzyme that recognises this palindrome.
(c)Name the enzyme that can link these two DNA fragments.

SECTION C

22. Study the figure given below 3

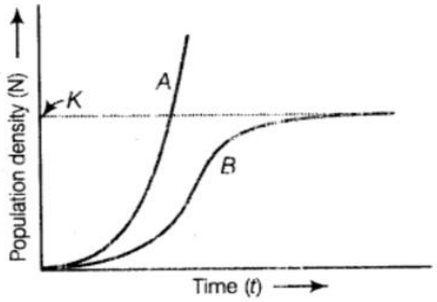


(a) Name the structure of which the diagram is a part.
(b) Name 'A' and 'B' . What is the difference between them with reference to the number of chromosomes?
(c) What is 'F' cell? Mention its function.

23. Differentiate between geitonogamy and xenogamy in plants. Which one between the two will lead to inbreeding depression and why ? 3

24. (a) Draw a schematic representation of the structure of a transcription unit and show the following in it: 3
(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.

25. Study the population growth curve 3



(a)Identify Curve 'A' and curve 'B'.
(b)Mention the conditions responsible for the Curves 'A' and curve 'B' respectively.
(c)Give the necessary equation for curve 'B'

26. (a) All human beings have cellular oncogenes but only a few suffer from cancer diseases. Give reason. 3
(b) How is malignant tumour different from benign tumour?

OR

How do Physiological barriers, cellular barriers and cytokine barriers provide innate immunity in humans ?

27. Describe the process of gene amplification for rDNA technology experiments. 3

28. Analyse the effects of 'Alien species invasion' on the biodiversity of a given area. Provide two examples. 3

SECTION D

Q.no 29 and 30 are case based questions. Each question has subparts with internal choice in one subpart.

29. Sickle –cell anaemia is a genetic disorder where it affects the shape of red blood cells, which carry oxygen to all parts of the body. 4

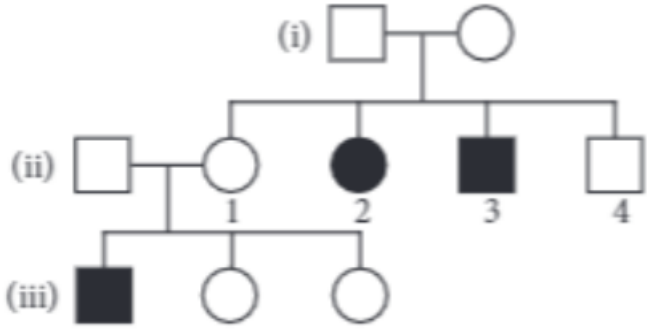
Red blood cells are usually round and flexible, so they move easily through blood vessels. In sickle cell anemia, some red blood cells are shaped like sickles or crescent moons. These sickle cells also become rigid and sticky, which can slow or block blood flow.

Sickle cell anaemia is caused due to mutations in a gene called HBB. It is an inherited blood disorder that occurs if both the maternal and paternal copies of HBB gene are defective.

The disease is controlled by a pair of allele, **HbA** and **HbS.**

- *Homozygous dominant **(HbA HbA)** normal*
- *Heterozygous **(HbAHbS)** carrier, sickle cell trait*
- *Homozygous recessive **(HbSHbS)** affected*

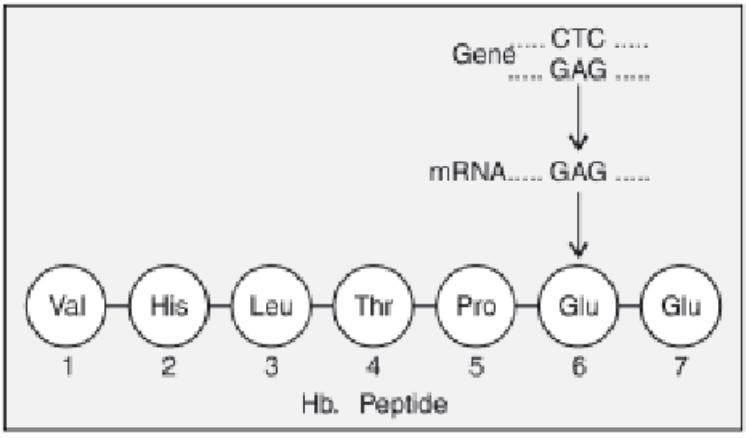
There's no cure for most people with sickle cell anemia. Treatments can relieve pain and help prevent complications associated with the disease.



(a) Study the above given pedigree chart for sickle cell anaemia and give the genotypes of First and second child.

(b) What type of disorder is sickle cell anaemia ? State whether it is recessive or dominant.

(c)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,

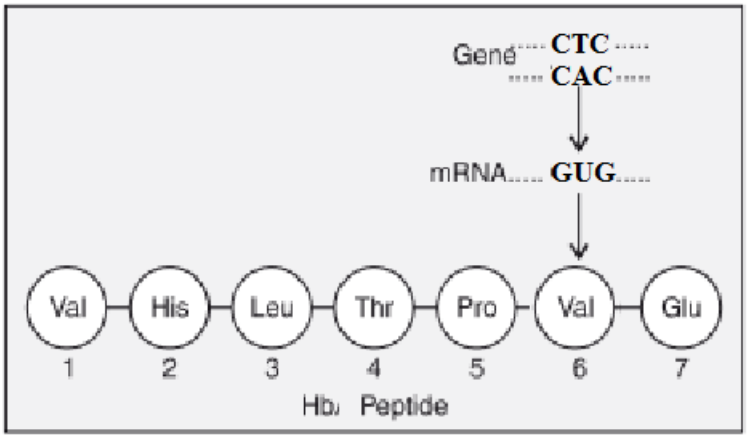


Is this representation of the sequence of amino acids indicating a normal human or a

sufferer from a certain blood related genetic disease? Give reason in support of your answer.

OR

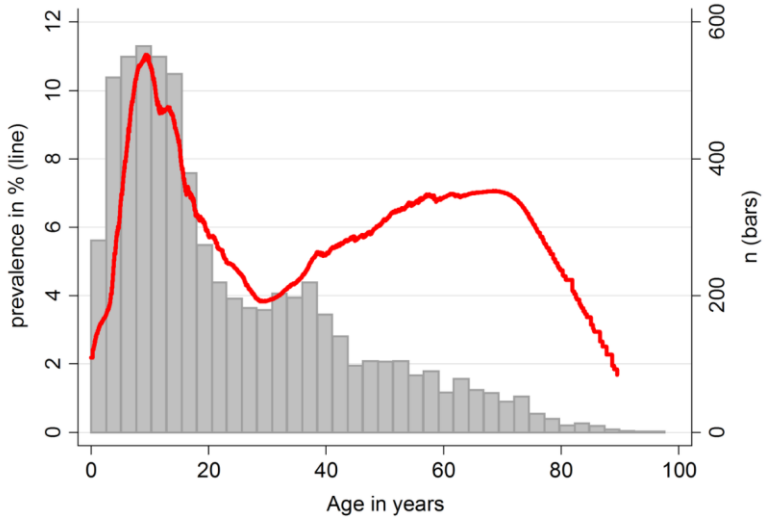
(c) Given below is the representation of a relevant part of amino acid composition of the β-chain of haemoglobin, related to the shape of human red blood cells,



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.

30. Ascaris, the common round worm and Wuchereria, the filarial worm, are some of the helminths which are known to be pathogenic to man. Ascaris, an intestinal parasite causes ascariasis. Symptoms of this disease include internal bleeding, muscular pain, fever, anemia and blockage of the intestinal passage. The eggs of the parasite are excreted along with the faeces of infected persons which contaminate soil, water, plants, etc. 4

Given below is a graph of *Ascaris lumbricoides* Infection in the Mbeya Region of Tanzania



(a) From the above graph **s**tate the main prevalence peak, in accordance with the age of maximum infection intensity in Mbeya region of Tanzania.

(b)How does a person acquire ascariasis?

(c)Name a helminth pathogen which gets transmitted to a healthy person through the bite of a female mosquito vector. Mention its two diagnostic symptoms.

OR

(c)Name the causative organism of the disease amoebiasis. List three symptoms of the disease.

SECTION E

31. (a)Describe the stages of oogenesis in human female. 5
(b)Draw a well labelled diagram of a human ovum released after ovulation.

OR

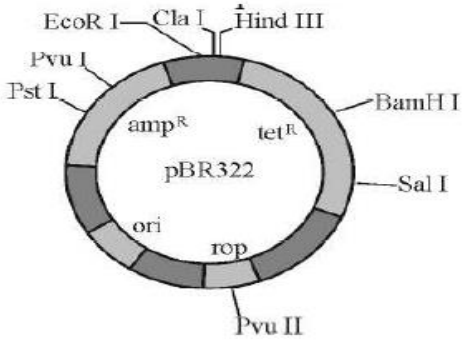
Where does the process of megasporogenesis start in an angiosperm ? Describe the process up to the formation of embryo sac with the help of a diagram

32. Describe the Hershey and Chase experiment. Write the conclusion drawn by the scientists after their experiment. 5

OR

(a)List any four major goals of Human Genome project.
(b)Write any four ways the knowledge from HGP is of significance for humans.
(c)Expand BAC and mention its importance.

33. (a)Observe the diagram shown below of pBR 322. Answer the questions that follow : 5



(i) What is pBR322 ?
(ii) Write the role of 'rop'.
(iii) State the significance of 'ampR' and 'tetR'.

(b)What are transgenic animals ? How was the first transgenic cow found to be more useful than the normal cow, for humans ?

OR

(a)Explain three basic steps to be followed during genetic modification of an organism.
(b)List any four ways by which GMO's have been useful for enhanced crop output.