COMMON PRE-BOARD EXAMINATION 2023-24

Subject: BIOLOGY (044)

Class XII

Time: 3 Hrs. Max. Marks: 70

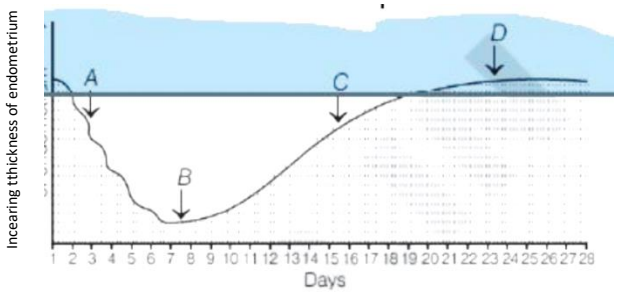
***General Instructions:***

Read the following instructions carefully:

(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 labeled diagrams should be drawn.

## SECTION A

1. If an endosperm cell of an angiosperm contains 24 chromosomes, the number of chromosomes in each cell of the root will be [1]
   (A) 8 (B) 4 (C) 16 (D) 24
2. The below diagram describe the changes that occurs in endometrium during normal menstruation. Choose the option with correct description for point A,B,C,D [1]




   (A) C- Ovulation B- Menstruation
   (B) A- Ovulation C-Menstruation
   (C) A- Menstruation C- Ovulation
   (D) B- Ovulation C- Menstruation
3. ZZ/WW type of sex determination is seen in [1]
   (A) Platypus (B) Snails (C) Cockroach (D) Peacock
4. DNA replication requires various enzymes, table represent enzyme and function; choose the function of respective enzyme. [1]

| | | X | Y | Z | W |
|---|---|---|---|---|---|
| (I) | Helicase | Breakdown of H bond | Joining DNA fragments | Formation of RNA primer | Joining DNA fragments |
| (II) | DNA polymerase | Polymerization of nucleotides | Polymerization of nucleotides | Polymerization of nucleotides | Polymerization of nucleotides |
| (III) | Ligase | Joining DNA fragments | Formation of RNA primer | Joining DNA fragments | Breakdown of H bond |

| | | | | | |
|---|---|---|---|---|---|
| (IV) | Primase | Formation of RNA primer | Breakdown of H bond | Breakdown of H bond | Formation of RNA primer |

(A) X (B) Y (C) Z (D) W

5. The scientist who developed a chemical method for the synthesis of RNA molecule with defined base combination is [1]
(A) George Gamaw (B) Hargovind Khuarana
(C) Marshall Nirenberg (D) Severo Ochao

6. Which of the following refer to correct example(s) of organisms which have evolved due to changes in environment brought about by anthropogenic (human) action? [1]
(i) Darwin's finches of Galapagos Island
(ii) Herbicide resistant weeds
(iii) Drug resistant eukaryotes
(iv) Man-created breeds of domesticated animals like dogs.
(A) only (i) (B) (i) & (iii) (C) (ii), (iii) & (iv) (D) only (iv)

7. Which of the following factor is not associated with Nicotine/tobacco smoking [1]
(A) Release of adrenaline and noradrenaline
(B) Increase in blood pressure and heart rate
(C) Increase in CO content in blood
(D) Increase in concentration of oxyhaemoglobin

8. Which one of the following options gives the correct match of a disease with its causative organism and mode of infection? [1]

| Disease | Causative organism | Mode of infection |
|---|---|---|
| (A) Typhoid | *Salmonella typhi* | With inspired air |
| (B) Pneumonia | *Streptococcus pneumoniae* | Droplet infection |
| (C) Elephantiasis | *Wuchereriabancrofti* | With infected water and food |
| (D) Malaria | *Plasmodium vivax* | Bite of male Anopheles mosquito |

9. Choose the correct combination of the statements(A-D) regarding the characteristics of certain organisms [1]
(i) Methanogens are Archaebacteria which produce methane in marshy areas.
(ii) Chemosynthetic autotrophic bacteria synthesize cellulose from glucose.
(iii) Mycoplasma lacks a cell wall and can survive without oxygen.
(iv) Nostoc is a filamentous blue green alga which fixes atmospheric nitrogen.
(A) (ii) , (iii)
(B) (i) , (ii) , (iii)
(C) (i) , (iii), (iv)
(D) (ii), (iii), (iv)

10. In order to make the host cell competent divalent cations such as calcium are used because [1]
(A) The divalent ions have to be in a specific concentration
(B) They cause the DNA uptake by the cell
(C) They increase the efficiency with which DNA enters the bacterium through pores in its cell wall
(D) Both B and C

11. Which among the following is based on antigen antibody interaction? [1]
(A) PCR (B) ELISA (C) Electrophoresis (D) DNA fingerprinting

12. The biomass available for consumption to heterotrophs and the rate of formation of new organic matter by consumers are referred to as [1]
(A) gross primary productivity and net primary productivity respectively
(B) net primary productivity and gross primary productivity respectively
(C) gross primary productivity and secondary productivity respectively
(D) net primary productivity and secondary productivity respectively

**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-Dehydration & dormancy of mature seed is crucial for storage of seed. [1]
Reason-Seeds of *Lupinus arcticus* remains viable for a few years in normal condition.

14. Assertion: Number of chromosomes in one genome is equal to number of linkage groups. [1]
Reason: Linkage groups give important information about location of genes in the chromosomes.

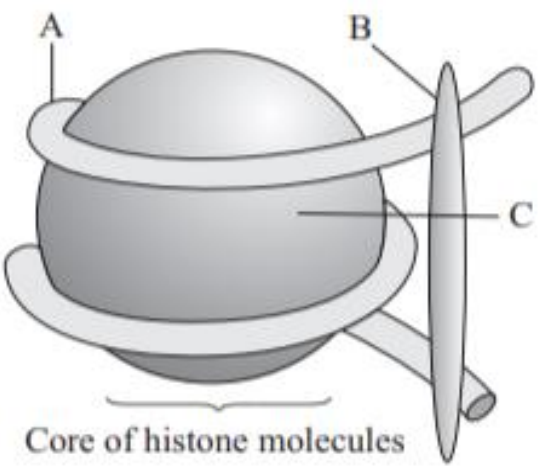
15. Assertion: DNA is considered to be better genetic material than RNA for most organisms. [1]
Reason: 2′-OH group present in DNA makes it labile and less reactive.

16. Assertion (A): Kangaroo Rat expels highly diluted urine. [1]
Reason (R): Kangaroo rats live across the deserts of Arizona.

## SECTION B

17. Geitonogamous flowers are genetically autogamous but functionally cross pollinated. [2]
Justify.

18. The given figure shows the structure of a nucleosome Label A, B & C. What is C made up of? [2]



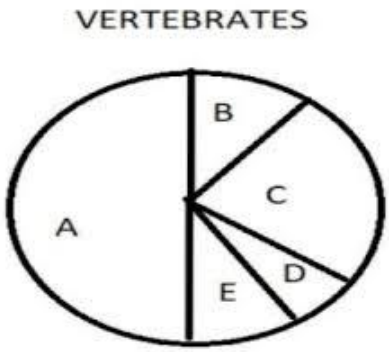

19. Observe the given figure: [2]
(a) State the role of (i) ori and (ii) rop.
(b) What will happen if the ori site was inactivated in the given plasmid vector.


20. Microbes play a dual role when used for sewage treatment as they not only help to retrieve usable water but also useful in generating renewable form of energy. Enlist points to explain the statement. [2]

21. If in a population of size 'N', the birth rate is represented as 'b' and the death rate as 'd', the increase or decrease in 'N' during a unit time period 't' will be dN/dt = (b - d) x N [2]
The equation given above can also be represented as dN/dt = r x N
(a) Write a significance of calculating 'r' for any population.
(b) In a pond there are 100 frogs, 20 more were born in a year. Calculate the birth rate of this population.
(c) Mention two different ways giving suitable example of each, other than absolute counting by which the population density can be determined.

OR

Given figure describes proportionate number of species of major taxa of vertebrates.




a) Which group of vertebrates represent maximum number of taxa marked as 'A'?
b) In the above figure, which groups of vertebrates represent 'B', 'C' and 'E' respectively, if 'D' is labeled as Reptiles?

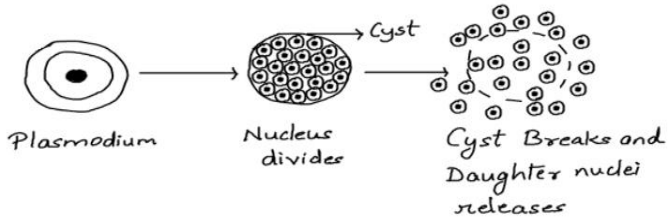
## SECTION C

22. (a) Mrs. Maria Jade is a research scholar who has black guinea pigs. (In guinea pigs, black is dominant to white). She wants to check if the guinea pig is pure, as she wants to raise black guinea pigs for her research work. What should Mrs. Maria Jade do? How will she be able to interpret her results? [3]
(b) Name the disorder and give the karyotype of the condition in which a human male suffers as a result of an additional X – chromosome.

23. Female uterus has glandular as well as muscular layers. [3]
(a) Name these layers from inside to outside.
(b) Which layer is principally involved in the menstrual cycle?
(c) Mention the name of the event and the hormone that cause the rupture of the uterine layer during menstrual cycle.

24. 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. [3]
(a) State any two reasons responsible for the cause of infertility in case of male and female.
(b) Suggest and explain any two techniques that can help the couple to have a child where the problem is with male.

25. (a) Which type of mode of reproduction is visible in the following figure also mention in which host of Plasmodium does this process take place? [3]




(b) Describe the symptoms which manifests in the host and state the reason.

26. Observe the given sequence of nitrogenous bases on a DNA fragment and answer the following question – [3]
5′ –GAATTC – 3′
3′ –CTTAAG – 5′
(a) Name a restriction enzyme which can recognize this DNA sequence.
(b) Write the sequence after digestion.
(c) Why are the ends generated after digestion called sticky ends?
(d) Which type of bonds do restriction endonucleases (molecular scissors) cleave in DNA molecules?

27. (a) How do The Mediterranean orchids Ophrys employ 'sexual deceit' to get pollination done by a species of bee? [3]
(b) Monarch butterflies are highly distasteful to predator, accepted as preventive measure from predation. How Monarch butterflies adopted this technique to get protected?
(c) Name the plant which found over Himalaya ranges that exhibit Genetic diversity? Which chemical substance is obtained from this plant?

28. Depict the Verhulst-Pearl Logistic Growth curve? Explain [3]

OR

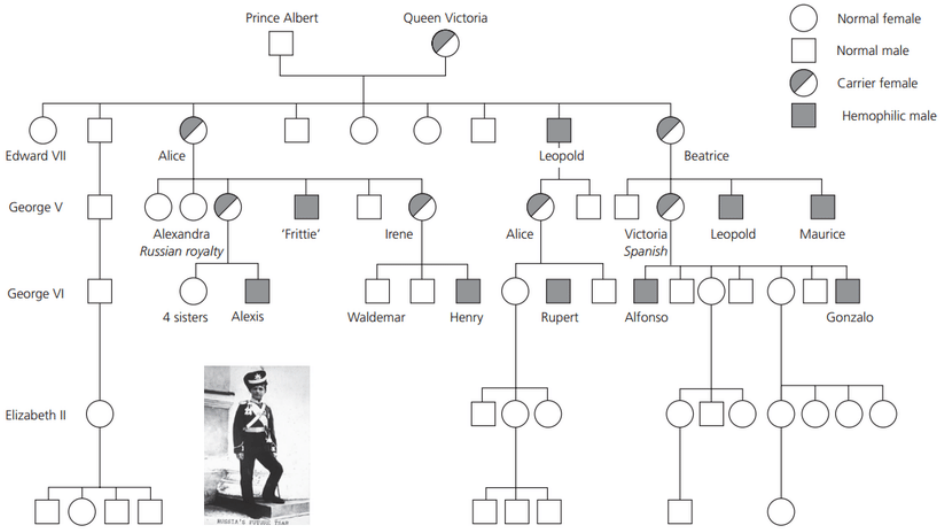
A particular species of wild cat is endangered. In order to save them from extinction, which is desirable – in situ or ex situ? Justify your answer and explain the difference between the two approaches.

## SECTION D

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

29. Hemophilia is a genetic disorder of rare blood condition where people do not have the clotting factor which enables their blood to clot when bleeding. It's an inherited disease that's usually passed from mother to son. Hemophilia has been called a "royal disease". This is because the hemophilia gene was passed from Queen Victoria, who became Queen of England in 1837, to the ruling families of Russia, Spain and Germany. Queen Victoria's gene for hemophilia was caused by spontaneous mutation. The pedigree chart of her family is given below. Of her children, one son, Leopold, had hemophilia, and two daughters, Alice and Beatrice, were carriers. Beatrice's daughter married into the Spanish royal family. She passed the gene to the male heir to the Spanish throne. Queen [4]

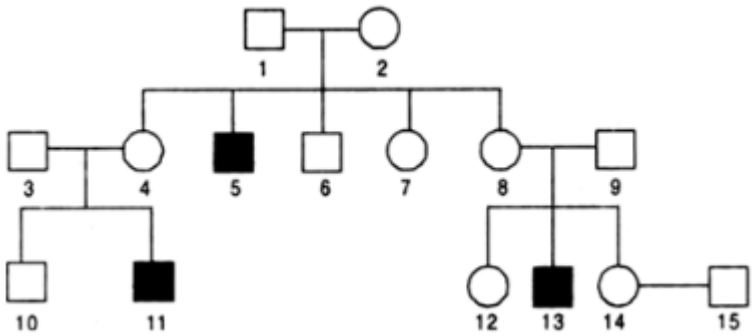
Victoria's other daughter, Alice, had a carrier daughter, Alix. Alix became Empress Alexandra at her marriage to Russia's Czar Nicholas in 1894. Their son, born in 1904 and named Alexis, inherited hemophilia from his mother. Hemophilia is a disorder that can be only appear in a generation if mother is carrier for disease and father has hemophilia or both parents have hemophilia.




(a) What type of disorder is Haemophilia?

(b) It is known that Queen Victoria of England married an unaffected male. Why was her son affected with the disorder?

The following pedigree chart shows the inheritance of haemophilia in a family.




(c) What would be the possible genotype of members 4 & 5? What would be the probability that member 12 has a hemophilic boy if she was a carrier and she marries a normal male?

OR

A blood test shows that member 14 has a hemophilic gene. What would be the probability that her child will be a hemophilic boy?

30. Priya was 4 years old when she contracted chicken pox. It took her around 15 days to recover completely. Priya is 5 years old now, her mother got her vaccinated a few days back for DPT (5th Dose) as per immunization programme. Recently she was playing with her friend in the park when her friend accidently fell on an iron pipe and badly bruised her knee. She was taken to the hospital where the doctor gave her an ATS injection and painkillers. [4]

Based on the above information , answer the following questions:

(a) What type of immunity has Priya developed against chicken pox after her recovery and

Tetanus after the 5th dose?

(b) Why did Priya's mother repeated the 5th dose?

(c) Why was her friend given ATS? Name the type of immunity that she developed.

OR

Give two differences between administration of the 5th dose which Priya received and the ATS which her friend received?

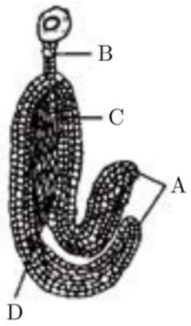
## SECTION E

31. (a) Draw a labelled diagram of human blastocyst. How does it get implanted in the uterus? [5]

(b) Justify with four points to show that placenta acts as an endocrine tissue?

OR

(i) Identify the given figure and its labelled parts A, B, C and D.




(ii) Explain the development of the above given structure from the embryo sac of dicot flower.

(iii) Which of the following is an/are endospermic seed/seeds in the given examples: Mango, castor, Pea, Wheat, Beans. What are endospermic seeds?

32. β Thalassemia and Sickle cell anemia are disorders which affect the hemoglobin in the Red blood cells. Bring out the differences or similarities between the two based on: [5]

(a) definition, (b) inheritance pattern (c) mutation, (d) cause, and (e) symptoms

OR

(i) Write the stages at which Regulation of gene expression can be achieved in eukaryotes.

(ii) What is meaning of I, P and O in operon?

(iii) What are the Z, y and a genes called as? Why are they termed so?

33. (a) Suggest any two possible treatments that can be given to a patient exhibiting adenosine deaminase deficiency. [5]

(b) Why do children cured by enzyme-replacement therapy for adenosine deaminase deficiency need periodic treatment?

(c) Why do the toxic insecticidal proteins secreted by *Bacillus thuringiensis* kill the insect and not the bacteria itself?

(d) Name the specific type of gene that is incorporated in a cotton plant to protect the plant against cotton boll worm infestation.

OR

Describe the various steps involved in Recombinant DNA technology with the help of a well labelled. Diagram.