COMMON PRE-BOARD EXAMINATION: 2022-23

Class-XII Subject: BIOLOGY (044)

Date: 19/01/2023

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 4marks each; and Section–E has 3 questions of 5 marks each.
(iv)There is no overall choice. However, internal choices have been provided in somequestions. 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. Seema, a mother of one year old daughter wanted to space her second child. Her doctor suggested CuT. Out of the options given below, select the correct action of CuT.

(a) increase phagocytosis of sperms and suppress sperm motility and fertilizing capacity of sperms.
(b) prevents ovulation and implantation.
(c) avoids insemination.
(d) prevents menstruation. 1

2. Given below are four contraceptive methods and the devices used. Select the correct match:

S.no	Method	S.no	Device
a)	Barrier	(i)	Vasectomy, Tubectomy
b)	IUD	(ii)	Condom, diaphragm
c)	Surgical technique	(iii)	Saheli
d)	Hormone administration	(iv)	Copper T

(a) a)-(i) b)-(ii) c)-(iii) d-(iv)
(b) a)-(ii) b)-(iii) c)-(iv) d-(i)
(c) a)-(ii) b)-(i) c)-(iii) d-(iv)
(d) a)-(ii) b)-(iv) c)-(i) d-(iii) 1

3. The DNA in nucleoid is organized in
(a) a set of positively charged basic proteins
(b) beads-on-string structure
(c) large loops held by proteins 1
(d) a unit of eight molecules

4. Select the key concepts about mechanism of speciation according to de Vries and Darwin respectively from the following:
(a) saltation and natural selection
(b) Branching descent and large heritable differences arising suddenly in a population
(c) Use and disuse of organs and minor heritable variations
(d) Adaptive ability and natural selection. 1

5. Identify the correct match for the type of barrier in innate immunity.

(a) Cytokine barrier- Monocytes

(b) Cellular barrier-interferons

(c) Physical barrier- Mucus

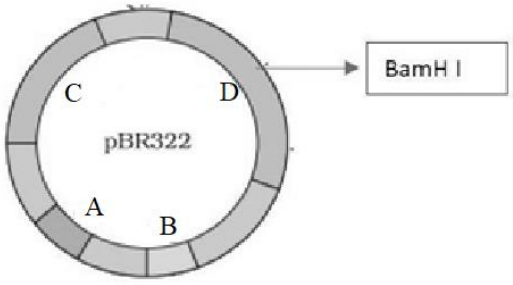
(d) Physiological barrier-Neutrophils 1

6. Which of the following statements with respect to cancer are correct?
A) Contact inhibition is the property shown by cancerous cells.
B) Antibodies against cancer-specific antigens can be used for detection of certain cancers.
C) Benign tumours show the property of metastasis.
D) In diagnosis of cancer, computed tomography uses UV rays to generate a three-dimensional image of the internals of an object.
E) Alpha interferons are given to cancer patients to activate their immune system.

(a) A), B), D), E)
(b) B), C), E)
(c) A), D), E)
(d) B), D), E) 1

7. One common bacterium found in the anaerobic sludge during sewage treatment
(a) Mycobacterium
(b) Bacillus thuringiensis
(c) Azospirillum
(d) Methanobacterium 1

8. The figure below shows the structure of a plasmid.



Choose the correct action for the label A and D from the given table.

	A	D
(a)	Selectable marker	Sequence where replication starts
(b)	Sequence where replication starts	Selectable marker
(c)	Proteins involved in the replication	Antibiotic resistance gene
(d)	Transformant	Recognition site

1

9. A marine biologist observes that major food source of seals declines due to pollution or overfishing. Which of the following equations will represent the growth with such limited resources?

(Where population size is N, birth rate is b, death rate is d, unit time period is t, and carrying capacity is K).

(a) $dN/dt = KN$
(b) $dN/dt = r N$
(c) $dN/dt = r N(K-N/K)$
(d) $dN/dt = r N(K+N/K)$

1

10. Cuckoo laying her eggs in crow's nest. The kind of population interaction exhibited in this case is

(a) endoparasitism
(b) amensalism
(c) commensalism
(d) brood parasitism

1

11. Which of the following ecological pyramid is always erect and upright?
(a) Pyramid of biomass
(b) Pyramid of energy
(c) pyramid of number
(d) All of these

1

12. Which of the following is an example of in situ conservation?
(a) Wildlife safari
(b) Sacred groves
(c) Zoological parks
(d) Botanical gardens

1

Question No. 13 to 16 consist of two statements – Assertion (A) and Reason (R). Answer thesequestions 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: Pollen grains can withstand harsh conditions.
Reason: The exine of pollen grains is made up of sporopollenin which is resistant to high Temperatures, strong acids or alkali as well as enzymatic degradation.

1

14. Assertion: In honeybee, females are diploid and males are haploid.
Reason: The males produce sperms by meiosis. 1

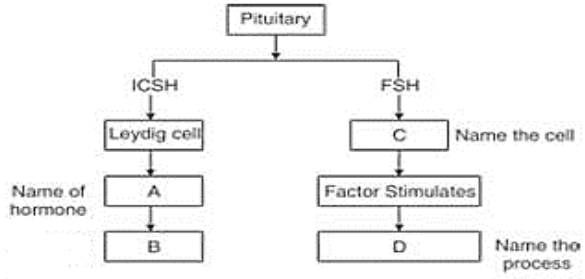
15. Assertion: Genetic modification has increased efficiency of mineral usage by plants.
Reason: Use of genetically modified crop is a possible solution for minimizing the use of fertilizers and chemicals. 1

16. The size of a population for any species is not a static parameter. It keeps changing with time, depending on various factors including food, availability, predation pressure and adverse weather. It is these changes in population density that give us some idea of what is happening to the population.

Assertion: The density of a population in a given habitat during a given period, fluctuates due to natality, immigration, mortality and emigration.
Reason: Natality and immigration contribute to a decrease and mortality, emigration contributes to an increase. 1

SECTION - B

17. Given below is an incomplete chart showing influence of hormones on gametogenesis in males. Observe the chart carefully and fill in the blanks A, B, C and D.



2

18. A true breeding pea plant, homozygous dominant for round green pods is crossed with another pea plant with wrinkled yellow pods (rrgg). With the help of punnett square show, the above cross and mention the results obtained phenotypically and genotypically in F1 generation? 2

19. Humans have innate immunity for protection against pathogens that may enter the gut along with food. What are the two barriers that protect the body from such pathogens? 2

20. Following is the sequence of nucleotide in two strands of DNA. Observe the strands and answer the preceding questions.

5' - GAATTC- 3'
3' - CTTAAG -5'

(a) Name the special term for such an arrangement of nucleotide.
(b) What are special type of enzymes which function at this specific points?
(c) What is their significance in biotechnology? 2

21. a) Construct an ideal pyramid of energy when 10,00,000 Joules of sunlight is available. Label all its trophic levels.
b) Differentiate between a detritivore and a decomposer.

OR

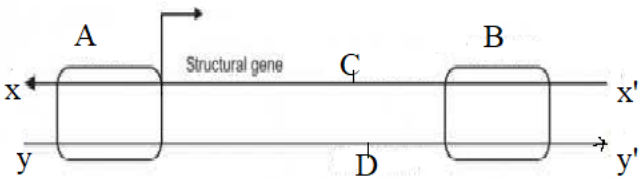
Draw a pyramid of biomass starting with phytoplanktons. Label 3 trophic levels. Is the pyramid upright or inverted? Why? 2

SECTION - C

22. Draw a sectional view of the human ovary showing the different stages of developing follicles, corpus luteum and ovulation. 3

23. Explain the adaptations that ensure pollination in the following plants. Mention the pollinating agents in each of the plant.
(a) Grass
(b) Vallisneria 3

24. (a) Identify the polarity of x to x' and y to y' in the diagram below.



(b) What is the significance of A and B in transcription.
(c) If the sequence of D is y- ATGCATGCATGCATGCATGCATGC-y'. Write down the sequence of complementary strand and the sequence of mRNA transcribed. 3

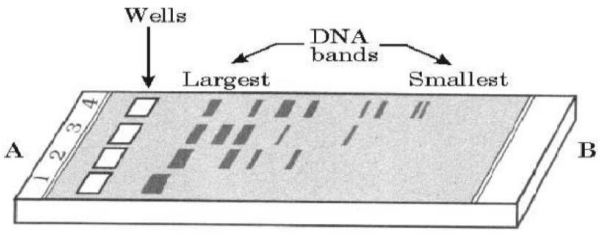
25. (a) How is Hardy-Weinberg's expression "$(p^2 + 2pq+q^2) = 1$" derived?
(b) List any two factors that can disturb the genetic equilibrium. 3

26. (a) Highlight the structural importance of an antibody molecule with a neat labelled diagram.
(b) Differentiate between active and passive immunity.

OR

Explain, how the transmission of each of the following diseases take place?
(i) Amoebiasis
(ii) Malaria
(iii) Ascariasis 3

27.



Observe the diagram of gel electrophoresis and answer the questions which follows:
(a) Name the substance used as a medium/matrix in gel electrophoresis along with its source.
(b) Identify A and B. Why does DNA move towards B in the gel electrophoresis?
(c) How can one observe DNA in the gel after electrophoresis? 3

28. (a) Rain forests has greater biodiversity on earth. List any two hypothesis that are proposed by the biologists to account for the greater biological diversity. 3

(b) List any two major causes of loss of biodiversity in these rain forests.

SECTION - D

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

29. The cytological observations made in a number of insects led to the development of the concept of genetic/ chromosomal basis of sex-determination. Henking (1891) could trace a specific nuclear structure all through spermatogenesis in a few insects, and it was also observed by him that 50 per cent of the sperm received this structure after spermatogenesis, whereas the other 50 per cent sperm did not receive it. Henking gave a name to this structure as the X body but he could not explain its significance. Further investigations by other scientists led to the conclusion that the 'X body' of Henking was in fact a chromosome and that is why it was given the name X-chromosome. It was also observed that in a large number of insects the mechanism of sex determination is of the XO type, i.e., all eggs bear an additional X-chromosome besides the other chromosomes (autosomes). On the other hand, some of the sperms bear the X-chromosome whereas some do not. Eggs fertilised by sperm having an X-chromosome become females and, those fertilised by sperms that do not have an X-chromosome become males. Grasshopper is an example of XO type of sex determination in which the males have only one X-chromosome besides the autosomes, whereas females have a pair of X-chromosomes. Insects and mammals including man, XY type of sex determination is seen where both male and female have same number of chromosomes.
Among the males an X-chromosome is present but its counterpart is distinctly smaller and called the Y-chromosome. Females, however, have a pair of X-chromosomes. Both males and females bear same number of autosomes. Hence, the males have autosomes plus XY, while female have autosomes plus XX. In human beings and in Drosophila the males have one X and one Y chromosome, whereas females have a pair of X chromosomes besides autosomes. males produce two different types of gametes, (a) either with or without X-chromosome or (b) some gametes with X-chromosome and some with Y-chromosome. Such types of sex determination mechanism are designated to be the example of male heterogamety. Organisms, e.g., birds a different mechanism of sex determination is observed. In this case the total number of chromosome is same in both males and females. But two different types of gametes in terms of the sex chromosomes are produced by females, i.e., female heterogamety. In order to have a distinction with the mechanism of sex determination described earlier, the two different sex chromosomes of a female bird has been designated to be the Z and W chromosomes. In these organisms the females have one Z and one W chromosome, whereas males have a pair of Z-chromosomes besides the autosomes.
(a) Can you name an organism that has XO type of sex-determination?
(b) What factors determine a human child's gender?
(c) How is the sex determination mechanism different in female birds?

OR

(c) With the help of a cross, highlight the sex determination in human beings. 4

30. Acquired immunity and Graft Rejection:
Acquired immunity, on the other hand, is pathogen specific. It is characterised by memory. This means that our body when it encounters a pathogen for the first time produces a response called primary response which is of low intensity. Subsequent encounter with the same pathogen elicits a highly intensified secondary or anamnestic response. This is ascribed to the fact that our body appears to have memory of the first encounter. The primary and secondary immune responses are carried out with the help of two special types of lymphocytes present in our blood, i.e., B-lymphocytes and T- lymphocytes.The B-lymphocytes produce an army of proteins in response to pathogens into our blood to fight with them. These proteins are called antibodies. The T-cells themselves do not secrete antibodies but help B cells produce them. Each antibody molecule has four peptide chains, two small called light chains and two longer called heavy chains. Hence, an

antibody is represented as H_2L_2. Different types of antibodies are produced in our body. IgA, IgM, IgE, IgG are some of them. Because these antibodies are found in the blood, the response is also called as humoral immune response. This is one of the two types of our acquired immune response - antibody mediated. The second type is called cell- mediated immune response or cell-mediated immunity (CMI). The T-lymphocytes mediate CMI. Grafts from just any source - an animal, another primate, or any human beings cannot be made since the grafts would be rejected sooner or later. Tissue matching, blood group matching are essential before undertaking any graft/transplant and even after this the patient has to take immuno-suppressants all his/her life. The body is able to differentiate 'self' and 'non-self and the cell-mediated immune response is responsible for the graft rejection.

(a) What type of response is mediated by antibodies?

(b) Which cell is responsible for cell mediated immunity?

(c) Mention the type of molecules which are most responsible for rejection of transplant?

OR

(c) Which immunoglobulin does constitute the largest percentage in human milk? 4

SECTION - E

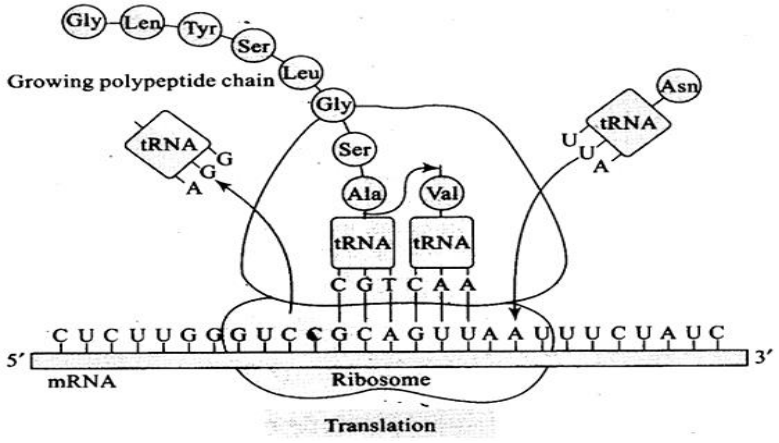
31. A woman has conceived, and implantation has occurred in her uterus. Trace the sequence of changes up to parturition which take place within her body.

OR

(a) Draw a diagram of L.S of an anatropous ovule of an angiosperm and label the following parts.
(i) Nucellus (ii) Secondary nucleus

(b) Trace the fate of haploid megaspores formed by the megaspore mother cell in an angiosperm plant. 5

32. Observe the diagram showing the process of translation given below.

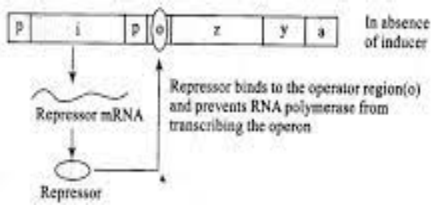


(a) Explain the steps involved in the elongation of polypeptide chain during its synthesis?

(b) Gene encoding RNA Polymerase II and III have been affected by mutation in a cell. Explain its impact on the synthesis of polypeptide, stating reasons.

OR

Study the schematic representation of the genes involved in the lac operon given below and answer the questions that follow:



(a) Trace the series of events when an inducer is present in the medium in which E.coli is growing.

(b) The protein produced by the i gene has become abnormal due to unknown reasons. Explain its impact on lactose metabolism stating the reason. 5

33. Observe the table given below carefully. The table shows the yield comparisons between Bt cotton and non-Bt cotton in the year 1994 and 1995.

Table 2. Yield comparisons between *Bt* and non-*Bt* cotton

	Yield (lb lint/acre)	
Year	*Bt* cotton (unsprayed)	non-*Bt* cotton (sprayed)
1994	1369	1392
1995	1465	1425

(a) One of the main objectives of biotechnology is to minimize the use of insecticides on cultivated crops. Explain how insect resistant crops like Bt cotton have been developed using techniques of biotechnology.

(b) How does Bt toxin produced by the bacteria kill the insect? Explain.

OR

(a) A person is born with a hereditary disease with a weakened immune system due to deficiency of an enzyme. Suggest a technique for complete cure for this disease, identify the deficient enzyme and explain the technique used for cure.

(b) How did an American company, Eli Lily use the knowledge of rDNA technology to produce insulin? 5