BANGALORE SAHODAYA SCHOOLS COMPLEX ASSOCIATION (BSSCA)

PRE-BOARD EXAMINATION (2023-2024)

CLASS: XII

DATE: 13.12.2023 **MAX. MARKS: 70**

SUBJECT: BIOLOGY (CODE 044) **SET - 2** **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. Even in absence of pollinating agencies, seed setting is assured in -

   a) Commelina b) Zostera c) Salvia d) Fig

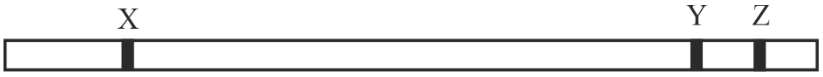
2. Endosperm is consumed by the Embryo in the seed of -

   a) Coconut b) Castor c) Pea d) Maize

3. The following ratio is generally constant for a given species,

   a) A+C/G+C b) T+C/G+A c) G+C/A+T d) A+G/T+C

4. Given below is a genetic map with 3 genes x, y, z.



According to genetic map, show which of the following statements is correct:

i) The strength of linkage between y and z is stronger than x and z.

ii) The chances of recombination between x and y are higher than x and z.

iii) The strength of linkage between x and y is stronger than y and z.

iv) The chances of recombination between y and z is lower than x and z.

   a) (i) and (ii) b) (ii) c) (iii) d) (i) and (iv)

5. In a population of 1000 individuals, 360 belong to genotype AA, 480 to Aa and the remaining 160 to aa. Based on this data, the frequency of allele A in the populations is -

a) 0.4 b) 0.5 c) 0.6 d) 0.7

6. Darwin in his 'Natural selection Theory' did not believe in any role of which one of the following in organic evolution:

a) Parasites and predators as natural enemies.
b) Survival of the fittest.
c) Struggle for existence.
d) Discontinuous variations.

7. The allele for black hair (B) is dominant over brown hair (b) and the allele for brown eye (E) is dominant over blue eye (e). Out of the offspring obtained upon mating a black haired and brown eyed individual (BbEe) with a brown haired and brown eyed individual (bbEE). The ratio of brown haired and brown eyed individuals to black haired and brown eyed individuals is -

a) 2:1 b) 3:1 c) 2:2 d) 1:2

8. In a strand of nucleic acid, two nucleotides are linked together by:

a) 3'-5' phosphodiester bond
b) 5'-3' phosphodiester bond
c) 2'-5' phosphodiester bond
d) 1'-3' phosphodiester bond

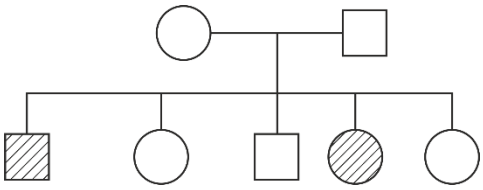
9. Read the given statements and select the option which are true (T) and which are false (F).

i) Typhoid fever can be confirmed by Widal test.
ii) *Entamoeba histolytica* resides in jejunum and ileum parts of the small intestine and is more common in females than males.
iii) Elephantiasis is caused by a protozoan parasite *Trichophyton.*
iv) Plant yielding 'cocaine' is native to South America.

	I	II	III	IV
a)	T	F	F	F
b)	T	F	F	T
c)	F	T	F	T
d)	F	T	T	T

10. Which of the following is commonly used as a vector introducing a DNA fragment in human lymphocytes?
    a) λ phage b) Ti-plasmid c) Retrovirus d) pBR322

11. Given below is a pedigree chart of a family with five children. It shows the inheritance of attached earlobes as opposed to the free ones. The squares represent the male individuals and circles, the female individuals. Which one of the following conclusions drawn is correct?



    a) The parents are homozygous recessive.
    b) The trait is Y-linked.
    c) The parents are homozygous dominant.
    d) The parents are heterozygous.

12. Select the incorrect food chain:
    a) Grass → grasshopper → frog → snake → eagle
    b) Phytoplankton → Zooplanktons → Small fish → Large fish
    c) Diatoms → Zooplanktons → Small fish
    d) Grass → Frog → Vulture

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:** Pollen grains are shed at 3-celled stage in some angiosperms.
    Reason: In some species, the vegetative cell of pollen grain divides mitotically to form two male gametes.

14. **Assertion:** In Bacteria, translation of mRNA begins before it is fully transcribed.
    Reason: There is no spatial separation of cytosol and nucleus in bacteria.

15. **Assertion:** Interferons are the proteins produced by body cells infected by viruses.
    Reason: Interferons stimulate inflammation at the site of injury.

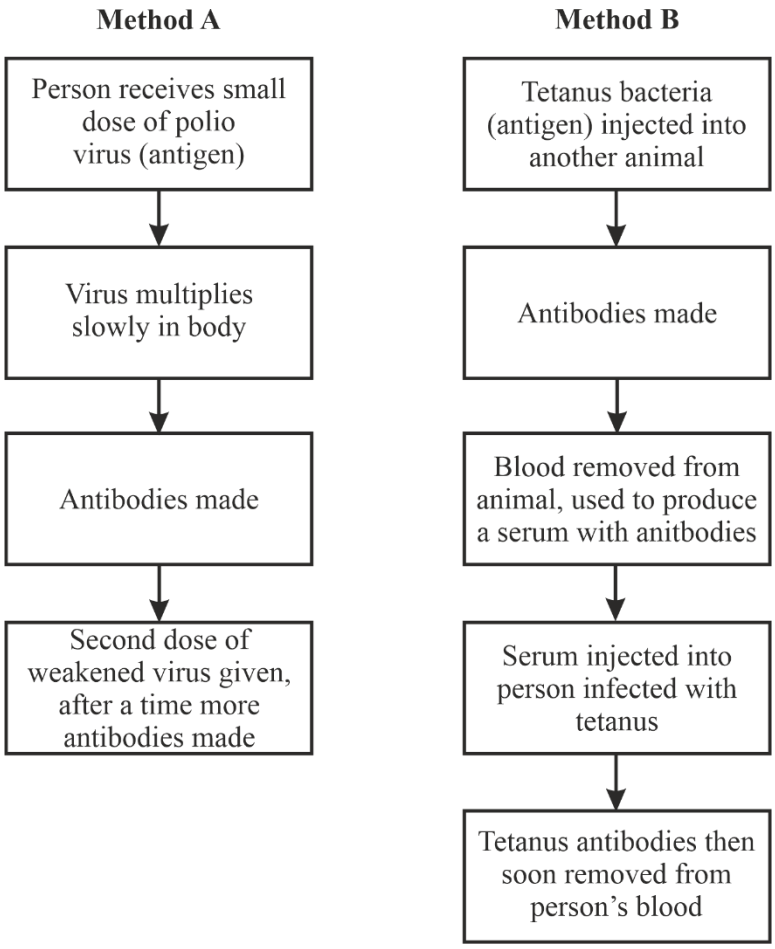
16. **Assertion:** A genetic probe is helpful in the detection of specific DNA sequence.

Reason: Genetic probe is a radiolabelled DNA, which has base sequence complementary to the DNA fragment being detected.

SECTION – B

17. How do 'implants' act as an effective method of contraception in human females? Mention its one advantage over contraceptive pills.

18.



a) How does method A differ from method B in providing immunity?

b) In immunisation against polio a second dose of the weakened virus is given. Explain why this booster is necessary.

19. Give the names and functions of the hormones released by the pituitary gland which are involved in the process of spermatogenesis.

20. a) You have created a recombinant DNA molecule by ligating a gene to a plasmid vector. By mistake, exonuclease enzyme is added to the test tube containing recombinant DNA. How will your experiment get affected as you plan for a transformation now?

b) How is endonuclease different from exonuclease?

21. a) Draw a pyramid of number considering a big banyan tree supporting a population of insects, small birds and their predators.
    b) Construct an ideal pyramid of energy when 1,000,000 joules of sunlight is available. Label all its trophic levels.

OR

The gross primary productivity (GPP) of a meadow in southeastern Kansas is found to be 38,000 Kcal/m^2. Respiration which is measured by the amount of CO_2 released is 13,500 Kcal/m^2, what is the net primary productivity (NPP) for this ecosystem, in Kcal/m^2 per year?

SECTION – C

22. Discuss any three types of Assisted Reproductive Technologies practiced to help infertile couple.

23. Trace the journey of the ovum from the ovary until the implantation of the embryo diagrammatically.

24. How do different organisms evolve similar adaptive structures? Provide an example to illustrate this phenomenon.

25. a) In a 3.8Kbp long piece of DNA, 820 Adenine bases were found. What would be the number of Cytosine bases?
    b) In a nucleus, the number of RNA nucleoside triphosphates is 10 times the number of DNA nucleoside triphosphates. But only DNA nucleotides are added during the DNA replication. Why?

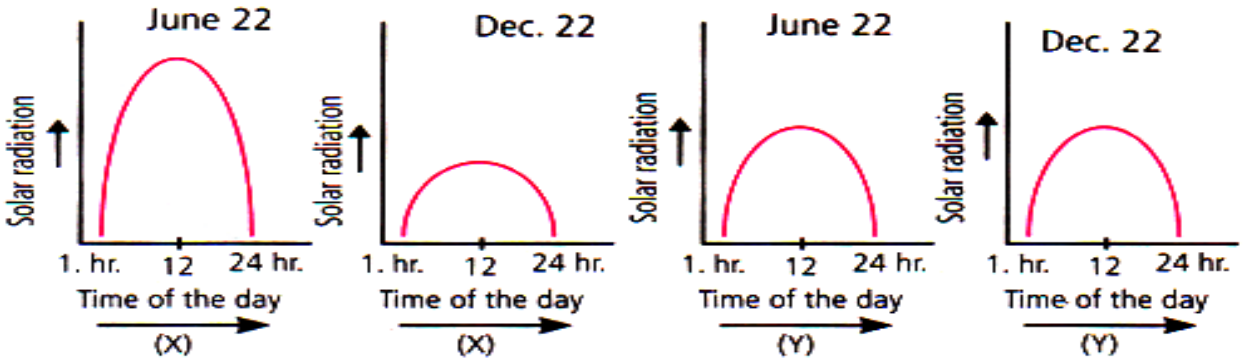
26. a) Baculoviruses are excellent candidates for integrated pest management in an ecological sensitive area. Explain giving two reasons.
    b) What is organic farming?
    c) Why is it suggested to switch over to organic farming?

27. "Specific Bt Toxin gene is incorporated into cotton plant so as to control infestation of Bollworm".
    Mention the source organism from which the gene was isolated and represent the mode of action in the form of a flowchart.

OR

How is transgenic tobacco plant protected against *Meloidogyne incognita?* Explain the process.

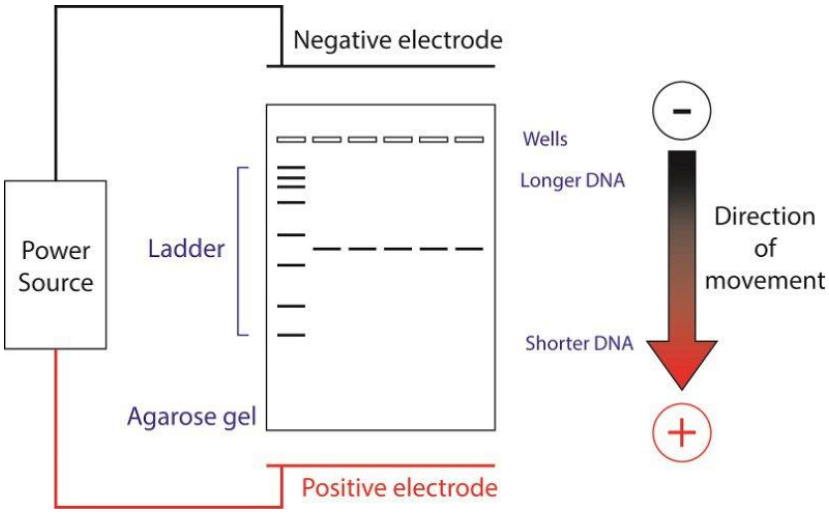
28. The graphs (X) and (Y) below depict the diurnal variations in the solar radiations in the month of June (Summer) and in the month of December (Winter).
    a) Which of the two graphs depict tropical region and temperate regions respectively?
    b) Which of the two regions (X) or (Y) will show high biological diversity and why?



SECTION – D

Question No. 29 and 30 are Case-based questions. Each question has 3 subparts with internal choice in one subpart.

29. Observe the diagrammatic representation and answer the following questions:



a) Identify and name the technique. What is the purpose of this technique?

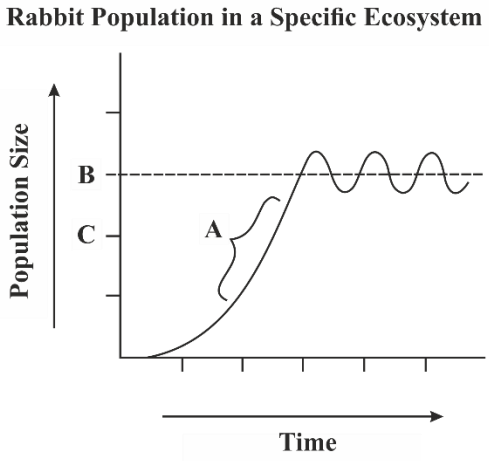
b) Explain why DNA has an overall negative charge.

c) What is the source of agarose? Which property of its gel helps in the above technique?

OR

What is the role of electric current and the Ethidium Bromide in the process?

30. Read the following graph to answer the given questions:



a) What does the dotted line represent? Define the same.

b) Over a period of time, the location of the dashed line would move from location B to location C on this graph. Why?

c) Describe the situation where dashed line may go up.

OR

In an aquarium, two herbivorous species of fish are living together and feeding on phytoplanktons. As per the Gause's principle, one of the species is to be eliminated in due course of time, but both are surviving. Explain how is it possible.

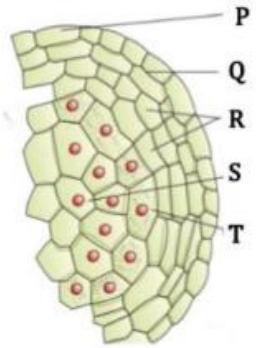
SECTION – E

31. a) How can a plant flowering in Mumbai be fertilised by pollen grains of the same species in New Delhi? Provide suitable explanation for your answer.

    b) Trace the development of the polyploidal cell that is formed after double fertilisation in a groundnut seed and a maize seed.

OR

Observe the given diagram of an enlarged microsporangium.



Identify and name the parts which are -

a) involved in dehiscence of the anther.

b) binucleate.

c) identify and trace the fate of cells labelled 'T' diagrammatically till it reaches the style of the pistil.

32. a) You have an individual who is totally heterozygous for 2 genes that are not linked. One gene is for ear size (AA or Aa being big ears whereas aa is for small ears) and the other gene is for bulgy eyes (BB and Bb for bulgy eyes whereas bb represents normal eyes). If you testcross this individual, what are the resulting genotypes and phenotypes?

    b) If the 4 types of offspring from the above cross, did not show 1:1:1:1, but were as follows, what would this represent?

PERCENTAGES	GENOTYPE	PHENOTYPE
48%	AaBb	Big ears, bulgy eyes
2%	Aabb	Big ears, normal eyes
2%	aaBb	Small ears, bulgy eyes
48%	aabb	Small ears, normal eyes

OR

The father is heterozygous for tongue rolling and homozygous dominant for unattached earlobes and the mother is homozygous recessive for tongue rolling and heterozygous for unattached earlobes. What is the possibility and probability of their offspring inheriting these traits. The ability to roll ones tongue is dominant (R) over the "non-rolling" condition (r.) Unattached earlobes (U) are dominant over attached earlobes (u).

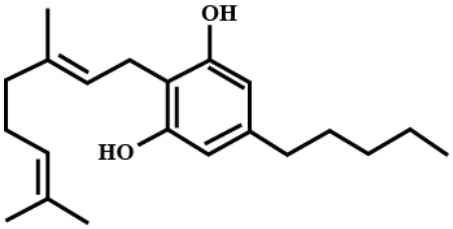
Complete a Punnett square for this cross and record the probabilities for genotypes and phenotypes of the offspring as ratios.

33. A patient had tested positive to Elisa test. Identify the disease and pathogen responsible. Discuss the life cycle of the pathogen with the help of a diagrammatic representation

OR

a) Drugs and alcohol give short-term 'high' and long-term ‘damages’. Discuss the damages by giving suitable examples.

b) Which group of drugs does this represent?



c) What are the modes of consumption of these drugs?