

# BUDHA DAL PUBLIC SCHOOL, PATIALA

Pre Board Examination (23 January 2024)

Class XII (Science)

Subject - Biology (Set - B)

Time: 3hrs.

M.M. 70

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 labeled diagrams should be drawn.

## Section - A

Q1. A dicotyledonous plant bears flowers but never produces fruits and seeds. The most probable cause for the above situation is

- a) Plant is dioecious and bears only pistillate flowers.
- b) Plant is dioecious and bears both pistillate and staminate flowers.
- c) Plant is monoecious.
- d) Plant is dioecious and bears only staminate flowers.

Q2. In a flower, if the megaspore mother cell forms megaspores without undergoing meiosis and if one of the megaspores develops into an embryo sac, its nuclei would be

- a) haploid b) diploid c) a few haploid and a few diploid d) with varying ploidy

Q3. In the image depicting a level of the packaging of the DNA helix, identify P and Q.

- a) P: Base pairs; Q: DNA
- b) P: nucleosome; Q: DNA
- c) P: nucleosome; Q: chromatin
- d) P: histone; Q: chromosome



Q4. Which of the following combination of chromosome numbers represents the correct sex determination pattern in honey bees?

- a) Male 32, female 16 b) Male 16, female 32 c) Male 31, female 32 d) Female 32, male 31

Q5. At a particular locus, the frequency of allele A is 0.6 and that of allele a is 0.4. What would be the frequency of heterozygotes in a random mating population at equilibrium?

- a) 0.32 b) 0.16 c) 0.24 d) 0.48

Q6. The process by which organisms with different evolutionary history evolve similar phenotypic adaptation in response to a common environmental challenge, is called :

- a) Natural selection b) convergent evolution c) Non-random evolution d) Adaptive radiation

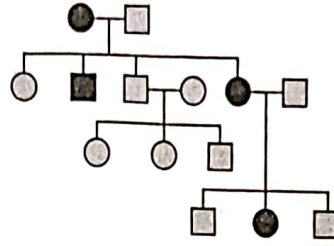
Q7. Which is the smallest part of DNA molecule that can be changed by a point mutation?

- a) Oligonucleotide b) Codon c) Gene d) Nucleotide

8-1

Q8. Study the pedigree analysis of humans given here and identify the type of inheritance along with an example.

- a) Sex-linked recessive, Haemophilia
- b) Sex-linked dominant, Vitamin D resistant rickets
- c) Autosomal recessive, Sickle-cell anaemia
- d) Autosomal dominant, Myotonic dystrophy



Q9. Which of the following are the reason(s) for rheumatoid arthritis? Choose the correct option:

- a) The ability to differentiate pathogens or foreign molecules from self cells increases.
- b) Body attacks self cells.
- c) More antibodies are produced in the body.
- d) The ability to differentiate pathogens or foreign molecules form self cells increase.

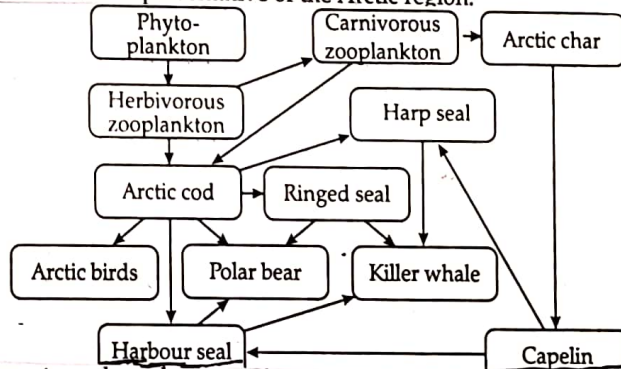
Q10. Which of the following term is referred to 'molecular scissors' and 'chemical knife' respectively?

Molecular scissors	Chemical knife
a) Recombinant DNA	Polymerases
b) Taq polymerase	Polymerases
c) Restriction enzyme	Endonucleases
d) Taq polymerase	Endonucleases

Q11. Which one of the following is not the product of transgenic experiments?

- a) Pest-resistant crop variety
- b) High nutritional value in grains
- c) Production of insulin by rDNA technique
- d) Drought-resistant crops

Q12. Given below is a food web representative of the Arctic region.



Increasing temperatures have been causing changes in the ocean ecosystem. These changes have caused the population of Arctic cod to decline rapidly.

- P. The population of arctic birds will increase.
- Q. The ringed seal will slowly become extinct.
- R. The harbor seal will be dependent on capelins alone

- a) Only P    b) Only R    c) Only Q and R    d) all, P, Q and R

Each of the following questions (Q.No. 13 to Q.No 16) consists of two statements, one is Assertion (A) and the other is Reason (R). Give answer:

- a) Both Assertion (A) and Reason (R) true and Reason (R) is the correct explanation of Assertion (A).
- b) Both Assertion (A) and Reason (R) are true but Reason (R) is not a correct explanation of Assertion (A).
- c) Assertion (A) is true but Reason (R) is false.
- d) Assertion (A) is false but Reason (R) is true.

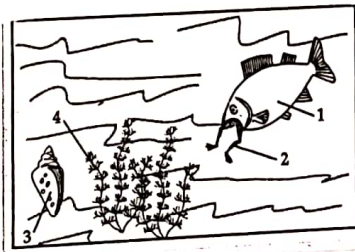
B-2

- Q13. Assertion : Endosperm is completely consumed during, the development of embryo in ex-albuminous seeds.  
Reason : Castor, pea and beans are all examples of ex-albuminous seeds.
- Q14. Assertion : Polycistronic mRNA is capable of forming a number of different polypeptide chains.  
Reason : Polycistronic mRNA has terminator codons.
- Q15. Assertion : Ganja is hallucinogen.  
Reason : It alters perception, causes illusion and damages cardiovascular system.
- Q16. Assertion : Gene therapy is a method of treating a disorder but cannot cure it.  
Reason : Cells are drawn from a patient and the functional gene is introduced into these cells and transferred back to the patient.

Section - B

- Q17. Write the function of each of the following:  
a) Seminal vesicle  
b) Acrosome of human sperm
- Q18. Explain pleiotropy with the help of an example.
- Q19. When you go for a trek/trip to any high altitude places, you are advised to take it easy and rest for the first two days. Comment, giving reasons.
- Q20. Explain the process by which a bacteria cell can be made 'competent' to take up foreign DNA from its surroundings, using divalent cations and temperature treatment.
- Q21. In a botanical garden of a city there is a huge banyan tree growing on which hundreds of birds and thousands of insects live. Draw the pyramids of numbers and also biomass represented by this community. Comment giving reasons on the two different pyramids drawn.

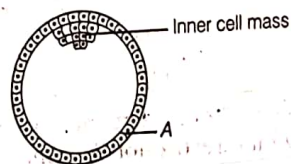
OR



- A part of an aquatic ecosystem is represented in the picture given here:  
(a) Mention the relationship between 1 and 2 with respect to population interaction.  
(b) Mention the relationship between 3 and 4 with regard to trophic levels?  
(c) Construct a food chain operating in the ecosystem.

Section - C

- Q22. a) Identify A in the given figure and mention its function.  
b) Name the stage of human embryo that is shown in the figure  
c) Mention the fate of the inner cell mass after implantation in the uterus. Where are the stem cells located in this embryo?





Q23. Where are the following structures present in a male gametophyte of an angiosperm? Mention the function of each one of them.

- a) Germ pore    b) Sporopollenin    c) Generative cell

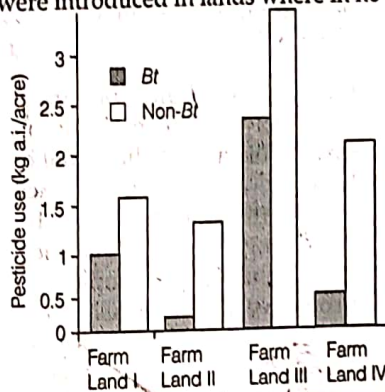
Q24. A woman has certain queries as listed below, before starting with contraceptive pills. Answer them.

- a) What do contraceptive pills contain and how do they act as contraceptives?  
 b) What schedule should be followed for taking these pills?

Q25. What is adaptive radiation? When can adaptive radiation be referred to as convergent evolution? Give an example.

Q26. The aeration tank of a sewage treatment plant is not functioning properly. Explain in detail the impact of this on the treatment of sewage and BOD of the effluent.

Q27. The graph given below shows the usage of pesticides on Bt crops and non-Bt crops, in four types of farm lands. Cotton bollworm were introduced in lands where in no pesticide was used.



- a) Explain what effect would a Bt and non-Bt crop have on the pest?  
 b) Which of the below four farm lands have successfully applied the concepts of biotechnology to show better management practices and use of agrochemicals?

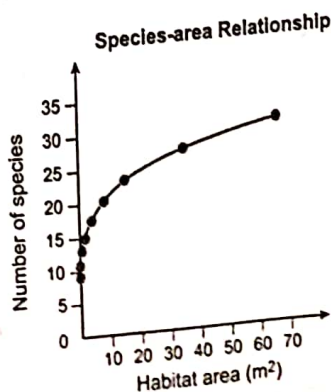
OR

Lipoprotein lipase deficiency (LPLD) is a genetic disorder in which a person has a defective gene for lipase. This leads to high triglycerides, stomach pain, fat deposits under the skin. It may eventually affect the liver, pancreas and may also cause diabetes. The disorder occurs if a child acquires defective genes from both parents (autosomal recessive). ERT (enzyme replacement treatment) is one of the treatments offered to patients with LPLD.

- a) (i) What procedure is followed in ERT?  
 (ii) What could be one possible drawback of ERT?  
 b) How can LPLD be treated using Biotechnology? Elaborate.

Q28. Diversity is seen in the living world at various levels. The distribution of biodiversity shows specific patterns that account for the species richness or paucity across the globe.

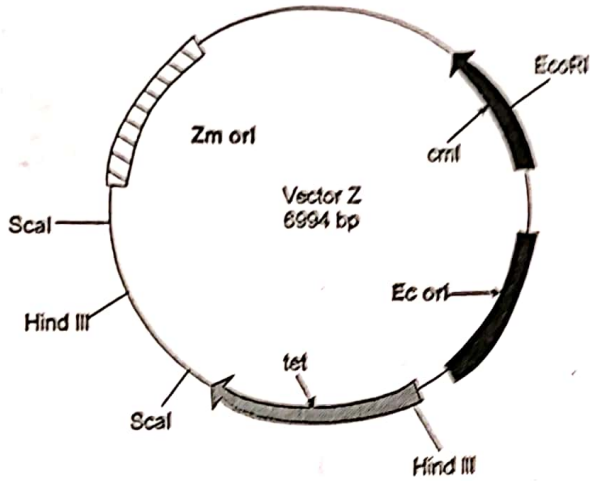
- a) Explain, with reasons how species diversity changes with changing latitudes.  
 b) The graph below represents species - area relationship. What does such a graph signify?



B-4

Case Based Questions:

29. Shown below is a cloning vector 'Z' that Kamla wants to use to create a recombinant vector with her gene of interest.



The vector consists of sites for three restriction enzymes - ScaI, HindIII and EcoRI. Restriction sites for the same enzymes are also present in the gene of interest. There are two 'ori' sequences - one allows

it to replicate in *Escherichia coli* and another allows replication in *Symonomas mobilis*. Apart from this, the vector consists of two antibiotic resistance genes - one against tetracycline (tet) and another against chloramphenicol (cmr).

- (a) What is the advantage of having two 'ori' sequences in the same vector? Give a situation in which this would be particularly useful.

OR

If the vector was cut using Hind III, what would colonies growing on a medium containing tetracycline DEFINITELY contain?

- (b) Suggest which of the three restriction enzymes would be suitable for insertion of the gene of interest. Give TWO advantages of using the enzyme chosen by you.  
 (c) State ONE disadvantage of using the other two restriction enzymes not chosen in (b). 4

30. Predator Y shown in the image below is a type of wild cat that inhabits the forests and preys primarily on prey X which are herbivores. Shown below is data on their respective populations over time.



- (a) What is the likely cause for the pattern seen in the prey and predator populations through the years?  
 (b) Hypothetically, if all the predators of the forests become extinct, what will happen to the vegetation of the forest?  
 (c) Consider a situation where another similar species of predator immigrates to the forest. What is likely to happen over time and why? 4

OR

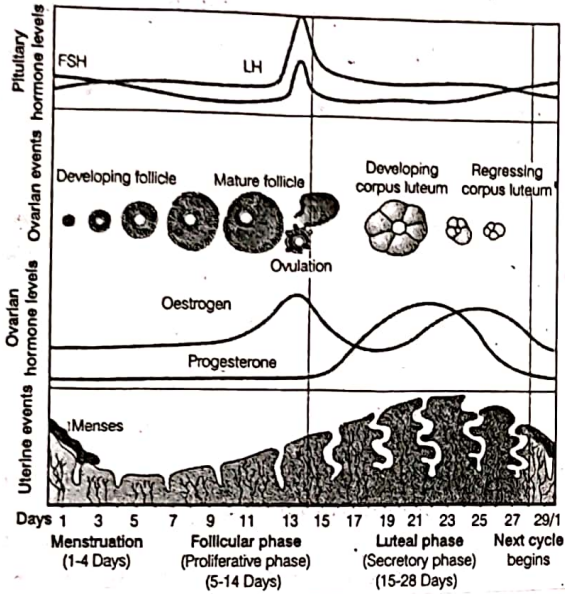
Juglone is a chemical produced naturally in most parts of the black walnut plant. This chemical leaches into the soil when the plant falls. This leads to the death of many plants that grow around the black walnut plant.

Identify the type of ecological interaction between the black walnut and other plants growing around it. Justify. 4

SECTION E

31.

Study the diagrammatic presentation of various events during a menstrual cycle given below and answer the questions that follows.



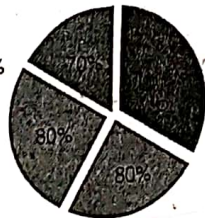
- (i) The released ovum present in Fallopian tube gets fertilised with sperm, how will it affect the menstrual cycle?
- (ii) LH released by the pituitary gland become abnormally low at day 14 due to unknown reasons. Explain its impact on ovulation stating the reasons.
- (iii) If progesterone is absent or low in level, will menstruation occur? Justify your answer.

OR

Surrogacy is the method where one woman bears a child for another. It provides hope and optimism to those who are depressed for not having children. In the past years, the practice of surrogacy has developed very well in India.

In a hospital, the medical records were analysed to check the success rates of surrogacy. The following Pie chart was drawn to analyse the success rates of surrogacy and IVF with donor eggs and self eggs.

- Surrogacy with donor eggs 100%
- Surrogacy with self eggs 80%
- IVF with donor eggs 80%
- IVF with self eggs 70%



- (i) Why the success rate with donor eggs are more successful?
- (ii) As shown in the figure, why the chance of a successful pregnancy are usually higher with surrogacy when compared to IVF?

(iii) State two reasons that are responsible for the cause of infertility.

iv) How can childless couples can be helped by the following assisted reproductive technologies?

- a) GIFT    b) ICSI (Intracytoplasmic Sperm Injection)

B-6



Q32.

- State and explain the law of dominance as proposed by Mendel.
- How would phenotypes of monohybrid  $F_1$  and  $F_2$  progeny showing incomplete dominance in snapdragon and co-dominance in human blood group be different from Mendelian monohybrid  $F_1$  and  $F_2$  progeny? Explain.

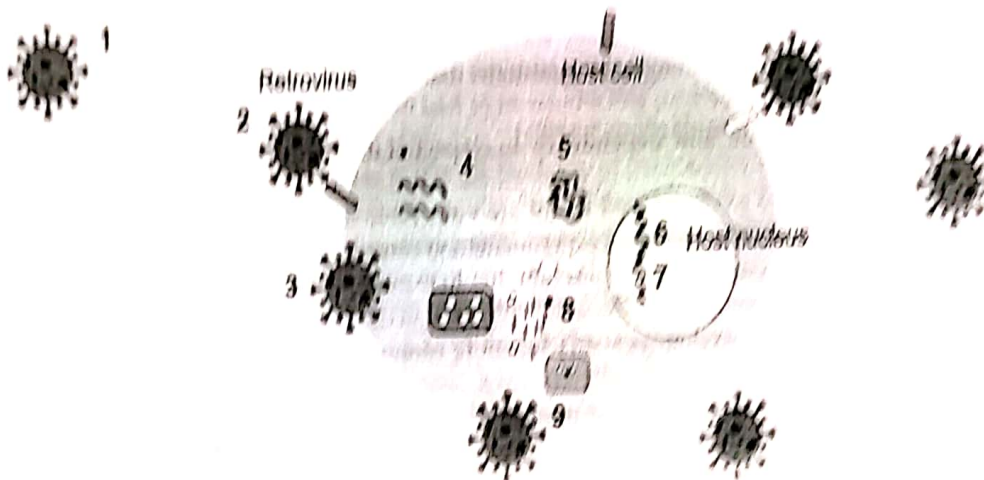
OR

Explain the process of transcription in prokaryotes. How is the process different in eukaryotes?

Q33.

The image below represents the replication of a retrovirus.

In the image, steps 1 - 5 depict different stages in the invasion of the retrovirus into the host cell and steps 6 - 9 show the invasion of the host DNA and the processes resulting out of it.



- Why does the retrovirus need to use reverse transcriptase to infect the host genome?
- What is the significance of step 7 and 8 (after the viral genome enters the host nucleus) as shown in the diagram.

OR

- Differentiate between the roles of B-lymphocytes and T-lymphocytes in generating immune responses.
- Identify and name the disease in which the patient's cells lose the property of contact inhibition. State its causes due to physical, chemical or biological agents.