BUDHA DAL PUBLIC SCHOOL, PATIALA
Second Term Examination (10 December 2024)
Class XII (Science)
Subject – Biology (Set - A)

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. Human settlement often leads to habitat loss which leads to fragmentation, forming smaller patches of habitats. Select the statements that describe how a small patch differs from a large patch of the same habitat.

i) Invasive species will never be seen here
ii) Population of large animals decreases
iii) Biodiversity decreases
iv) Competition from surrounding habitats increase

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

Q2. Select the options which is/are incorrect statement(s) with respect to T-lymphocytes in the human body.

i) They are a type of white blood cells
ii) They are produced in bone marrow
iii) They remain active at all time in the body
iv) They mature in the bone marrow

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

Q3. Which of the following statement is incorrect?

a) Energy content gradually decreases from first to fourth trophic level
b) Biomass decreases from first to fourth trophic level
c) Energy content gradually increases from first to fourth trophic level
d) Number of individuals decreases from first trophic level to fourth trophic level

Q4. Introduction of an alien DNA into a plant host cell is achieved by making them

a) Competent with bivalent ions b) Using microinjection
c) Using gene gun d) Using lysozymes and chitinase

Q5. **Match the following list of bacteria and their commercially important products :**

	Column A	**Column B**
i)	Aspegillus niger	(a) Lactic acid
ii)	Acetobacter aceti	(b) Butyric acid
iii)	Clostridium butylicum	(c) Acetic acid
iv)	Lactobacillus	(d) Citric acid

a) i-b, ii-c, iii-d, iv-a b) i-b, ii-d, iii-c, iv-a c) i-d, ii-c, iii-b, iv-a d) i-d, ii-a, iii-c, iv-b

Q6. While explaining interspecific interaction of population, (+) sign is assigned for beneficial interaction, (-) sign is assigned for detrimental interaction and (O) for neutral interaction. Which of the following interactions can be assigned (+) for one species and (-) for another species involved in the interaction?

a) Commensalism b) Competition c) Predation d) Ammensalism

Q7. **Match the following columns and select the correct option :**

	Column A	Column B
a)	Bt cotton	(i) Gene therapy
b)	Adenosine deaminase deficiency	(ii) Cellular defence
c)	RNAi	(iii) Detection of HIV infection
d)	PCR	(iv) Bacillus thuringiensis

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

Q8. If the population of 50 Paramecium present in a pool increases to 150 after an hour, what would be the growth rate of population?

a) 150 per hour b) 200 per hour c) 5 per hour d) 100 per hour

Q9. Given over here is global diversity of invertebrates. What groups of four portions (a –d) represents respectively

a) a – crustaceans, b – insects, c – mollusks, d – other animal groups

b) a – mollusks, b – other animal groups, c – crustaceans, d - insects

c) a – insects, b – mollusks, c – crustanceans, d – other animal groups

d) a – insects, b – crustaceans, c – other animal groups, d - molluscs

Q10. **Match the following diseases with causative organisms and select the correct option:**

	Column A	Column B
a)	Typhoid	(i) Wuchereria
b)	Pneumonia	(ii) Plasmodium
c)	Filariasis	(iii) Salmonella
d)	Malaria	(iv) Haemophilus

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

Q11. Restriction Endonuclease – Hindi II always cuts DNA molecules at a particular point by recognizing a specific sequence of:
a) Six base pairs b) Four base pairs c) Seven base pairs d) Three base pairs

Q12. Statement – I : The majority of baculoviruses used as biological control agent are in the genus Nucleopolyhedrovirus.
Statement – II : These viruses are excellent candidates for species-specific, narrow spectrum insecticidal applications.

a) Both Statement I and Statement II are false.
b) Statement I is correct but Statement Ii is false.
c) Statement I is incorrect but Statement II is true.
d) Both Statement I and Statement II are true.

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.**

Q13. **Assertion :** Agrobacterium tumefaciens is popular in genetic engineering because this bacterium is associated with roots of all cereals and pulse crops.
Reason : A gene incorporated in the bacterial plasmid gets automatically transferred to the crop for the pest resistant.

Q14. **Assertion :** In recombinant DNA technology, human genes are often transferred onto bacteria or yeast.
Reason : Both bacteria and yeast multiply very fast to form huge population which expresses the desired gene.

Q15. **Assertion :** Appearance of dry, scaly lesions on the skin, nails and scalp are the symptoms of ring worms.
Reason : Heat and moisture help the fungi to grow on the body of host to cause ringworms.

Q16. **Assertion :** There are 34 biodiveristy hot spots in the world.
Reason : High level of species richness is criterion for selection of a biodiversity hot spot.

Section – B

Q17. Mention one application for each of the following:
a) Antihistamine b) Cytokinin - barrier

Q18. Name the genus of baculovirus that acts as a biological control agent inspite of being a pathogen. Justify by giving three reasons that make it an excellent candidate for the job.

Q19. What are transgenic animals? How are they being used for vaccine safety and chemical safety testing? Explain.

Q20. 'Insertional inactivation' is a method to detect recombinant DNA. Explain the method.

Q21. What would be the best method to measure that total population density of the number of fishes in river and why?

Section – C

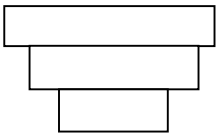
Q22.

a) Write the inference drawn by Alexander von Humboldt after his extensive explorations of South American jungle.

b) Study the graph given below :

As per Alexander von Humboldt, what do you symbols S, A, Z and C in the graph stand for, in respect of a species and area relationship?

Q23. Identify the type of the given ecological pyramid and give one example of each pyramid of number and pyramid of biomass.



OR

Draw a pyramid of numbers considering a big banyan tree supporting a population of insects, small birds and their predators.

Q24. Study the graph given below showing the different types of growth curves of different species:

Answer the following:

a) Name the type of growth curve 'a' shown in the graph.

b) State one reason why the growth curve 'b' is said to be logistic.

c) What is 'K' representing in the equation $\frac{dN}{dt} = rN\left[\frac{K-N}{K}\right]$ given along the logistic curve.

Q25. Why is the introduction of genetically engineered lymphocytes into an ADA deficienty patient is not a permanent cure? Suggest a possible permanent cure.

Q26. Some restriction enzymes break a phosphodiester bond on both the DNA strands, such that only one end of each molecule is cut and these ends have regions of single stranded DNA. BamHl is one such restriction enzyme which binds at the recognition sequence, 5′-GGATCC- 3′ and cleaves these sequences just after the 5′-guanine on each strand.

a) What is the objective of this action?
b) Explain how the gene of interest is introduced into a vector.
c) You are given the DNA shown below.
5′-ATTTTGAGGATCCGTAATGTCCT 3′
3′ TAAAACTCCTAGGCATTACAGGA 5′
If this DNA was cut with BamHl, how many DNA fragments would you expect? Write the sequence of these double-stranded DNA fragments with their respective polarity?
d) A gene M was introduced into E.coli cloning vector pBR322 at BamHl site. What will be its impact on the recombinant plasmids? Give a possible way by which you could differentiate non-recombinant to recombinant plasmids.

Q27. Observe the diagram shown below of pBR322. Answer the questions that follow:

a) What is pBR322?
b) Write the role of 'rop'.
c) State the significance of amp^R and tet^R.

Q28. Study the picture of biogas plant given below and answer the questions that follow:

a) Name the components gaining entry from A into the chamber.
b) Mention the group of bacteria and the condition in which they act on the component that entered from A in the digester.
c) Name the components that get collected in gas holder.

Section – D

Case Based Questions:

Q29. The data below shows the concentration of nicotine smoked by a smoker taking 10 puffs/ minute.

Q1. With reference to the above graph explain the concentration of nicotine in blood at 10 minutes.
Q2. How will this affect the concentration of carbon monoxide and haembound oxygen at 10 minutes.
Q3. How does cigarette smoking result in high blood pressure and increase in heart rate?

OR

Q3. How does cigarette smoking result in lung cancer and emphysema?

Q30. Study the diagram given below that shows the steps involved in the procedure of selecting transformed bacteria and answer the questions that follow:

a) Identify the colony that has got transformed. Justify your answer.
b) What are the sites in a plasmid called where ampicillin and tetracycline resistance genes are inserted? State their role in genetic engineering.
c) Name two enzymes playing an important role in genetic engineering.

OR

c) State the role of $\beta -$ galactosidase in insertional inactivation

Section – E

Q31. An individual has been consuming drugs of a specific kind which has caused high blood pressure, anxiety, paranoia and aggressive behaviour.

a) Identify the class of drugs that could potentially be detected in his bloodstream.
b) Based on the class identified in (a) state any two
   (i) Example of drugs that belongs to it.
   (ii) Long-term physical and mental effects each if consumption of the drugs is continued.
   (iii) Treatment or support strategies that could assist him in addressing his drug usage.

OR

a) In a wastewater treatment plant, sampling was done thrice at various stages in the treatment process indicated by A, B and C in the following diagram.

Each time the sample was taken, its BOD was measured, resulting in the following recorded values 30 mg/L, 300 mg/L, 250 mg/L.

i) Define BOD and determine which of these BOD values correspond to stages A, B and C in the treatment process.

ii) Based on (i), justify your answer for each value.

b) Secondary treatment of the sewage is also called biological treatment. Justify this statement and explain the process.

Q32. Polymerase Chain Reaction (PCR) is an in-vitro technique used to amplify nucleic acid sequence. The conditions and duration of each step in PCR are as follows.
Step 1 at 94 ^{0}C for 2 min
Step 2 at 50-65 ^{0}C for 30 seconds
Step 3 72 ^{0}C for 5 min

a) Give two reasons why amplification using PCR can be better than amplification in-vivo using plasmids?

b) At which step does the denaturation of DNA take place? How does this occur?

c) What would be the result of the PCR reaction if step 2 does not occur?

d) At what step would PCR be important in rDNA technology?

OR

'Bt cotton', the genetically modified crop, has greatly helped the cotton farmers to increase their crop yield.

a) How was Bt cotton plant made resistant to bollworm?

b) Describe the mechanism that leads to be death of bollworms feeding on Bt cotton plants.

Q33.

a) Explain how it is ensured that the orchid Ophrys is pollinated by a specific species of bee.

b) Introduction of alien species has led to environmental damage and decline of indigenous species. Give any one example of how it has affected the indigenous species.

c) Could the extinction of Steller's sea cow and passenger pigeon be saved by man? Give reasons to support your answer.

OR

a) "It is often said that the pyramid of energy is always upright. On the other hand, the pyramid of biomas can be both upright and inverted." Explain with the help of examples and sketches.

b) The sun provides 1,000,000 J of sunlight (solar energy) to an ecosystem. Write the amount of energy that is available to the first and third trophic levels.