

SAMPLE QUESTION PAPER

CLASS XII

BIOLOGY (044)

TERM II (2021-22)

Max. Marks 35

Time allowed: 2 hours

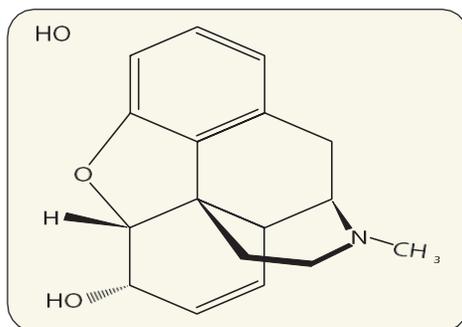
General Instructions:

- i) All questions are compulsory.
- ii) The question paper has three sections and 13 questions. All questions are compulsory.
- iii) Section–A has 6 questions of 2 marks each; Section–B has 6 questions of 3 marks each; and Section–C has a case-based question of 5 marks.
- 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.

Q. No.		Marks
Section A		
1	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
2	<p>A patient admitted in ICU was diagnosed to have suffered from myocardial infarction. The condition of coronary artery is depicted in the image below.</p> <p>Name two bioactive agents and their mode of action that can improve this condition.</p>  <p>The diagram shows a cross-section of a coronary artery. On the left, the artery is partially blocked by a yellow, waxy substance labeled 'CHOLESTEROL'. This blockage is labeled 'REDUCED BLOOD FLOW'. On the right, a dark red mass labeled 'CLOT' is shown further narrowing the artery.</p>	2
	<p>OR</p> <p>Substantiate by giving two reasons as to why a holistic understanding of the flora and fauna the cropland is required before introducing an appropriate biocontrol method.</p>	

3

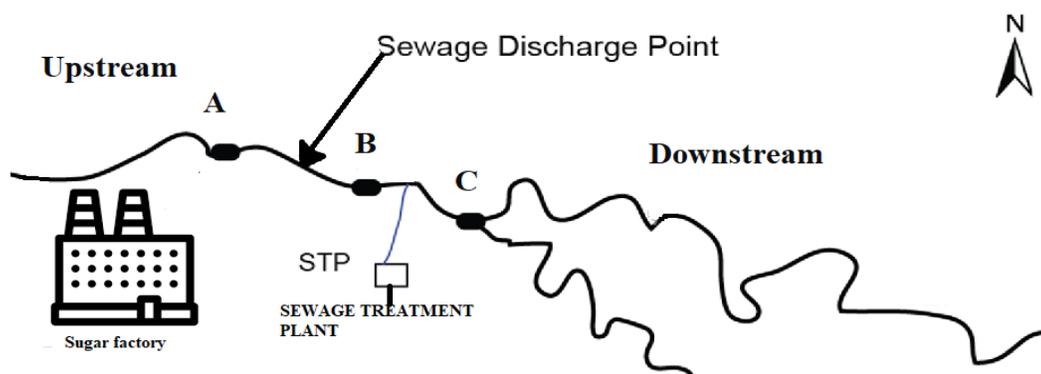
Identify the compound chemical structure is shown below. State any three of its physical properties.



2

4

Water samples were collected at points A, B and C in a segment of a river near a sugar factory and tested for BOD level. The BOD levels of samples A, B and C were 400 mg/L, 480 mg/L and 8 mg/L respectively. What is this indicative of? Explain why the BOD level gets reduced considerably at the collection point C?



2

5

An ecologist study an area with population A, thriving on unlimited resources and showing exponential growth, introduced population B and C to the same area. What will be the effect on the growth pattern of the population A, B and C when living together in the same habitat?

2

6

With the decline in the population of fig species it was noticed that the population of wasp species also started to decline. What is the relationship between the two and what could be the possible reason for decline of wasps?

OR

With the increase in the global temperature, the inhabitants of Antarctica are facing fluctuations in the temperature. Out of the *regulators* and the *conformers*, which of the two will have better chances of survival? Give two adaptations that support them to survive in the ambient environment? Give one suitable example.

2

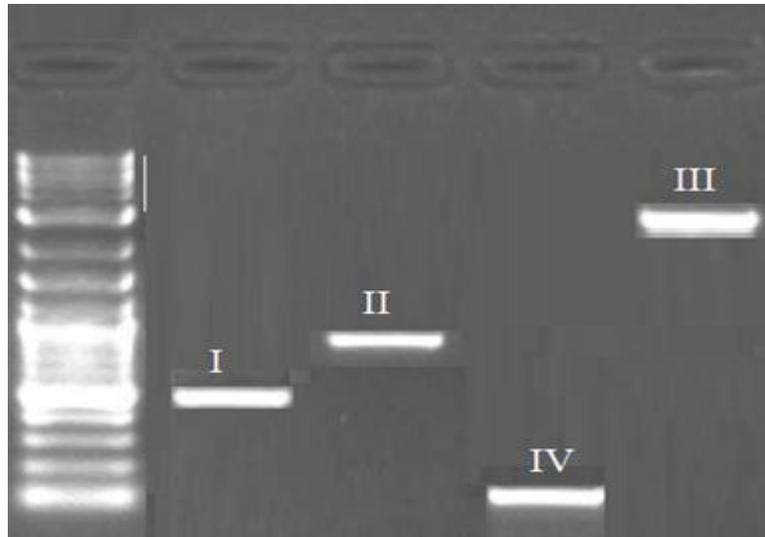
SECTION B

7	<p>How do normal cells get transformed into cancerous neoplastic cells? Elaborate giving three examples of inducing agent.</p> <p>OR</p> <p>A person is suffering from a high-grade fever. Which symptoms will help to identify if he/she is suffering from Typhoid, Pneumonia or Malaria?</p>	3
8	<p>Recognition of an antigenic protein of a pathogen or exposure to a pathogen occurs during many types of immune responses, including active immunity and induced active immunity.</p> <p>Specify the types of responses elicited when human beings get encountered by a pathogen.</p>	3
9	<p>In a pathological lab, a series of steps were undertaken for finding the gene of interest. Describe the steps, or make a flow chart showing the process of amplification of this gene of interest.</p>	3
10	<p>a. 'The Evil Quartet' describes the rates of species extinction due to human activities. Explain how the population of organisms is affected by fragmentation the habitats.</p> <p>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?</p> <p>c. Could the extinction of Steller's sea cow and passenger pigeon be saved by man? Give reasons to support your answer.</p>	3
11	<p>a. The image shown below is of a sacred grove found in India. Explain how has human involvement helped in the preservation of these biodiversity rich regions.</p> <div style="text-align: center;">  </div> <p>b. Value of Z (regression coefficient) is considered for measuring the species richness of an area. If the value of Z is 0.7 for area A ,and 0.15 for area B, which area has higher species richness and a steeper slope?</p>	3

12

The image below depicts the result of gel electrophoresis

3



If the ladder represents sequence length upto 3000 base pairs (bp),

- Which of the bands (I - IV) correspond to 2500 bp and 100 bp respectively?
- Explain the basis of this kind of separation and also mention the significance of this process.

SECTION C

13

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. BamH1 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.

5

- What is the objective of this action?
- Explain how the gene of interest is introduced into a vector.
- You are given the DNA shown below.

5' ATTTTGAGGATCCGTAATGTCCT 3'

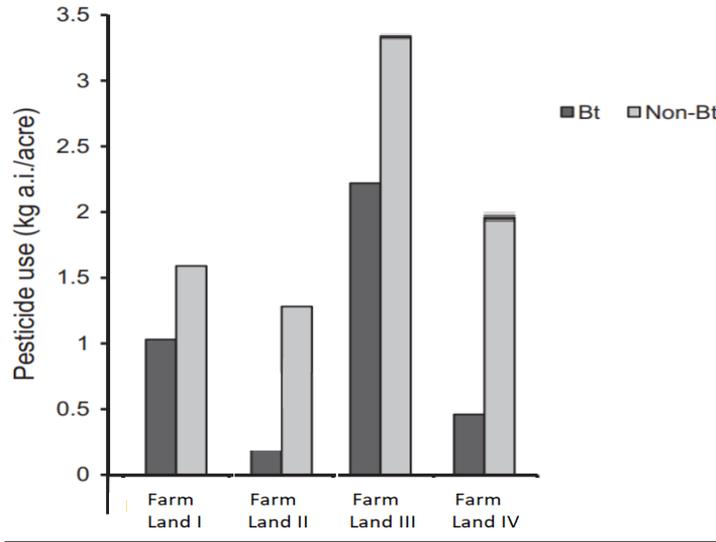
3' TAAACTCCTAGGCATTACAGGA 5'

If this DNA was cut with BamHI, how many DNA fragments would you expect? Write the sequence of these double-stranded DNA fragments with their respective polarity.

- A gene M was introduced into *E.coli* cloning vector PBR322 at BamH1 site. What will be its impact on the recombinant plasmids? Give a possible way by which you could differentiate non recombinant to recombinant plasmids.

OR

GM crops especially Bt crops are known to have higher resistance to pest attacks. To substantiate this an experimental study was conducted in 4 different farmlands growing Bt and non Bt-Cotton crops. The farm lands had the same dimensions, fertility and were under similar climatic conditions. The histogram below shows the usage of pesticides on Bt crops and non-Bt crops in these farm lands.



- Which of the above 4 farm lands has successfully applied the concepts of Biotechnology to show better management practices and use of agrochemicals? If you had to cultivate, which crop would you prefer (Bt or Non- Bt) and why?
- Cotton Bollworms were introduced in another experimental study on the above farm lands **wherein no pesticide was used**. Explain what effect would a Bt and Non Bt crop have on the pest.

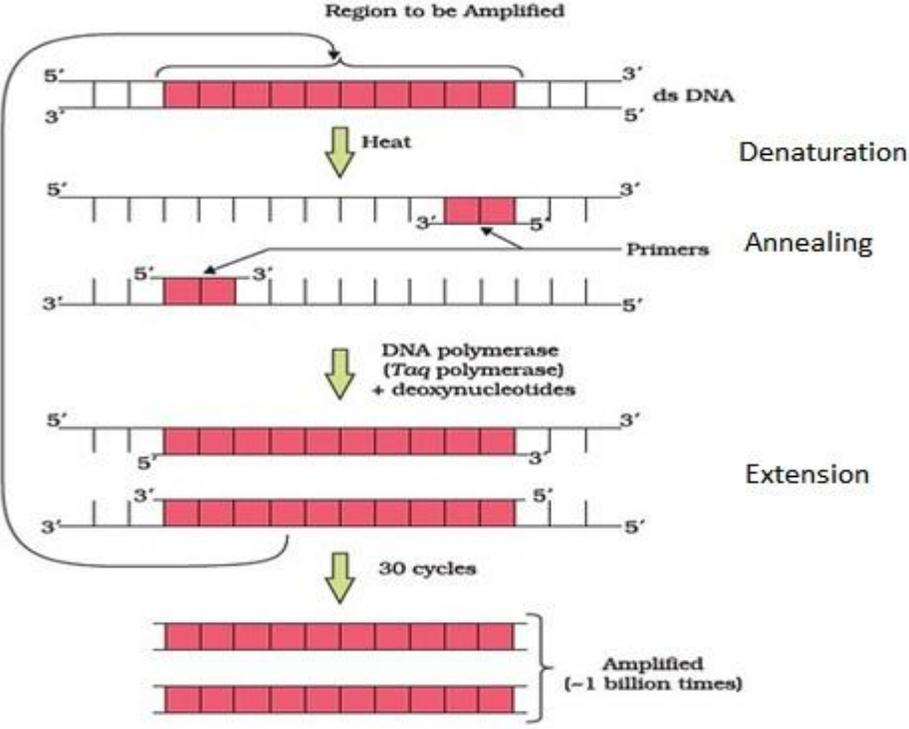
MARKING SCHEME (SQP)
CLASS XII
BIOLOGY (044)
TERM II (2021-22)

Q. No.	Section A	Marks
1	<p>Microbial pathogens enter the gut of humans along with food:</p> <ul style="list-style-type: none"> • Physical barriers: Mucus coating of the epithelium lining the gastrointestinal tract helps in trapping microbes entering our body. (1 Mark) • Physiological barriers: Acid in the stomach, saliva in the mouth prevent microbial growth. ($\frac{1}{2}+\frac{1}{2}$ Mark) 	2
2	<p>Streptokinase (produced by the bacterium <i>Streptococcus</i>) is used as a 'clot buster' for removing clots from the blood vessels of patients who have undergone myocardial infarction. (1 mark)</p> <p>Statins (produced by the yeast <i>Monascus purpureus</i>) act as blood-cholesterol lowering agents. (1 mark)</p> <p>OR</p> <p>Eradication of pests will disrupt predator-prey relationships, where beneficial predatory and parasitic insects which depend upon flora and fauna as food or hosts, may not be able to survive. (1 mark)</p> <p>Holistic approach ensures that various life forms that inhabit the field, their life cycles, patterns of feeding and the habitats that they prefer are extensively studied and considered. (1 mark)</p>	2
3	<p>It is Morphine. (1/2 mark)</p> <p>Physically it appears as a white, odourless, crystalline compound. (1½ mark)</p>	2
4	<p>At collection points A and B, the BOD level is high due to high organic pollution caused by sugar factory and sewage discharge. (1 mark)</p> <p>At the collection point C, the water was released after secondary treatment/ biological treatment (where vigorous growth of useful aerobic microbes into flocs consume the major part of the organic matter present in the river water or effluent due to sugar factory and sewage discharge). (1 mark)</p>	2

5	<p>This interaction will lead to competition between the individuals of population A,B and C for resources. Eventually the 'fittest' individuals will survive and reproduce. (1 mark)</p> <p>The resources for growth will become finite and limiting, and population growth will become realistic. (1 mark)</p>	2
6	<p>The relationship between the plant and pollinator is called mutualism. Fig depends on wasp for pollination, and wasp depends on fig for food and shelter. (1 mark)</p> <p>With the decline in population of figs, wasp loses its source of food and shelter. (1 mark)</p> <p>OR</p> <p>Regulators; Thermoregulation, Osmoregulation Birds/mammals (any one) (½ x 4 Marks)</p>	2

SECTION B

7	<p>Transformation of normal cells into cancerous neoplastic cells may be induced by following physical, chemical or biological agents causing DNA damage:</p> <ul style="list-style-type: none"> ● Ionising radiations like X-rays and gamma rays ● Non-ionizing radiations like UV. ● Chemical carcinogens present in tobacco smoke ● Cellular oncogenes (c-onc) or proto-oncogenes, when activated under certain conditions cause cancer. Viruses with oncogenes can transform normal cells to cancerous cells. (any 3; 1 x 3 marks) <p>OR</p> <p>If the person has sustained high fever (39° to 40°C), weakness, stomach pain, constipation, headache and loss of appetite, it is Typhoid. (1 mark)</p> <p>If the person has fever, chills, cough and headache; and the lips and fingernails turn gray to bluish, it is Pneumonia. (1 mark)</p> <p>If the person has chills and high fever recurring every three to four days then, it is Malaria. (1 mark)</p>	3
8	<ul style="list-style-type: none"> ● When our body encounters an antigenic protein or a pathogen for the first time it produces a response which is of low intensity and our body retains memory of the first encounter. (1 mark) ● The subsequent encounter with the same pathogen elicits a highly intensified response carried out with the help of two special types of lymphocytes present in our blood, B- 	3

	<p>lymphocytes, and T-lymphocytes. (1 mark)</p> <ul style="list-style-type: none"> The B-lymphocytes produce an army of proteins in response to these 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. (1 mark) 	
<p>9</p>	<p>The flow chart shows the three steps involved in the process of PCR showing the following</p> <ul style="list-style-type: none"> - Denaturation The DNA strands are treated with a temperature of 94°C (Heat) and the strands are separated. - Annealing The primers anneal to the complementary strands - Extension The DNA polymerase facilitates the extension of the strands. (1x3=3 marks) <p>OR</p>  <p style="text-align: center;">Diagram : Polymerase Chain Reaction</p>	<p>3</p>
<p>10</p>	<p>a. When a large habitat is broken into small fragments due to various activities, mammals and birds requiring large territories and certain animals with migratory habitats are badly affected, leading to population decline. (1 mark)</p> <p>b.</p> <ul style="list-style-type: none"> Nile perch introduced in Lake Victoria eventually led to the extinction of an ecologically unique assemblage of more than 200 species of cichlid fish. 	<p>3</p>

	<ul style="list-style-type: none"> Parthenium/Lantana/water hyacinth caused environmental damage and threat to our native species African catfish-<i>Clarias gariepinus</i> introduced for aquaculture purposes is posing a threat to the indigenous catfishes in our rivers. (Any one) (1 mark) <p>c. Yes; Humans have overexploited natural resources for their 'greed' rather than 'need' leading to extinction of these animals. Sustainable harvesting could have prevented extinction of these species. (1 mark)</p>	
11	<p>a. India's history of religious and cultural traditions emphasized the protection of nature. In many cultures, tracts of forest are set aside, all the trees and wildlife within are venerated and given total protection. Sacred groves in many states are the last refuges for a large number of rare and threatened plants. (2 marks)</p> <p>b. Area A will have more species richness and a steeper slope. (1 mark)</p>	3
12	<p>a. Band III corresponds to 2500 base pairs, and Band IV corresponds to 100bp. ($\frac{1}{2} + \frac{1}{2}$ mark)</p> <p>b. The fragments will resolve according to their size. The shorter sequence fragments would move farthest from well as seen in Band IV (100 bp) which is lighter as compared to Band III which is heavier being 2500 base pairs. (1 mark)</p> <p>The significance of electrophoresis is to purify the DNA fragments for use in constructing recombinant DNA by joining them with cloning vectors. (1 mark)</p>	3
SECTION C		
13	<p>a. The two different DNA molecules will have compatible ends to recombine. ($\frac{1}{2}$ mark)</p> <p>b. Restriction enzyme cuts the DNA of the vector and then ligates the gene of interest into the DNA of the vector. (1 mark)</p> <p>c. 2 fragments ($\frac{1}{2}$ mark)</p> <p>5' ATTTTGAG 3' 5'GATCCGTAATGTCCT 3' 3' TAAACTCCTAG 5'.3'GCATTACAGGA 5' (1 mark)</p> <p>d. BamH1 site will affect tetracycline antibiotic resistance gene, hence the recombinant plasmids will lose tetracycline resistance due to inactivation of the resistance gene. (1 mark)</p> <p>Recombinants can be selected from non recombinants by plating into a medium containing tetracycline, as the recombinants will not grow in the medium because the tetracycline resistance gene is cut. (1 mark)</p>	5

OR

- a. Farm Land II. (½ mark)
Bt crop. (½ mark)
Because the use of pesticides is highly reduced for Bt crop
// Decrease of pesticide used is also more significant for
Bt crop. (1 mark)
- b. In Bt cotton a cry gene has been introduced from bacterium
Bacillus thuringiensis (Bt) which causes synthesis of a toxic
protein. This protein becomes active in the alkaline gut of
bollworm feeding on cotton, punching holes in the lining
causing death of the insect. (2 marks)
However; a Non Bt crop will have no effect on the cotton
bollworm/ the yield of cotton will decrease / non Bt will
succumb to pest attack. (1 mark)
