



# Delhi Public School, Howrah

PRE-BOARD EXAMINATION (2024-2025)

Class-XII

Care must be taken not to write anything on the question paper. All the questions must be attempted in the correct sequence.

Subject: - Biology (Code No. 044)



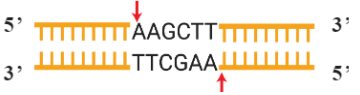



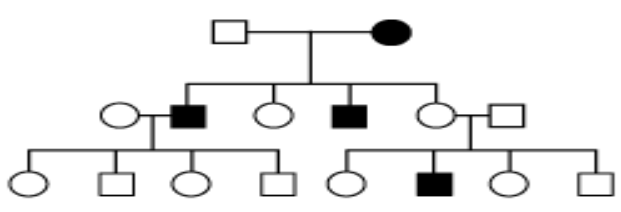
Time: -3 Hours

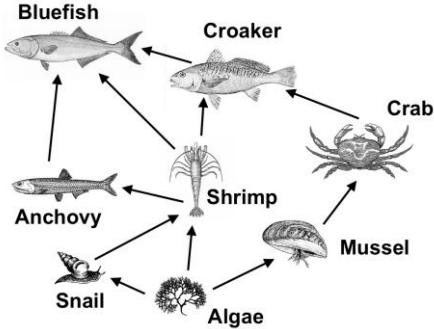
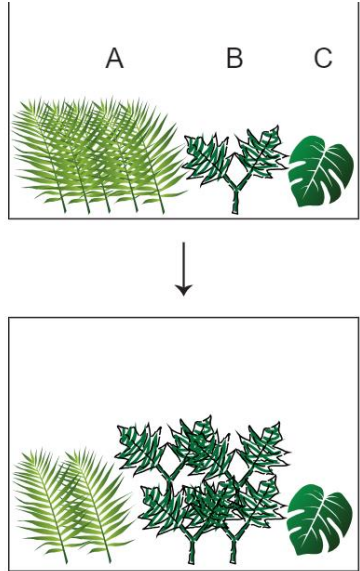
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## General Instructions:

- All questions are compulsory.
- The question paper has five sections and 33 questions. All questions are compulsory.
- 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.
- 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.
- Wherever necessary, neat and properly labeled diagrams should be drawn.

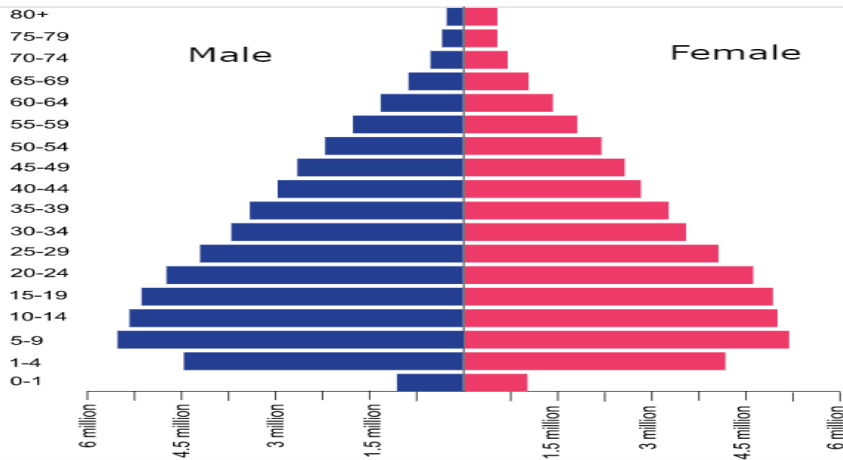
Q. No.	SECTION A Q. No. 1 to 12 are multiple choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.	Marks										
1.	Consider a cross to investigate the pea pod texture trait, involving constricted or inflated pods. Mendel found that the traits behave according to a dominant/recessive pattern in which inflated pods were dominant. If you performed this cross and obtained 650 inflated-pod plants in the F <sub>2</sub> generation, approximately how many constricted-pod plants would you expect to have?  a. 600      b. 165      c. 217      d. 468	1										
2.	Match the following list of bacteria and their commercially important products. <table border="1"><thead><tr><th>Bacterium</th><th>Product</th></tr></thead><tbody><tr><td>(i) <i>Aspergillus niger</i></td><td>(A) Lactic acid</td></tr><tr><td>(ii) <i>Acetobacter aceti</i></td><td>(B) Butyric acid</td></tr><tr><td>(iii) <i>Clostridium butylicum</i></td><td>(C) Acetic acid</td></tr><tr><td>(iv) <i>Lactobacillus</i></td><td>(D) Citric acid</td></tr></tbody></table> Choose the correct match. 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)	Bacterium	Product	(i) <i>Aspergillus niger</i>	(A) Lactic acid	(ii) <i>Acetobacter aceti</i>	(B) Butyric acid	(iii) <i>Clostridium butylicum</i>	(C) Acetic acid	(iv) <i>Lactobacillus</i>	(D) Citric acid	1
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3.	Codons UCA, UCG, UCU, UCC, AGC, and AGU code for the amino acid serine. What do these codons indicate? a. that the genetic code is universal b. that the genetic code is degenerate c. that UCA is the initiator codon d. that all amino acids are coded by six codons	1										
4.	A lab technician studies microscope slides containing cross sections of a testis. He is asked to identify and	1										

	<p>label spermatogonia in the slides. Which of the following characteristics should he look for, in order to correctly identify these cells?</p> <ol style="list-style-type: none"> <li>Located in seminiferous tubules.</li> <li>Located in Sertoli cells.</li> <li>Mature sperm cells undergoing mitosis.</li> <li>Immature germ cells undergoing mitosis.</li> </ol>	
5.	<p>The restriction enzyme (RE) HindIII recognizes the sequence AAGCTT The image below depicts the recognition site in double stranded DNA.</p> <p>5'  3' 3'  5'</p> <p>From the following scenarios, identify the one that would result in sticky ends (cut sites are marked by arrows).</p> <p>a.  b. </p> <p>c.  d. </p>	1
6.	<p>A cuckoo bird lays its eggs in a warbler bird's nest. Once hatched, the cuckoo chicks displace the warbler chicks, tricking the parent warbler into caring for them over their own young. What type of ecological interaction does the cuckoo have with the warbler?</p> <ol style="list-style-type: none"> <li>Commensalism</li> <li>Parasitism</li> <li>Mutualism</li> <li>Predation</li> </ol>	1
7.	<p>Tamal and Afza have two children. They want to prevent any more pregnancies at all costs. Which of the following birth control methods would be the most efficient one for them?</p> <ol style="list-style-type: none"> <li>Vasectomy</li> <li>Condom</li> <li>Female condom</li> <li>Withdrawal method</li> </ol>	1
8.	<p>5 megaspore mother cells (MMCs) in a flower undergo megasporogenesis. If this species of plant undergoes monosporic development, how many embryo sacs will develop after megasporogenesis?</p> <ol style="list-style-type: none"> <li>20</li> <li>15</li> <li>10</li> <li>5</li> </ol>	1
9.	<p><b>Pedigree Chart for Eye Color in an Insect</b></p>  <div style="border: 1px solid black; padding: 5px;"> <p><b>Key</b></p> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: black; margin-right: 5px;"></span> Male with white eyes</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: black; border-radius: 50%; margin-right: 5px;"></span> Female with white eyes</li> <li><span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Male with red eyes</li> <li><span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; border-radius: 50%; margin-right: 5px;"></span> Female with red eyes</li> </ul> </div> <p>The above pedigree chart shows the inheritance pattern for eye color that results when a red-eyed male mates with a white-eyed female. On the basis of the information provided in the chart, which of the</p>	1

	<p>following can be concluded about the pattern of inheritance of white eye color in this insect species?</p> <ol style="list-style-type: none"> <li>White eye color is a recessive sex-linked trait inherited from the mother.</li> <li>Red eye color is a dominant sex-linked trait inherited from the father.</li> <li>White eye color is a dominant trait inherited from the father.</li> <li>Red eye color is a recessive trait inherited from the mother.</li> </ol>	
10.	<p>The process of using microorganisms to detoxify or remove pollutants from the environment is called:</p> <ol style="list-style-type: none"> <li>Bioremediation</li> <li>Bioaccumulation</li> <li>Biomagnification</li> <li>Bioprocessing</li> </ol>	1
11.	 <p>Which of the organisms in this food web gets energy from both producers and consumers?</p> <ol style="list-style-type: none"> <li>Algae</li> <li>Anchovy</li> <li>Snail</li> <li>Shrimp</li> </ol>	1
12.	<p>(A) is a species of plant native to a region. A migratory bird unknowingly introduces the seeds of two additional species of plants, (B) and (C). Both species acclimatize successfully to the local environment. The image below depicts the change in distribution of plants after a period of time has passed.</p>  <p>Which of the following outcomes is the most likely to eventually occur?</p> <ol style="list-style-type: none"> <li>Equal growth of species A, B, C.</li> <li>B and C are both invasive species that outcompete species A for resources.</li> <li>B is an invasive species that outcompetes species A for resources.</li> <li>C is an invasive species that outcompetes species A for resources.</li> </ol>	1

	<p><b>Question No. 13 to 16 consist of two statements</b> – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:</p> <p>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.</p>																
13.	<p>Assertion (A): In humans the genotype with all the dominant alleles (AABBCC) will have the darkest skin colour.  Reason (R): In a polygenic trait, phenotype reflects the contribution of each allele.</p>	<b>1</b>															
14.	<p>Assertion (A): A wide range of contraceptive methods are available for family planning.  Reason (R): Natural method includes condoms, diaphragms, etc., while barrier methods use of included method like periodic abstinence, lactational amenorrhea, etc.</p>	<b>1</b>															
15.	<p>Assertion (A): Ecological equivalents possess similar types of adaptations.  Reason (R): Ecological niche is the total interaction of a species with environment.</p>	<b>1</b>															
16.	<p>Assertion (A): Energy value of biogas is lower than that of organic matter.  Reason (R): Biogas minimizes the chances of spread of fecal pathogens.</p>	<b>1</b>															
<b>SECTION B</b>																	
17.	<p><u>Attempt either option a or b.</u></p> <p>a. Use the information provided in the table given below to answer the following questions:</p> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Tropic level</th> <th>Net Production(KJm<sup>-2</sup>y<sup>-1</sup>)</th> <th>Respiration (KJm<sup>-2</sup>y<sup>-1</sup>)</th> </tr> </thead> <tbody> <tr> <td>Top Carnivore</td> <td>50</td> <td>35</td> </tr> <tr> <td>Carnivores</td> <td>420</td> <td>378</td> </tr> <tr> <td>Herbivores</td> <td>4490</td> <td>4041</td> </tr> <tr> <td>Producers</td> <td>45000</td> <td>40,367</td> </tr> </tbody> </table> <p>i. Calculate the gross primary productivity.  ii. Analyze the trend in the Net Production from Producers to Top Carnivore. Give a reason for your observation.</p> <p style="text-align: center;"><b>OR</b></p> <p>b. How much energy will be available to hawks in the food chain comprising hawk, snake, paddy, and mice if 1,000,000 J of energy is available to paddy from the Sun?</p>	Tropic level	Net Production(KJm <sup>-2</sup> y <sup>-1</sup> )	Respiration (KJm <sup>-2</sup> y <sup>-1</sup> )	Top Carnivore	50	35	Carnivores	420	378	Herbivores	4490	4041	Producers	45000	40,367	<b>2</b>
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18.	<p><u>Attempt either option a or b.</u></p> <p>a. Name two hormones that are constituents of contraceptive pills. Why do they have high and effective contraceptive value? Name a commonly prescribed non-steroidal oral pill.</p> <p style="text-align: center;"><b>OR</b></p> <p>b. If implementation of better techniques and new strategies are required to provide more efficient care and assistance to people, then why is there a statutory ban on amniocentesis? Write the use of this technique and give reason to justify the ban.</p>	<b>2</b>															
19.	<p>a. Why have DNA fragments in band 'D' moved farther away in comparison to those in band 'C'?</p> <p>b. Identify the anode end in the given diagram.</p> <p>c. What does E represent in the diagram given below?</p>	<b>2</b>															

20. The image below represents the age distribution pyramid of the population of the Philippines in the year 2015.



Based on this information, what you can conclude about the population of Philippines?

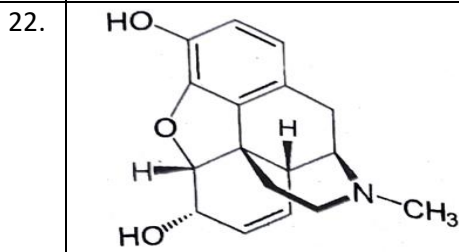
21. Attempt either option a or b.

a. State the theory of biogenesis. How does Miller's experiment support this theory?

OR

b. State the reason for the increased population of dark- coloured moths coinciding with the loss of lichens (on tree bark) during industrialization period in England.

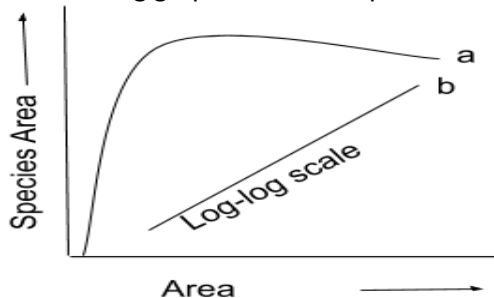
### SECTION C

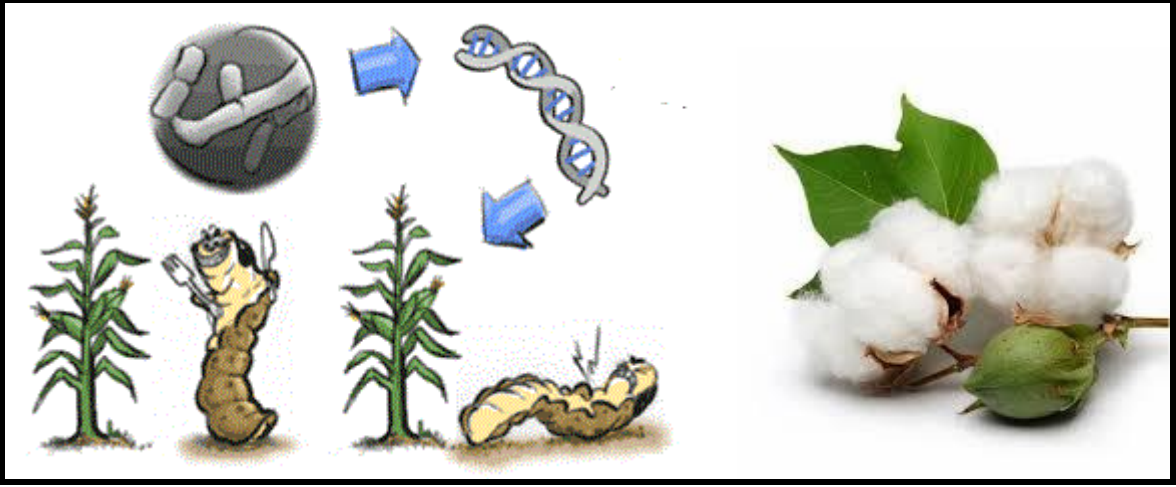


- Name the category of drugs represented by the chemical structure given above.
- If the methyl group is substituted by acetyl group we get a bitter crystalline compound. Name the compound.
- Name the natural source of these compounds.
- State the harmful effects of this class of drugs on the human body.

23. a. Endometriosis is a disease characterized by the presence of endometrial-like tissue found outside the uterus—in the uterine tubes, on the ovaries, or even in the pelvic cavity. Offer a hypothesis as to why endometriosis increases a woman's risk of infertility.
- b. While anabolic steroids (synthetic testosterone) bulk up muscles, they can also affect testosterone production in the testis. Using the knowledge of negative feedback mechanism, describe what would happen to testosterone production in the testis if a male takes large amounts of synthetic testosterone.

24. The following graph shows the species -area relationship. Answer the questions that follows.



	<p>a. Name the naturalist who studied the kind of relationship shown in the graph. Write the observations made by him.</p> <p>b. Write the situations as discovered by the ecologists when the value of 'Z' (slope of the line) lies between i. 0.1 and 0.2 ii. 0.6 and 1.2.</p> <p>c. When would the slope of the line 'b' become steeper?</p>	
25.	<p>A population of cats can be either black or white; the black allele (B) has complete dominance over the white allele (b). Given a population of 1,000 cats; 840 black and 160 white, determine the allele frequency, the frequency of individuals per genotype, and number of individuals per genotype.</p>	3
26.	<p>Draw a labelled diagram of a mature embryo sac.</p>	3
27.	<p>a. How can retroviruses be used efficiently in biotechnology experiments in spite of them being disease causing?</p> <p>b. Explain the work carried out by Cohen and Boyer that contributed immensely in biotechnology.</p> <p>c. Explain the significance of palindromic nucleotide sequences in the formation of recombinant DNA.</p>	3
28.	<p>a. Give a suitable explanation for the picture given below.</p>  <p>b. Mention the chemical change that proinsulin undergoes, to be able to act as mature insulin.</p>	3
<b>SECTION D</b>		
29.	<p>The clinical gene therapy is given to a 4 years old patient for a enzyme which is crucial for the immune system to function. Observe the therapeutical flow chat and give the answer of the following:</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p style="text-align: center;">(A) Lymphocytes of the Patient.</p> <p style="text-align: center;">↓</p> <p style="text-align: center;">(B) .....</p> <p style="text-align: center;">↓</p> <p style="text-align: center;">(C) Introduction of functional ADA cDNA into Lymphocytes.</p> <p style="text-align: center;">↓</p> <p style="text-align: center;">(D) .....</p> </div> <p>a. Complete the steps (B) and (D).</p> <p>b. Identify the disease to be cured.</p>	4

Attempt either subpart c or d

c. Do you think the above method is sufficient to cure the patient? Explain your answer.

**OR**

d. At present what method is available to cure the patient permanently?

30. In the late 18th century, smallpox was a widely spreading disease causing the death of several affected individuals in Britain. Edward Jenner, who pioneered the concept of vaccination, inoculated matter from the cowpox lesions of a dairymaid into an 8-year-old boy. Post-inoculation, the boy developed a mild fever, loss of appetite and discomfort but was better after a few days. Next, he was inoculated with matter from a smallpox lesion and he did not develop any disease.

a. What form of immunity, now known, did Edward Jenner provide the boy with?

b. Give a reason to support your answer in (a).

Attempt either subpart c or d

c. Describe the form/s of immunity that is provided when an individual is vaccinated/immunized? Use appropriate examples to justify your answer.

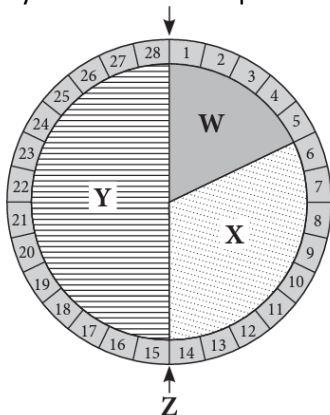
**OR**

d. Which form of immunization does not generate a memory response? Give a reason to support your answer.

**SECTION E**

31. Attempt either option a or b.

a. Study the schematic representation of menstrual cycle and answer the following questions.



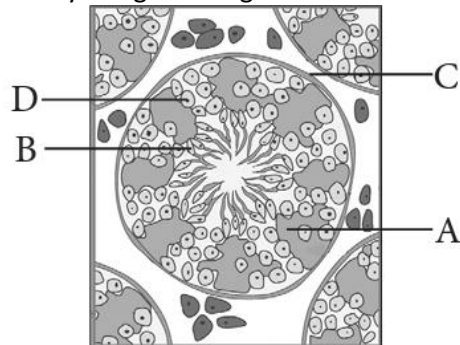
i. Identify W, X, Y and Z in the given figure.

ii. What events take place during the phase X and Y?

iii. In which phase does the concentration of estrogen in the blood attain peak?

**OR**

b. Study the given diagram and answer the following questions.



i. Identify the labelled parts A, B, C and D.

ii. Briefly explain the labelled part A.

iii. Write briefly about the labelled part B?

32. Attempt either option a or b.

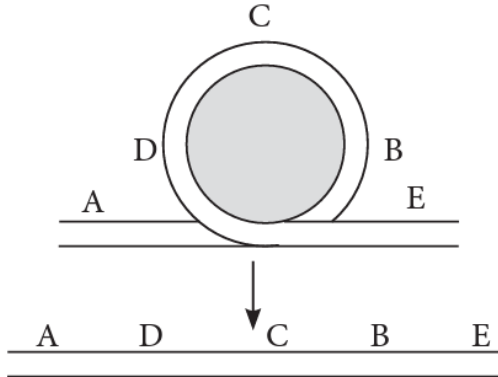
5

a. In shorthorn cattle, the coat colours red or white are controlled by a single pair of alleles. A calf which receives the allele for red coat from its mother and the allele for white coat from its father is called a 'roan'. It has an equal number of red and white hairs in its coat.

- i. Is this an example of codominance or of incomplete dominance?
- ii. Give a reason for your answer.
- iii. With the help of genetic cross explain what will be the consequent phenotype of the calf when
  - A. red is dominant over white
  - B. red is incompletely dominant.

**OR**

b. Refer to the given figure and answer the following questions.



- i. Which phenomenon is represented by the given figure?
- ii. Explain the subtype of the phenomenon by assuming 'C' as the point of centromere.
- iii. What is the effect of this phenomenon on crossing over and sterility?

33. Attempt either option a or b.

5

a. i. Draw a schematic diagram of the E. coli cloning vector Pbr322 and mark the following in it :

- 'ori'
- 'rop' gene
- ampicillin resistance gene
- restriction site BamHI

ii. State the role of 'rop' gene.

iii. A cloning vector does not have a selectable marker. How will it affect the process of cloning?

iv. Why is insertional inactivation preferred over the use of selectable markers in cloning vectors?

**OR**

b. i. With the help of a diagram show the process of Lac operon.

ii. A mixture of fragmented DNA was electrophoresed in an agarose gel. After staining the gel with ethidium bromide, no DNA bands were observed. What could be the reason?

iii. Why must a cell be made 'competent' in biotechnology experiments? How does calcium ion help in doing so?