CBSE

ADDITIONAL PRACTICE QUESTIONS
Biology (044)
Class XII| 2023–24

Max Marks: 80 **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 labeled diagrams should be drawn.

Section A

Q.Nos.	Questions	Marks
1	During the pollen grain formation, the generative cell divides to give rise to the two male gametes. What is the ploidy of the generative cell? (a) n (b) 2n (c) 3n (d) 4n	1
2	Kiwi is a dioecious species. Which of the following methods can be definitely RULED OUT as a possible mode of pollination in its case? P) cleistogamous autogamy Q) chasmogamous autogamy R) geitonogamy S) xenogamy (a) only P and R	1

	(b) only P and Q (c) only Q and S (d) only P, Q and R	
3	Arun thinks that identifying the exact mRNA sequence from the protein sequence is difficult. Is he correct and why? (a) No, as the genetic code is universal. (b) Yes, as the genetic code is degenerate. (c) No, as the mRNA is translated into a protein sequence. (d) Yes, as the mRNA contains introns which are non-coding sequences.	1
4	Crickets are insects that follow the XO type of sex determination. Which of the following statements is ALWAYS TRUE about this type of sex determination? (a) Eggs that have an O chromosome will give rise to a male cricket. (b) Eggs that have an X chromosome will give rise to a female cricket. (c) Sperms that have an X chromosome will give rise to a male cricket. (d) Sperms that have an O chromosome will give rise to a male cricket.	1
5	Oysters are generally either dark or light in colour. Dark oysters excel in dark environments, while light oysters thrive in bright environments. Intermediate-coloured oysters are disadvantaged, lacking effective camouflage in either setting. Which type of natural selection does this phenomenon exemplify? (a) directional (b) stabilising (c) disruptive (d) (The phenomenon described does not exemplify natural selection.)	1
6	A team of archaeologists found a fossilized skeleton of a human-like creature with a brain capacity of more than 700cc. The structure and its associated findings also show evidence that this creature could use tools for hunting. Which stage of human evolution is this creature NOT from? (a) *Homo erectus*	1

<table>
<tr><td></td><td>(b) Homo habilis
(c) Neanderthal Man
(d) Australopithecines</td><td></td></tr>
<tr><td>7</td><td>Which of the following is CORRECT about the movement of DNA on an agarose gel and the reason for it?
<table><tr><th>Option</th><th>Movement across terminals</th><th>Reason</th></tr><tr><td>P</td><td>positive to negative</td><td>charge on histones</td></tr><tr><td>Q</td><td>negative to positive</td><td>charge on histones</td></tr><tr><td>R</td><td>positive to negative</td><td>charge on DNA</td></tr><tr><td>S</td><td>negative to positive</td><td>charge on DNA</td></tr></table>
(a) P
(b) Q
(c) R
(d) S</td><td>1</td></tr>
<tr><td>8</td><td>What is the MINIMUM possibility of a dominant trait being expressed in the offspring after a test cross?

(a) 25%
(b) 50%
(c) 75%
(d) 100%</td><td>1</td></tr>
<tr><td>9</td><td>Which process is responsible for increasing the percentage of alcohol in whisky after fermentation?

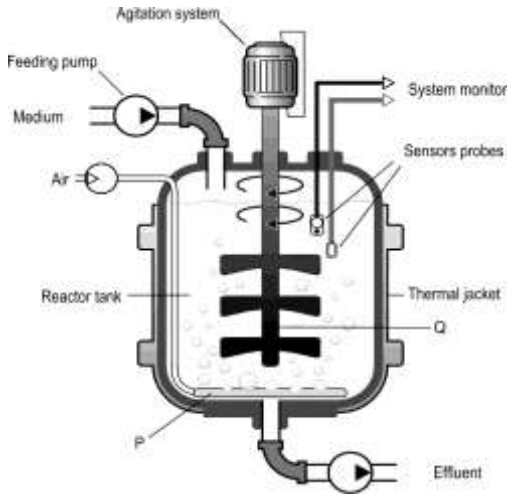
(a) malting
(b) dilution
(c) distillation
(d) maturation</td><td>1</td></tr>
<tr><td>10</td><td>What does I in the restriction enzyme named 'Hin S2 I' indicate?

(a) It cuts after the first nucleotide in the restriction site.
(b) It is the first enzyme isolated from strain S2 of the bacterium.
(c) There is definitely more than one enzyme isolated from the same bacterium.
(d) There is only one enzyme that can be used to digest a plasmid from strain S2 for the bacterium.</td><td>1</td></tr>
<tr><td>11</td><td>Sumi and Nisha said the following about somatic hybridization in plants.

Sumi: Gametes are not required for hybridization.</td><td>1</td></tr>
</table>

	Nisha: The resultant plant that grows after the fusion of the cells is genetically identical to the parent plants. Who among them is/are CORRECT? (a) only Sumi (b) only Nisha (c) both Sumi and Nisha (d) neither Sumi nor Nisha	
12	Rupal says that in marine food chains where the pyramid of biomass is inverted, the 10% rule of energy transfer is not applicable. Is she CORRECT and why? (a) No, because every level still gets 10% of the energy from the lower level. (b) Yes, because there are more consumers and so more energy is transferred. (c) No, because the pyramid of biomass can never be inverted for any food chain. (d) Yes, because there is lower biomass of producers in these food chains so less energy is transferred.	1
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 (A): The coconut endosperm is multinucleate throughout its development. Reason (R): Some endosperms undergo free nuclear division without the formation of distinct cell boundaries.	1
14	Assertion (A): DNA ligase is not used in PCR. Reason (R): Discontinuous fragments are not formed in the amplification of DNA by PCR.	1
15	Assertion (A): To promote sustainability while minimizing waste, it is recommended to reuse needles up to two times for the same person. Reason (R): Sterilisation of needles eliminates all pathogens and ensures safety.	1
16	Assertion (A): Nuclear DNA extracted from a cell is visible to the naked eye but unstained plasmid DNA running in an agarose gel is not. Reason (R): Plasmid DNA is transparent but nuclear DNA is not.	1

Section B

17	Kavya says that the placenta produces relaxin which plays a crucial role during pregnancy. (a) Is she correct? Justify. (b) Name TWO other hormones secreted by the placenta during pregnancy	2
18	Thalassemia is an autosomal recessive disorder that causes anaemic conditions in an individual. A blood smear from a heterozygous individual shows blood cells that are small, pale and irregularly shaped along with normal RBCs. (a) State the genotypic and phenotypic ratios of offspring born to a carrier mother and a thalassemic father. (b) Does the allele for thalassemia exhibit codominance? Justify.	2
19	Explain any TWO reasons why the treatment of AIDS is only partially effective.	2
20	Rati wants to grow a variant of the *lactobacillus spps.* in a bioreactor. Lactobacillus is an anaerobic bacterium commonly used as a starter culture for diary products. Shown below is a bioreactor she had in her laboratory.  (a) Identify ONE component that should definitely NOT be present in the reactor to grow the *lactobacillus spps.* Justify. (b) Explain TWO quantities that the sensors in the bioreactor should monitor.	2

21	Shown below is a food chain. Fallen leaf ⟶ Millipedes ⟶ Fungi ⟶ Earthworm ⟶ Soil (A) (B) (C) (D) (a) Millipedes have a hard exoskeleton whose composition is different from that of the leaves. Considering all other conditions to remain the same, which step is likely to be slower between A to B and B to C and why? (b) What would be the direction of the flow of energy in this food chain? **OR** (a) A coral reef can be regarded as an ecosystem. Mention any TWO reasons why. (b) The net primary productivity (NPP) of a coral reef is approximately 2000 g C/m^2/year and the gross primary productivity (GPP) is 4000 g C/m^2/year. Calculate the respiration losses (R) of this ecosystem.	2 2

Section C

22	A biologist sees the following cells in a cross-section of the seminiferous tubule and its surrounding tissues and counts the number of various kinds of cells. Spermatozoa, Spermatid, Primary spermatocyte, Secondary spermatocyte, Leydig cells, Sertoli cells, Spermatogonium. From these cells, identify the cells: (a) that are diploid. (b) that can produce hormones and their names.	3
23	A couple is trying to conceive and start a family. (a) If the woman's period, which is regular, is scheduled to start on July 19, what was the estimated date of ovulation for the previous cycle? (b) Name the four important reproductive hormones and state whether their levels will be high or low on the date identified in (a).	3
24	As part of assisted reproductive technologies (ART), (a) What is the destination for blastomeres with a count of less than 8 cells and more than 8 cells? (b) What could be the reason behind transferring to the destinations identified in (a)? (c) What techniques are used to transfer the blastomeres to the destinations identified in (a)?	3

<table>
<tr><td>25</td><td>(a) State any FOUR phenomena in which the Hardy-Weinberg theorem may not hold true.
(b) A population of 100 individuals has a frequency of allele A of 0.3 and a frequency of allele a of 0.7. The frequency of the heterozygous genotype (Aa) is 0.49. Is this population in Hardy-Weinberg equilibrium? Justify.</td><td>3</td></tr>
<tr><td>26</td><td>State whether each of these statements given below is/are true or false. Justify your answer.

(a) Flocs reduce the pollution in water by increasing its BOD.
(b) Mycorrhiza is a type of parasitic relationship in which only the plants benefit from fungi.</td><td>3</td></tr>
<tr><td>27</td><td>Erythropoietin is a glycoprotein hormone that is otherwise naturally produced in the kidney when the body becomes anaemic. However, this does not happen in the case of chronic renal diseases where kidney function is lost. Epoetin alfa is a human erythropoietin produced in cell culture using recombinant DNA technology. The cell culture used is called Namalwa cells, a human cell culture. There are eight exons and seven introns in a single gene that encodes the hormone, whose sequence is known.

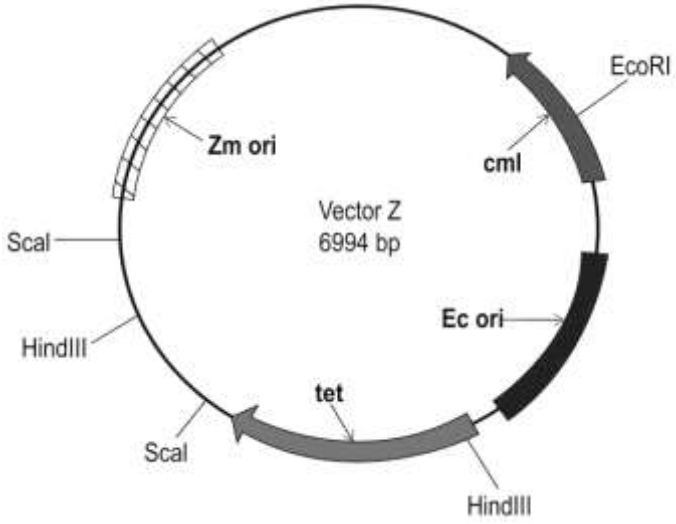
Explain the step-by-step process that should be followed for producing human erythropoietin in culture.

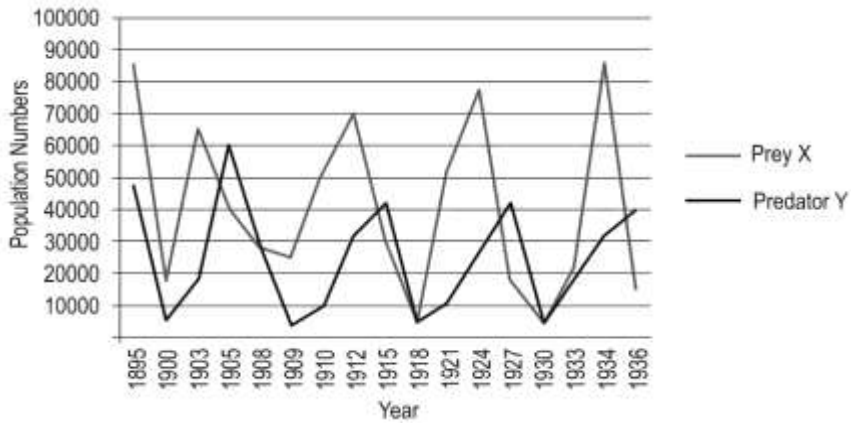
OR

Today, many genetic disorders can be detected using a single cell from an embryo. This helps in planning the child's health care in advance, and in some cases even treating the disorder while the baby is still in the womb.
(a) Identify a biotechnological technique that can be used for this purpose. Give a reason to support your answer.
(b) Can the technique identified in (a) be used to detect the presence of RNA viruses? Justify.</td><td>3</td></tr>
<tr><td>28</td><td>In a study comparing two continents - Antarctica and Asia, the species-area relationship was investigated using the following data:
<table><tr><th>Parameter</th><th>Antarctica</th><th>Asia</th></tr><tr><td>Area</td><td>14×10^6 km^2</td><td>44×10^6 km^2</td></tr><tr><td>Regression coefficient</td><td>1</td><td>1</td></tr><tr><td>Y-intercept</td><td>5</td><td>10</td></tr></table></td><td>3</td></tr>
</table>

	(a) Calculate the species richness value for each region. (b) Based on (a), which continent will have greater biodiversity and why?	

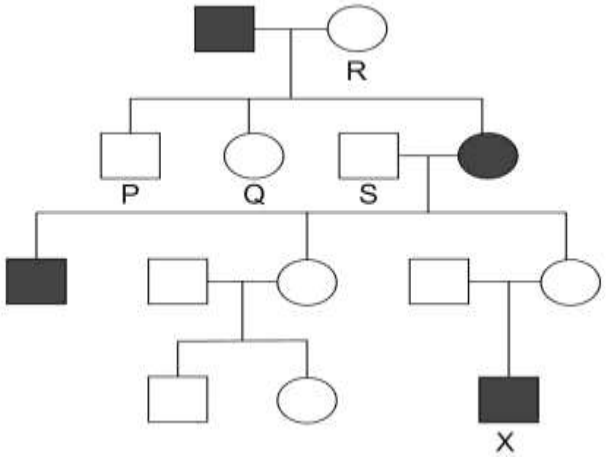
Section D

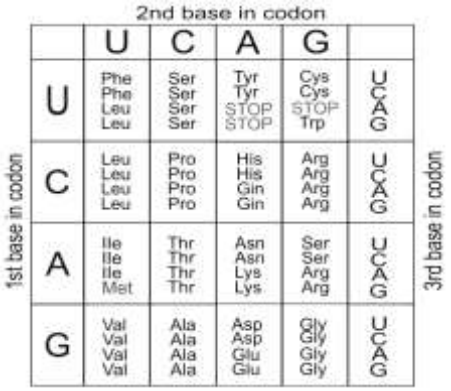
29	Shown below is a cloning vector 'Z' that Kamla wants to use to create a recombinant vector with her gene of interest.  The vector consists of sites for three restriction enzymes - ScaI, HindIII and EcoRI. Restriction sites for the same enzymes are also present in the gene of interest. There are two 'ori' sequences - one allows it to replicate in *Escherichia coli* and another allows replication in *Zymomonas mobilis*. Apart from this, the vector consists of two antibiotic resistance genes - one against tetracycline (tet) and another against chloramphenicol (cml). (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 HindIII, 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? **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	A Non-Government Organisation (NGO) aims to increase awareness against STDs. (a) What could be the ideal target age group for the NGO? (b) Mention any TWO potential long-term health-related complications of untreated STDs that the NGO should educate the target age group about. (c) Mention ONE contraceptive method that provides protection against the STD. Justify. (d) State TWO contraceptive methods that do not protect against STDs that they can educate the group about.	5

	OR Amey and Lalita are expecting their first child, with Lalita being in her second month of pregnancy with no known complications. Amey's family has a history of cystic fibrosis while Lalita's family has a history of Down's syndrome, leading to a concern that the baby may have one of these conditions. (a) Suggest and explain a way of testing if their baby is at risk for any genetic disorders. (b) In case of the presence of one or both of the abnormalities and posing a risk to the mother's health, mention one possible option for them to consider. (c) Is the process mentioned in (b) safe for Lalita at the current gestational age? Justify. (d) Under what conditions is the process mentioned in (b) illegal?	
32	Shown below is a pedigree of an individual X who is suffering from ocular albinism which results in permanent vision loss. Use the pedigree to answer the questions that follow:  (a) Complete the following statement about this disease: The trait for the disease is linked to _____ (X-chromosome/Y-chromosome/autosome) and is _____ (dominant/recessive). (b) Give a reason to support your answer to (a). (c) Identify the genotypes of individuals P, Q, R and S marked in the pedigree. **OR**	5

	Shown below is a nucleotide sequence and the genetic code. 5' - ATGCGTAGACTCGTA - 3'  (a) Identify the protein sequence formed by this sequence. (b) Draw the tRNA molecule for the third codon with its polarity labelled. Give a reason to support the polarity identified. (b) The first guanine base in the nucleotide sequence changes to cytosine. Identify the type of mutation caused by this change. (c) Will the mutated sequence form an mRNA and protein? Justify.	
33	(a) Classify the following scenarios as active/passive immunity and justify your answer. (i) A fetus receives antibodies from its mother through the placenta. (ii) A person accidentally gets cut by a blade and later receives a tetanus shot. (iii) A person receives a blood transfusion from a donor who has been vaccinated against a disease. (b) Zoya is bitten by an infected Anopheles mosquito in the morning. In the evening, another non-infected Anopheles mosquito bites Zoya and then bites Zaheer immediately. How likely is Zaheer to get malaria? Justify your answer. **OR** A patient is suffering from fatigue, high fever, and weight loss, and has been observing an increasing number and size of lumps in various regions of her body over a very short time.	5

	(a) What could she be suffering from? (b) Mention FOUR ways in which the disease identified in (a) is caused and FOUR techniques that can be used to diagnose it.	