CBSE EXAMINATION PAPER-2023

BIOLOGY

(Solved)

Time allowed : 3 hours | Maximum Marks : 80

General Instructions :

Read the following instructions carefully and follow them :

i. This question paper contains **38 questions.** All questions are **compulsory.**

ii. This question paper is divided into **5 sections.**

iii. **Section A** – questions number **1 to 4** are case based questions

iv. **Section B** – questions number **5 to 18** are multiple choice questions

v. **Section C** – questions number **19 to 24** are very short answer

vi. **Section D** – questions number **25 to 32** are short answer

vii. **Section E** – questions number **33 to 38** are long answer

viii. There is no overall choice given in the question paper. However, an internal choice has been provided in few questions.

ix. Use of calculator is NOT allowed.

Section A

Question 1.

Question 2.

The following pedigree chart shows the inheritance of a genetic disorder up to three generations of a family. Observe the chart and answer the questions that follow.

If the mother 'B' is a carrier of the disease, what will be the probability of their daughter being a sufferer of this disease?

[1 Marks]

(2)

(ii) Is it a recessive or a dominant disorder?

[1 Marks]

(3)

Write the genotypes of the individuals 'C', 'D' and 'H'.

[1 Marks]

(4)

If the female 'D' marries a normal man, what will be the probability of their daughter being a sufferer of this disease?

[1 Marks]

(5)

Is the disease sex-linked or autosomal as per the chart ? Give reasons in support of your answer.

[1 Marks]

Question 3.

The diagram shows the life cycle of a pathogenic protozoan

Question 4.

The diagram shows the life cycle of a pathogenic protozoan.

(1)

Name the parasitic stage that is being transfered from host 'X' to host 'Y'.

[1 Marks]

(2)

Write the changes the parasite undergoes in the liver.

[1 Marks]

(3)

Write the changes the parasite undergoes when it enters the RBC.

[1 Marks]

(4)

Trace the changes parasite undergoes when the host 'X' takes the the blood meal from infected host 'Y'.

[1 Marks]

(5)

At which stage during the life cycle of the pathogen does the host 'Y' experience the symptoms of the diseas. e ? Name thedisease and the toxic substance responsible for these symptoms.

[1 Marks]

Section B

Question 5.

Choose the set of sex determining chromosomes that indicates the correct sex of the respective organism.

[1 Marks]

(A) Homozygous sex chromosomes (XX) produce male sex in Drosophila

(B) Homozygous sex chromosomes (ZZ) determine female sex in birds

(C) XO type of sex chromosomes determine male sex in grasshoppers

(D) XXY condition in humans, as found in Turner Syndrome, determines male sex

Question 6.

Given below is a list of steps Meselson and Stahl carried out in their experiment to prove that DNA replication is semi-conservative. Select the option that gives the correct sequence of steps followed by them.

(i) Bacteria transferred to a N14 medium and sampled every 20 minutes.

(ii) All bacteria contain hybrid DNA (N14 DNA and N15 DNA).

(iii) Bacteria grown in N15 medium for many generations.

(iv) All bacteria contain N15 DNA.

(v) Bacteria contain either all N14 DNA or all hybrid DNA.

[1 Marks]

(A) (ii) (iv) (iii) (i) (v)

(B) (iii) (iv) (i) (ii) (v)

(C) (iv) (iii) (ii) (v) (i)

(D) (i) (ii) (v) (iv) (iii)

Question 7.

Identify the option that gives the correct type of evolution exhibited by the two animals shown, living in the same habitat in Australia.

[1 Marks]

(A) Disruptive Selection

(B) Convergent Evolution

(C) Divergent Evolution

(D) Homologous Ancestry

Question 8.

Which of the following options correctly matches the name of the hormone to its site of production in the human body?

[1 Marks]

(A) P-i, Q-iv, R-iii, S-ii

(B) P-iii, Q-iv, R-i, S-ii

(C) P-ii, Q-iii, R-i, S-iv

(D) P-i, Q-iii, R-ii, S-iv

Question 9.

Which of the following seeds have remained alive for the longest period?

[1 Marks]

(A) Yucca gigantea

(B) Mangifera indica

(C) Striga asiatica

(D) Phoenix dactylifera

Question 10.

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 times in the body.

(iv) They mature in the bone marrow.

[1 Marks]

(A) (i) and (iv) only

(B) (iii) only

(C) (iv) only

(D) (iii) and (iv) only

Question 11.

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 increases.

[1 Marks]

(A) (ii), (iii) and (iv) only

(B) (ii) and (iv) only

(C) (i) and (iii) only

(D) (i), (ii) and (iii) only

Question 12.

Identify the option that does not exhibit a parasitic relationship.

[1 Marks]

(A) Ticks on dogs

(B) Head lice in humans

(C) Female Anopheles

(D) Cuscuta on a mango tree

Question 13.

Which of the following is commonly known as baker's yeast?

[1 Marks]

(A) Penicillium notatum

(B) Monascus purpureus

(C) Propionibacterium sharmanii

(D) Saccharomyces cerevisiae

Question 14.

The given schematic illustration shows three steps 'P', 'Q' and 'R' of the I polymerase chain reaction.

Which of the following statements are correct with reference to the illustration given above?

(i) Step 'P' is showing denaturation at low temperature.

(ii) Step 'Q' is a denaturation of DNA strand at high temperature, followed by annealing.

(iii) Step 'R' is an extension of DNA in presence of thermostable DNA polymerase.

(iv) Step 'Q' is extension with two sets of primers.

[1 Marks]

(A) (ii) only

(B) (i) and (iii) only

(C) (ii) and (iii) only

(D) (i) only

Question 15.

Assertion (A): In humans the genotype with all the dominant alleles (AABBCC) will have the darkest skin color.

Reason (R): In a polygenic trait, phenotype reflects the contribution of each allele.

[1 Marks]

(A) Assertion (A) is false, but Reason (R) is true.

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

(C) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(D) Assertion (A) is true, but Reason (R) is false.

Question 16.

Assertion (A): The number of white winged moths decreased drastically after industrialisation in England. Reason (R): Effects of industrialisation were more marked in rural areas of England.

[1 Marks]

(A) Assertion (A) is false, but Reason (R) is true.

(B) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(C) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

(D) Assertion (A) is true, but Reason (R) is false.

Question 17.

Assertion (A): More and more children in metro cities of India suffer from allergies and asthma due to sensitivity to the environment.

Reason (R): Modern day lifestyle and a protected environment in early life has resulted in lowering the immunity.

[1 Marks]

(A) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

(B) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

Question 18.

Assertion (A): The Mediterranean orchid Ophrys uses sexual deceit to get pollinated by a species of bee. Reason (R): The female bee changes its colour depending on the temperature of the area.

[1 Marks]

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

Section C

Question 19.

(a) Explain the process of the development of a male gametophyte in an angiosperm.

(b) Why is it called a male gametophyte ?

[2 Marks]

Question 20.

(a) Write the first step the primary effluent undergoes when it enters the secondary treatment plant and state the purpose.

(b) What is the level of B.O.D indicative of in the secondary treatment plant ? Mention its significance.

[2 Marks]

Question 21.

Given below is a food web that involves nine organisms.

(a) Identify two producers and two carnivores shown in the food web.

(b) Is it possible to make an ecological pyramid depicting this food web ? Give reason in support of your answer.

[2 Marks]

Question 22.

Illustrate with the help of an example how introduction of an alien species turns invasive and causes decline of an indigenous species.

[2 Marks]

Question 23.

Explain how recombinant DNA technology is used to detect a disease even before any clinical symptom appears.

[2 Marks]

Question 24.

'Insertion inactivation' is metjod to detect recombinant DNA . Explain the method?

[2 Marks]

Section D

Question 25.

(i) How many types of RNA polymerases are there in a eukaryote cell ? Mention which one of them transcribes hnRNA.

(ii) Write the changes that hnRNA undergoes before it leaves the nucleus as mRNA.

[3 Marks]

Question 26.

The length of DNA in any cell is far greater than the dimension of its nucleus. Explain how this enormous DNA is packaged in a eukaryotic cell.

[3 Marks]

Question 27.

Expand and explain the following techniques used in the Test Tube Baby' programme:

(a) GIFT

(b) ZIFT

(c) IUI

[3 Marks]

Question 28.

Given below is a diagrammatic sectional view of a seminiferous tubule. State the developmental process of :

(a)(i) b' from 'a'.

(ii) 'e' from 'd'.

(iii) 'd' from 'b'.

(b) Identify 'a', 'b' and 'c'.

[3 Marks]

Question 29.

(a) Darwin's theory of Natural Selection is widely accepted but some limitations have been identified by modern biologists. Mention the limitations identified.

(b) Name and state the most accepted theory of evolution in modern times.

(c) Mention any two ways the limitations identified in Darwin's theory of evolution are explained in modern biology.

[3 Marks]

Question 30.

(a) Name the category of drugs represented by the chemical structure given above.

(b) If the methyl group is substituted by acetyl group we get a bitter crystalline compound. Name the compound.

(c) Name the natural source of these compounds.

(d) State the harmful effects of this class of drugs on the human body.

[3 Marks]

Question 31.

(a) Write the scientific name of the nematode that infests the tobacco plants and the part that it infests.

(b) How is Agrobacterium used to protect tobacco plant from this attack ?

[3 Marks]

Question 32.

Explain the following population interactions with the help of one example each :

(a) Brood Parasitism

(b) Co-evolution of mutualists

[3 Marks]

Section E

Question 33.

Answer the following questions with respect to recombinant DNA technology:

(i) Why is plasmid considered to be an important tool in rDNA technology? From where can plasmids be isolated ? (Any two sources)

(ii) Explain the role of 'ori' and selectable marker in a cloning vector.

(iii) "r-DNA technology cannot proceed without restriction endonuclease." Justify.

[5 Marks]

Question 34.

Answer the following questions based on Bt-crops :

(i) Why do farmers prefer to grow Bt cotton crop than genetically unmodified cotton crops ?

(ii) Name any two insects that are killed by Bt toxin.

(iii) Explain the mechanism by which Bt toxin kills the insects but not the bacterium which possesses the toxin.

[5 Marks]

Question 35.

Protein synthesis requires the services of all three types of RNAs, namely t-RNA, m-RNA and r-RNA. Explain the role of each of them during the process of protein synthesis in

prokaryotes.

[5 Marks]

Question 36.

A homozygous tall pea plant with green seeds is crossed with a homozygous dwarf pea plant with yellow seeds.

(i) Write the possible phenotype and genotype of F1 generation.

(ii) State the laws of Mendel that are proved true by the F1 generation.

(iii) Mention the F2 phenotypic ratio along with their possible phenotypes.

(iv) Write the genotypes of the male and female gametes produced by F1 progeny.

[5 Marks]

Question 37.

Given below is a diagrammatic representation of a human ovum.

(i)Identify the parts 'a', 'b' and 'c'.

(ii) This ovum is released from the ovary with incomplete meiotic division. When, where and how is the meiotic division completed?

(iii) How does an ovum ensure the entry of a single sperm during fertilisation?

[5 Marks]

Question 38.

(i) Double fertilisation is an event unique to all flowering plants. Explain the process.

(ii) Give a reason for the following :

(1) A seed of an orange has many embryos.

(2) Cashew is a false fruit but Guava is a true fruit.

[5 Marks]