HIMACHAL PRADESH BOARD OF SCHOOL EDUCATION

Class 12th

Biology (2024-25)

Time: 3 Hours **Maximum Marks: 60**

General Instructions:-

1. All questions are compulsory.
2. The question paper consists of four sections: A, B, C, and D.
3. Section A contains 12 multiple-choice questions of 1 mark each.
4. Section B contains 10 very short answer questions of 2 marks each.
5. Section C contains 6 short answer questions of 3 marks each.
6. Section D contains 2 long answer questions of 5 marks each.
7. Draw neat and labelled diagrams wherever necessary.

SECTION A: Multiple Choice Questions

1.A person accidentally cuts his finger with a rusty nail. Within hours, the area becomes red, swollen, and warm. Which component of the innate immune system is primarily responsible for these signs?

A) Antibodies B) Memory T cells

C) Inflammatory response D) Plasma cell (1)

2. What is the role of reverse transcriptase in a retrovirus?

(a) It synthesises proteins. (b) It copies DNA to RNA.

(c) It transcribes RNA to DNA. (d) It replicates RNA. (1)

3. hCG, hPL and relaxin are produced in women. The production of these hormones takes place

(a) at the time of puberty (b) Only during pregnancy

(c) during menstruation (d) at the time of menopause (1)

4.For a long time, it was believed that life came out of decaying and rotting matter like straw, mud, etc. This was the theory of

(a) catastrophism (b) spontaneous generation

(C) panspermia (d) chemogeny (1)

5.If a plant species has 12 chromosomes (2n=12), how many chromosomes will a pollen grain have?

(a) 6 (b)12 (c) 18 (d) 3

(1)

6. If a red-flowered plant (RR) is crossed with a white-flowered plant (WW) under incomplete dominance, what will be the phenotype of the offspring (RW)?

A) Red B) White C) Pink D) Red and white spotted (1)

7. The lac operon is an example of:

(a) Positive gene regulation (b) Repressible from Negative

(c) Constitutive gene expression (d) Inducible gene expression (1)

8. From a Sewage treatment plant, three water Samples, the A, B and C are tested for BOD Value and the recorded values of BOD are 6mg/L, 400mg/L and 20 mg/L respectively. What is correct about these samples ?.

a) Sample A is taken from Untreated sewage

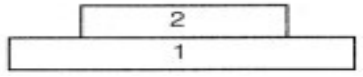
b) Sample B belong to secondary effluent of sewage

c) Sample C is taken from Primary effluent -

d) Sample B is collected from untreated sewage (1)

9. Which of the following enzymes is responsible for the unwinding of DNA?
(a) DNA polymerase (b) DNA ligase
(c) DNA helicase (d) RNA polymerase (1)

10. The diagram shows a pyramid of biomass.



A sharp decrease is seen in biomass at higher trophic levels in the grassland ecosystem. Choose the correct option for the levels of the ecosystem.

	1	2
a	Carnivor	Herbivore
b	Producers	Herbivore
c	Herbivore	Producers
d	Producers	Carnivor

(1)

Question Nos. 11 & 12 consist of two statements- Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below

(a) Both Assertion and Reason are true and Reason is the correct explanation of assertion
(b)Both Assertion and Reason are true, but Reason is not the correct explanation of assertion
(c)Assertion is false, but Reason is false
(d) Assertion is false, but Reason is true

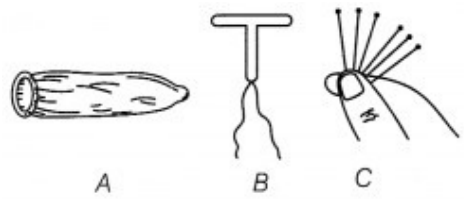
11. Assertion (a) : AUG acts as a start codon for the nucleotide sequence.
Reason (B) : AUG codes for methionine and starts the process. (1)

12. Assertion (A) keystones species are not relevant to biodiversity conservation.
Reason (R) keystone species have a significant impact on community structure and characteristics. (1)

Section B (Very Short Answers)

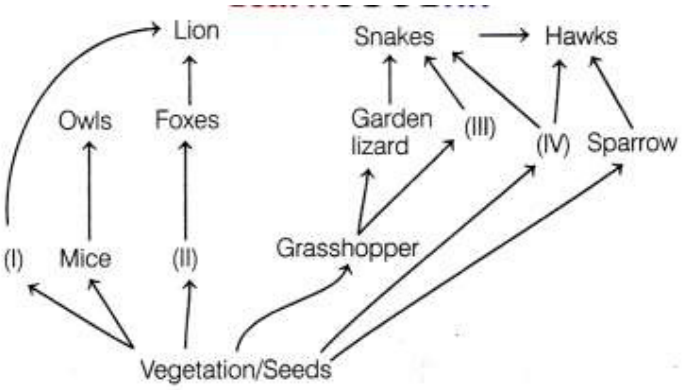
13 .Cloning sites are required in a vector to facilitate the action of restriction enzymes during the genetic engineering process. What will happen if many recognition sites are present within the vector? (2)

14.In the figure below, different methods of contraceptives are shown. Study them and answer the questions that follows.



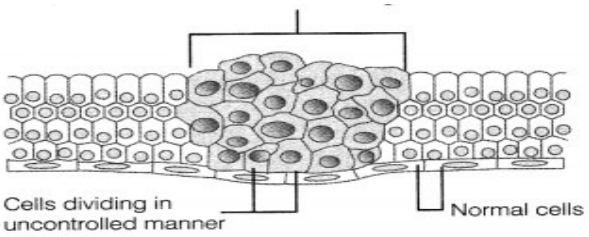
(i) Name these methods of contraceptive measures. Also mention which one of these is better suited for prevention against an STD.
(ii) How are these methods better than the natural methods of contraception? (2)

15. The following diagram exhibits the feeding relationship between different animals in a forest.



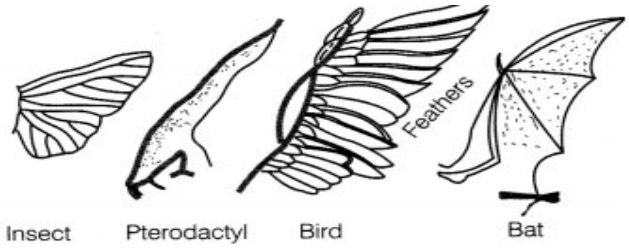
Interpret the given diagram and identify the animals that may be present at stages I-IV. Also explain, why is the first trophic level always occupied by a plant. (2)

16. The figure given below indicates the uncontrolled growth of cells which results in tumour. These can be either benign (stay in fix spot) or malignant (can move to other parts of the body) and can cause cancer.



Based on the above figure, answer the following questions.
(i) Cancer is one of the most dreaded diseases. Explain contact inhibition with respect to the disease.
(ii) Cancer patients are often given a-interferon as a part of the treatment. Give a reason.
(2)

17. Given below are the modifications in the wings of different organisms.



(i) What conclusion can you derive with respect to these organisms?
(ii) How is the study of comparative morphology and anatomy helpful in evolutionary studies? (2)

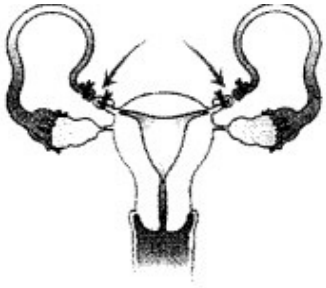
Or

In a typical nucleus, some regions of chromatin are stained light and others dark. Explain why is it so and what its significance is? (2)

18. What is the role of the selectable marker gene in the pBR322 plasmid, and how does it facilitate the identification of recombinant colonies?

19.Biodiversity must be conserved as it plays an important role in many ecosystem services that nature provides. Explain any two services of the ecosystem. (2)

20. The figure given below is related to the control of pregnancy. Study the figure and answer the questions that follow.



(i) Name the process that is shown in the above figure.
(ii) Explain how this process helps to control pregnancy. (2)

21 Explain the process of hormonal regulation of spermatogenesis. (2)

22 In the activated sludge process, what is the role of the aeration tank, and why is it important to maintain adequate oxygen levels in this tank?. (2)

SECTION C(Short Answer)

23.Consider a eukaryotic cell where the transcription of a gene is initiated by RNA polymerase binding to the promoter region. The gene sequence on the DNA template strand is 3'-TACGGTACCTAG-5'. After transcription, the RNA undergoes processing to form mature mRNA.

Question:

Based on the scenario provided:

1. Identify the mRNA sequence that would be synthesised from the given DNA template strand.
2. Explain the role of the promoter region in the initiation of transcription.
3. List two key modifications that occur to the primary RNA transcript in eukaryotic cells to form mature mRNA.

(3)

24 Pollination is the transfer of pollen grain from male reproductive part to the female reproductive part. This later enables fertilisation and production of seeds. This process of pollination is mainly facilitated by pollinating agents such as air, water, animals, etc. But if the flowers are closed or prefer self pollination then plant's itself become the pollinating agents. Based on the type of pollinators pollen grains have developed different feature.

(i) Write the characteristic features of anther, pollen and stigma of wind pollinated flowers.

(ii) How do flowers reward their insect pollinator? Explain.

Or

A couple married for 11 years did not have a child. They consulted the doctor which advised them some test. In result of these test it was found that the sperm count of male partner is very less. The doctor suggested them to opt for ART (Assisted Reproductive Technology).

(i) According to you which ART will be beneficial for this couple and why?

(ii) If the women was unable to produce ovum and male was healthy then which method of ART should they used?

(iii) Does the process of ART can be facilitated for couples whose either of partner is suffering from AIDS. (3)

25 DNA molecule contains 20% adenine. Using Chargaff's rules, calculate the percentage of the other three nucleotides: thymine, cytosine, and guanine. (3)

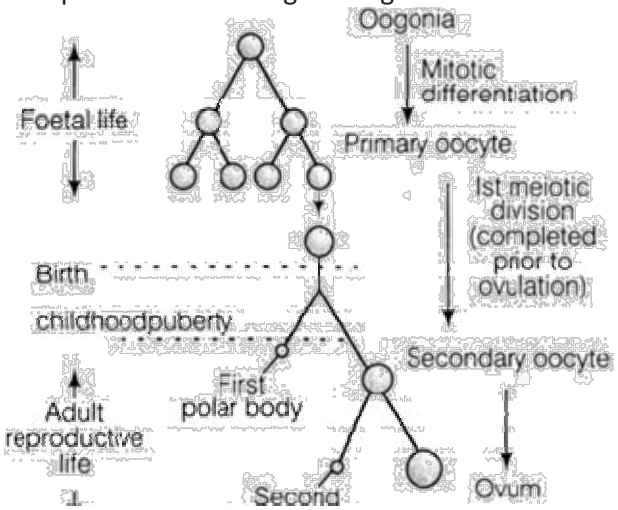
26.A population of a certain species of butterflies has a gene with two alleles: a dominant allele (A) and a recessive allele (a). In a recent survey, it was found that 16% of the butterfly population exhibited the recessive phenotype. Assuming that the population is large, mating is random, and there are no evolutionary forces acting on the population, use the Hardy-Weinberg principle to calculate the frequency of the dominant allele (A) and the recessive allele (a) in the population.(3)

27. A forest ecosystem is observed where fallen leaves from various trees have accumulated on the forest floor. Over time, the leaves start to decompose, and the nutrient-rich humus forms in the soil. Explain the role of decomposers in this process and discuss how the decomposition of leaf litter contributes to the nutrient cycling and overall health of the forest ecosystem. (3)

28. A man with haemophilia marries a normal woman. What is the probability that their daughters will be carriers of haemophilia?

SECTION D LONG ANSWERS

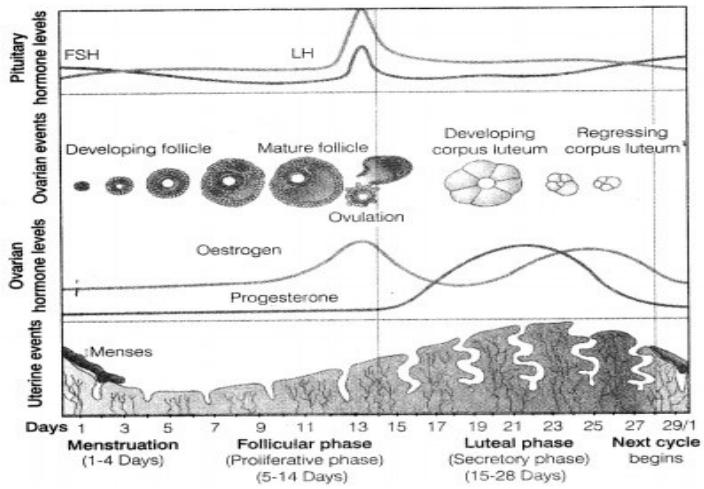
29. Observe the schematic representation of orgenesis given below. (5)



(i) Explain and illustrate the phases in oogenesis.
(ii) After the formation of a secondary oocyte, if sperm does not fertilise the egg, what will happen then? Explain.

OR

Study the diagrammatic presentation of various events during a menstrual cycle given below and answer the questions that follow.



(i) The released ovum present in Fallopian tube gets fertilised with sperm, how will it affect the menstrual cycle?
(ii) LH released by the pituitary gland becomes abnormally low at day 14 due to unknown reasons. Explain its impact on ovulation stating the reasons.
(iii) If progesterone is absent or low in level, will menstruation occur? Justify your answer.

30. Bt cotton is a genetically modified variety of cotton that has been engineered to produce a protein from the bacterium *Bacillus thuringiensis* (Bt) which is toxic to certain pests, particularly the cotton bollworm. This modification aims to reduce the need for chemical pesticides and increase crop yields.

In a recent field study, farmers using Bt cotton reported a significant reduction in pest damage and an increase in yield compared to traditional cotton crops. However, there are concerns about the potential development of Bt-resistant pests and the impact of Bt cotton on non-target organisms and biodiversity.

Question:

1. Describe the genetic modification process used to produce Bt cotton. (2 marks)
2. Explain two benefits and two potential concerns associated with the use of Bt cotton. (3 marks)

OR

Explain the different types of population interactions in an ecosystem, focusing on competition, predation, mutualism, and parasitism. Provide examples of each interaction and discuss how these interactions affect the populations involved. (5)

CHAPTER WISE MARKS DISTRIBUTION

S No	Name of Chapter	1 Mark MCQ	2 Marks Questions	3 Marks Questions	5 Marks Questions	TOTAL MARKS
1	Sexual Reproduction in Flowering Plants	02 02 Marks	01 02 Marks	_____	_____	04 Marks
2	Human Reproduction	01 01 Mark	02 04 Marks	_____	_____	05 Marks
3	Reproductive Health	_____	_____	01 03 Marks	_____	03 Marks
4	Principles of Inheritance and Variations	01 01Mark	02 04 Marks	_____	_____	05 Marks
5	Molecular Basis Of Inheritance	_____	01 02 Marks	01 03 Marks	_____	05 Marks
6	Evolution	02 02 Marks	01 02 Marks	_____	_____	04 Marks
7	Human Health and Disease	01 01Mark	_____	_____	01 04 Marks	05 Marks
8	Microbes in Human Welfare	02 02 Marks	01 02 Marks	_____	_____	04 Marks
9	Biotechnology: Principles & Processes	02 02Mark	_____	_____	01 04 Marks	06 Marks
10	Biotechnology : Applications	_____	01 02 Marks	_____	01 04 Marks	06 Marks
11	Organisms and Populations	01 01Mark	_____	01 03 Marks	_____	04 Marks
12	Ecosystem	_____	_____	_____	01 04 Marks	04 Marks
13	Biodiversity and Conservation	_____	01 02 Marks	01 03 Marks	_____	05 Marks

BLUEPRINT FOR MCQs

Sr. No.	Name of Unit	Number of Questions
1	Concept Based/Direct Questions	**4**
2	Understanding & Knowledge Based	**3**
3	High Difficulty Level	**3**
4	Assertion & Reason	**2**
	Total	**12**

Difficulty Level

Level	MCQ	Very Short	Short	Long	Total
Easy	4,5,6,9	14,15,18,19	24,27	29	11 (36.5%)
Moderate	2,10,11,12	16,17,20,21	25,26	30	11 (36.5%)
Hots	1,3,7,8	13,22	23,28	-	08 (27%)