# SAMPLE QUESTION PAPER

## BLUE PRINT

**Time Allowed :** 3 hours **Maximum Marks :** 70

| S. No. | | Chapter | VSA /Case based/ AR (1 mark) | SA-I (2 marks) | SA-II (3 marks) | LA (5 marks) | Total | |
|---|---|---|---|---|---|---|---|---|
| 1. | Unit-VI | Sexual Reproduction in Flowering Plants | 2(2) | – | – | 1* | **2(2)** | **14** |
| 2. | | Human Reproduction | 2(2) | – | 1(3) | 1(5) | **4(10)** | |
| 3. | | Reproductive Health | – | 1(2) | – | – | **1(2)** | |
| 4. | Unit-VII | Principles of Inheritance and Variation | 3(6) | 1+1*(2) | – | – | **4(8)** | **18** |
| 5. | | Molecular Basis of Inheritance | 2+1*(2) | – | 1(3) | 1+1*(5) | **4(10)** | |
| 6. | Unit-VIII | Human Health and Diseases | – | 2+1*(4) | 1(3) | 1+1*(5) | **4(12)** | **14** |
| 7. | | Microbes in Human Welfare | – | 1(2) | – | – | **1(2)** | |
| 8. | Unit-IX | Biotechnology : Principles and Processes | 2(2) | 3(6) | – | – | **5(8)** | **12** |
| 9. | | Biotechnology and Its Applications | 1(1) | – | 1+1*(3) | – | **2(4)** | |
| 10. | Unit-X | Organisms and Populations | 2(5) | 1(2) | 1(3) | – | **4(10)** | **12** |
| 11. | | Biodiversity and Conservation | 2(2) | – | – | – | **2(2)** | |
| | | **Total** | **16(22)** | **9(18)** | **5(15)** | **3(15)** | **33(70)** | |

*It is a choice based question.

**Subject Code : 044**

# BIOLOGY

***Time allowed : 3 hours*** ***Maximum marks : 70***

## *General Instructions :*

*(i) All questions are compulsory.*

*(ii) The question paper has four sections: Section A, Section B, Section C and Section D. There are 33 questions in the question paper.*

*(iii) Section-A has 14 questions of 1 mark each and 02 case-based questions. Section-B has 9 questions of 2 marks each. Section-C has 5 questions of 3 marks each and Section-D 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

**1.** State two reasons to convince a farmer to use an apomictic crop.

**2.** How are pea seeds different from castor seeds with respect to endosperm?

**3.** State the role of myometrium.

**4.** Write the function of middle piece in human sperm.

**5.** How would you find the genotype of an organism exhibiting a dominant phenotype trait?

**6.** Write the genotypes of both the parents who have produced a sickle celled anaemic offspring.

**7.** Name the enzyme and state its property that is responsible for continuous and discontinuous replication of the two strands of a DNA molecule.

**8.** What is biopiracy?

**9.** Name the material used as matrix in gel-electrophoresis and mention its role.

**10.** Where would you expect more species biodiversity–in tropics or in polar regions?

**11.** **Assertion :** $Mg^{2+}$ ion is essential for protein synthesis.

**Reason :** $Mg^{2+}$ ion is required for the association of two ribosomal subunits for protein synthesis to take place.

(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 true but reason is false.

(d) Both assertion and reason are false.

**OR**

**Assertion :** DNA Polymorphism is the basis for genetic mapping of human genome as well as DNA fingerprinting.

**Reason :** Polymorphism in DNA arises due to mutations.

(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 true but reason is false.
(d) Both assertion and reason are false.

**12. Assertion :** The matrix used in gel electrophoresis should have controllable pore size.

**Reason :** Agarose concentration can be changed to change pore sizes.

(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 true but reason is false.
(d) Both assertion and reason are false.

**13. Assertion :** Biodiversity hotspots are the regions which possess low levels of species richness, high degree of endemism and no loss to habitats.

**Reason :** Total number of biodiversity hotspots in the world is 32 with two of these hotspots found in India.

(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 true but reason is false.
(d) Both assertion and reason are false.

**14. Assertion :** Ecothermal animals show hibernation and aestivation.

**Reason :** Ecothermal animals are warm blooded poikilothermal animals.

(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 true but reason is false.
(d) Both assertion and reason are false.

**15. Read the following and answer any four questions from 15(i) to 15(v) given below:**

An organism is an individual entity but in nature, an organism can not exist alone. There is an interrelationship between organisms and their environment which affects their distribution, abundance and survival. For example, bees pollinate flowers and flowers rely on this for reproduction, while bees rely on flowers for food. The relationships between organism might be beneficial for both organisms or beneficial for one organism and harmful for other. The interaction in which one organism get benefits and the other is neither harmed nor benefitted is called commensalism. An example of commensalism is the interaction between sea anemone that has stinging tentacles and the clown fish that lives along them. The fish gets protection from predators which stay away from the stinging tentacles. The sea anemone does not appear to derive any benefit by hosting the clown fish. Similar to these, an orchid growing as an epiphyte on a mango branch takes nutrition from plant but in return mango do not derives any apparent benefit. Barnacles growing on the back of a whale is also an example of commensalism.

**(i)** In commensalism,

(a) both organism get benefitted
(b) one organism get benefitted and other is neither benefitted nor harmed
(c) one organism get benefitted and other get harmed
(d) both organism either get benefitted or get harmed.

**(ii)** The example of commensalism does not include
(a) barnacles growing on the back of a whale
(b) remora of family Echineidae rides attached to sharks
(c) fig flower pollinated by wasp
(d) cattle egrets and cattle.

**(iii)** In relationship of sea anemone and clown fish
(a) only sea anemone gets benefitted
(b) only clown fish gets benefitted
(c) neither sea anemone nor clone fish gets benefitted
(d) both sea anemone and clone fish gets benefitted.

**(iv)** The occurrence of orchid plant on mango tree is a perfect example of
(a) Mutualism (b) Commensalism
(c) Parasitism (d) both (a) and (b).

**(v)** **Assertion :** In nature, no organism can exist alone.
**Reason :** There is an interrelationship between organisms and their environment which affects their distribution, abundance and survival.
(a) Both assertion and reason are true, and the reason is the correct explanation of the assertion.
(b) Both assertion and reason are true, but the reason is not the correct explanation of the assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

**16. Read the following and answer any four questions from 16(i) to 16(v) given below:**

Sexual reproduction produce variation which was experimentally verified in tiny fruit flies, *Drosophila melanogaster* by Thomas Hunt Morgan and his colleagues. *Drosophila* is best known organism for genetic studies as they could be grown on simple synthetic medium in the laboratory. They complete their life cycle in about two weeks, and a single mating could produce a large number of progeny flies. Also, there was a clear differentiation of the sexes – the male and female flies are easily distinguishable. Also, it has many types of hereditary variations that can be seen with low power microscopes. Similar to Mendel's dihybrid cross, Morgan performed several dihybrid crosses to study sex linked genes in *Drosophila*. Morgan hybridised yellow-bodied, white-eyed females to brown-bodied, red-eyed males and intercrossed their $F_1$ progeny. He observed that the two genes did not segregate independently of each other and the $F_2$ ratio deviated very significantly from the 9:3:3:1 ratio. In his findings the proportion of parental gene combinations were much higher than the non-parental type. Morgan attributed this due to the physical association or linkage of the two genes and coined the term linkage to describe this physical association of genes on a chromosome and the term recombination to describe the generation of non-parental gene combinations.

**(i)** Linkage is _____.
(a) close association of genes (b) close association of chromosomes
(c) close association of traits (d) both (a) and (b)

**(ii)** The probability of more non-parental traits obtained in a cross is due to _____.
(a) linkage (b) recombination
(c) both linkage and recombination (d) random mating

**(iii)** *Drosophila* is best for genetic studies as it _____.
(a) has short life cycle (b) is easy to culture in laboratory
(c) male and female are distinguishable (d) all of these.

**(iv)** If the genes for white eyes and yellow wings are very tightly linked and they will show _____ parental types in progeny.

(a) 100% (b) 0% (c) 10% (d) None of these

**(v)** Refer to the given table (hypothetical data).

| Traits | Parental types | Non-parental types |
|---|---|---|
| White eyes and yellow wings | 75 | 25 |
| Red eyes and miniature wings | 35 | 65 |

Read the following statements that are drawn as conclusions from the above data and select the correct option.

I. White eyes and yellow wings are linked traits.

II. Red eyes and miniature wings are linked traits.

III. Neither White eyes and yellow wings nor red eyes and miniature wings are linked traits.

(a) Only I is true. (b) Only II is true.

(c) Only III is true. (d) Both I and II are true.

## SECTION - B

**17.** It is a general observation that nursing mother does not conceive. Justify.

**18.** A man with blood group B married a woman with O blood group. What will be all the possible phenotypes and genotypes of the progeny?

**OR**

Do you agree to the perception in our society that the woman is responsible for the gender. Substantiate your answer scientifically.

**19.** Name the causative organism, two symptoms and mode of transmission of ringworms.

**OR**

Mention one application for each of the following :

(i) Passive immunisation (ii) Antihistamine

(iii) Colostrum (iv) Cytokinin-barrier

**20.** What is *Eco*RI? How does *Eco*RI differ from an exonuclease?

**21. (a)** Mention the number of primers required in each cycle of polymerase chain reaction (PCR). Write the role of primers and DNA polymerase in PCR.

**(b)** Give the characteristic feature and source organism of the DNA polymerase in PCR.

**22.** Write the role of '*ori*' and 'restriction' site in a cloning vector pBR322.

**23.** How do methanogens help in producing biogas?

**24.** Name the two primary lymphoid organs. State the importance of T-lymphocytes.

**25.** Why do we experience shivering during winters when the temperature is very low?

## SECTION - C

**26.** Why is the DNA considered a better genetic material than RNA?

**27.** At what stage does *Plasmodium* gain entry into the human body? Write the different stages of its life cycle in the human body.

**28.** Name the nematode that damages the roots of tobacco plants. How is transgenic tobacco plant made resistant to nematode using biotechnology?

**OR**

How does the gene therapy help patients with ADA-deficiency?

**29.** **(a)** Where is acrosome present in human sperm?

**(b)** Which organelle forms it?

**(c)** What is its function?

**30.** Name the special type of tissue enabling plants like lotus and water hyacinth to survive in aquatic environment. Mention any two specific functions of this tissue.

## SECTION - D

**31.** **(a)** Where are the Leydig's cells located in male reproductive system and what is their function?

**(b)** Explain the role of any two male accessory glands.

**(c)** How does the corpus luteum act as an endocrine gland?

**OR**

Give reasons why:

(i) Most zygotes in angiosperms divide only after certain amount of endosperm is formed.

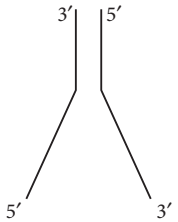
(ii) Micropyle remains as a small pore in the seed coat of a seed.

(iii) Integuments of an ovule harden and water content is highly reduced as the seed matures.

(iv) Anthers of angiosperm flowers are described as dithecous.

(v) Organisms produced due to sexual reproduction adapt better to the changing environmental conditions.

**32.**




(i) Identify the structure shown above.

(ii) Redraw the structure as a replicating fork and label the parts.

(iii) Write the source of energy for this replication and list the enzymes involved in this process.

(iv) Mention the difference in the synthesis based on the polarity of the two template strands.

**OR**

Study the schematic representation of the genes involved in the *lac* operon given below and answer the questions that follow:

| *p* | *i* | *p* | *o* | *z* | *y* | *a* |
|---|---|---|---|---|---|---|

(i) Identify and name the regulatory gene in this operon. Explain its role in 'switching off' the operon.

(ii) Why is the *lac* operon's regulation referred to as negative regulation?

(iii) Name the inducer molecule and the products of the genes '*z*' and '*y*' of the operon. Write the functions of these gene products.

**33. (a)** (i) Write the scientific names of the two species of filarial worms causing filariasis.

(ii) How do they affect the body of infected person(s)?

(iii) How does the disease transmit?

**(b)** Explain what causes chill in humans during malarial attack. Name the causative organism of malignant malaria.

**OR**

**(a)** Give the scientific name of the pathogen causing diphtheria. How is it transmitted?

**(b)** When does a human body elicit an anamnestic response?

**(c)** How do interferons protect us?