# CBSE
# Class XII Biology
# Board Paper 2013 - Delhi (Set 1)

**Time: 3 hrs** **Total Marks: 70**

**General Instruction**:

1. All questions are compulsory.
2. This question paper consists of four Sections A, B C and D. Section A contains 8 questions of one mark each, Section B is of 10 questions of two marks each, Section C is of 9 questions of three marks each, and Section D is of 3 questions of five marks each.
3. There is no overall choice. However an internal choice has been provided in one question of 2 marks, one question of 3 marks and all the three questions of 5 marks weightage. A student has to attempt only one of the alternatives in such questions.
4. Wherever necessary, the diagrams drawn should be neat and properly labelled.

## SECTION A

**1.** An anther with malfunctioning tapetum often fails to produce viable male gametophytes. Give any one reason. [1]

**2.** Why sharing of injection needles between two individuals are not recommended? [1]

**3.** Name the enzyme and state its property that is responsible for continuous and discontinuous replication of the two strands of a DNA molecule. [1]

**4.** Identify the examples of convergent evolution from the following: [1]
(i) Flippers of penguins and dolphins
(ii) Eyes of octopus and mammals
(iii) Vertebrate brains

**5.** Write the importance of MOET. [1]

**6.** Why is the enzyme cellulase needed for isolating genetic material from plant cells and not from the animal cells? [1]

**7.** Name the type of biodiversity represented by the following: [1]
(a) 50,000 different strains of rice in India.
(b) Estuaries and alpine meadows in India.

**8.** Write the equation that helps in deriving the net primary productivity of an ecosystem. [1]

## SECTION B

**9.** Geitonogamous flowering plants are genetically autogamous but functionally cross-pollinated. Justify. [2]

**10.** When and where do chorionic villi appear in humans? State their function. [2]

**11.** In a cross between two tall pea plants, some of the offsprings produced were dwarf. Show with the help of Punett square how this is possible. [2]

**12.** A student on a school trip started sneezing and wheezing soon after reaching the hill station for no explained reasons. But, on return to the plains, the symptoms disappeared. What is such a response called? How does the body produce it? [2]

**13.** Name two commonly used bioreactors. State the importance of using a bioreactor.[2]

**14.** Write the function of adenosine deaminase enzyme. State the cause of ADA deficiency in humans. Mention a possible permanent cure for an ADA deficiency patient. [2]

**15.** Expand the following and mention one application of each: [2]

(i) PCR

(ii) ELISA

**OR**

(a) Mention the difference in the mode of action of exonuclease and endonuclease.

(b) How does restriction endonuclease function?

**16.** Name any two sources of e-Wastes and write two different ways for their disposal. [2]

**17.** Why the pyramid of energy is always upright? Explain. [2]

**18.** Explain why very small animals are rarely found in polar region. [2]

## SECTION C

**19.** Draw a diagram of the microscopic structure of human sperm. Label the following parts in it and write their functions. [3]

(i) Acrosome
(ii) Nucleus
(iii) Middle piece

**20.** With the help of any two suitable examples explain the effect of anthropogenic actions on organic evolution. [3]

**21.** [3]

(a) Why human ABO blood group gene is considered a good example of multiple alleles?
(b) Work out a cross up to F1 generation only, between a mother with blood group A (Homozygous) and the father with blood group B (Homozygous). Explain the pattern of inheritance exhibited.

**22.** Describe the structure of a RNA polynucleotide chain having four different types of nucleotides. [3]

**23.** Differentiate between inbreeding and outbreeding in cattle. State one advantage and one disadvantage for each one of them. [3]

**24.** [3]

(a) Why are the fruit juices bought from market clearer as compared to those made at home?
(b) Name the bioactive molecules produced by *Trichoderma polysporum* and *Monascus purpureus*.

**25.** [3]

(a) Why are transgenic animals so called?
(b) Explain the role of transgenic animals in
(i) Vaccine safety and
(ii) Biological products with the help of an example each.

**26.** How have human activities caused desertification? Explain. [3]

**OR**

How does algal bloom destroy the quality of a fresh water body? Explain.

**27.** Explain mutualism with the help of any two examples. How is it different from commensalism? [3]

## SECTION D

**28.** [5]

(a) Draw a diagrammatic sectional view of a mature anatropous ovule and label the following parts in it:
   (i) That develops into a seed coat.
   (ii) That develops into an embryo after fertilization.
   (iii) That develops into an endosperm in an albuminous seed.
   (iv) Through which the pollen tube gains entry into the embryo sac.
   (v) That attaches the ovule to the placenta.

(b) Describe the characteristics features of wind pollinated flowers.

**OR**

(a) Draw a diagrammatic sectional view of the female reproductive system of human and label the parts,
   (i) where the secondary oocytes develop
   (ii) which helps in collection of ovum after ovulation.
   (iii) Where fertilization occurs.
   (iv) Where implantation of embryo occurs.

(b) Explain the role of pituitary and the ovarian hormones in menstrual cycle in human females.

**29.** Describe the asexual and sexual phases of life cycle of *Plasmodium* that causes malaria in humans. [5]

**OR**

(a) What is plant breeding? List the two steps the classical plant breeding involves.
(b) How has the mutation breeding helped in improving crop varieties? Give one example where this technique has helped.
(c) How has the breeding programme helped in improving the public nutritional health? State two examples in support of your answer.

**30.** A child suffering from Thalassemia is born to a normal couple. But the mother is being blamed by the family for delivering a sick baby. [5]

(a) What is Thalassemia?
(b) How would you counsel the family not to blame the mother for delivering a child suffering from this disease? Explain.
(c) List the values your counselling can propagate in the families.

# CBSE
# Class XII Biology (Theory)
# Board Paper 2013 – Delhi (Set 1)
# SOLUTION

**Time: 3 hrs** **Total Marks: 70**

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## SECTION A

1. **Ans.** An anther with malfunctioning tapetum often fails to produce viable gametophytes because the tapetum provides nutritive materials to the dividing microsporocytes.

2. **Ans.** Sharing of injection needles between two individuals is not recommended because it causes fatal and dangerous diseases such as AIDS and hepatitis which are incurable.

3. **Ans**. DNA-dependent DNA polymerase is the enzyme which polymerises the DNA strand in the 5′ to 3′ direction resulting in continuous and discontinuous replication.

4. **Ans.** Examples of convergent evolution are
   (i) Wings of insect, bird and bat
   (ii) Australian marsupials and placental mammals

5. **Ans.** MOET stands for multiple ovulation embryo transfer technology which is a programme for herd improvement. The importance of MOET is to increase herd size in a short time.

6. **Ans.** Cellulase enzyme is used for isolating genetic material from plant cells and not from animal cells because it breaks down the plant cell wall made of cellulose. Animal cells do not have a cell wall.

7. **Ans.**
   (a) 50,000 different strains of rice: Genetic diversity
   (b) Estuarine and alpine meadows: Ecological diversity

8. **Ans.** The equation of net primary productivity of an ecosystem is
   $$NPP = GPP - R$$
   where NPP = Net primary productivity
   GPP = Gross primary productivity
   R = Respiratory rate

## SECTION B

**9. Ans.** Geitonogamy is a kind of pollination in which the pollen grains are transferred from the anther of a flower to the stigma of another flower on the same plant. It usually occurs in plants which show monoecious condition in which male and female flowers are borne on the same plant.

The plants are genetically autogamous as the gametes come from the same parent plant, but because the pollen grains are being transferred to a different flower which needs a pollinating agent, it is functionally an example of cross-pollination.

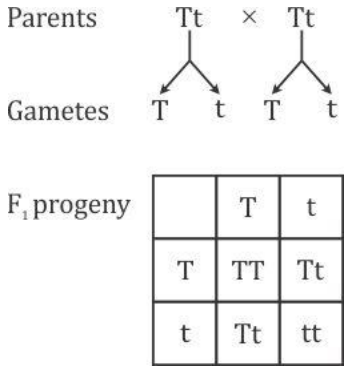
**10. Ans.** Chorionic villi are finger-like projections which arise from the trophoblast layer and develop in the zygote after it has undergone implantation.

Functions of chorionic villi:

(a) They take part in the formation of the placenta, which is the connecting link between the mother and the foetus.

(b) They supply oxygen and nutrients to the growing embryo.

**11. Ans.** In a cross between two tall pea plants, some offspring produced were dwarf which ensures that both parents are heterozygous (Tt).




| | T | t |
|---|---|---|
| T | TT | Tt |
| t | Tt | tt |

Phenotypic ratio: 3:1

Genotypic ratio: 1:2:1

**12. Ans.** Sneezing and wheezing in a particular environment and their sudden disappearance in another environment is due to allergy to pollen and mites. When the body is exposed to an antigen, a substance which causes the immune system to make antibodies against it, a complex set of reactions begins. The job of the antibodies is to detect and destroy substances which cause disease and sickness. In allergic reactions, the antibody is immunoglobulin E or IgE.

**13. Ans.** Two commonly used bioreactors are batch type and stirred tank bioreactors.

The importance of using bioreactors is

(i) It provides a large volume for cultures. Thus, products are obtained in high quantity.

(ii) It also provides the optimal conditions for achieving the growth of desired products such as temperature, pH, vitamins and oxygen.

**14. Ans.** Adenosine deaminase enzyme (ADA) is very crucial for the proper functioning of the immune system. The deficiency of ADA causes severe combined immunodeficiency disease. The patients lack functional T-lymphocytes and fail to fight infectious pathogens. A permanent cure for ADA deficiency is gene therapy in which lymphocytes are extracted from the patient's bone marrow and a normal functional gene for ADA is introduced into the lymphocytes with the help of a retrovirus.

**15. Ans.**

(i) PCR: Polymerase chain reaction

Application of PCR: It is useful to detect genetic disease in the foetus before birth.

(ii) ELISA: Enzyme-linked immunosorbent assay

Application of ELISA: It is useful in the early diagnosis of diseases using antigen–antibody interactions.

**OR**

(a) Exonucleases remove nucleotides from the ends of the DNA, whereas endonucleases make cuts at specific positions within the DNA.

(b) Each restriction endonuclease inspects the DNA molecule in search of a specific recognition sequence. When it gets its specific recognition sequence, it binds to the site and cuts each of the two strands of the double helix at specific points by hydrolysing the phosphodiester backbones.

**16. Ans.** Two sources of e-wastes are

(i) Parts of computers and television sets

(ii) Smart phones, parts of air conditioners and refrigerators

Two ways for disposal of e-wastes are

(i) Recycling of e-wastes

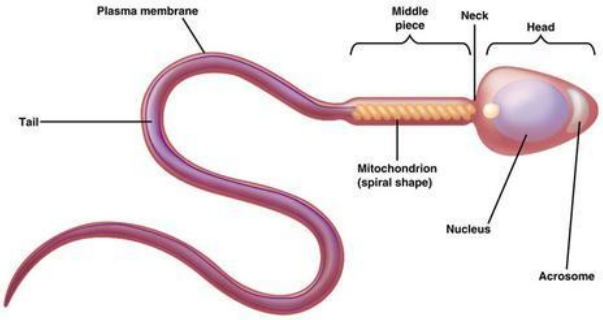
(ii) Incineration of e-wastes, i.e. burning e-wastes completely into ashes

17. **Ans.** The pyramid of energy is a graphical representation of the amount of accumulated energy per unit area in different trophic levels of a food chain. An energy pyramid is always upright because there is a gradual decrease in energy at successive trophic levels. This happens because according to the 10% law of energy transfer, only 10% of the total energy is transferred from one trophic level to another.

18. **Ans.** Small animals are cold-blooded organisms. They do not have constant body temperature and need to spend energy to generate heat through metabolism. So, they are rarely found in the polar regions.

## SECTION C

**19. Ans.**




Structure of human sperm

**20. Ans.** Effect of anthropogenic actions on organic evolution can be explained by the following examples:

(i) Use of chemicals such as mosquito repellents, pesticides and fungicides has enabled the selection of mosquito and pest species which are better adaptive to the environment. Because of the anthropogenic action, the rate of evolution has increased, and as a result, in a very short time, a new species has evolved which can resist chemicals.

(ii) Use of antibiotics has increased the rate of evolution of bacteria and virus. Among many species of bacteria, mutation occurred in few individuals. Because of selection using antibiotics, individuals who have got resistive properties got selected and produced a large number of progeny.

**21. Ans.**

(a) In multiple allelism, a character is controlled by three or more alleles. Because the ABO blood group has three alleles—i, $I^A$ and $I^B$, it is considered a good example of multiple alleles.

(b) Genotype of mother: $I^A\ I^A$; Genotype of father: $I^B\ I^B$

Parents $I^A\ I^A \times I^B\ I^B$

Gametes $I^A$ $I^B$

$F_1$ Progeny $I^A\ I^B$

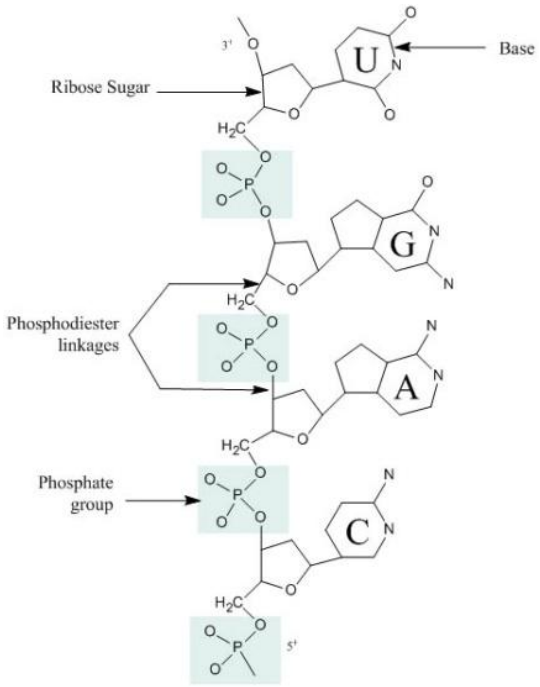
Blood group of the child will be AB. This is due to co-dominance, where allele $I^A$, for A-type blood group is co-dominant with its allele $I^B$ for the B-type blood group.

**22. Ans.** The RNA molecule is a single chain polynucleotide. Each nucleotide is composed of three main components—a nitrogenous base, a 5-carbon ribose sugar and a phosphate group.

(i) The axis or backbone of a polynucleotide chain is formed of alternate residues of phosphate and ribose sugar.

(ii) Phosphate combines with carbon of the sugar and carbon 3′ of the next sugar.

(iii) Nitrogenous bases are purines (adenine and guanine) and pyrimidines (cytosine and uracil). The nitrogenous base is linked to the ribose sugar through N-glycosidic linkages.




**23. Ans**.

| Inbreeding | Outbreeding |
|---|---|
| It refers to the mating of closely related individuals within the same breed for 4–6 generations. | It refers to the breeding of unrelated animals, which may be between individuals of the same breed but having no common ancestors for 4–6 generations or between different breeds or different species. |

- **Advantage of inbreeding**: It develops homozygous pureline in an animal; thus, it increases homozygosity to evolve a pureline in any animal.
- **Disadvantage of inbreeding**: Continued inbreeding reduces fertility and even yield, leading to a condition called inbreeding depression.

- **Advantage of outbreeding**: It produces offspring having desirable features of both parents.
- **Disadvantage of outbreeding**: It may produce infertile hybrid offspring.

**24. Ans.**

(a) The fruit juices bought from the market are clearer as compared to those made at home because of the addition of proteases and pectinases in them.

(b) The bioactive molecules produced by

(i) *Trichoderma polysporum* is cyclosporin A (immunosupressor).

(ii) *Monascus purpureus* is statins (lowers blood cholesterol level).

**25. Ans.**

(a) Transgenic animals are so called because they contain a foreign or transgene and have been modified by insertion of recombinant DNA. Positive traits have been inserted in them to produce products which are beneficial to humans.

(b) The role of transgenic animals in

(i) Vaccine safety: Transgenic animals are predominantly used for testing of vaccines before they are used on human beings. Example: Transgenic mice are used to test the safety of polio vaccine.

(ii) Biological products: Many human diseases are controlled by biological products. The transgenic animals which produce these products are introduced with DNA which codes for a particular product such as human protein (α-I-antitrypsin) for treating emphysema. In 1997, the first transgenic cow (Rosie) was produced. She was capable of secreting human protein-enriched milk. The milk contained the human alpha-lactalbumin and was nutritionally a more balanced product for human babies than cow milk.

**26. Ans.** Causes of desertification:

(i) Improper farming practices: Farming practices are improper when crops are continually grown, harvested and the soil is not given enough time to replace its nutrients. This leads to loss of fertility of soil.

(ii) Soil erosion: Excessive ploughing of land may also cause soil erosion. Animal grazing may also cause lack of natural vegetation (forest) and hence lack of plant roots to bind the soil particles together, causing soil erosion.

(iii) Deforestation: Human beings cut down trees to serve their own purposes such as construction of houses and roads. Increase in industrialisation also increases deforestation.

(iv) Mining: Mining activities and leaching of minerals destroy soil quality and make it infertile.

**OR**

Algal bloom destroys the quality of a freshwater body in the following ways:

(i) Aquatic life is affected when algae consume dissolved oxygen from the water body.

(ii) Algal blooms are sometimes toxic to humans as humans consume aquatic organisms as food.

(iii) Water body is polluted as algal blooms spread over water bodies such as lakes and they exhibit a foul smell.

(iv) They block sunlight, which does not reach submerged aquatic plants which may have a role in supplying necessary nutrients to other aquatic life forms.

**27. Ans.** Mutualism is the relationship between two organisms where both are benefited for food, shelter and substratum for attachment. Two examples are

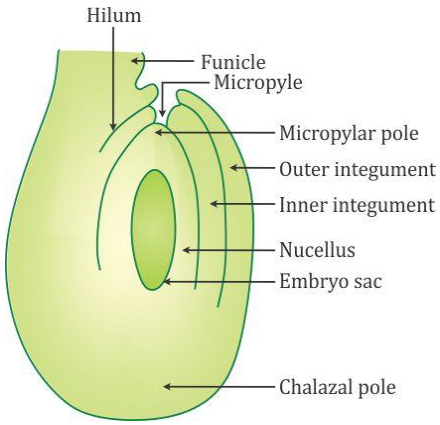
(i) Mycorrhiza is the mutualistic relationship between fungi and roots of higher plants. The fungus helps in mineral nutrition of the plant with which they are associated and obtains in turn carbohydrates from the plant.

(ii) The association of *Trichonympha* and termite is symbiotic. *Trichonympha* lives in the gut of termites and digests the cellulose of wood for them, and in turn, the termite provides food, shelter and constant internal environment to *Trichonympha*.

Commensalism is a type of interaction between two organisms where one is benefited and the other is neither harmed nor benefited. Example: The sucker fish bears a sucker on the dorsal side of its head which helps it to attach itself to the body of the shark. The sucker fish is benefited with free transport and free food left behind by the shark which is neither harmed nor benefited.

## SECTION D

**28. Ans.**




Mature Anatropous Ovule

(a)

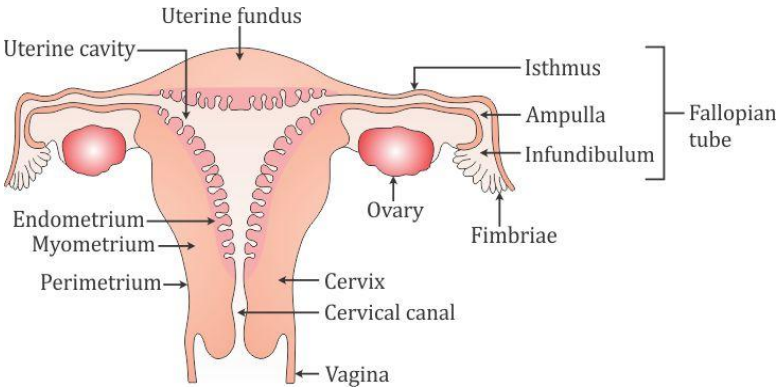
(i) that develops into seed coat: Integument
(ii) that develops into an embryo after fertilisation: Embryo sac
(iii) that develops into an endosperm in an albuminous seed: Nucellus
(iv) through which the pollen tube gains entry into the embryo sac: Micropyle
(v) that attaches the ovule to the placenta: Funicle

(b) The characteristic feature of wind-pollinated flowers are

(i) The flowers are inconspicuous, odourless and not showy.
(ii) They have well-exposed stamens.
(iii) They are devoid of nectar and edible pollen.
(iv) The pollen is small, smooth and dry.

**OR**

(a)




Human Female Reproductive System

(i) Ovary
(ii) Fimbriae
(iii) Fallopian tubes

(iv) Uterus

(b) The menstrual cycle starts with menstrual flow caused by the breakdown of the endometrium of the uterus, which is followed by the follicular phase. The role of the pituitary and ovarian hormones in the menstrual cycle are

(i) In this phase, the release of gonadotropins [luteinising hormone (LH) and follicle-stimulating hormone (FSH)] increases. Growing follicles produce oestrogen.

(ii) On the $14^{th}$ day, LH and FSH rupture the Graafian follicles to release ovum.

(iii) The corpus luteum secretes large amounts of progesterone which is essential for the maintenance of the endometrium.

**29. Ans.** Life cycle of Plasmodium:

(i) Plasmodium sporozoites enter the human body through the bite of the female Anopheles mosquito.

(ii) Sporozoites undergo asexual reproduction when the parasites enter the liver cells and then attack the RBCs resulting in their rupture.

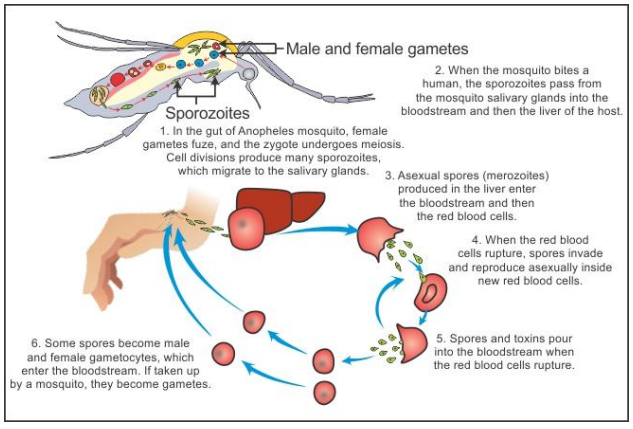
(iii) The rupture of RBCs produces a toxic element called haemozoin which is responsible for the chill and high fever for 3–4 days.

(iv) When a female Anopheles mosquito bites an infected person, these parasites enter the mosquito's body and multiply forming sporozoites.

(v) These sporozoites are stored in the salivary glands of the mosquito and are released when a healthy person is bitten by this mosquito.

(vi) When these mosquitoes bite a human, the sporozoites are introduced into the body of human beings.

Thus, Plasmodium requires two hosts—man and mosquito—to complete its life cycle. The female Anopheles mosquito acts as the vector.




**OR**

(a) Plant breeding is the genetic improvement of the crop to create desired plant types which are better suited for cultivation.

Classical plant breeding involves two steps—hybridisation and artificial selection.

(b) Traits such as disease resistance against bacterial, viral and fungal diseases can be induced by mutation using gamma radiation. Gamma radiation causes changes in the DNA structure and forms new traits which are not a part of the parental traits having desirable characteristics.
Example: Mung beans have been made resistant against yellow mosaic virus and powdery mildew.

(c) Breeding of crops with high levels of vitamins and minerals is the step taken to improve public health. This is called biofortification. Its objectives are
(i) Protein content and quality
(ii) Oil content and quality
(iii) Vitamin content
(iv) Micronutrient and mineral content

- Two examples are
(i) Atlas 66, with high protein content, has been used as a donor for improving cultivated wheat.
(ii) IARI, New Delhi, has produced protein-enriched beans such as lablab and broad beans.

**30. Ans.**

(a) Thalassaemia is a form of inherited autosomal recessive blood disorder which is caused by the weakening and destruction of red blood cells. It is caused by the deletion or mutation of a gene in any of the α or β chains of haemoglobin leading to the synthesis of improper folded haemoglobin which results in anaemia which is a major symptom of thalassaemia.

(b) Because thalassaemia is an autosomal recessive disorder, it will only be caused in the child if both parents are heterozygous and the mutation is carried on any one of the autosome which acts as a carrier. So, it has an equal probability of mother or father. So, it is unjustified to blame only the mother for the abnormality in the child.

(c) The list of values which can be counselled in the families for thalassaemia are
(i) Giving proper nutritional content to the child.
(ii) Encouraging the child to follow medical treatment regularly.
(iii) Support the child emotionally when the child faces fear, anxiety and depression.
(iv) Treat the mother with complete dignity and respect.