CBSE
Class XII Biology
Sample Paper - 8

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

General Instructions:

1. All questions are compulsory.
2. This question paper consists of five sections A, B, C and D. Section **A** contains **5** questions of **one** mark each, Section **B** is of **7** questions of **two** marks each, Section **C** is of **12** 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

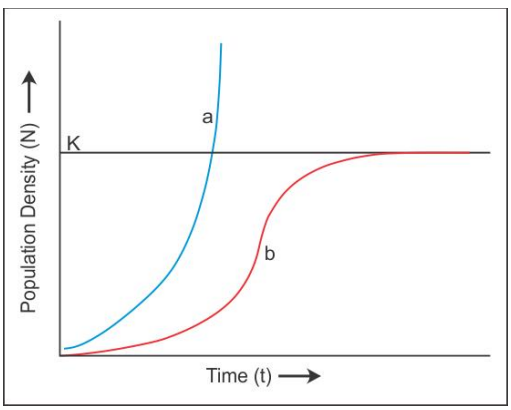
1. List two most common STDs. [1]

2. Give one important use of GMO. [1]

3. Why insulin was genetically engineered in bacteria? [1]

4. Mass extinction of species has been witnessed even before humans appeared on the Earth. Why is the extinction in progress presently considered predominantly different and alarming? [1]

5. In the absence of predators, which curve, (a) or (b), would appropriately depict the prey population? [1]



Section B

6. Why do you think the zygote is dominant for some time in a fertilised ovule? [2]

7. Briefly describe the 'origin of replication'. [2]

8. Distinguish between a leading strand and a lagging strand. [2]

9. What is the difference between function of primase and DNA polymerase? [2]

10. Where would you look for signs of secondary succession? When does secondary succession end? [2]

OR

Name the major greenhouse gases. What is their effect on the surface of the Earth?

11. Coconut palm is monoecious, while date palm is dioecious. Why are they called so?[2]

12. Name the group of organisms and the substrate they act on to produce biogas. [2]

Section C

13. What are chasmogamous flowers? Why does cross-pollination not occur in cleistogamous flowers? Give reasons for your answer. [3]

14. What changes occur in the uterus during (i) Menstruation (ii) Proliferative phase (iii) Secretory phase? [3]

15. Who are universal recipients and universal donors? Write their genotypes. [3]

16. Explain how condition XXY chromosomes can arise in humans. [3]

17.

(a) Rearrange the following in the ascending order of the evolutionary tree: Reptiles, salamander, lobefins and frogs

(b) Name two reproductive characters which probably make reptiles more successful than amphibians. [3]

18. Why is it generally difficult to transplant organs from one person to another? How is this difficulty now overcome? [3]

19. What is allergy? How are allergies related to the body's immune system? [3]

20.

(a) Differentiate between inbreeding and outbreeding.

(b) Explain inbreeding depression and how it can be overcome.

(c) Mention two advantages of the inbreeding programme in cattle. [3]

21. What are the uses of genetically modified plants? [3]

22. Draw a schematic sketch of the pBR322 plasmid and label the following:

(a) Any two restriction sites

(b) *Ori* and *rop* genes

(c) An antibiotic-resistant gene [3]

23. Give three important examples of commensalism. [3]

24. Why do we say energy flow in the biosphere is unidirectional? [3]

OR

What would happen to the successive trophic levels in the pyramid of energy, if the rate of reproduction of phytoplankton was slowed down? Suggest two factors which could cause such a reduction in phytoplankton reproduction.

Section D

25. How does the megaspore mother cell develop into a 7-celled, 8 nucleate embryo sac in an angiosperm? Draw a labelled diagram of a mature embryo sac. [5]

OR

What are the major functions of male accessory ducts and glands?

26. Give the salient features of the double helix structure of DNA. [5]

OR

State the aim and describe Meselson and Stahl's experiment.

27.

(a) What is plant breeding? List two steps involved in classical plant breeding.

(b) How has mutation breeding helped in improving crop varieties? Give one example where this technique has helped.

(c) How has the breeding programme helped in improving public nutritional health? State two examples in support of your answer. [5]

OR

(a) How are cancer cells different from normal cells?

(b) Pick the correct carcinogens from the following: Asbestos, infra red rays, arsenic, polythene, casein, caffeine, tobacco smoke, gamma rays

(c) Write three methods to detect cancer of internal organs.

CBSE
Class X Biology
Sample Paper – 8 (Solution)

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

Section A

1. AIDS and gonorrhoea

2. These are more tolerant to abiotic stresses.

3. Insulin from animal sources used to cause allergy and reactions in human beings, so it was genetically engineered in bacteria.

4. The present process of extinction is due to human intervention and is not gradual but is at alarmingly fast rates which are a threat to ecological balance and even human survival.

5. Curve 'a'.

Section B

6. The embryo of the seed is formed from the zygote at the micropylar end of the embryo sac. The zygote divides only after a certain amount of endosperm is formed. So, endosperm development precedes embryo development. This is an adaptation to provide assured nutrition to the developing embryo. Thus, the zygote is considered dominant for some time in a fertilised ovule.

7. It is the start point where DNA replication begins at a specific point where interwound DNA segments start unwinding. In prokaryotic cells, there is a single origin of replication, whereas in eukaryotic cells, there are numerous origins of replication.

8.

Leading strand	Lagging strand
i. It is synthesised continuously without any gap before the other strand. ii. It does not need ligase enzyme.	i. It is synthesised discontinuously in short fragments after the first strand. ii. It needs DNA ligase enzyme for joining Okazaki fragments.

9. Primase enzyme synthesises the primer during DNA replication. The DNA polymerase adds deoxyribonucleotides to the primer at the end in a sequence as influenced by the template.

10. The signs of secondary succession appear in an area where the primary or earlier community in an area was destroyed by forest fire, flood or cultivation. The secondary succession ends when it is occupied by dominant species to reach the climatic climax.

OR

Carbon dioxide and methane are greenhouse gases. These gases absorb the infrared radiation emitted from the Earth's surface and do not allow them to escape into space. The molecules of these gases radiate heat energy and thus raise the temperature of the Earth. In the absence of these gases, the average temperature at the surface of the Earth would have been a chilly −18°C rather than the present average of 15°C.

11. In coconut palm, both male and female flowers develop on the same individual. This condition is called monoecious. In date palm, the male and female flowers develop on separate individuals. This condition is called dioecious.

12. Name of the group of organisms-Methanogens
Substrate-Cellulosic material/cow dung/agricultural waste

Section C

13. Chasmogamous flowers are similar to flowers of other species with exposed anthers and stigma. Examples: Oxalis and Commelina. Cross- pollination does not occur in cleistogamous flowers because

(i) These flowers do not open at all.

(ii) The anthers and stigma lie close to each other. When the anthers dehisce in the flower buds, pollen grains come in contact with the stigma to affect pollination.

14.

(i) Changes in the uterus during menstruation: Endometrial lining and uterine epithelium glands slough off and bleeding occurs because of the rupture of blood vessels.

(ii) Changes in the uterus during the proliferative phase: Repairing of endometrial lining, increase in vascular supply, the endometrium enlarges; uterine glands become corkscrew shaped and uterine movement increases.

(iii) Changes in the uterus during the secretory phase: Hypertrophy of uterine endometrium for implantation, endometrial glands become complicated, active and corkscrew shaped.

15. People with blood group AB are called universal recipients.

AB blood does not cause clumping of corpuscles of any group, and so, the people with AB blood can receive blood from persons of all blood groups. AB blood contains both A and B type of antigens in the RBC but no antibodies in the plasma. Its genotype is represented as I^AI^B.

People with blood group O are called universal donors.

It is because they can give blood to all and can receive only from their own blood group. The O blood group lacks antigen in the RBC and is not clumped by the serum of any blood group. Its genotype is represented as I^OI^O or ii.

16. All human beings bear 23 pairs of chromosomes. The first 22 pairs of chromosomes are called autosomes and the last 23^{rd} pair is called the sex chromosome. In the human female, it is represented by XX. During gamete formation, at meiosis I, if the homologous sex chromosome does not get separated (non-disjunction), then the human female ova possesses 24 chromosomes (22 + XX) instead of normal (22 + X). When such an ovum is fertilised by a sperm containing Y chromosome (22 + Y), it results in offspring with (44 + XXY) chromosomes. This condition is known as Klinefelter's syndrome and is found only in males.

17.

(a) Lobefins < Frogs < Salamander < Reptiles

(b) Reptiles are more successful than amphibians because

(i) They show internal fertilisation.

(ii) Their eggs are thick-shelled which do not dry up in the Sun like those of amphibians.

(iii) Presence of amnion (embryonic membrane).

18. The transplanted organs are sometimes rejected because the immune system recognises the 'non-self' organ. The implanted organ acts as antigenic to the host, which reacts by the production of T effector lymphocytes. These invade the tissue surrounding the grafted organ and reject the graft. To avoid such rejections, drugs like immunosuppressants (heavy doses of cortisol and cyclosporine) are used.

19. Allergy is the hypersensitivity of the body to certain foreign substances. The allergy-causing substances are called allergens.

The allergic reaction in the body is related with the immune system of the body. When the immune system of the body is weak, sufficient antibodies (IgE) are produced in response to the entry of antigen (allergens, mites in dust, pollen and animal dander). The allergens then combine with the mast cells and cause their bursting. A sufficient quantity of histamine and serotonin is released with the mast cells resulting in inflammatory response. The use of drugs such as anti-histamine, adrenalin and steroids quickly reduce the symptoms of allergy.

20.

(a)

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.

(b) Continued inbreeding usually reduces the fertility of animals and even their productivity. This condition is called inbreeding depression. It can be overcome by mating them with unrelated superior animals of the same breed. Such type of mating usually helps restore fertility and yield.

(c) Advantages of inbreeding:

i. It helps in the accumulation of superior genes and elimination of undesirable genes.

ii. It develops a homozygous pureline in an animal; thus, it increases homozygosity to evolve a pureline in any animal.

iii. It exposes harmful recessive genes for undesirable characters which are eliminated by selection.

21. Genetic modification in plants:

(i) Makes crops more tolerant to abiotic stresses

(ii) Reduces dependency on chemical pesticides

(iii) Helps reduce post-harvest losses

(iv) Increases the efficiency of mineral usage by plants

(v) Enhances the nutritional value of food, e.g. vitamin A-enriched rice

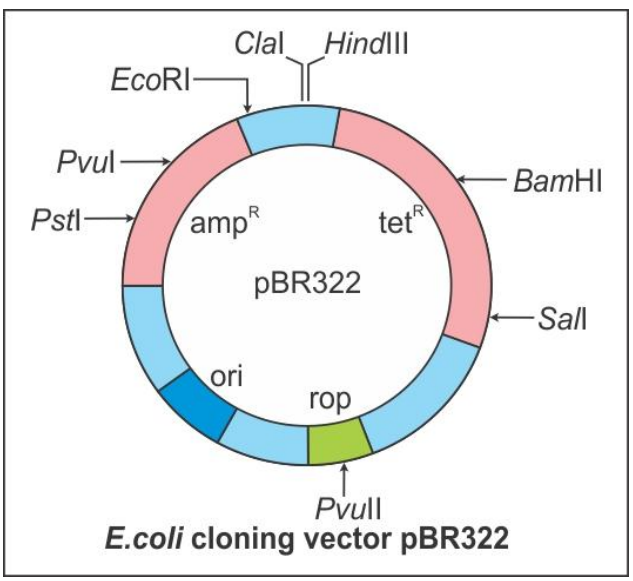
(Any three points)

22.

(a) Two restriction sites: BamHI and PvuII

(b) *Ori* and *rop* genes: *Ori* is the origin of replication. *Rop* codes for the proteins involved in the replication of the plasmid.

(c) Antibiotic-resistant genes: amp^R and tet^R



***E.coli* cloning vector pBR322**

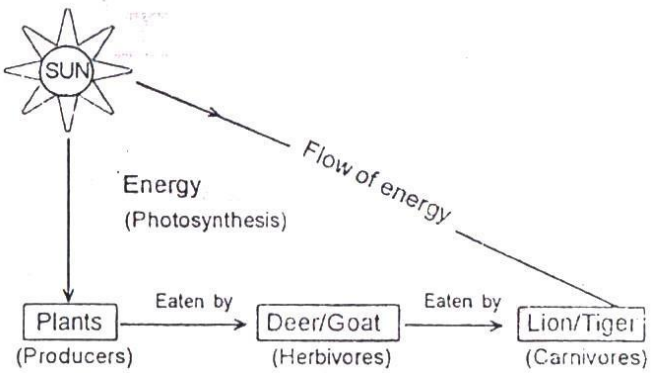
23.

(i) An orchid plant growing on a mango branch and barnacles growing on the back of a whale are examples of commensalism. In these interactions, neither the mango nor the whale derives any benefit.

(ii) The egret always moves closely with the cattle in the grazing field. As the cattle move, the insects stir up and flush out from the grass and the egret easily catches these insects for its feed. So, in this interaction, the egret is benefited and the cattle are neither benefited nor harmed.

(iii) The sea anemone has stinging tentacles and the clown fish lives among them. The fish gets protection from predators because of the stinging tentacles of the sea anemone. The sea anemone does not get any benefit by hosting the clown fish.

24. The main source of energy in the biosphere is the Sun. During photosynthesis, solar energy is converted to chemical energy in plants. Plants are consumed by herbivores, and chemical energy of plants is partially transferred to herbivores. Carnivores consume herbivores; thereby the chemical energy of herbivores is transferred to the carnivores. Thus, we can say that the flow of energy in the biosphere is unidirectional.



OR

If the rate of reproduction of phytoplankton slows down, then the net primary productivity decreases. As a result, the flow of energy will also decrease in the successive trophic level.

The two factors which cause a reduction in phytoplankton reproduction are

(a) Less water availability

(b) Less nutrient availability

Section D

25.

(i) The functional megaspore enlarges and undergoes three free nuclear mitotic divisions. The first division produces a binucleate embryo sac.

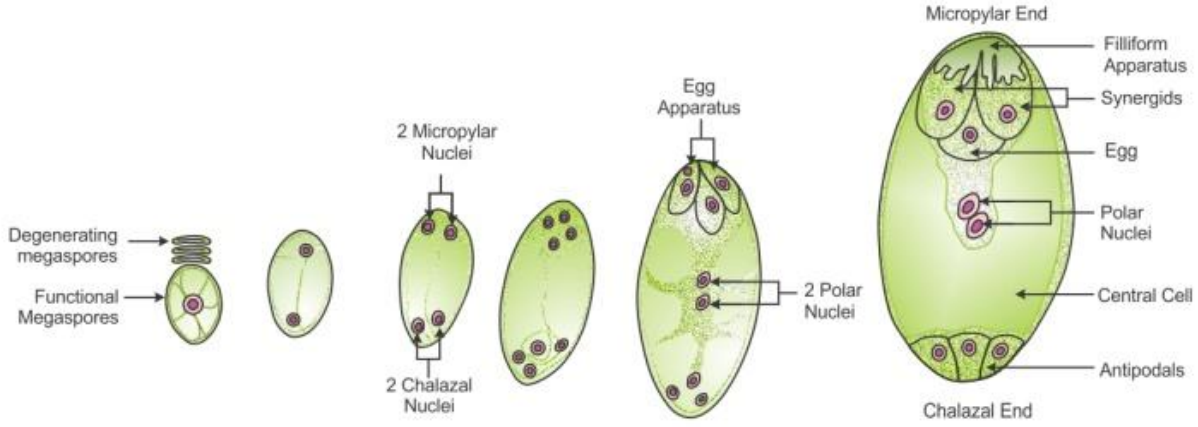
(ii) The two nuclei shift to the two ends and divide there twice forming a four nucleate and then an eight nucleate structure.

(iii) One nucleus from each side moves to the middle. These are called polar nuclei. The remaining three nuclei form cells at the two ends, 3-celled egg apparatus at the micropylar end and three antipodal cells at the chalazal end.

(iv) The egg apparatus consists of two synergids and one egg cell.

(v) The synergids have special cellular thickenings at the micropylar tip called filiform apparatus which play an important role in guiding the pollen tubes into the synergid.

(vi) Thus, at maturity, a typical angiosperm embryo sac is 8-nucleate but 7-celled.



OR

(i) Seminal vesicles: These are paired, tubular, club-shaped structures situated just above the prostate gland and near the base of the urinary bladder and at the interior of the rectum. The ducts from the seminal vesicles join the posterior part of the vas deferens and form the common ejaculatory duct. The seminal vesicles secrete clear alkaline, yellowish, viscous fluid and contain globulin, citrate, inositol, fructose and flavins. Fructose provides energy to facilitate the motility of sperms after ejaculation and flavin gives semen a strong fluorescence in UV light. The secretion of seminal vesicles constitutes about 60% of the ejaculate.

(ii) Prostate gland: It is the largest auxiliary gland with chestnut-like shape situated around the 1st part of the urethra below the urinary bladder. It is surrounded by a thin and dense capsule of fibrous connective tissue and muscle fibres which provides firm palpation to it. It secretes milky, thin and alkaline fluid containing citric acid, bicarbonate ions, lipids and acid phosphatase which gives

characteristic seminal odour and alkalinity to the ejaculate. It increases the motility of the sperms and neutralises the acidity of urine. It constitutes about 5–30% of the ejaculate.

(iii) Cowper's glands (Bulbourethral glands): These are paired glands situated beneath the bladder and on each side of the urethra into which their ducts open. They are about the size of a pea seed and form the floor of the pelvis. They secrete clear, white, viscous, alkaline, mucoid lubricant which neutralise the activity of the acidic female vaginal secretions and increase the mobility and survival potentiality of sperms in the genital tract of females.

26. Features of the double helix structure of DNA:

(i) It is made of two polynucleotide chains where the backbone is constituted by sugar-phosphate and the base project inside.

(ii) The two chains run in antiparallel directions. One chain has the polarity 5′–3′ and the other has 3′–5′.

(iii) The bases in the two strands are paired through hydrogen bonds (H bonds). Adenine forms two hydrogen bonds with thymine from the opposite strand and *vice versa*. Similarly, guanine is bonded with cytosine with three H bonds.

(iv) The two chains are coiled in a right-handed fashion. The pitch of the helix is 3.4 nm and these are roughly ten base pairs in each turn. The distance between a bp in a helix is approximately equal to 0.34 nm.

(v) The plane of one base pair stacks over the other in the double helix. Thus, H bonds confer stability to the helical structure.

OR

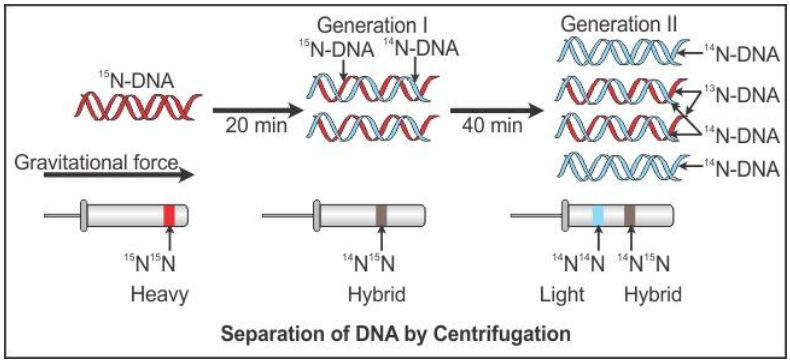
In 1958, the aim of Matthew Meselson and Franklin Stahl was to prove that DNA replicates in a semi-conservative way. The DNA consists of two helices which are combined. When the two helices are copied, each will have one part coming from the original (parental) cell. The other part will be newly made.

Experimental procedure:

(i) *E. coli* was grown for several generations in a medium with $^{15}NH_4Cl$. As a result, ^{15}N was incorporated into newly synthesised DNA. This DNA could be distinguished by centrifugation in CsCl density gradient.

(ii) These *E. coli* cells are then transferred to normal $^{14}NH_4Cl$ medium and the DNA was extracted as a double-stranded helix. The various samples were separated independently on CsCl gradients to measure the density of DNA.

(iii) DNA extracted from the culture after another generation (second generation) was composed of equal amounts of hybrid and light DNA.



Separation of DNA by Centrifugation

27.

(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. They cause changes in 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 a 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, which is having 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.

OR

(a)

Cancer Cells	Normal Cells
i. They do not undergo differentiation.	i. They undergo differentiation.
ii. They undergo uncontrolled divisions.	ii. Cell divisions are regulated.
iii. These cells do not require extracellular growth factors.	iii. These cells require extracellular growth factors.
iv. Cells do not remain adhered.	iv. Cells remain adhered to one

v. Cell death is inhibited. vi. These tend to form tumours.	another. v. Cells have a finite lifespan. vi. Tumours are not formed.

(b) The carcinogens are asbestos, gamma rays, tobacco smoke and arsenic.

(c) Detection and diagnosis of cancer depend on histological features of the malignant structure. Various methods used to detect cancer of the internal organs are

(i) Biopsy of the bone marrow and the abnormal count of WBCs are used to detect leukaemia.

(ii) The Pap test is used to detect cervical cancer or cancer of the genital tract.

(iii) Radiography, CT scanning and magnetic resonance imaging are useful techniques to detect cancer of internal organs.