CBSE Sample Paper -03 (solved)
Class 12 Biology

General Instructions:

(i) All questions are compulsory.

(ii) This question paper consists of four Sections A, B, C and D. Section A contains 5 questions of one mark each, Section B is of 5 questions of two marks each, Section C is of 12 questions of three marks each and 1 question of four mark and Section D is of 3 questions of five marks each.

(iii) 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.

(iv) Wherever necessary, the diagrams drawn should be neat and properly labelled.

Section A

1. What is the Ploidy of PEN ?
2. What are explants?
3. What were the primitive earth conditions created by Miller?
4. A tourist at very high altitude feels nausea, fatigue and Heart palpitations. Name the disorder by which he is suffering?
5. Expand MOET

Section B

6. Name the diseases diagnosed by (a) WIDAL test (b)ELISA test.
7. Why is genetic code termed as Degenerate?
8. What is meant by meristem culture?

OR

What are histones?

9. Complete the steps for separation and isolation of DNA fragments.
   a. DNA fragment separates in matrix of.....
   b. DNA fragments are stained with.....
   c. DNA fragments are viewed under.....
   d. Fragments are extruded from gel piece. This is called.....
10. How do bio-fertilizers enrich the fertility of soil? Explain giving examples.

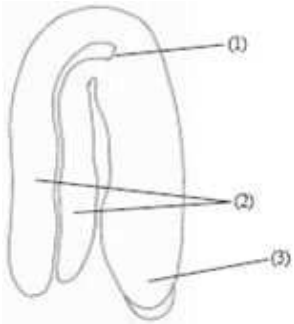
Section C

11. According to Hardy-Weinberg's principle the allele frequency of a population remains constant. If frequency of dominant allele is 0.6 than give frequency of heterozygous population

12. Expand MTP. Why are MTPs carried out?

OR

State the function of each of the labelled part.



13. What is meant by 'charging of tRNA? Why does a tRNA have to be charged with an amino acid?

14. What is meant by ozone shield? Name ozone depleting substances. How do the ozone depleting substances affect the ozone shield? Write two damaging effect of ozone-depletion on humans.

15. What is the basic principle of vaccination? How do vaccines prevent microbial infections? Name the organism from which hepatitis B vaccine is produced.

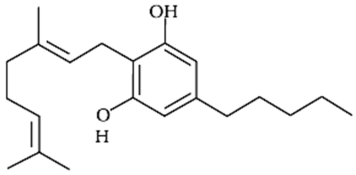
16. Three Codons on mRNA are not recognized by t RNA. What are they? What is the general term used for them? What is their role in protein synthesis?

17. In peas, tallness is dominant over dwarfness, and red colour of flowers is dominant over the white colour. When a tall plant bearing red flowers was pollinated by a dwarf plant bearing white flowers, the different phenotypic groups were obtained in the progeny in numbers mentioned against them.

    Mention the genotypes of the two parents and of the types of four offspring.

18. How BOD is related to water pollution?

19. Identify the chemical structure. Give the scientific name of the plant from which it is obtained. Which two plant parts are used to extract this compound? Name the body system most affected by this compound.



20. What are the complexities involved in transcription of eukaryotic DNA?
21. Diagrammatically represent the genetic basis of blood group inheritance.
22. What are the factors that contribute to Population density?
23. **On world population day Aman and his friends arranged an awareness campaign Programme in their locality. Some narrow minded people rebuked the children and asked them not to talk on such things in public. The children convinced the elders about the need for the programme and on understanding their point of view, they also joined the campaign.**

    a) What values did the elderly people and Aman show on the occasion?

    b) Why is such awareness programme necessary?

    c) What role has the government played in controlling population explosion?

Section D

24. When does the secondary oocyte become an ovum?

OR

Write a detailed note on male gametophyte of plants. Illustrate.

25. What is integrated organic farming

OR

Who demonstrated the semi-conservative replication of DNA? Explain the procedure in detail.

26. Explain the five population interactions.

OR

Describe the different causes of Biodiversity Loss.

CBSE Sample Paper -03 (solved)

Class 12 Biology

ANSWERS

Section A

1. 3n.
2. Any part of a plant taken out and grown in a test tube, under sterile conditions in special nutrient media.
3. High temperature, volcanic storms, reducing atmosphere containing CH_4, NH_3.
4. Altitude sickness.
5. Multiple ovulation embryo transfer technology.

Section B

6.
   a. Widal test - typhoid.
   b. ELISA test - AIDS.
7. Some amino acids are coded by more than one codon, hence the code is degenerate.
8. Although the plant is infected with a virus, the meristem (apical and axillary) is free of virus. Hence, one can remove the meristem and grow it *in vitro* to obtain virus-free plants. Scientists have succeeded in culturing meristem of banana, sugarcane, potato, etc.

   OR

   Histones are positively charged, basic proteins. They organize to form a unit of eight molecules called as histone octamer. The negatively charged DNA is wrapped around the positively charged histone octamer to form a structure called nucleosome.
9.
   a. DNA fragment separates in matrix of **agarose.**
   b. DNA fragments are stained with **ethidium bromide.**
   c. DNA fragments are viewed under **UV light.**
   d. Fragments are extruded from gel piece. This is called **elution.**
10. Biofertilisers are organisms that enrich the nutrient quality of the soil. The main sources of biofertilisers are bacteria, fungi and cyanobacteria.

Bacteria form nodules on the roots of leguminous plants formed by the symbiotic association of Rhizobium. These bacteria fix atmospheric nitrogen into organic forms, which is used by the plant as nutrient. Other bacteria can fix atmospheric nitrogen while free-living in the soil (examples Azospirillum and Azotobacter), thus enriching the nitrogen content of the soil.

Section C

11. Frequency of dominant allele 'p' is 0.6

Therefore that of recessive allele 'q' will be 0.4

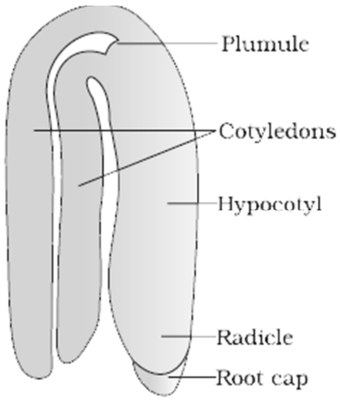
Because, p + q = 1

Therefore, the frequency of heterozygous population will be 2pq.

2 x 0.6 x 0.4 = 0.48.

12. Intentional or voluntary termination of pregnancy before full term is called medical termination of pregnancy (MTP) or induced abortion. They are carried out to get rid of unwanted pregnancies either due to casual unprotected intercourse or failure of the contraceptive used during coitus or rapes. MTPs are also essential in certain cases where continuation of the pregnancy could be harmful or even fatal either to the mother or to the foetus or both.

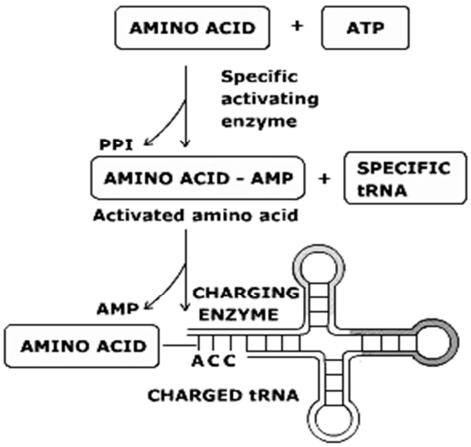
OR



This is the T.S of a dicot embryo.

a. Is the Plumule which is the first stem.
b. Are cotyledons which are the first leaves.
c. Is radicle which is the first root.

13. Amino acids are activated in the presence of ATP and linked to their cognate tRNA–a process commonly called as charging of tRNA or aminoacylation of tRNA . if two such charged tRNAs are brought close enough, the formation of peptide bond between them would be favored energetically. This helps in translation or the formation of proteins.



14. Ozone shield is found in the upper part of the atmosphere called the stratosphere, and it acts as a shield absorbing ultraviolet radiation from the sun. UV rays are highly injurious to living organisms since DNA and proteins of living organisms preferentially absorb UV rays, and its high energy breaks the chemical bonds within these molecules.

    Ozone is being depleted by chlorofluorocarbons (CFCs). CFCs find wide use as refrigerants. CFCs discharged in the lower part of atmosphere move upward and reach stratosphere. In stratosphere, UV rays act on them releasing Cl atoms. Cl degrades ozone releasing molecular oxygen, with these atoms acting merely as catalysts; Cl atoms are not consumed in the reaction.

    UV radiation of wavelengths shorter than UV-B, are almost completely absorbed by Earth's atmosphere, given that the ozone layer is intact. But, UV-B damages DNA and mutation may occur. It causes aging of skin, damage to skin cells and various types of skin cancers. In human eye, cornea absorbs UV-B radiation, and a high dose of UV-B causes inflammation of cornea, called snow-blindness, cataract, etc. Such exposure may permanently damage the cornea.

15. The principle of immunization or vaccination is based on the property of 'memory' of the immune system. In vaccination, a preparation of antigenic proteins of pathogen or inactivated/weakened pathogen (vaccine) is introduced into the body. The antibodies produced in the body against these antigens would neutralise the pathogenic agents during actual infection. The vaccines also generate memory – B and T-cells that recognize the pathogen quickly on subsequent exposure and overwhelm the invaders with a massive production of antibodies. If a person is infected with some deadly microbes to which quick

immune response is required as in tetanus, we need to directly inject the preformed antibodies, or antitoxin (a preparation containing antibodies to the toxin).

Hepatitis B vaccine is produced from yeast.

16. The three codons not recognized by t-RNA are

    a. UAA

    b. UGA and

    c. UAG.

    They are called stop codons.

    They are involved in termination of protein synthesis.

17. Tall, Red = 138

    Tall, White = 132

    Dwarf, Red = 136

    Dwarf, White = 128

    Since the numbers obtained are In a ratio of 1 :1:1: 1, it is a dihybrid test cross involving a Cross between the heterozygous and recessive parents.

    The genotypes of the parents are TtRr and ttrr.

    And the genotypes of the offspring are TtRr, Ttrr, ttRr, ttrr.

18. The amount of biodegradable organic matter in sewage water is estimated by measuring Biochemical Oxygen Demand (BOD). BOD refers to the amount of the oxygen that would be consumed if all the organic matter in one liter of water were oxidised by bacteria. The sewage water is treated till the BOD is reduced. The BOD test measures the rate of uptake of oxygen by micro-organisms in a sample of water and thus, indirectly, BOD is a measure of the organic matter present in the water. The greater the BOD of waste water more is its polluting potential.

19. This is the skeletal structure of cannabinoid.

    Natural cannabinoids are obtained from the inflorescences of the plant Cannabis sativa. The flower tops, leaves and the resin of cannabis plant are used in various combinations to produce marijuana, hashish, charas and ganja. Generally taken by inhalation and oral ingestion, these are known for their effects on cardiovascular system of the body.

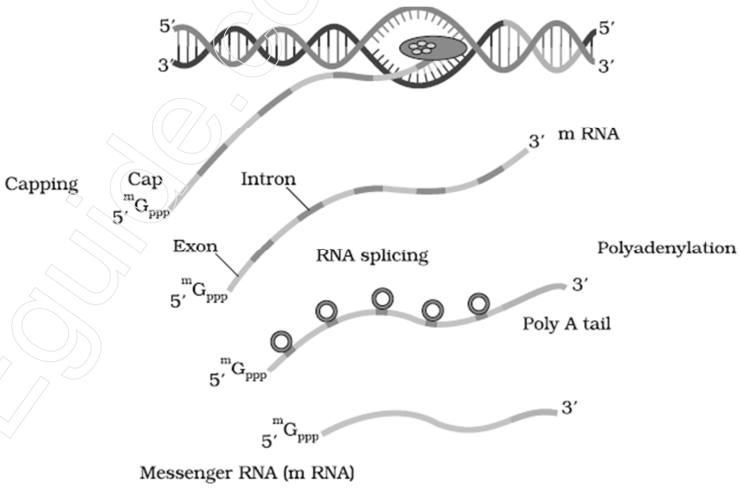
20. Transcription of eukaryotic DNA

a) There are at least three RNA polymerases in the nucleus (in addition to the RNA polymerase found in the organelles)

The RNA polymerase I transcribes rRNAs (28S, 18S, and 5.8S), whereas the RNA polymerase II transcribes precursor of mRNA, the heterogeneous nuclear RNA (hnRNA). RNA polymerase III is responsible for transcription of tRNA, 5srRNA, and snRNAs (small nuclear RNAs).

b) The primary transcripts contain both the exons and the introns and are non-functional. Hence, it is subjected to a process called splicing where the introns are removed and exons are joined in a defined order.

c) hnRNA undergoes additional processing called as capping and tailing. In capping an unusual nucleotide (methyl guanosine triphosphate) is added to the 5′-end of hnRNA. In tailing, adenylate residues (200-300) are added at 3′-end in a template independent manner. It is the fully processed hnRNA, now called mRNA, that is transported out of the nucleus for translation.



21. The genetic basis of blood group inheritance.

Allele from Parent 1	Allele from Parent 2	Genotype of offspring	Blood types of offspring
I^A	I^A	$I^A I^A$	A
I^A	I^B	$I^A I^B$	AB
I^A	i	$I^A i$	A
I^B	I^A	$I^A I^B$	AB
I^B	I^B	$I^B I^B$	B
I^B	i	$I^B i$	B
i	i	$i\,i$	O

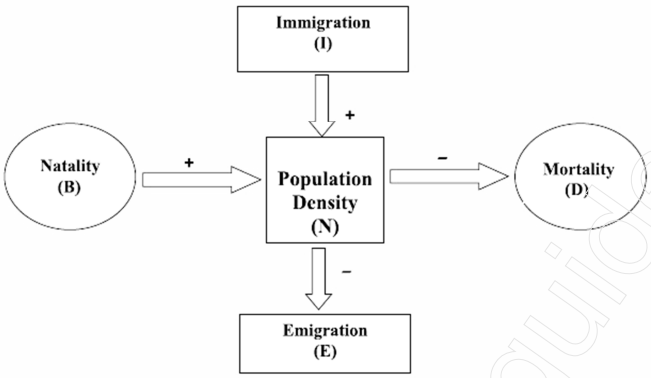
22. The density of a population in a given habitat during a given period, fluctuates due to changes in four basic processes,

(i) ***Natality*** refers to the number of births during a given period in the population that are added to the initial density.

(ii) ***Mortality*** is the number of deaths in the population during a given period.

(iii) ***Immigration*** is the number of individuals of the same species that have come into the habitat from elsewhere during the time period under consideration.

(iv) ***Emigration*** is the number of individuals of the population who left the habitat and gone elsewhere during the time period under consideration.



23.

a. Aman and his friends show understanding of population explosion, team work and motivational capacity.

b. To understand the problem faced by the family and the nation due to increasing population, simultaneously the benefits of having a small family.

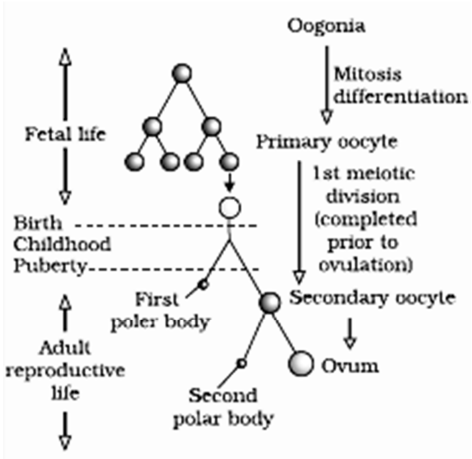
c. i) Public awareness through mass media.
ii) Education at all levels
iii) Family planning
iv) Increasing marriageable age (18 for girls, 21 for boys)

Section D

24. The process of formation of a mature female gamete is called oogenesis.

- Oogenesis is initiated during the embryonic development stage when a couple of million gamete mother cells (oogonia) are formed within each fetal ovary.

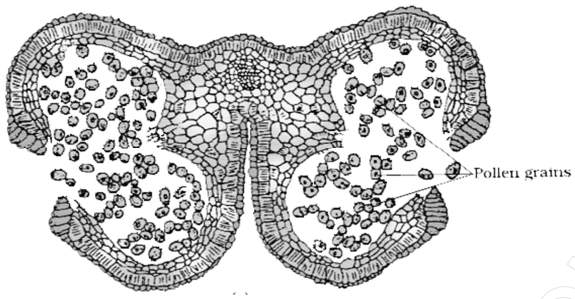
- These cells start division and enter into prophase-I of the meiotic division and get temporarily arrested at that stage, called primary oocytes. Each primary oocyte then gets surrounded by a layer of granulosa cells and is called the primary follicle. A large number of these follicles degenerate during the phase from birth to puberty.
- The primary follicles get surrounded by more layers of granulosa cells and a new theca and are called secondary follicles.
- The secondary follicle soon transforms into a tertiary follicle which is characterised by a fluid filled cavity called antrum. The theca layer is organised into an inner theca interna and an outer theca externa. It is at this stage that the primary oocyte within the tertiary follicle grows in size and completes its first meiotic division. It is an unequal division resulting in the formation of a large haploid secondary oocyte and a tiny first polar body. The secondary oocyte retains bulk of the nutrient rich cytoplasm of the primary oocyte. The tertiary follicle further changes into the mature follicle or Graafian follicle .The secondary oocyte forms a new membrane called zona pellucid surrounding it. The Graafian follicle now ruptures to release the secondary oocyte (ovum) from the ovary by the process called ovulation.
- The process of fusion of a sperm with an ovum is called fertilisation.

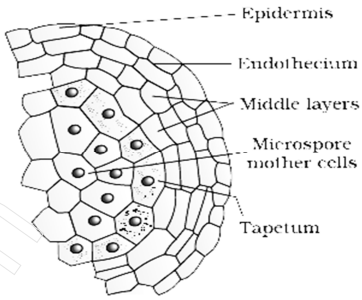


- During fertilisation, a sperm comes in contact with the *zona pellucida* layer of the ovum and induces changes in the membrane that block the entry of additional sperms. The secretions of the acrosome help the sperm enter into the cytoplasm of the ovum through the zona pellucida and the plasma membrane. This induces the completion of the meiotic division of the secondary oocyte. The second meiotic division is also unequal and results in the formation of a second polar body and a haploid ovum (ootid). Soon the haploid nucleus of the sperms and that of the ovum fuse together to form a diploid zygote.

OR

As the anther develops, the cells of the sporogenous tissue undergo meiotic divisions to form microspore tetrads. As each cell of the sporogenous tissue is capable of giving rise to a microspore tetrad. Each one is a potential pollen or microspore mother cell (PMC). The process of formation of microspores from a pollen mother cell through meiosis is called microsporogenes is. The microspores, as they are formed, are arranged in a cluster of four cells–the microspore tetrad. As the anthers mature and dehydrate, the microspores dissociate from each other and develop into pollen grains. Inside each microsporangium several thousands of microspores or pollen grains are formed that are released with the dehiscence of anther.





25. Integrated organic farming is a cyclical, zero-waste procedure, where waste products from one process are cycled in as nutrients for other processes. This allows the maximum utilization of resource and increases the efficiency of production. It includes bee-keeping, dairy management, water harvesting, composting and agriculture in a chain of processes, which support each other and allow an extremely economical and sustainable venture. There is no need to use chemical fertilizers for crops, as cattle excreta (dung) are used as manure. Crop waste is used to create compost, which can be used as a natural fertilizer or can be used to generate natural gas for satisfying the energy needs of the farm.

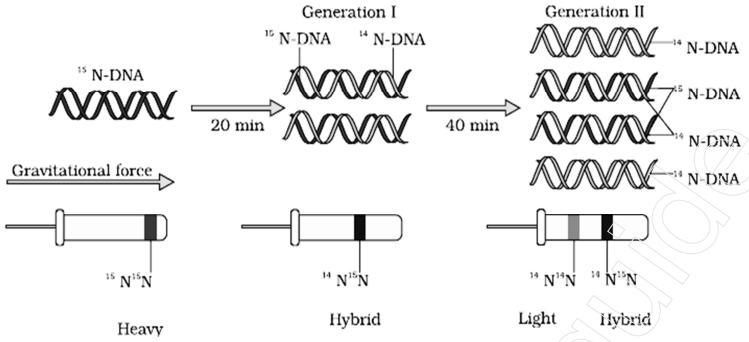
OR

DNA replicates semiconservatively. It was shown first in Escherichia coli and subsequently in higher organisms, such as plants and human cells. Meselson and Stahl proved the semi conservative replication

(i) They grew E. coli in a medium containing 15NH4Cl (15N is the heavy isotope of nitrogen) as the only nitrogen source for many generations. The result was that 15N was incorporated into newly synthesised DNA (as well as other nitrogen containing compounds). This heavy DNA molecule could be distinguished from the normal DNA by centrifugation in a cesium chloride (CsCl) density gradient.

(ii) Then they transferred the cells into a medium with normal 14NH4Cl and took samples at various definite time intervals as the cells multiplied, and extracted the DNA that remained as double-stranded helices. The various samples were separated independently on CsCl gradients to measure the densities of DNA.

(iii) The DNA that was extracted from the culture one generation after the transfer from 15N to 14N medium [that is after 20 minutes; E. coli divides in 20 minutes] had a hybrid or intermediate density. DNA extracted from the culture after another generation [that is after 40 minutes, II generation] was composed of equal amounts of this hybrid DNA and of 'light' DNA..



26. Interspecific interactions arise from the interaction of populations of two different species. They could be beneficial, detrimental or neutral (neither harm nor benefit) to one of the species or both. Assigning a '+' sign for beneficial interaction, '-' sign for detrimental and 0 for neutral interaction, the possible outcomes of interspecific interactions are

Species A	Species B	Name of Interaction
+	+	Mutualism
-	-	Competition
+	-	Predation
+	0	Parasitism
+	0	Commensalism
-	0	Amensalism

The interspecific relationships may be broadly classified as:

a. Symbiosis: In symbiosis, either both or one of the species of population is benefited while none is harmed. Symbiosis may further be classified into commensalism, protocooperation and mutualism.

b. Commensalism: The association of two or more populations which live together, but donot enter into any kind of physiological exchange, and in which only one of the populations called commensal is benefited while the other, host is not effected is called commensalism. Sea anemone that has stinging tentacles and the clown fish that lives among them. The fish gets protection from predators which stay away from the stinging tentacles. The anemone does not appear to derive any benefit by hosting the clown fish.

c. Mutualism: Association of two populations in which there occurs a close and often permanent and obligatory contact, and where both the populations are benefited. Here each population is completely dependent upon the other.

d. Antagonism: In antagonism, one species is benefited at the cost of the other i.e. one species is generally harmed. Antagonism may further be classified into amensalism, parasitism, predation and competition.

e. Amensalism: The relationship between the two populations, in which one population inhibits the other while remaining unaffected itself, is called as amensalism.

f. Parasitism: An association between two animals which live together, in which one derives its nourishment at the expense of the other is called as parasitism. lice on humans and ticks on dogs.

g. Predation: Predation represents a direct and often complex interaction of two or more species, of the eaters and the being eaten.

h. Competition: When two species in the same community require the same resources as food, shelter, light etc., which are in short supply in relation to the number seeking it, or interact in such a way that it affects their growth and survival, they are said to be in competition with each other. on the rocky sea coasts of Scotland, the larger and competitively superior barnacle Balanus dominates the intertidal area, and excludes the smaller barnacle Chathamalus from that zone. In general, herbivores and plants appear to be more adversely affected by competition than carnivores.

i. Neutralism: In neutralism none of the two populations which are in interaction with each other is affected.

OR

There are four major causes are.

(i) Habitat loss and fragmentation: This is the most important cause driving animals and plants to extinction. The most dramatic examples of habitat loss come from tropical rain forests. The Amazon rain forest (it is so huge that it is called the 'lungs of the planet') harbouring probably millions of species is being cut and cleared for cultivating soya beans or for conversion to grasslands for raising beef cattle. Besides total loss, the degradation of many habitats by pollution also threatens the survival of many species. When large habitats are broken up into small fragments due to various human activities, mammals and birds requiring large territories and certain animals with migratory habits are badly affected, leading to population declines.

(ii) Over-exploitation: Humans have always depended on nature for food and shelter, but when 'need' turns to 'greed', it leads to over-exploitation of natural resources. Presently many marine fish populations around the world are over harvested, endangering the continued existence of some commercially important species.

(iii) Alien species invasions: When alien species are introduced unintentionally or deliberately for whatever purpose, some of them turn invasive, and cause decline or extinction of indigenous species. The Nile perch introduced into Lake Victoria in east Africa led eventually to the extinction of an ecologically unique assemblage of more than 200 species of cichlid fish in the lake.

(iv) Co-extinctions: When a species becomes extinct, the plant and animal species associated with it in an obligatory way also become extinct. When a host fish species becomes extinct, its unique assemblage of parasites also meets the same fate. Another example is the case of a coevolved plant-pollinator mutualism where extinction of one invariably leads to the extinction of the other.