Previous Year Question Paper 2020

- Please check that this question paper contains **11** printed pages.
- Code number given on the right-hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains **30** questions.
- **Please write down the Serial Number of the question before attempting it.**
- 15 minutes of time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the student will read the question paper only and will not write any answer on the answer script during this period.

BIOLOGY (Theory)

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

General Instructions:

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. Cleistogamous flowers are self -pollinate because **1 Mark**

A. they are bisexual flowers which do not open at all.

B. they are bisexual and open flowers.

C. they are unisexual.

D. their stigma matures before the anthers dehisce.

Ans: They are bisexual flowers that do not open at all.

Or

Asexual reproduction by zoospores is observed in

A. Penicillium

B. Hydra

C. Sponge

D. Chlamydomonas

Ans: Chlamydomonas

2. The theory of evolution supported by the experiment conducted by Louis Pasteur is **1 Mark**

A. Spontaneous generation theory

B. Life comes only from pre -existing life

C. Abiogenesis of life

D. Big bang theory

Ans: Spontaneous generation theory

3. The diagnostic test that confirms typhoid in humans is **1 Mark**

A. ELISA

B. Widal

C. MRI

D. Amniocentesis

Ans: Widal

4. The bioactive molecule used as an immunosuppressive agent during organ transplant is **1 Mark**

A. Tetracycline

B. Cyclosporin -A

C. Statin

D. Streptomycin

Ans: Cyclosporin-A

Or

'Blue revolution' refers to

A. construction of water dams for conservation of water

B. production of fish in large quantities

C. sewage treatment

D. controlling algal bloom

Ans: production of fish in large quantities

5. Which one of the following is not the product of transgenic experiments? **1 Mark**

A. Pest-resistant crop variety

B. High nutritional value in grains

C. Production of insulin by rDNA technique

D. Drought -resistant crops

Ans: Production of insulin by rDNA technique

SECTION - B

6. Write the ploidy and number of chromosomes in human (a) meiocytes, and (b) gametes. 2 Marks

Ans: The number of chromosomes in a cell is measured by ploidy. Chromosomes are threadlike structures that contain DNA, which is the genetic material.

a) (Meiocytes) 2n, = 46

b) (Gametes) n, = 23

7. What is aneuploidy? Name a chromosomal disorder in humans caused due to (a) gain of an autosome, and (b) loss of a sex chromosome in females.

2 Marks

Ans: Aneuploidy is the presence of an abnormal number of chromosomes in a cell, such as 45 or 47 instead of 46 in a human cell. It does not include a difference in one or more complete sets of chromosomes. A euploid cell has any number of complete chromosome sets.

1. Turner's syndrome

2. Down's syndrome

8. State a functional difference between the following codons: 2 Marks

a) AUG and UAA

Ans:

AUG	UAA
It is Start codon	It is Stop codon
Initiator codon	Terminator Codon

b) Specific and Degenerate

Ans:

Specific	Degenerate
A codon that codes for only one amino acid.	A codon that codes for more than one amino acid.
Only one codon	More than one codon

9. **(a)** Identify any two marsupials from the list given below : **2 Marks**

i. Lemur

ii. Spotted cuscus

iii. Flying phalanger

iv. Bobcat

v. Tasmanian wolf

vi. Mole

Ans: A marsupial is any mammalian infraclass belonging to the Marsupialia order. All extant marsupials live in Australasia and the Americas. Flying phalanger and Tasmanian wolf are marsupials, according to the above list.

(b) ‘‘Australian marsupials exhibit adaptive radiation.’’ Justify the statement.

Ans: Any member of the mammalian infraclass Marsupialia is referred to as a marsupial. Australasia and the Americas are home to all extant marsupials. Because Australian marsupials are descended from a common ancestor, they are all found on the Australian island continent.

10. **Name the type of immunity the mother provides the newborn baby. How does it happen?** **2 Marks**

Ans: Passive immunity is present when a baby is born. Passive immunity is created when antibodies produced by another person are transferred to another person. Passive immunity protects for a short period, usually a few weeks or months. Because mother's milk contains yellowish fluid colostrum, which provides antibodies Ig A to protect the infant.

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

2 Marks

Ans: The lymphatic system, also known as the lymphoid system, is a part of the circulatory and immune systems invertebrates. A large network of lymph, lymphatic vessels, lymph nodes, lymphatic or lymphoid organs, and lymphoid tissues make up the lymphatic system. The bone marrow and the thymus are examples of primary lymphoid organs. They produce lymphocytes, which are immune system cells.

Importance of T-lymphocytes:

(a) They aid B-cells in the production of antibodies

(b) They are responsible for graft rejection.

12. How are malignant tumors different from benign tumors? Why are some patients treated with α-interferons? 2 Marks

Ans:

(a) When cells grow and divide more than they should or do not die when they should, an abnormal mass of tissue forms. Tumors can be benign (non-cancerous) or malignant (cancerous). Benign tumors can grow to be quite large, but they do not spread to nearby tissues or other parts of the body.

(b) Tumors can range in size from a small nodule to a large mass, and they can appear almost anywhere on the body, depending on the type. Benign tumors stay put and don't spread to other parts of the body, whereas malignant tumors multiply and spread to other parts of the body. Malignant tumors are more harmful and cause serious damage. Benign tumors cause little damage. Because it is a biological response modifier that activates the immune system, some patients are treated with alpha - interferons.

Or

Name the hormone with which a cow is administered using MOET technology. State the function of this hormone. 2 Marks

Ans: MOET (Multiple Ovulation Embryo Transfer Technology) is a technique in which an animal's multiple eggs are fertilized and the embryo is harvested on the seventh day without surgery. It is a traditional method of producing embryos in cattle that is still used today. the hormone with which a cow is administered using MOET Technology Follicular Stimulating Hormone.

Functions of FSH:

(a) FSH aids in the regulation of the menstrual cycle in women and stimulates the production of eggs in the ovaries. Women's FSH levels fluctuate

throughout the menstrual cycle, with the highest levels occurring just before the ovary releases an egg. This is referred to as ovulation.

(b) FSH aids in the regulation of sperm production in men. FSH levels in men do not fluctuate much in most cases.

(c) FSH levels in children are typically low until puberty when they begin to rise. It aids in the production of estrogen by the ovaries in females. It aids the signaling of the testes to produce testosterone in boys.

SECTION - C

13. Draw a longitudinal section of the pistil from a flowering plant, where pollination has occurred. Label the following :

(a) Stigma showing germinating pollen grains

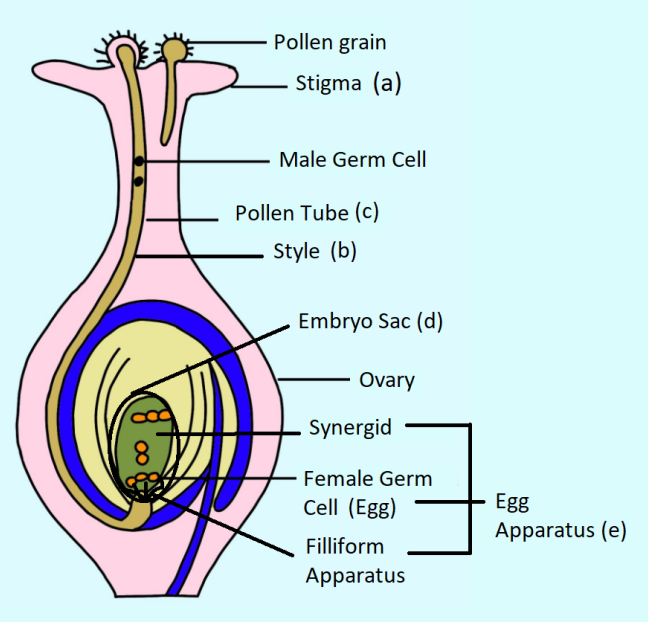
(b) Style

(c) Pollen tube reaching the micropyle of the ovule

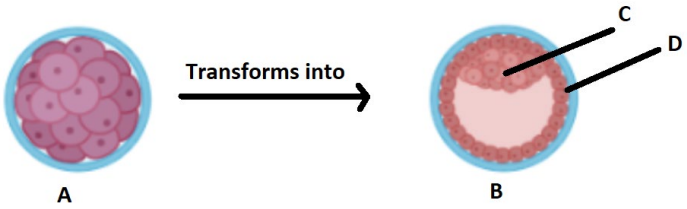
(d) Embryo sac

(e) Components of the egg apparatus

Ans:



14. Study the given diagram :



A is an embryonic stage that gets transformed into B, which in turn gets implanted in the endometrium in human females.

(a) Identify A, B, and its parts C and D.

(b) State the fate of C and D in the course of embryonic development in humans. **3 Marks**

Ans: Blastocyst is the embryonic stage that is implanted in the uterine wall of a human female. It's the stage after the morula stage when trophoblast cells form a ring around the periphery and an inner cell mass forms.

a) In the given figure,

A - Morula

B - Blastocyst

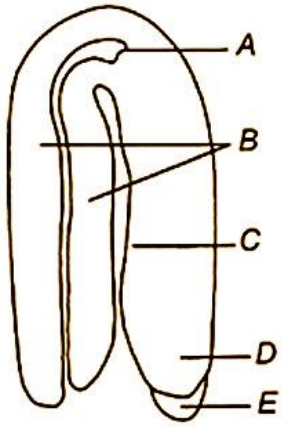
C - Stem cell

D – Trophoblast

b) Trophoblasts are the cells that make up a blastocyst's outer layer. In humans, they appear four days after fertilization. They nourish the embryo and form a significant portion of the placenta. Trophoblast aids in the attachment of the embryo to the endometrium as it forms the placenta, which is formed by stem cells.

Or

(a) Identify the figure given below and also identify the parts B, C, D, and E.



(b) State the function of E. **3 Marks**

Ans: The above is the figure of 'Mature Dicot Embryo'. The eudicot seed's two cotyledons are linked to the rest of the embryo by vascular tissue (xylem and phloem). Food reserves are stored in the endosperm of endospermic dicots.

(a) **B-**Suspensor

(b) **C-** Radicle

(c) **D-**Plumule

(d) **E-**Cotyledon

(b) A cotyledon is a seed leaf that grows inside the embryo of a seed. Cotyledons help a plant embryo get the nutrition it needs to germinate and grow into a photosynthetic organism. They can also be a source of nutritional reserves or aid the embryo in metabolizing nutrition stored elsewhere in the seed.

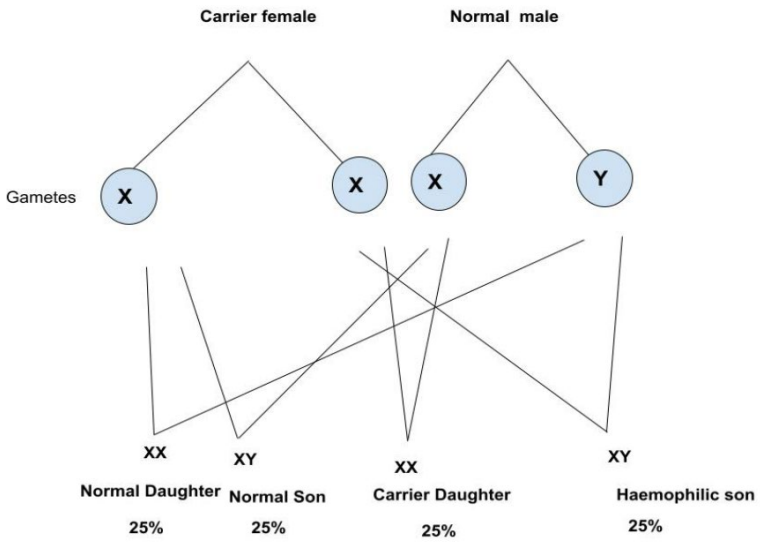
15. A normal couple has their first child, who is haemophilic. Work out a cross to show how it is possible. State the possibility of the normal and the hemophilic children, along with their sexes, that can be born to them.
3 Marks

Ans: Hemophilia is a bleeding disorder caused by an inherited inability for the blood to clot properly. This can cause bleeding on its own as well as bleeding after an injury or surgery. Clotting factors are proteins found in the blood that can help stop bleeding.

here,

Carrier female= XX^h

Normal male= XY



16. Starting from the pioneer species, trace the sequence that follows in an ecological succession on a bare rock, until the climax community is reached in an ecosystem. Name this type of succession. 3 Marks

Ans: Primary succession is a type of ecological succession that takes place in areas where there has never been any life.

a) It includes places like bare rocks, where the soil is incapable of supporting life. Volcanic eruptions, oil spills, floods, glacier retreat, and other natural disasters can all cause primary succession.

b) The pioneer species are those that have been around for a long time. After the pioneer species, intermediate species such as plants and other organisms colonize the soil and alter the soil composition and habitat. Finally, the climax community is formed, which allows for the survival of larger and more complex organisms.

c) Hardy species that are the first to colonize barren environments or previously biodiverse steady-state ecosystems that have been disrupted, such as by fire, are referred to as pioneer species.

d) Lichens, which grow on rocks without soil and break down the rocks into the soil for plants, may be among the first life forms.

e) The process of ecological succession describes how the structure of a biological community (that is, an interacting group of various species in a desert, forest, grassland, or marine environment, for example) changes over time. Lichens are the first species to appear on rocks because they secrete acid and dissolve rocks, assisting in soil formation and paving the

way for bryophytes, which hold a small amount of soil. Higher plants and scrub succeed it, and after a few stages, a stable climax forest community emerges.

17. The release of municipal wastewater and industrial waste into our natural water bodies is causing a disastrous effect on aquatic life. Explain the biological treatment that should be given to it before releasing it into the natural water bodies. 3 Marks

Ans: Municipal and industrial wastewater were combined and sent to a single drain for treatment during the first half of the twentieth century. Human and marine life were exposed to health risks as a result of this process, which necessitated the separation of municipal and industrial wastewater.

a) Municipal and industrial wastewater, when properly treated, can be a valuable source of energy and nutrients. Sludge from municipal wastewater, for example, can be used to extract energy and bio-solids for agricultural purposes, while phosphorous from eutrophication can be used to make fertilizers.

b) We are adding a disastrous effect on aquatic life by releasing municipal wastewater and industrial waste into our natural water bodies. These are the biological treatments that should be given to it before releasing it into natural water bodies to correct this.

c) To begin, the primary effluent is pumped into large aeration tanks, where it is mechanically constantly agitated and the air is pumped in, allowing useful aerobic microbes to grow into Flocs/masses of bacteria associated with fungal filaments.

d) The effluent is then passed into settling tanks where Flocs are allowed to sediment, resulting in activated sludge, as these microbes consume a large portion of the organic matter in the effluent, lowering BOD. A small portion of this is returned to the aeration tank as an inoculum, while the majority of the sludge is pumped into large tanks known as anaerobic sludge digesters, where anaerobic bacteria are grown.

e) As cities and industries expand, monetary and intellectual investments in efficient and long-term treatment of water discharged from municipal and industrial sources are required. Before releasing the nutrient-rich water back into the streams for marine life, wastewater should be viewed as a valuable resource from which energy can be extracted.

18. Mention any two advantages of the micropropagation technique. Write how its process is carried out in the laboratory. Name any two important food plants grown commercially by this method. 3 Marks

Ans:

a) Micropropagation is an artificial method for rapidly multiplication of plants in a controlled environment using tissue or cell culture techniques. The method is widely used to create genetically identical plants, pathogen-free plants, mass plant production, gene conservation, and other applications.

b) Plants are produced in vitro through asexual reproduction or vegetative propagation in this artificial propagation process. Plants can be produced asexually (via multiplication of vegetative parts) or sexually (via seed production). Clonal propagation, where plants can be populated from a single individual through asexual means of reproduction, is one method of asexual reproduction that involves multiplying genetic replicas of plants.

c) Because figs, grapes, bananas, and other plants do not produce functional seeds, asexual reproduction via the multiplication of vegetative parts is the only option for in vivo propagation. Potato, apple, and a variety of other ornamental plants have all been successfully propagated using clonal propagation techniques.

d) Micropropagation has proven to be beneficial in a variety of ways. Micropropagation has the following advantages in plant production:

e) It is an alternative method for vegetative propagation with a higher multiplication rate.

f) In a short amount of time, single plant tissue can produce a large number of identical plants.

19. When Bacillus thuringiensis enters a certain insect's body, the insect gets killed, but itself remains unaffected. Explain how it is possible. 3 Marks

Ans: Bt is a microbe that lives in the soil. It produces proteins that are poisonous to young insects (larvae). Bt comes in a variety of forms. Each one is aimed at a different type of insect. Beetles, mosquitoes, black flies, caterpillars, and moths are among the insects targeted.

1) Routine testing is required with Bt pesticides to ensure that unwanted toxins and microbes are not present. Since 1961, the US Environmental Protection Agency (EPA) has approved Bt for use in pesticides.

2) When Bacillus thuringiensis enters a certain insect's body, the insect gets killed, but itself remains unaffected because it contains some acids that produce protein from substances that are toxic to insects.

20. **3 Marks**

(a) Write how parasites have evolved with adaptation to co -exist with their hosts in an ecosystem.

Ans: Co-evolution between the host and the parasite is a special case of co - evolution. It's defined as the reciprocal adaptive genetic change of two antagonists (for example, different species or genes) as a result of reciprocal selective pressures. Hosts and parasites are subjected to reciprocal selective pressures, which can result in rapid reciprocal adaptation. The antagonists in the case of host-parasite coevolution are different.

If the parasite evolves a special mechanism to reject or resist the parasite, the parasite must (simultaneously) evolve, i.e. co-evolve, a mechanism to counteract and neutralize the parasite.

(b) Parasites are host -specific and tend to co -evolve. How would the parasite respond if the host evolves a certain mechanism to resist or reject the parasite?

Ans: To be successful with the same host species, the parasite must evolve a mechanism to counteract and neutralize the host's resistance or rejection of the parasite.

Or

(a) Name an ideal pyramid existing in an ecosystem. Construct it up **to its** three trophic levels along with their names. **3 Marks**

Ans: A graphical representation of the biomass or bio productivity at each trophic level in a given ecosystem is known as an ecological pyramid (also trophic pyramid, Estonian pyramid, energy pyramid, or food pyramid).

The pyramid of energy is the ideal pyramid:

carnivores - 100J

herbivores - 1000J

plants - 10000J

100000J

(b) The sun provides 1,000,000 J of sunlight (solar energy) to an ecosystem. Write the amount of energy that is available to the first and third trophic levels, respectively.

Ans: Solar energy is the radiant light and heat from the Sun that is captured through a variety of ever-evolving technologies like solar heating, photovoltaics, solar thermal energy, solar architecture, molten salt power plants, and artificial photosynthesis. Solar energy is combined with inorganic soil substances (nitrogen and other elements), as well as water and carbon dioxide in the air, by autotroph plants or producers to produce organic matter such as cellulose.

10,00,000J from sun, (1%) = 10,000 J

10,000J ⇒ 1000J ⇒ 100J

First trophic level Third trophic level

21. Global carbon is fixed in the biosphere through photosynthesis. 3 Marks

Ans: The two natural processes by which carbon is returned to the atmosphere are respiration by plants and animals and decomposition by bacteria and fungi.

Soil carbon storage is a critical ecosystem service that occurs as a result of ecological processes interacting. The effects of human activities on these processes can result in carbon loss or improved storage. The global carbon cycle is fueled by geologic processes as well as photosynthesis and animal respiration. Carbon dioxide is taken up by plants from the atmosphere and converted to carbon in plant tissue and oxygen in the atmosphere. Plants, like humans, use respiration to generate energy.

(a) Explain any two ways by which carbon is returned to the atmosphere through natural processes.

Ans: Various organic compounds decompose when plant residues are returned to the soil. Decomposition is a biological process in which complex organic molecules in the dead matter are physically broken down and biochemically transformed into simpler organic and inorganic molecules (Juma, 1998). The continuous addition of decaying plant residues to the soil surface contributes to soil biological activity and carbon cycling. These processes are aided by the breakdown of soil organic matter, as well as root growth and decay. Carbon cycling is the continuous transformation of organic and inorganic carbon compounds between the soil and the atmosphere by plants, micro, and macroorganisms.

(b) List any two human activities that have influenced the carbon cycle in nature.

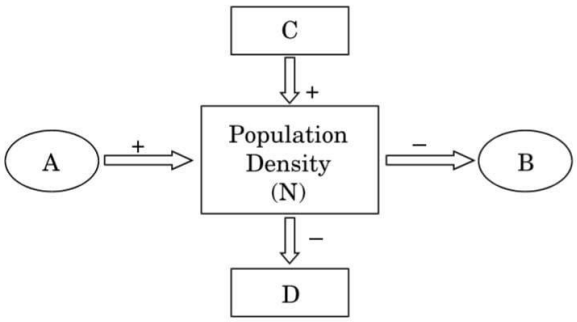
Ans: The carbon cycle in nature has been influenced by two human a ctivities:

Fossil fuel combustion: Organic matter decays and becomes compressed beneath layers upon layers of sand, earth, rock, and ocean, resulting in fossil fuels such as coal, oil, and natural gas. The term "fossil fuel" is derived from the word "fossil," which refers to the mineralized remains of ancient creatures that once inhabited the planet. The process of burning fossil fuels produces carbon dioxide, water, and energy.

Forest fuelwood is burned: Wood fuel (also known as fuelwood) is a type of fuel that includes things like firewood, charcoal, chips, sheets, pellets, and sawdust. Source, quantity, quality, and application all influence the type of form that is used. Wood is the most readily available form of fuel in many areas, requiring no or few tools in the case of picking up dead wood, though specialized tools, such as skidders and rakes, are required in any industry.

SECTION - D

22.



Study the schematic representation given above and answer the following questions : 3 Marks

Ans: The above schematic representation shows population density. The success of organisms and the effects they have on their environment are determined by their population density. A population in biology is a group of individuals from the same species who live in the same area at the same time.

(a) Identify A in it.

Ans: In the above schematic representation, 'A' represents Natality. The birth rate in a population is referred to as natality. The growth or decrease in a population can be determined by comparing it to the death or mortality rate. The

total number of live births per 1,000 population divided by the number of years in the period equals the birth rate. The number of live births is usually derived from a birth registration system, while population counts are derived from a census.

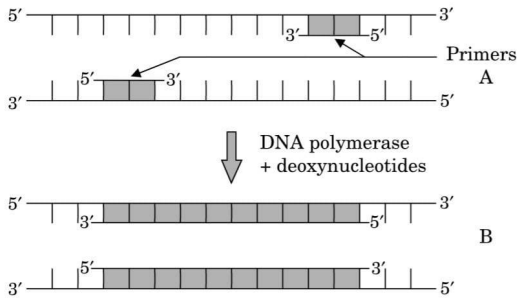
(b) Identify D in it.

Ans: In the above schematic representation, 'B' represents mortality. Mortality is the state of having to die one day or the rate of failure or loss. All animals will eventually die, which is an example of mortality. The number of high school students who do not graduate is an example of mortality. The death rate is high. A mortality rate is a measure of the frequency with which people die in a given population over a given period.

(c) When the population density at time t is N as shown above, write the populationdensity at time t + 1 in the form of an equation using appropriate symbols.

Ans: When the population density at time t is N as shown above, but, if the population density at time t + 1 then the equation will be N (t+1)=Nt+[(B+I)-(D+E)].

23. **(a)** Identify steps A and B in a cycle of Polymerase Chain Reaction given below. **3 Marks**



self made

Ans: A chain reaction is a series of reactions in which a reactive product or by - product initiates more reactions. Positive feedback in a chain reaction causes a self-amplifying chain of events. The polymerase chain reaction (PCR) is a widely used method for rapidly making millions to billions of copies of a specific DNA sample, allowing scientists to take a small sample of DNA and amplify it to a large enough amount to study in-depth. in the above polymerase chain reaction,

A= Annealing: Annealing is a heat treatment process that alters a material's physical and sometimes chemical properties to increase ductility and reduce hardness, making it easier to work with.

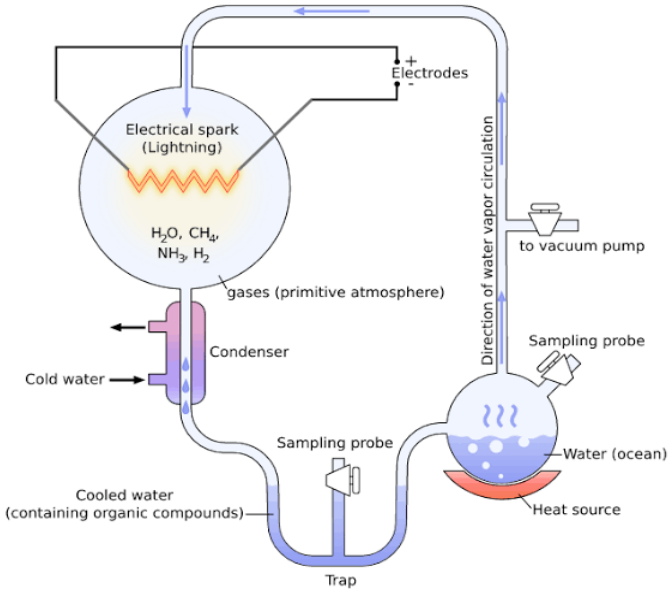
B=Extension: Each base's loosened nucleotides are used to grow the complementary DNA strand, resulting in extension. The final product is two double-stranded DNA products. The temperature used during the extension phase is determined by the type of DNA polymerase used.

(b) State the specific characteristic feature of the enzyme in carrying step B.

Ans: Proteins that act as biological catalysts are known as enzymes. Catalysts help to speed up chemical reactions. Substrates are the molecules on which enzymes can act, and the enzyme converts the substrates into different molecules called products. In repeated cycles of primer annealing, DNA synthesis, and duplex DNA dissociation to serve as new templates, a thermostable DNA polymerase is used.

The theoretical amplification of template DNA is 2^n, where n is the number of cycles, assuming no reagents are limited and the enzyme maintains full activity. so, step B carries the Thermostable (DNA Polymerase). For PCR amplification, Taq DNA polymerase is the most commonly used enzyme. With a half-life of 40 minutes at 95°C, this enzyme is extremely heat resistant. This is the specific characteristic feature of the enzyme in carrying step B.

24. Study the diagrammatic representation of S.L. Miller's experiment given below and answer the questions that follow : 3 Marks



Vedantu website

(a) How did S.L. Miller create the conditions which existed before the

origin of any life on Earth?

Ans: The Miller–Urey experiment (also known as the Miller experiment) was a chemical experiment that simulated the conditions thought to exist on the early Earth in 1952 and tested the chemical origin of life under those conditions. At the time, the experiment backed up Alexander Oparin and J. B. S. Haldane's hypothesis that putative primitive Earth conditions favored chemical reactions.

(b) Name the organic compound formed and collected at the end of his experiment.

Ans: Conditions were created by electric discharge (high temperature) in a closed flask containing CH_4, NH_3, H_2, water vapors. Water (H_2O), methane (CH_4), ammonia (NH_3), and hydrogen were used in the experiment (H_2). All of the chemicals were kept in a sterile 5-liter glass flask that was connected to a 500-ml flask half-filled with water. The water in the smaller flask was heated to cause evaporation, and the resulting water vapor was allowed to enter the larger flask. Continuous electrical sparks were fired between the electrodes to simulate lightning in the water vapor and gaseous mixture, and then the simulated atmosphere was cooled, causing the water to condense and flow into a U-shaped trap at the bottom of the apparatus.

(c) Mention the kind of evolution his experiment supports.

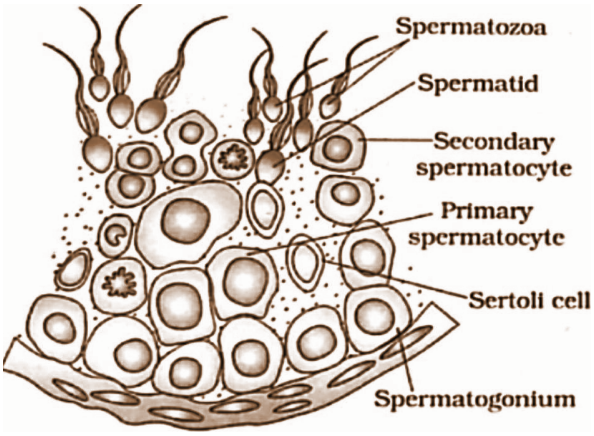
Ans: The solution collected at the trap turned pink after a day, and the solution was deep red and turbid after a week of continuous operation. To prevent microbial contamination, the boiling flask was removed and mercuric chloride was added. The reaction was halted with the addition of barium hydroxide and sulfuric acid, and the impurities were removed by evaporation. Miller identified five amino acids in the solution using paper chromatography: α-alanine, β-alanine were positively identified, while aspartic acid and -aminobutyric acid (AABA) were less certain due to the faint spots. Thus, the amino acid is the organic compound formed and collected at the end of his experiment.

Thus, the kind of evolution his experiment supports is called chemical evolution. The first step in the evolution of life on this planet was the formation of complex organic molecules (see also organic molecules) from simple inorganic molecules in the oceans during the early history of the Earth. Chemical evolution took place over less than a billion years.

SECTION - E

25. **(a)** Draw the sectional view of a seminiferous tubule of humans. Label it's six parts. **5 Marks**

Ans: a) Seminiferous tubules are tubules found in the testes that are mostly coiled. Spermatozoa (male gametes) are produced in these cells. Sertoli cells, which are sustentacular columnar cells, and spermatogenic cells, which give rise to sperm cells, make up the epithelial lining of the seminiferous tubule. The sectional view of a seminiferous tubule of humans is as follows:



(b) Name the pituitary hormones involved in the process of spermatogenesis. State their functions.

Ans: Your pituitary gland is a small but vital organ. Your brain, skin, energy, mood, reproductive organs, vision, growth, and other vital organs are all affected if your pituitary gland isn't functioning properly. It is known as the "master" gland because it directs the release of hormones from other glands. The pituitary gonadotropins FSH and LH are required for the development and maintenance of spermatogenesis. In response to the hypothalamic gonadotropin-releasing hormone, both hormones are secreted and regulated as part of the HPG axis (GnRH).

FSH: Your pituitary gland, a small gland beneath your brain, produces FSH. FSH is an important hormone for sexual development and function. FSH aids in the regulation of the menstrual cycle in women and stimulates the production of eggs in the ovaries.

LH: Your pituitary gland, a small gland beneath your brain, produces LH. LH is essential for sexual development and function. LH aids in the regulation of the menstrual cycle in women. It also causes an egg to be released from the ovary.

Or

5 Marks

(a) IUDs are said to be effective contraceptives. Name any two commonly used IUDs and write the mode of their actions.

Ans: When choosing the most appropriate contraceptive method, many factors must be considered by women, men, or couples at any point in their lives. These factors include safety, effectiveness, accessibility, and affordability, as well as acceptability. Contraceptive counseling, when provided, is an important guiding principle, as is a voluntary informed choice of contraceptive methods.

Progestasert- The Progestasert system combines the benefits of IUDs and oral mini dose progesterone preparations in one convenient package. For one year, an internal device delivers progesterone to the uterine lumen and endometrium. A T-shaped Progestasert with a daily release of 65 mcg has been chosen for clinical use on a large scale. It prevents implantation by making the uterus unsuitable.

CuT- Copper (Cu) T is another name for CuT. Because copper is spermicidal, it is a contraceptive device used by women. Contraceptives are an important method in family planning because they are used to prevent pregnancy. Copper ions reduce sperm motility.

(b) When is sterilization advised to married couples? How is it carried out in a human male and a female, respectively?

Ans: Sterilization is any of several medical birth control methods that prevent a person from reproducing. Surgical and non-surgical sterilization methods are available for both males and females. Sterilization is recommended for the male/female partner as a last resort to avoid further pregnancies.

In male: Male sterilization, also known as vasectomy, is a surgical procedure that involves cutting and tying the two tubes that carry sperm from the testes (testicles) to the penis (vas deferens). Vasectomy is a surgical procedure that provides long-term contraception. Vasectomies are performed on about 15,000 men in Australia each year.

In females: Tubectomy, also known as tubal sterilization, or female sterilization is a long-term contraception procedure for women. It is a surgical procedure that prevents the egg released by the ovary from reaching the uterus by blocking the fallopian tubes. Around the belly button, a few small incisions are made. A laparoscope, a telescopic device, is inserted through one of the cuts. The tip of the laparoscope has a small camera that transmits images to a screen, giving the surgeon a view of the internal organs. The surgeon inserts special instruments to seal the tubes by following the images and working through the tiny cuts.

26. Explain the expression of lac operon genes in E. coli growing in a lactose - containing culture medium. 5 Marks

Ans:

a) Lactose metabolism genes are found in the lac operon of E. coli. When lactose is present but glucose is not, it is expressed. The lac repressor and catabolite activator protein are two regulators that turn the operon "on" and "off" in response to lactose and glucose levels (CAP).

b) Lactose is sensed by the lac repressor. When lactose is present, it stops acting as a repressor and blocks transcription of the operon. Lactose is sensed indirectly by the lac repressor via its isomer allolactose.

c) CAP, or catabolite activator protein, is a glucose sensor. When glucose levels are low, it activates transcription of the operon. Through the "hunger signal" molecule cAMP, CAP detects glucose indirectly.

d) Lactose can be broken down by E. coli bacteria, but it is not their preferred fuel. They would much rather use glucose if it is available. Lactose is broken down in fewer steps and with less energy than glucose. If lactose is the only sugar available, however, E. coli will use it as an energy source right away.

e) The repressor is inactivated in the presence of an inducer, lactose, by interaction with the inducer, allowing RNA polymerase access to the promoter and transcription to proceed. Lac mRNA is then transcribed, followed by the synthesis of ß galactosidase, permease, and transacetylase.

Or

Name the types of cells and the process by which hnRNA is formed. Describe the processing mechanism it undergoes before it becomes functional.

a) Heterogeneous nuclear RNA is abbreviated as hnRNA. RNA Polymerase II produces large pre-mRNAs of various nucleotide sequences, which are processed in the nucleus to become cytoplasmic mRNAs.

b) The process of copying a segment of DNA into RNA is known as transcription. Messenger RNA is made up of DNA segments that have been transcribed into RNA molecules that can encode proteins (mRNA). Non-coding RNAs are made from segments of DNA that are not copied into RNA molecules (ncRNAs).

c) The amount of mRNA in a given tissue is more than 10 times that of ncRNA when measured across multiple cell types (though in particular single cell types ncRNAs may exceed mRNAs). Even though less than 2%

of the human genome can be transcribed into mRNA, at least 80% of mammalian genomic DNA can be transcribed into mRNA, the general preponderance of mRNA in cells is valid.

d) Nucleic acids, such as DNA and RNA, use base pairs of nucleotides as a complementary language. An RNA polymerase reads a DNA sequence during transcription and produces a complementary, antiparallel RNA strand called a primary transcript.

e) During transcription in eukaryotic cells, the primary transcript contains both exons and introns, which are non-functional. The primary transcript is then subjected to splicing, in which introns are removed and exons are joined in a defined order. A nucleotide (methyl guanosine triphosphate) is added to the 5' end of hnRNA during capping.

27. There is a great concern all over the world to conserve biodiversity for maintaining the ecological balance in nature. Explain giving three reasons. Write different ways that have helped in increasing the tiger population in our country. 5 Marks

Ans: Biodiversity refers to the variety of plants, animals, and microorganisms that exist, as well as the genes they contain and the ecosystems in which they live. We are fortunate to live in the lowland tropics, where biodiversity is abundant. Tropical areas are known to have more species per square kilometer than temperate areas, and biodiversity declines as the altitude rise.

The following three reasons should be considered when conserving biodiversity:

a) Narrowly utilitarian - Nature provides humans with numerous economic benefits, such as food, firewood, fiber, and industrial products.

b) Broadly utilitarian - Contribute to a variety of ecological services, such as the production of oxygen and pollination.

c) Ethical - Every species has intrinsic value, and we have a moral obligation to care for it and pass on our biological legacy to future generations in good condition.

To save tigers, there are two approaches:

a) in situ conservation (protecting the natural habitat of the forest where the tiger lives/protecting the entire ecosystem).

b) Ex situ conservation– threatened tigers are removed from their natural habitat and placed in special settings, such as zoological parks or wildlife sanctuaries, for protection and special care.

Or

What is integrated organic farming? How did Ramesh Chandra Dagar, a farmer from Sonepat, Haryana effectively use this procedure and succeed with zero waste?

Ans:

1. Organic farming is an agricultural system that emphasizes crop rotation and companion planting while utilizing organic fertilizers such as compost manure, green manure, and bone meal. It began in the early twentieth century as a reaction to rapidly changing agricultural practices.
2. Integrated farming is a type of agriculture that uses a variety of production enterprises, long and diversified crop rotations, and crop residue or animal excreta restitution to the soil to reduce the use of inputs from outside the farm.
3. Integrated Organic farming is a type of farming system that focuses on cultivating the land and raising crops in such a way that the soil remains alive and healthy. Organic wastes (crop, animal, and farm wastes, aquatic wastes) and other biological materials, mostly produced in situ, are combined with beneficial microbes (biofertilizers) to release nutrients to crops.
4. Integrated organic farming is a cyclical process that recycles waste products from one process as nutrients for another.
5. In a chain of processes, his farm includes beekeeping, dairy management, water harvesting, composting, and agriculture.
6. Chemical fertilizers are not required because cattle excreta (dung) is used as a natural fertilizer. Crop waste can be composted and used to generate natural gas to meet the farm's energy requirements.