

# CUET UG Biology Sample Paper - 18

Duration: 1 Hour

Maximum Marks: 250

## Instructions

- This paper contains a total of 50 Multiple Choice Questions.
- Each correct answer carries **+5 marks**.
- Each incorrect answer carries **-1 mark**.
- No negative marking for unattempted questions.

**Q1.** In a 7-celled, 8-nucleate embryo sac of an angiosperm, the central cell contains:

- (A) Two haploid polar nuclei
- (B) One diploid secondary nucleus
- (C) Three antipodal cells
- (D) One egg cell and two synergids

**Q2.** Identify the correct sequence of events in the life cycle of *Plasmodium* in the human body:

- (A) Sporozoites → Liver cells → RBCs → Gametocytes
- (B) Gametocytes → Liver cells → Sporozoites → RBCs
- (C) RBCs → Gametocytes → Liver cells → Sporozoites
- (D) Liver cells → Sporozoites → Gametocytes → RBCs

**Q3.** Which of the following represents the 'Evil Quartet' regarding biodiversity loss?

- (A) Fragmentation, Pollution, Over-exploitation, Co-extinction
- (B) Habitat loss, Over-exploitation, Alien species invasion, Co-extinction
- (C) Global warming, Habitat loss, Pollution, Over-population
- (D) Over-exploitation, Deforestation, In-situ conservation, Pollution



**Q4.** Match List-I (Contraceptive) with List-II (Mechanism): [

- (a) Lippes Loop - (i) Blocks gamete transport
- (b) Saheli - (ii) Non-medicated IUD
- (c) Tubectomy - (iii) Inhibits ovulation/implantation
- (d) Cu7 - (iv) Suppresses sperm motility

(A) (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv)

(B) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

(C) (a)-(ii), (b)-(i), (c)-(iii), (d)-(iv)

(D) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)

**Q5.** If the sequence of the coding strand in a transcription unit is 5'-ATGCATGC-3', the sequence of mRNA will be:

(A) 5'-TACGTACG-3'

(B) 5'-UACGUACG-3'

(C) 5'-AUGEAUGC-3'

(D) 5'-AUGCATGC-3'

**Q6.** The enzyme used to join DNA fragments is:

(A) DNA Polymerase

(B) Restriction Endonuclease

(C) DNA Ligase

(D) Helicase

**Q7.** In the Lac Operon, the 'i' gene codes for:

(A) Inducer

(B) Repressor protein

(C) Beta-galactosidase



(D) Permease

**Q8.** Which hormone level reaches its peak during the LH surge in the menstrual cycle?

(A) Progesterone

(B) Estrogen

(C) FSH

(D) GnRH

**Q9.** The Hardy-Weinberg equilibrium is affected by all of the following except:

(A) Gene migration

(B) Genetic drift

(C) Random mating

(D) Mutation

**Q10.** Bt cotton is resistant to pests due to the presence of:

(A) Protein crystals (Pro-toxin)

(B) Lipid toxins

(C) RNA interference

(D) Antibiotic resistance gene

**Q11.** According to the Pyramid of Energy, if 10,000 J of energy is available at the producer level, the energy at the tertiary consumer level will be:

(A) 1000 J

(B) 100 J

(C) 10 J

(D) 1 J



**Q12.** The process of RNA interference (RNAi) involves:

- (A) Silencing of specific mRNA using dsRNA
- (B) Amplification of DNA using PCR
- (C) Protein synthesis in ribosomes
- (D) Cleaving DNA at specific sites

**Q13.** Which of the following is an example of Ex-situ conservation?

- (A) National Parks
- (B) Wildlife Sanctuaries
- (C) Botanical Gardens
- (D) Biosphere Reserves

**Q14.** Down's syndrome is caused by:

- (A) Trisomy of chromosome 21
- (B) Monosomy of X chromosome
- (C) XXY genotype
- (D) Deletion of chromosome 5

**Q15.** The first human-like hominid was:

- (A) Homo habilis
- (B) Homo erectus
- (C) Australopithecus
- (D) Neanderthal man

**Q16.** Microbes like *Lactobacillus* grow in milk and convert it to curd by producing:

- (A) Citric acid



- (B) Lactic acid
- (C) Acetic acid
- (D) Butyric acid

**Q17.** In the context of Sewage Treatment, 'Flocs' are:

- (A) Masses of anaerobic bacteria
- (B) Masses of aerobic bacteria associated with fungal filaments
- (C) Chemical precipitates of nitrogen
- (D) Heavy metals settled at the bottom

**Q18.** The semi-conservative nature of DNA replication was first shown in:

- (A) *Vicia faba*
- (B) *Escherichia coli*
- (C) *Drosophila melanogaster*
- (D) *Streptococcus pneumoniae*

**Q19.** Which structure provides nutrition to the developing sperms?

- (A) Leydig cells
- (B) Sertoli cells
- (C) Epididymis
- (D) Vas deferens

**Q20.** A population interaction where one species is harmed and the other is unaffected is:

- (A) Parasitism
- (B) Amensalism
- (C) Commensalism



(D) Mutualism

**Q21.** The naming of Restriction Enzyme *EcoRI*, 'co' stands for:

- (A) Colony
- (B) Coelom
- (C) Coli
- (D) Co-enzyme

**Q22.** Humulin is produced by inserting the gene for human insulin into:

- (A) *Bacillus thuringiensis*
- (B) *Escherichia coli*
- (C) *Saccharomyces cerevisiae*
- (D) *Agrobacterium tumefaciens*

**Q23.** Transcription in eukaryotes requires:

- (A) RNA polymerase I, II, and III
- (B) Only RNA polymerase II
- (C) DNA polymerase III
- (D) Reverse transcriptase

**Q24.** Adaptive radiation is best exemplified by:

- (A) Darwin's Finches
- (B) Industrial melanism
- (C) Antibiotic resistance in bacteria
- (D) Human evolution

**Q25.** The method of directly injecting a sperm into the ovum is called:



- (A) GIFT
- (B) ZIFT
- (C) ICSI
- (D) IUI

**Q26.** Double fertilization is a characteristic feature of:

- (A) Gymnosperms
- (B) Angiosperms
- (C) Pteridophytes
- (D) Bryophytes

**Q27.** The most common type of embryo sac in angiosperms is:

- (A) Monosporic
- (B) Bisporic
- (C) Tetrasporic
- (D) All of the above

**Q28.** Primary productivity is defined as the rate of formation of:

- (A) Inorganic matter by producers
- (B) Organic matter by consumers
- (C) Organic matter by producers
- (D) Energy by decomposers

**Q29.** During DNA Fingerprinting, the separated DNA fragments are transferred to a synthetic membrane such as:

- (A) Cellulose
- (B) Nitrocellulose



- (C) Polyethylene
- (D) Agarose

**Q30.** Which of the following is a "Stop Codon"?

- (A) AUG
- (B) GUG
- (C) UAA
- (D) UGG

**Q31.** Morgan used *Drosophila melanogaster* for his experiments because:

- (A) They could be grown on simple synthetic medium
- (B) They have a short life cycle (2 weeks)
- (C) A single mating could produce many offspring
- (D) All of the above

**Q32.** The 'X' body observed by Henking was actually:

- (A) Y chromosome
- (B) X chromosome
- (C) Autosome
- (D) Nucleolus

**Q33.** Cleistogamous flowers ensure:

- (A) Cross-pollination
- (B) Autogamy
- (C) Geitonogamy
- (D) Wind pollination



- Q34.** The function of the filiform apparatus is to:
- (A) Guide the entry of pollen tube
  - (B) Protect the egg cell
  - (C) Stimulate division of the generative cell
  - (D) Produce nectar
- Q35.** The part of the fallopian tube closest to the ovary is:
- (A) Ampulla
  - (B) Isthmus
  - (C) Infundibulum
  - (D) Cervix
- Q36.** After ovulation, the Graafian follicle transforms into:
- (A) Corpus albicans
  - (B) Corpus callosum
  - (C) Corpus luteum
  - (D) Primary follicle
- Q37.** Which of the following is not a copper-releasing IUD?
- (A) CuT
  - (B) Multiload 375
  - (C) Progestasert
  - (D) Cu7
- Q38.** The principle of 'Competitive Exclusion' was proposed by:
- (A) Darwin



- (B) Gause
- (C) MacArthur
- (D) Verhulst-Pearl

**Q39.** In DNA, the distance between two consecutive base pairs is approximately:

- (A) 3.4 nm
- (B) 0.34 nm
- (C) 2.0 nm
- (D) 34 nm

**Q40.** The structural gene in a transcription unit is:

- (A) Monocistronic in eukaryotes
- (B) Polycistronic in prokaryotes
- (C) Both A and B
- (D) Monocistronic in prokaryotes

**Q41.** High levels of which gas are produced during anaerobic sludge digestion?

- (A) Methane, Hydrogen sulphide, Carbon dioxide
- (B) Oxygen, Nitrogen, Methane
- (C) Carbon monoxide, Methane, Hydrogen
- (D) Ethane, Methane, Oxygen

**Q42.** Which enzyme is known as the 'Molecular Scissors'?

- (A) Ligase
- (B) Polymerase
- (C) Restriction Endonuclease
- (D) Exonuclease



**Q43.** The process of heating a substance to a specific temperature and then cooling it quickly to kill microbes is:

- (A) Sterilization
- (B) Pasteurization
- (C) Fermentation
- (D) Carbonization

**Q44.** Which antibody is present in colostrum?

- (A) IgG
- (B) IgA
- (C) IgM
- (D) IgE

**Q45.** HIV attacks which cells in the human body?

- (A) B-lymphocytes
- (B) Helper T-lymphocytes
- (C) Red Blood Cells
- (D) Platelets

**Q46.** Statins, used for lowering blood cholesterol, are produced by:

- (A) *Monascus purpureus*
- (B) *Trichoderma koningii*
- (C) *Aspergillus niger*
- (D) *Acetobacter aceti*

**Q47.** Age pyramids with a broad base indicate:



- (A) Declining population
- (B) Stable population
- (C) Expanding population
- (D) Zero growth population

**Q48.** The region of the biosphere reserve where no human activity is allowed is:

- (A) Transition zone
- (B) Buffer zone
- (C) Core zone
- (D) Restoration zone

**Q49.** 'ZIFT' stands for:

- (A) Zygote In-vitro Fertilization Transfer
- (B) Zygote Intra-fallopian Transfer
- (C) Zygote Internal Fallopian Transit
- (D) Zone Intra-fallopian Transfer

**Q50.** Smallest cell-free system for protein synthesis is often associated with the study of:

- (A) Nirenberg and Matthaei
- (B) Watson and Crick
- (C) Hershey and Chase
- (D) Meselson and Stahl

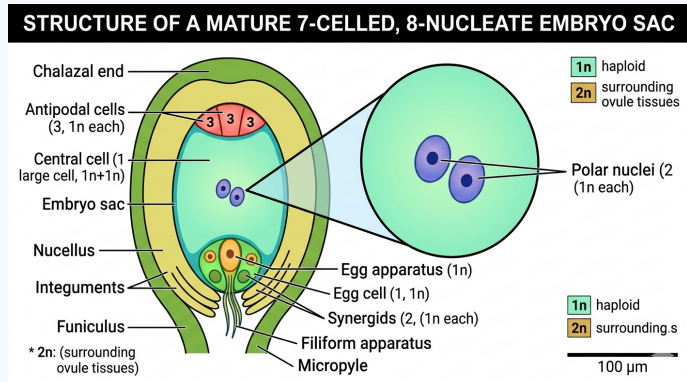


Detailed Solutions

Q1.

Solution

**Concept:** The angiosperm embryo sac (female gametophyte) is typically a 7-celled, 8-nucleate structure. Its precise nuclear distribution defines the process of double fertilization.



**Solution:** 1. **Structure:** The mature embryo sac is organized as follows: three antipodal cells at the chalazal end, one egg apparatus (one egg cell and two synergids) at the micropylar end, and one large central cell. 2. **Nuclear Distribution:** While there are 7 cells, there are 8 nuclei. The egg apparatus and antipodals are all haploid (1n) and contain one nucleus each (total 6). 3. **The Central Cell:** The remaining two nuclei, known as **polar nuclei**, are situated in the large central cell. 4. **Visual Clarification:** Referencing the provided diagram, you can clearly see that the two large central nuclei (polar nuclei) are contained within a single large central cell, defining its 8-nucleate, 7-celled nature before the final fusion of polar nuclei into a diploid secondary nucleus.

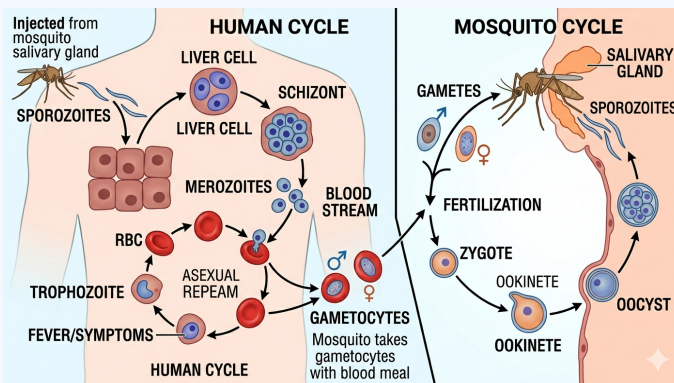
**Final Answer:** Two haploid polar nuclei

**Answer:** (A)

Q2.

**Solution**

**Concept:** The life cycle of the malaria parasite, *Plasmodium*, is digenetic, meaning it requires two hosts: the female Anopheles mosquito (primary host) and humans (secondary host).



**Solution:** 1. **Infection:** The process begins when an infected female Anopheles mosquito bites a human, injecting the infectious stage called **sporozoites** into the bloodstream. 2. **Exo-erythrocytic Stage:** These sporozoites quickly travel to the **liver cells** (hepatocytes), where they multiply asexually. 3. **Erythrocytic Stage:** The parasite forms then burst out of the liver cells and enter the **Red Blood Cells (RBCs)**, where further asexual reproduction occurs, leading to the symptoms of malaria. 4. **Sexual Stage Initiation:** Some parasites in the RBCs differentiate into sexual stages called **gametocytes** (male and female), which are later sucked up by another mosquito to complete the cycle.

**Final Answer:** Sporozoites → Liver cells → RBCs → Gametocytes

**Answer: (A)**

Q3.

**Solution**

**Concept:** The 'Evil Quartet' is a term used by ecologists to describe the four major causes of accelerated rates of species extinction caused by human activities.

**Solution:** 1. **Habitat Loss and Fragmentation:** This is the most important cause. Large habitats are broken into small fragments, leading to the decline of animals requiring large territories. 2. **Over-exploitation:** When biological systems are harvested faster than they can replenish (e.g., over-fishing), it leads to extinction. 3. **Alien Species Invasions:** Introduction of non-native species (intentionally or accidentally) often causes the decline or extinction of indigenous species (e.g., Nile perch in Lake Victoria). 4. **Co-extinctions:** When a host species becomes extinct, the specific parasites or mutualists associated with it also face extinction.

**Final Answer:** Habitat loss, Over-exploitation, Alien species invasion, Co-extinction

**Answer: (B)**

Q4.

**Solution**

**Concept:** Contraceptive methods are designed to prevent pregnancy by interfering with the normal processes of ovulation, fertilization, or implantation.

**Solution:** 1. **Lippes Loop:** This is a **non-medicated IUD** (Intrauterine Device) that increases the phagocytosis of sperms within the uterus. 2. **Saheli:** A non-steroidal oral contraceptive pill developed in India. It works by **inhibiting implantation** and interfering with the estrogen receptors. 3. **Tubectomy:** A surgical sterilization method for females where a small part of the fallopian tube is removed or tied up, thereby **blocking gamete transport**. 4. **Cu7:** A copper-releasing IUD. Copper ions **suppress sperm motility** and the fertilizing capacity of sperms.

**Final Answer:** (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv)

**Answer: (A)**

Q5.

**Solution**

**Concept:** Transcription is the process of copying genetic information from one strand of DNA into RNA. DNA has two strands: the template strand and the coding strand.

**Solution:** 1. **Strand Identification:** The template strand ( $3' \rightarrow 5'$ ) is used by RNA polymerase to synthesize mRNA. The **coding strand** ( $5' \rightarrow 3'$ ) has the same sequence as the newly formed mRNA, except for one base. 2. **Base Pairing Rule:** In DNA, Adenine (A) pairs with Thymine (T). In RNA, Adenine (A) pairs with **Uracil (U)**. 3. **The Shortcut:** Because the coding strand ( $5'-ATGCATGC-3'$ ) and the mRNA are complementary to the same template, they are identical in sequence and polarity, with the exception that Thymine (T) in DNA is replaced by Uracil (U) in RNA. 4. **Application:** Replacing T with U in  $5'-ATGCATGC-3'$  gives  $5'-AUGEAUGC-3'$  (Note: The provided option C contains the sequence AUGCATGC with 'U' replacing 'T' logically, though the typo 'E' in the option list is noted, the logic follows  $T \rightarrow U$ ).

**Final Answer:**  $5'-AUGCATGC-3'$  (with U replacing T)

**Answer: (C)**



Q6.

**Solution**

**Concept:** Recombinant DNA technology relies on specific enzymes to manipulate DNA. While restriction enzymes act as "scissors," other enzymes act as "glue" to join DNA strands.

**Solution:** 1. **DNA Ligase Function:** DNA ligase is the specific enzyme that facilitates the joining of DNA strands together by catalyzing the formation of a phosphodiester bond. 2. **Mechanism:** It repairs single-strand breaks in duplex DNA and joins "sticky ends" or "blunt ends" produced by restriction endonucleases. 3. **Other Enzymes:** DNA Polymerase synthesizes new DNA strands; Restriction Endonucleases cut DNA at specific sequences; Helicase unwinds the DNA double helix. 4. **Importance:** Without DNA ligase, creating a recombinant DNA molecule (joining a foreign gene to a plasmid vector) would be impossible.

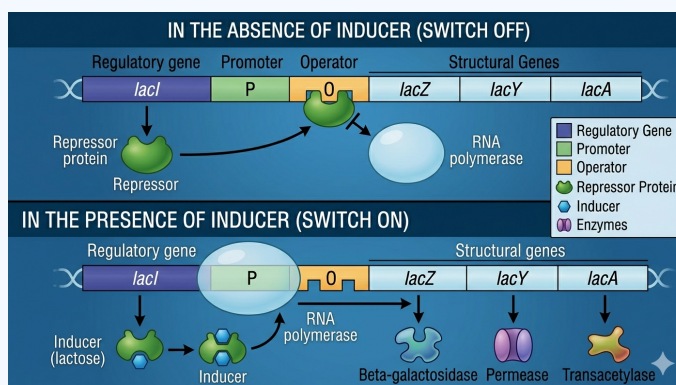
**Final Answer:** DNA Ligase

**Answer:** (C)

Q7.

**Solution**

**Concept:** The Lac Operon is a polycistronic system in *E. coli* that regulates lactose metabolism. It consists of regulatory genes and structural genes.



**Solution:** 1. **The 'i' Gene:** The term 'i' stands for the word *inhibitor*. This is a regulatory gene that is expressed constitutively (all the time). 2. **Product:** The 'i' gene synthesizes the **repressor protein**. 3. **Function:** In the absence of an inducer (lactose), the repressor protein binds to the operator region (o), preventing RNA polymerase from transcribing the structural genes. 4. **Structural Genes:** In contrast, z, y, and a code for Beta-galactosidase, Permease, and Transacetylase respectively.

**Final Answer:** Repressor protein

**Answer:** (B)

Q8.

**Solution**

**Concept:** The menstrual cycle is regulated by a complex interplay of pituitary hormones (LH, FSH) and ovarian hormones (Estrogen, Progesterone).

**Solution:** 1. **Follicular Phase:** As follicles grow, they secrete increasing amounts of **Estrogen**. 2. **Positive Feedback:** High levels of Estrogen exert a positive feedback on the pituitary gland, leading to a rapid increase in LH (Luteinizing Hormone) and FSH. 3. **LH Surge:** Both LH and FSH attain a peak level in the middle of the cycle (about 14<sup>th</sup> day). The rapid secretion of LH leading to its maximum concentration is called the LH surge. 4. **Hormonal Peaks:** While LH and FSH peak at mid-cycle, Estrogen also reaches its primary peak just before this surge to trigger it. Progesterone only peaks later during the luteal phase.

**Final Answer:** Estrogen

**Answer: (B)**

Q9.

**Solution**

**Concept:** The Hardy-Weinberg principle states that allele frequencies in a population are stable and remain constant from generation to generation in the absence of evolutionary influences.

**Solution:** 1. **Five Factors:** There are five factors known to affect Hardy-Weinberg equilibrium: gene migration (gene flow), genetic drift, mutation, genetic recombination, and natural selection. 2. **Equilibrium Conditions:** For a population to be in equilibrium, mating must be **random**. 3. **Disturbance:** Non-random mating (selective mating) changes the genotype frequencies and thus disturbs the equilibrium. 4. **Conclusion:** Since random mating is a requirement for maintaining equilibrium, it does not "affect" (disturb) it; rather, it preserves it.

**Final Answer:** Random mating

**Answer: (C)**

Q10.

**Solution**

**Concept:** Bt cotton is a genetically modified crop designed to provide resistance against lepidopteran insects (bollworms) without the need for excessive chemical pesticides.

**Solution:** 1. **Origin:** The bacterium *Bacillus thuringiensis* (Bt) produces specific **protein crystals** during a particular phase of their growth. 2. **Nature of Toxin:** These crystals contain a toxic insecticidal protein. In the bacterium and the plant, this exists as an inactive **pro-toxin**. 3. **Activation:** Once an insect ingests the pro-toxin, it is converted into an active form due to the **alkaline pH** of the insect's gut which solubilizes the crystals. 4. **Effect:** The activated toxin binds to the surface of midgut epithelial cells, creating pores that cause cell swelling and lysis, eventually killing the insect.

**Final Answer:** Protein crystals (Pro-toxin)

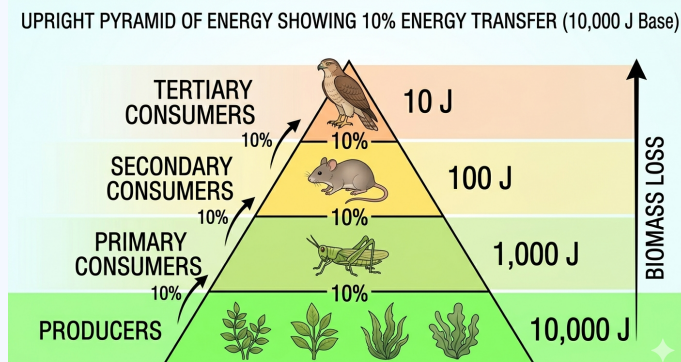
**Answer: (A)**



Q11.

**Solution**

**Concept:** The Pyramid of Energy represents the total energy stored at each trophic level. It follows the "10 percent law" proposed by Raymond Lindeman.



**Solution:** 1. **The 10% Law:** This law states that during the transfer of organic food energy from one trophic level to the next higher level, only about 10% of the energy is stored as flesh. The rest is lost during transfer, broken down in respiration, or lost to incomplete digestion. 2. **Calculation Step 1 (Producer to Primary Consumer):** 10% of 10,000 J = 1,000 J. 3. **Calculation Step 2 (Primary to Secondary Consumer):** 10% of 1,000 J = 100 J. 4. **Calculation Step 3 (Secondary to Tertiary Consumer):** 10% of 100 J = 10 J. 5. **Conclusion:** By the time energy reaches the tertiary consumer (e.g., a top predator), only 10 J remains from the original 10,000 J produced by the plants.

**Final Answer:** 10 J

**Answer:** (C)

Q12.

**Solution**

**Concept:** RNA interference (RNAi) is a biological process in which RNA molecules inhibit gene expression or translation by neutralizing targeted mRNA molecules.

**Solution:** 1. **Mechanism:** RNAi takes place in all eukaryotic organisms as a method of cellular defense. It involves the silencing of a specific mRNA. 2. **Double-Stranded RNA (dsRNA):** The process is initiated by a dsRNA molecule. This dsRNA is processed into small interfering RNAs (siRNAs). 3. **Silencing:** These small fragments bind to the target mRNA because they are complementary to it. 4. **Result:** Once bound, the mRNA is cleaved or prevented from being translated into a protein. In biotechnology, this is used to make plants resistant to specific parasites, like the nematode *Meloidogyne incognita*.

**Final Answer:** Silencing of specific mRNA using dsRNA

**Answer:** (A)



Q13.

**Solution**

**Concept:** Biodiversity conservation is categorized into two types: In-situ (on-site) and Ex-situ (off-site) conservation.

**Solution:** 1. **Ex-situ Definition:** This involves the protection of threatened animals and plants outside their natural habitats. 2. **Applications:** This approach is used when a species is critically endangered and needs urgent intervention to prevent extinction. 3. **Examples:** **Botanical Gardens**, Zoological Parks (Zoos), Wildlife Safari Parks, and Seed Banks/Cryopreservation centers are all Ex-situ methods. 4. **Contrast:** National Parks, Wildlife Sanctuaries, and Biosphere Reserves are In-situ methods because they protect the entire ecosystem in its natural location.

**Final Answer:** Botanical Gardens

**Answer:** (C)

Q14.

**Solution**

**Concept:** Mendelian disorders are caused by alterations in a single gene, while Chromosomal disorders are caused by the absence, excess, or abnormal arrangement of one or more chromosomes.

**Solution:** 1. **Cause of Down's Syndrome:** It is caused by the presence of an additional copy of chromosome number 21. 2. **Aneuploidy:** This condition is known as trisomy ( $2n + 1$ ). Instead of the normal pair, the individual has three copies of the 21st chromosome. 3. **Discovery:** It was first described by Langdon Down in 1866. 4. **Characteristics:** Affected individuals show short stature, small round head, furrowed tongue, partially open mouth, and mental retardation.

**Final Answer:** Trisomy of chromosome 21

**Answer:** (A)

Q15.

**Solution**

**Concept:** The evolution of man involves several stages, transitioning from arboreal primates to modern *Homo sapiens*.

**Solution:** 1. **Early Ancestors:** *Dryopithecus* and *Ramapithecus* lived about 15 million years ago. *Australopithecus* lived about 2 million years ago in East African grasslands. 2. **The First 'Homo':** The first creature considered "human-like" (a hominid) was *Homo habilis*. 3. **Features:** *Homo habilis* had a cranial capacity between 650–800 cc. They probably did not eat meat. 4. **Successors:** *Homo erectus* appeared later (about 1.5 million years ago) with a larger brain (900 cc) and evidence of meat-eating, followed by Neanderthals and eventually *Homo sapiens*.

**Final Answer:** *Homo habilis*

**Answer:** (A)



Q16.

**Solution**

**Concept:** Microorganisms play a vital role in the food industry. The conversion of milk to curd is a classic example of microbial fermentation.

**Solution:** 1. **The Organism:** Lactic Acid Bacteria (LAB), such as *Lactobacillus*, are the primary microbes involved in this process. 2. **Process:** When a small amount of curd (starter or inoculum) is added to fresh warm milk, the LAB multiply at suitable temperatures. 3. **Acid Production:** During growth, the LAB produce **lactic acid** as a metabolic byproduct. 4. **Coagulation:** This lactic acid coagulates and partially digests the milk proteins (casein), changing the texture from liquid to semi-solid (curd). 5. **Nutritional Benefit:** This process also increases the nutritional quality of the milk by increasing the content of Vitamin  $B_{12}$ .

**Final Answer:** Lactic acid

**Answer: (B)**

Q17.

**Solution**

**Concept:** Secondary treatment of sewage, also known as biological treatment, utilizes the natural metabolic processes of microbes to reduce the organic load of wastewater.

**Solution:** 1. **Aeration Tank:** Primary effluent is passed into large aeration tanks where it is constantly agitated and air is pumped into it. 2. **Microbial Growth:** This allows the vigorous growth of useful **aerobic microbes**. 3. **Floc Formation:** These microbes grow into specific masses called **flocs**, which are clusters of bacteria held together by slime and associated with fungal filaments to form mesh-like structures. 4. **BOD Reduction:** These flocs consume the major part of the organic matter in the effluent, significantly reducing the Biochemical Oxygen Demand (BOD) of the sewage.

**Final Answer:** Masses of aerobic bacteria associated with fungal filaments

**Answer: (B)**



Q18.

**Solution**

**Concept:** The semi-conservative model of DNA replication suggests that each strand of the DNA double helix serves as a template for the synthesis of a new, complementary strand.

**Solution:** 1. **The Experiment:** Matthew Meselson and Franklin Stahl performed the definitive experiment in 1958. 2. **The Organism:** They utilized the bacterium *Escherichia coli* (*E. coli*) for their research. 3. **Methodology:** They grew *E. coli* in a medium containing  $^{15}\text{NH}_4\text{Cl}$  (a heavy isotope of nitrogen) as the only nitrogen source for many generations, then switched them to a medium with normal  $^{14}\text{N}$ . 4. **Observation:** By using cesium chloride (CsCl) density gradient centrifugation, they proved that DNA molecules in the first generation of daughter cells were "hybrid," consisting of one old heavy strand and one new light strand. 5. **Additional Info:** Later experiments by Taylor on *Vicia faba* proved the same concept in chromosomes.

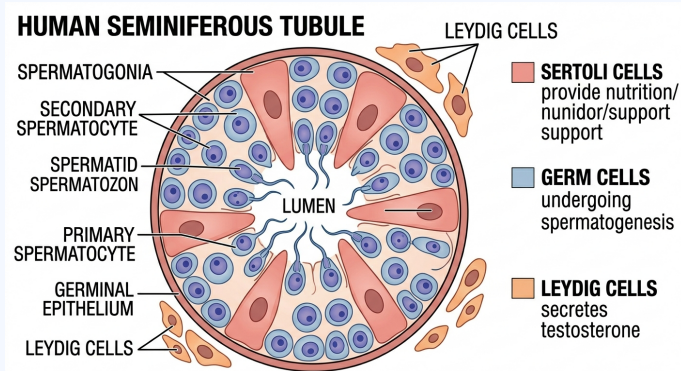
**Final Answer:** *Escherichia coli*

**Answer: (B)**

Q19.

**Solution**

**Concept:** Spermatogenesis occurs in the seminiferous tubules of the testes, which contain two types of specialized cells: male germ cells and Sertoli cells.



**Solution:** 1. **Sertoli Cells:** Often called "nurse cells," these are elongated, pyramidal cells found within the germinal epithelium of the seminiferous tubules. 2. **Function:** Their primary role is to provide **nutrition** to the developing germ cells (spermatogonia) as they undergo various stages of differentiation to become mature spermatozoa. 3. **Regulation:** They also act as the "blood-testis barrier" and are regulated by Follicle Stimulating Hormone (FSH). 4. **Other Cells:** Leydig cells (interstitial cells) produce androgens (testosterone); the Epididymis and Vas deferens are accessory ducts for sperm storage and transport.

**Final Answer:** Sertoli cells

**Answer: (B)**



Q20.

**Solution**

**Concept:** Population interactions describe the way individuals of different species interact within an ecosystem. These are classified as (+), (–), or (0) based on the effect on the participants.

**Solution:** 1. **Amensalism:** This is an interaction where one species is **harmed** (–) while the other species is neither benefited nor harmed **unaffected** (0). An example is the production of antibiotics by *Penicillium* which kills bacteria but does not affect the fungus itself. 2. **Parasitism:** One species (parasite) benefits (+) and the other (host) is harmed (–). 3. **Commensalism:** One species benefits (+) and the other is unaffected (0). 4. **Mutualism:** Both species benefit (+, +).

**Final Answer:** Amensalism

**Answer: (B)**

Q21.

**Solution**

**Concept:** The nomenclature of restriction endonucleases follows a specific set of rules based on the source organism from which the enzyme was isolated.

**Solution:** 1. **First Letter:** The first letter of the name comes from the genus of the prokaryotic cell (e.g., 'E' for *Escherichia*). 2. **Second and Third Letters:** The next two letters come from the species of the prokaryotic cell. In the case of *EcoRI*, 'co' stands for *coli* (from *Escherichia coli*). 3. **Fourth Letter:** The fourth letter is derived from the name of the strain (e.g., 'R' for the strain RY 13). 4. **Roman Numeral:** The Roman numeral following the name indicates the order in which the enzymes were isolated from that strain of bacteria.

**Final Answer:** Coli

**Answer: (C)**

Q22.

**Solution**

**Concept:** Insulin is a hormone used to manage diabetes. Traditionally extracted from animal pancreases, it is now produced using recombinant DNA technology to avoid immune responses.

**Solution:** 1. **Structure:** Human insulin consists of two short polypeptide chains: Chain A and Chain B, linked by disulfide bridges. 2. **Recombinant Method:** In 1983, Eli Lilly, an American company, prepared two DNA sequences corresponding to A and B chains of human insulin. 3. **Host Organism:** These sequences were introduced into plasmids of *Escherichia coli* (*E. coli*) to produce insulin chains separately. 4. **Assembly:** The chains were produced in the bacteria, extracted, and combined by creating disulfide bonds to form human insulin, termed "Humulin."

**Final Answer:** *Escherichia coli*

**Answer: (B)**



Q23.

**Solution**

**Concept:** Transcription in eukaryotes is more complex than in prokaryotes, involving multiple types of RNA polymerases and post-transcriptional modifications.

**Solution:** 1. **Division of Labor:** In eukaryotes, there are at least three RNA polymerases in the nucleus (in addition to the RNA polymerase found in the organelles). 2. **RNA Polymerase I:** Transcribes rRNAs (28S, 18S, and 5.8S). 3. **RNA Polymerase II:** Transcribes the precursor of mRNA, known as heterogeneous nuclear RNA (hnRNA). 4. **RNA Polymerase III:** Responsible for transcription of tRNA, 5S rRNA, and snRNAs (small nuclear RNAs). 5. **Conclusion:** Therefore, eukaryotic transcription requires the coordinated action of **RNA polymerase I, II, and III.**

**Final Answer:** RNA polymerase I, II, and III

**Answer:** (A)

Q24.

**Solution**

**Concept:** Adaptive radiation is the process of evolution of different species in a given geographical area starting from a point and literally radiating to other areas of geography (habitats).

**Solution:** 1. **Darwin's Finches:** On the Galapagos Islands, Darwin observed many varieties of finches. All the varieties, he conjectured, evolved on the island itself from the original seed-eating features. 2. **Diversification:** From the original seed-eating ancestors, many other forms with altered beaks arose, enabling them to become insectivorous and vegetarian finches. 3. **Mechanism:** This adaptation to new ecological niches is the hallmark of adaptive radiation. 4. **Other Examples:** Australian marsupials also show adaptive radiation, where a number of marsupials, each different from the other, evolved from an ancestral stock within the Australian island continent.

**Final Answer:** Darwin's Finches

**Answer:** (A)



Q25.

**Solution**

**Concept:** Infertility cases can be treated using Assisted Reproductive Technologies (ART). One highly specific method involves the direct manipulation of gametes.

**Solution:** 1. **ICSI Definition:** ICSI stands for **Intracytoplasmic Sperm Injection**. 2. **Procedure:** It is a specialized procedure to form an embryo in the laboratory in which a **sperm is directly injected** into the cytoplasm of the ovum. 3. **Usage:** This is typically recommended when there are severe issues with sperm count, motility, or the sperm's ability to penetrate the egg. 4. **Contrast:** GIFT (Gamete Intra-fallopian Transfer) involves transferring both gametes into the fallopian tube; ZIFT (Zygote Intra-fallopian Transfer) involves transferring a zygote; IUI (Intra-uterine Insemination) involves introducing sperm into the uterus.

**Final Answer:** ICSI

**Answer:** (C)

Q26.

**Solution**

**Concept:** Double fertilization is a complex fertilization mechanism unique to flowering plants (angiosperms) that involves the joining of a female gametophyte with two male gametes.

**Solution:** 1. **The Process:** After entering one of the synergids, the pollen tube releases two male gametes into the cytoplasm of the synergid. 2. **Syngamy:** One of the male gametes moves towards the egg cell and fuses with its nucleus, completing syngamy. This results in the formation of a diploid cell, the **zygote**. 3. **Triple Fusion:** The other male gamete moves towards the two polar nuclei located in the central cell and fuses with them to produce a triploid **Primary Endosperm Nucleus (PEN)**. 4. **Significance:** Since two types of fusions (syngamy and triple fusion) take place in an embryo sac, the phenomenon is termed double fertilization. It is a characteristic feature found only in **angiosperms**.

**Final Answer:** Angiosperms

**Answer:** (B)



Q27.

**Solution**

**Concept:** The development of the embryo sac (female gametophyte) from the megaspore mother cell is called megagametogenesis.

**Solution:** 1. **Megasporogenesis:** A single megaspore mother cell undergoes meiosis to form four megaspores. 2. **Degeneration:** In the majority of flowering plants, three of the megaspores degenerate, and only one remains functional. 3. **Monosporic Development:** The functional megaspore undergoes three sequential mitotic divisions to form the 8-nucleate, 7-celled embryo sac. 4. **Frequency:** Because this embryo sac develops from a single megaspore, it is called **monosporic** development. This is the most common type of embryo sac development in angiosperms (Polygonium type).

**Final Answer:** Monosporic

**Answer:** (A)

Q28.

**Solution**

**Concept:** Productivity in an ecosystem refers to the rate of biomass production. It is a key parameter to understand the energy flow in different ecosystems.

**Solution:** 1. **Primary Productivity:** This is defined as the amount of biomass or organic matter produced per unit area over a time period by **plants (producers)** during photosynthesis. 2. **Gross Primary Productivity (GPP):** The total rate at which organic matter is created by producers. 3. **Net Primary Productivity (NPP):** This is the GPP minus the energy lost by producers during respiration ( $GPP - R = NPP$ ). 4. **Secondary Productivity:** This is defined as the rate of formation of new organic matter by **consumers**, not producers.

**Final Answer:** Organic matter by producers

**Answer:** (C)

Q29.

**Solution**

**Concept:** DNA fingerprinting involves identifying differences in specific regions of DNA sequence called repetitive DNA. The process involves several steps of molecular biology.

**Solution:** 1. **Separation:** DNA is cut by restriction endonucleases and the fragments are separated by electrophoresis. 2. **Blotting:** The separated DNA fragments are then transferred (blotted) from the agarose gel to a synthetic membrane. 3. **The Membrane:** This synthetic membrane is typically made of **nitrocellulose** or nylon. 4. **Hybridization:** This step is crucial because it allows the DNA to be stabilized on a solid support so that hybridization with a labeled VNTR probe can occur.

**Final Answer:** Nitrocellulose

**Answer:** (B)



Q30.

**Solution**

**Concept:** The genetic code consists of 64 codons. Out of these, 61 codons code for amino acids, while 3 codons do not code for any amino acids.

**Solution:** 1. **Start Codon:** AUG is the most common start codon and also codes for the amino acid methionine. 2. **Stop Codons:** Codons that signal the termination of translation (protein synthesis) are called stop codons or termination codons. 3. **The Three Stop Codons:** These are UAA (Ochre), UAG (Amber), and UGA (Opal). 4. **Function:** These codons do not have corresponding tRNAs, which causes the ribosome to stop and release the newly synthesized polypeptide chain.

**Final Answer:** UAA

**Answer: (C)**

Q31.

**Solution**

**Concept:** Thomas Hunt Morgan, the father of experimental genetics, chose *Drosophila melanogaster* (the common fruit fly) as a model organism to study linkage and recombination.

**Solution:** 1. **Culture and Growth:** They could be grown easily on simple **synthetic medium** in the laboratory throughout the year. 2. **Life Cycle:** They complete their entire life cycle in about **two weeks**, allowing for multiple generations to be studied in a short period. 3. **Reproductive Capacity:** A single mating could produce a **large number of progeny** flies, providing statistically significant data. 4. **Genetic Variation:** There was a clear differentiation of the sexes (male and female were easily distinguishable) and they possessed many types of hereditary variations that could be seen with low-power microscopes.

**Final Answer:** All of the above

**Answer: (D)**



Q32.

**Solution**

**Concept:** The mechanism of sex determination was explored through the study of insects by Henking in 1891, which led to the discovery of sex chromosomes.

**Solution:** 1. **Observation:** Henking traced a specific nuclear structure through the stages of spermatogenesis in several insects. 2. **The 'X' Body:** He observed that 50% of the sperm received this specific structure, while the other 50% did not. He named this structure the '**X**' body. 3. **Identification:** Henking could not explain its significance at the time. However, later investigations by other scientists proved that this 'X body' was actually the **X chromosome**. 4. **Significance:** This led to the understanding of the XX-XO and XX-XY mechanisms of sex determination, where the presence or absence of this chromosome determined the sex of the offspring.

**Final Answer:** X chromosome

**Answer: (B)**

Q33.

**Solution**

**Concept:** Plants have evolved various mechanisms to ensure pollination. Cleistogamy is a condition where flowers do not open at all.

**Solution:** 1. **Definition:** Cleistogamous flowers (e.g., in *Viola*, *Oxalis*, and *Commelina*) remain permanently closed. 2. **Mechanism:** Since the flowers never open, the anthers and stigma lie very close to each other. When anthers dehisce in the flower buds, pollen grains come into contact with the stigma. 3. **Result:** This process guarantees **autogamy** (self-pollination). There is no chance of cross-pollen landing on the stigma. 4. **Advantage/Disadvantage:** The advantage is that seed set is assured even in the absence of pollinators. The disadvantage is the lack of genetic variation due to continuous inbreeding.

**Final Answer:** Autogamy

**Answer: (B)**



Q34.

**Solution**

**Concept:** The synergids in the egg apparatus of the embryo sac possess special cellular thickenings at the micropylar tip called the filiform apparatus.

**Solution:** 1. **Location:** The filiform apparatus is a finger-like projection of the wall into the cytoplasm of the synergid. 2. **Primary Function:** It plays a very important role in **guiding the entry of the pollen tube** into the synergid. 3. **Mechanism:** It secretes chemical substances (chemotropic secretion) that attract the pollen tube towards the micropylar end of the embryo sac. 4. **Secondary Role:** It also aids in the absorption and transport of nutrients from the nucellus into the embryo sac.

**Final Answer:** Guide the entry of pollen tube

Answer: (A)

Q35.

**Solution**

**Concept:** The female accessory ducts consist of oviducts (fallopian tubes), uterus, and vagina. Each fallopian tube is about 10–12 cm long and divided into regions.

**Solution:** 1. **Infundibulum:** The part of the fallopian tube **closest to the ovary** is the funnel-shaped infundibulum. It possesses finger-like projections called fimbriae which help in collection of the ovum after ovulation. 2. **Ampulla:** The infundibulum leads to a wider part of the oviduct called the ampulla, which is the site of fertilization. 3. **Isthmus:** The last part of the oviduct is the isthmus, which has a narrow lumen and joins the uterus. 4. **Cervix:** The cervix is the lower part of the uterus that opens into the vagina, not a part of the fallopian tube itself.

**Final Answer:** Infundibulum

Answer: (C)



Q36.

**Solution**

**Concept:** The ovarian cycle involves the development of follicles under the influence of pituitary hormones. Ovulation is the release of the secondary oocyte from the mature follicle.

**Solution:** 1. **Ovulation:** Under the influence of the LH surge, the mature Graafian follicle ruptures to release the secondary oocyte (ovum) into the fallopian tube. 2. **Transformation:** After the release of the egg, the remaining parts of the ruptured Graafian follicle do not degenerate immediately. Instead, they undergo a transformation. 3. **Endocrine Function:** The remaining granulosa cells and theca cells enlarge and accumulate a yellow pigment called lutein, forming the **Corpus luteum**. 4. **Hormone Secretion:** The Corpus luteum acts as a temporary endocrine gland, secreting large amounts of **progesterone**, which is essential for the maintenance of the endometrium for a possible pregnancy. 5. **Degeneration:** If fertilization does not occur, the Corpus luteum eventually degenerates into a white scar called the corpus albicans.

**Final Answer:** Corpus luteum

**Answer:** (C)

Q37.

**Solution**

**Concept:** Intrauterine Devices (IUDs) are classified into three types: non-medicated IUDs, copper-releasing IUDs, and hormone-releasing IUDs.

**Solution:** 1. **Copper-Releasing IUDs:** These include CuT, Cu7, and Multiload 375. They release copper ions that suppress sperm motility and the fertilizing capacity of sperms. 2. **Hormone-Releasing IUDs:** These include **Progestasert** and LNG-20. These devices make the uterus unsuitable for implantation and the cervix hostile to the sperms. 3. **Non-medicated IUDs:** An example is the Lippes loop, which primarily works by increasing phagocytosis of sperms. 4. **Identification:** Since the question asks for the device that is NOT a copper-releasing IUD, Progestasert is the correct choice as it belongs to the hormone-releasing category.

**Final Answer:** Progestasert

**Answer:** (C)



Q38.

**Solution**

**Concept:** In ecology, the study of competition between species for limited resources led to the formulation of the Competitive Exclusion Principle.

**Solution:** 1. **The Principle:** Gause's 'Competitive Exclusion Principle' states that two closely related species competing for the same resources cannot co-exist indefinitely. 2. **Outcome:** The competitively inferior one will be eliminated eventually. This holds true if resources are limiting. 3. **Mechanism:** If two species use the exact same niche, the one that is even slightly more efficient will out-reproduce the other. 4. **Alternative:** Later studies by MacArthur showed that species facing competition might evolve 'resource partitioning' (e.g., changing foraging times) to co-exist rather than being excluded.

**Final Answer:** Gause

**Answer: (B)**

Q39.

**Solution**

**Concept:** The double-helical structure of DNA, proposed by Watson and Crick, has very specific dimensions based on X-ray diffraction data from Rosalind Franklin and Maurice Wilkins.

**Solution:** 1. **Pitch of Helix:** The pitch (one full turn) of the DNA helix is 3.4 nm (or 34 Å). 2. **Base Pairs per Turn:** There are roughly 10 base pairs in each turn of the helix. 3. **Calculation:** To find the distance between two consecutive base pairs, we divide the pitch by the number of base pairs:  $3.4 \text{ nm} / 10 = 0.34 \text{ nm}$ . 4. **Other Dimensions:** The width (diameter) of the DNA double helix is constant at 2.0 nm (20 Å) due to the pairing of a purine with a pyrimidine.

**Final Answer:** 0.34 nm

**Answer: (B)**



Q40.

**Solution**

**Concept:** The transcription unit in DNA contains a promoter, a structural gene, and a terminator. The nature of the structural gene differs between prokaryotes and eukaryotes.

**Solution:** 1. **Monocistronic:** In eukaryotes, the structural gene is almost always monocistronic, meaning it contains the genetic information to translate only one single protein. 2. **Polycistronic:** In prokaryotes (bacteria), the structural genes are often polycistronic, where a single mRNA molecule can carry the code for multiple proteins that are usually part of the same metabolic pathway (e.g., the Lac Operon). 3. **Structure:** Eukaryotic monocistronic genes are further complicated by the presence of split genes (exons and introns), whereas prokaryotic genes are usually continuous. 4. **Conclusion:** Both statements A and B accurately describe the structural gene in their respective organisms.

**Final Answer:** Both A and B

**Answer:** (C)

Q41.

**Solution**

**Concept:** Sewage treatment involves a biological stage where anaerobic microbes digest the organic matter and aerobic flocs, leading to the production of biogas.

**Solution:** 1. **Anaerobic Sludge Digestion:** After the aerobic treatment, the remaining sludge is pumped into large tanks called anaerobic sludge digesters. 2. **Microbial Action:** Here, anaerobic bacteria digest the bacteria and the fungi present in the flocs. 3. **Gas Production:** During this digestion process, bacteria produce a mixture of gases. 4. **Composition:** The primary gases produced are **Methane** ( $CH_4$ ), **Hydrogen sulphide** ( $H_2S$ ), and **Carbon dioxide** ( $CO_2$ ). 5. **Usage:** This mixture of gases forms 'biogas' and can be used as a source of energy as it is inflammable.

**Final Answer:** Methane, Hydrogen sulphide, Carbon dioxide

**Answer:** (A)



Q42.

**Solution**

**Concept:** Genetic engineering requires tools to cut DNA at very specific locations to isolate desired genes or create recombinant molecules.

**Solution:** 1. **Restriction Endonucleases:** These are a class of enzymes that belong to a larger group called nucleases. 2. **Function:** They inspect the length of a DNA sequence and cut the two strands of the double helix at specific points by recognizing "palindromic nucleotide sequences." 3. **Analogy:** Because they "cut" the chemical bonds (phosphodiester bonds) of the DNA backbone with high precision, they are famously referred to as "**Molecular Scissors.**" 4. **Other Tools:** DNA Ligase is the "Molecular Glue," and Plasmids are the "Molecular Vehicles" or vectors.

**Final Answer:** Restriction Endonuclease

**Answer:** (C)

Q43.

**Solution**

**Concept:** Food preservation techniques aim to eliminate or inhibit the growth of pathogenic microorganisms to make food safe for consumption and increase shelf life.

**Solution:** 1. **Origin:** This process was developed by Louis Pasteur. 2. **Process:** In **Pasteurization**, the liquid (most commonly milk) is heated to a temperature of about 70°C for 15 to 30 seconds. 3. **Chilling:** Immediately after heating, it is cooled down very rapidly to a low temperature. 4. **Effect:** The sudden thermal shock kills the majority of bacteria and prevents the remaining ones from growing. This process does not significantly alter the nutritional value or taste of the milk.

**Final Answer:** Pasteurization

**Answer:** (B)

Q44.

**Solution**

**Concept:** Colostrum is the yellowish fluid secreted by the mother during the initial days of lactation, providing essential passive immunity to the newborn.

**Solution:** 1. **Antibodies:** Antibodies (Immunoglobulins) are proteins produced by the immune system to neutralize pathogens. 2. **Passive Immunity:** Since a newborn's immune system is not fully developed, it relies on pre-formed antibodies from the mother. 3. **Specific Type:** Colostrum is specifically rich in **IgA** (Immunoglobulin A) antibodies. 4. **Protection:** These antibodies protect the infant from various bacterial and viral infections by coating the respiratory and digestive tracts. 5. **Other Antibodies:** IgG can cross the placenta; IgE is involved in allergic reactions; IgM is the first to be produced during a primary infection.

**Final Answer:** IgA

**Answer:** (B)



Q45.

**Solution**

**Concept:** The Human Immunodeficiency Virus (HIV) causes AIDS by progressively destroying the body's immune system, specifically the cells responsible for coordinating the immune response.

**Solution:** 1. **Entry:** After getting into the body of the person, the virus enters into macrophages and subsequently into specialized white blood cells. 2. **The Target:** The primary target is the **Helper T-lymphocytes** (also known as  $T_H$  cells or  $CD4^+$  cells). 3. **Replication:** The virus uses the machinery of the Helper T-cell to replicate itself and produce more progeny viruses. 4. **Depletion:** As the progeny viruses are released into the blood, they attack other Helper T-lymphocytes. This leads to a progressive decrease in the number of these cells in the body of the infected person. 5. **Consequence:** Due to the decrease in Helper T-cells, the person starts suffering from infections that could otherwise be overcome, such as those caused by *Mycobacterium*, fungi, and even parasites like *Toxoplasma*.

**Final Answer:** Helper T-lymphocytes

**Answer: (B)**

Q46.

**Solution**

**Concept:** Secondary metabolites produced by microbes are used extensively in the pharmaceutical industry. Statins are molecules used to manage cardiovascular health.

**Solution:** 1. **The Organism:** Statins are produced by the yeast *Monascus purpureus*. 2. **Function:** They have been commercialized as blood-cholesterol lowering agents. 3. **Mechanism of Action:** Statins act by competitively inhibiting the enzyme responsible for the synthesis of cholesterol in the liver. 4. **Other Microbes:** *Trichoderma koningii* is a source of cellulase; *Aspergillus niger* produces citric acid; *Acetobacter aceti* produces acetic acid. 5. **Medical Importance:** By lowering "bad" cholesterol (LDL), statins help prevent atherosclerosis and associated heart diseases.

**Final Answer:** *Monascus purpureus*

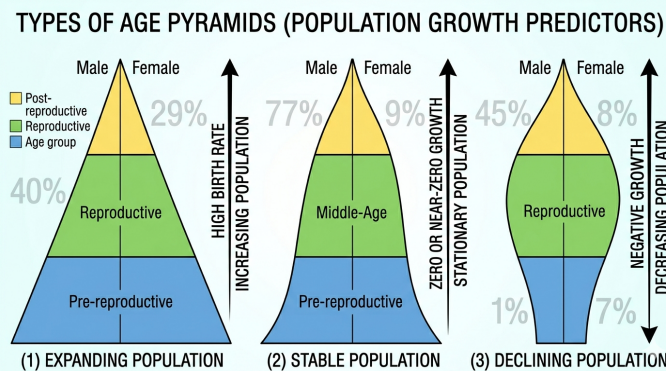
**Answer: (A)**



Q47.

**Solution**

**Concept:** An age pyramid is a graphic representation of the distribution of various age groups in a population. It serves as a predictor for future population growth.



**Solution:** 1. **Structure:** The pyramid is divided into three segments: pre-reproductive, reproductive, and post-reproductive individuals. 2. **Broad Base:** A pyramid with a very broad base indicates a high percentage of individuals in the pre-reproductive age group. 3. **Growth Prediction:** As these individuals mature into the reproductive phase, the number of births will significantly increase. 4. **Outcome:** Therefore, a broad base signifies an **expanding population**. 5. **Other Types:** A bell-shaped pyramid indicates a stable population, while an urn-shaped pyramid (narrow base) indicates a declining population.

**Final Answer:** Expanding population

**Answer:** (C)

Q48.

**Solution**

**Concept:** Biosphere reserves are a type of in-situ conservation where large areas of natural habitat are protected. They are divided into specific zones to balance conservation and human activity.

**Solution:** 1. **Core Zone:** This is the innermost, legally protected area. It is kept in a natural state, and **no human activity** (except strictly monitored research) is allowed. It is dedicated to the preservation of biodiversity and the ecosystem. 2. **Buffer Zone:** Surrounding the core zone, this area allows limited human activities like research, environmental education, and controlled tourism. 3. **Transition Zone:** This is the outermost part of the reserve where active cooperation between reserve management and local people takes place for activities like cropping, forestry, and recreation. 4. **Restoration Zone:** This is a term sometimes used for areas being managed to return to their original natural state.

**Final Answer:** Core zone

**Answer:** (C)

Q49.

**Solution**

**Concept:** Assisted Reproductive Technology (ART) provides various options for couples who cannot conceive naturally. These methods involve handling either gametes or embryos.

**Solution:** 1. **Definition:** ZIFT stands for **Zygote Intra-fallopian Transfer**. 2. **Process:** It is an In-vitro Fertilization (IVF) procedure where the egg is fertilized by the sperm outside the body in a laboratory. 3. **Transfer Stage:** The resulting **zygote** or early embryo (with up to 8 blastomeres) is then transferred into the **fallopian tube**. 4. **Contrast:** If the embryo has more than 8 blastomeres, it is transferred directly into the uterus, a procedure known as IUT (Intra-uterine Transfer).

**Final Answer:** Zygote Intra-fallopian Transfer

**Answer: (B)**

Q50.

**Solution**

**Concept:** Deciphering the genetic code required the collaboration of physicists, organic chemists, and geneticists to understand how the sequence of bases codes for amino acids.

**Solution:** 1. **Nirenberg and Matthaei:** Marshall Nirenberg and Heinrich Matthaei performed the first experiment to decipher the code using a **cell-free system** for protein synthesis. 2. **The Experiment:** They used a synthetic poly-U (uracil) RNA and found that it produced a polypeptide consisting only of the amino acid phenylalanine. 3. **Outcome:** This proved that UUU codes for Phenylalanine. 4. **Har Gobind Khorana:** He contributed by synthesizing RNA molecules with defined combinations of bases (homopolymers and copolymers). 5. **Severo Ochoa:** He discovered the enzyme (polynucleotide phosphorylase) that helped polymerize RNA with defined sequences in a template-independent manner.

**Final Answer:** Nirenberg and Matthaei

**Answer: (A)**



## Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	A	2	A	3	B	4	A	5	C
6	C	7	B	8	B	9	C	10	A
11	C	12	A	13	C	14	A	15	A
16	B	17	B	18	B	19	B	20	B
21	C	22	B	23	A	24	A	25	C
26	B	27	A	28	C	29	B	30	C
31	D	32	B	33	B	34	A	35	C
36	C	37	C	38	B	39	B	40	C
41	A	42	C	43	B	44	B	45	B
46	A	47	C	48	C	49	B	50	A

