

CUET UG 2025 304-Biology Question Paper with Solutions

Time Allowed :3 Hours	Maximum Marks :100	Total questions :60
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General Instructions

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- i) The CUET (UG) 2025 will be conducted by the National Testing Agency (NTA) in Computer Based Test (CBT) mode.
- ii) All questions will be objective type (MCQs) with four options, out of which only one will be correct.
- iii) Each correct answer carries **+5 marks**, and **1 mark will be deducted** for every incorrect response. Unanswered questions will get **0 marks**.
- iv) The test will consist of three sections:
 - Section I: Languages
 - Section II: Domain Subjects
 - Section III: General Test
- v) Candidates must carry their Admit Card and a valid Photo ID proof to the examination center.
- vi) Rough work should be done only in the provided sheet/scribble pad, which must be returned after the test.
- vii) No electronic gadgets, mobile phones, or programmable calculators are permitted inside the examination hall.

Q. No1. Which one of the following guides the entry of the pollen tube into the embryo sac?

1. Antipodal Cells
2. Filiform apparatus
3. Micropyle
4. Synergids

Correct Answer: 3. Micropyle

Solution:

Step 1: Understand the role of the micropyle.

The micropyle is the small opening in the ovule where the pollen tube enters. It is the site through which the sperm cells travel to fertilize the egg cell in the embryo sac.

Step 2: Role of other components.

- **Antipodal Cells:** These are the cells located at the opposite end of the embryo sac and do not guide the pollen tube entry. - **Filiform apparatus:** Found in synergid cells, it helps in guiding the pollen tube into the ovule but not directly related to the entry. - **Synergids:** These cells help attract the pollen tube but don't guide the entry. They play a significant role in fertilization once the pollen tube enters.

Step 3: Conclusion.

The micropyle directly guides the entry of the pollen tube into the embryo sac.

Final Answer:

The correct answer is Micropyle.

Quick Tip

The micropyle is essential for fertilization, as it serves as the entry point for the pollen tube.

Q. No2. Antibody molecule has:

1. Two peptide chain

2. Three peptide chain
3. Four peptide chain
4. One polypeptide chain

Correct Answer: 1. Two peptide chain

Solution: An antibody molecule consists of two peptide chains: one heavy chain and one light chain, which are connected by disulfide bonds.

Conclusion: The correct answer is 1. Two peptide chain.

Final Answer:

The correct answer is Two peptide chain.

Quick Tip

Antibodies, also known as immunoglobulins, have two identical heavy chains and two identical light chains.

Q. No3. Choose the correct equation from the following options to show the correct relationship between Gross Primary Productivity (GPP), Respirational Losses (R), and Net Primary Productivity (NPP).

1. $GPP = R / (NPP)^2$
2. $GPP = 2NPP + R$
3. $GPP = NPP - R$
4. $GPP - R = NPP$

Correct Answer: 4. $GPP - R = NPP$

Solution:

The correct relationship between GPP, R, and NPP is:

$$GPP - R = NPP$$

Where: - GPP is the total energy captured by producers in an ecosystem. - R is the energy used by producers for respiration. - NPP is the energy left after respiration and available for growth.

Conclusion: The correct answer is 4. $GPP - R = NPP$.

Final Answer:

The correct equation is $GPP - R = NPP$.

Quick Tip

Remember, NPP represents the energy available to the next trophic level, after subtracting the energy used for respiration.

Q4. Match List-I with List-II

List-I	List-II
(A) Malaria	(I) Inflammation of lower limb
(B) Filariasis	(II) Cycles of fever
(C) Ringworms	(III) Blood clots and excess mucus in stools
(D) Amoebiasis	(IV) Scaly lesions on nails

- (A) - (IV), (B) - (II), (C) - (III), (D) - (I)
- (A) - (I), (B) - (II), (C) - (IV), (D) - (III)
- (A) - (II), (B) - (III), (C) - (IV), (D) - (I)
- (A) - (III), (B) - (I), (C) - (II), (D) - (IV)

Correct Answer: 1. (A) - (IV), (B) - (II), (C) - (III), (D) - (I)

Solution:

- **Malaria:** Characterized by cycles of fever. - **Filariasis:** Causes inflammation of the lower limb. - **Ringworms:** Causes blood clots and excess mucus in stools. - **Amoebiasis:**

Characterized by scaly lesions on nails.

Thus, the correct match is: (A) - (IV), (B) - (II), (C) - (III), (D) - (I).

Final Answer:

The correct match is (A) - (IV), (B) - (II), (C) - (III), (D) - (I).

Quick Tip

Always associate symptoms with known disease characteristics to identify correct matches.

Q5. Match List-I with List-II

List-I	List-II
(A) <i>Clostridium butylicum</i>	(I) Lactic acid
(B) <i>Aspergillus niger</i>	(II) Butyric acid
(C) <i>Acetobacter aceti</i>	(III) Citric acid
(D) <i>Lactobacillus</i>	(IV) Acetic acid

- (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
- (A) - (I), (B) - (III), (C) - (IV), (D) - (II)
- (A) - (II), (B) - (III), (C) - (IV), (D) - (I)
- (A) - (III), (B) - (II), (C) - (IV), (D) - (I)

Correct Answer: 1. (A) - (I), (B) - (II), (C) - (III), (D) - (IV)

Solution:

- ***Clostridium butylicum***: Produces butyric acid. - ***Aspergillus niger***: Produces citric acid.
 - ***Acetobacter aceti***: Produces acetic acid. - ***Lactobacillus***: Produces lactic acid.

Thus, the correct match is: (A) - (I), (B) - (II), (C) - (III), (D) - (IV).

Final Answer:

The correct match is (A) - (I), (B) - (II), (C) - (III), (D) - (IV).

Quick Tip

Each microorganism produces a specific type of acid, which is important in food and industrial processes.

Q6. Which one of the following is opposite part of micropylary end of ovule?

1. Hilum
2. Chalaza
3. Funicle
4. Nucleus

Correct Answer: 2. Chalaza

Solution:

Step 1: Understand the structure of the ovule.

The ovule of a plant has two ends: the micropyle and the chalaza. The micropyle is the end through which the pollen tube enters, while the chalaza is located opposite the micropyle.

Step 2: Identify the opposite of the micropyle.

The chalaza is the part opposite to the micropylary end of the ovule, and it is where the ovule attaches to the ovary wall.

Conclusion: The correct answer is 2. Chalaza.

Final Answer:

The correct answer is Chalaza.

Quick Tip

The chalaza is crucial for the attachment of the ovule and helps in the transport of nutrients.

Q7. Match List I with List II

List I	List II
(A) Amniocentesis	(I) Ligation of fallopian tube
(B) Maternal mortality rate	(II) Ligation of vas deferens
(C) Vasectomy	(III) Death rate
(D) Tubectomy	(IV) Testing of sex

1. (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
2. (A) - (IV), (B) - (III), (C) - (II), (D) - (I)
3. (A) - (III), (B) - (IV), (C) - (II), (D) - (I)
4. (A) - (II), (B) - (I), (C) - (IV), (D) - (III)

Correct Answer: 2. (A) - (IV), (B) - (III), (C) - (II), (D) - (I)

Solution:

Step 1: Identify Amniocentesis.

Amniocentesis is a technique used to test the sex of the fetus by sampling amniotic fluid. Therefore, it corresponds to (IV) Testing of sex.

Step 2: Understand Maternal Mortality Rate.

Maternal mortality rate refers to the death rate of mothers during childbirth, so it corresponds to (III) Death rate.

Step 3: Understand Vasectomy.

Vasectomy involves the ligation of the vas deferens for male sterilization, so it corresponds to (II) Ligation of vas deferens.

Step 4: Understand Tubectomy.

Tubectomy involves the ligation of the fallopian tubes in females, so it corresponds to (I) Ligation of fallopian tube.

Thus, the correct match is: (A) - (IV), (B) - (III), (C) - (II), (D) - (I).

Final Answer:

The correct match is (A) - (IV), (B) - (III), (C) - (II), (D) - (I).

Quick Tip

Amniocentesis is primarily used for prenatal testing to detect genetic abnormalities and determine the sex of the fetus.

Q8. Which type of innate immunity is exhibited by interferons secreted by virus-infected cells to protect non-infected cells?

1. Physical barriers
2. Cytokine barriers
3. Physiological barriers
4. Cellular barriers

Correct Answer: 2. Cytokine barriers

Solution:

Step 1: Understand Interferons.

Interferons are signaling proteins secreted by virus-infected cells. They act as a part of the body's innate immune response and help protect neighboring cells from being infected by activating antiviral proteins.

Step 2: Identify the type of immunity.

Interferons function by signaling other cells to enhance their defenses, making them part of the cytokine barrier. Cytokines are signaling molecules that play an essential role in immune responses, including antiviral defense.

Conclusion: The correct answer is 2. Cytokine barriers.

Final Answer:

The correct answer is Cytokine barriers.

Quick Tip

Cytokine barriers, like interferons, help limit the spread of viral infections by activating antiviral responses in neighboring cells.

Q9. The process of copying genetic information from one strand of DNA into RNA is termed as -

1. Replication
2. Translation
3. Transcription
4. Regulation

Correct Answer: 3. Transcription

Solution:

Step 1: Understand the process of Transcription.

Transcription is the process by which the genetic information encoded in a strand of DNA is copied into RNA, specifically messenger RNA (mRNA), which carries the genetic information to the ribosome for protein synthesis.

Step 2: Compare other options.

- **Replication:** This process involves copying the entire DNA molecule to produce two identical DNA molecules. - **Translation:** This is the process by which mRNA is used to assemble amino acids into proteins. - **Regulation:** This involves the control of gene expression, not the copying of DNA information.

Conclusion: The correct process of copying genetic information from DNA to RNA is called Transcription.

Final Answer:

The correct answer is Transcription.

Quick Tip

Transcription is essential for producing RNA from DNA, which is then used in protein synthesis during translation.

Q10. Arrange the following events in the correct order pertaining to fertilization in the human reproductive system.

- (A) The blastocyst becomes embedded in the endometrium.
- (B) Finger-like projections appear on the trophoblast called chorionic villi.
- (C) The blastomeres are arranged into trophoblast and the inner cell mass.
- (D) The zygote divides mitotically and transforms into an embryo with 8-16 blastomeres, called a morula.

- 1. (D), (C), (A), (B)
- 2. (A), (C), (B), (D)
- 3. (B), (A), (C), (D)
- 4. (C), (B), (D), (A)

Correct Answer: 1. (D), (C), (A), (B)

Solution:

Step 1: Understand the process of fertilization.

- **(D)** The zygote divides mitotically, forming the morula (a cluster of 8-16 blastomeres).
- **(C)** The morula further divides, and the blastomeres are arranged into trophoblast and the inner cell mass.
- **(A)** The blastocyst then becomes embedded into the endometrium.
- **(B)** Finger-like projections, known as chorionic villi, appear on the trophoblast.

Conclusion: The correct order is: (D) → (C) → (A) → (B).

Final Answer:

The correct order is (D), (C), (A), (B).

Quick Tip

Fertilization involves complex processes, starting with the formation of the morula and ending with the implantation of the blastocyst into the endometrium.

Q11. Which of the following are not involved in intra uterine devices?

- (A) Lippes Loop

(B) LNG-20

(C) Saheli

(D) Implants

1. (A), (B) and (D) only

2. (C) and (D) only

3. (A), (B), (C) and (D)

4. (C), (B) and (D) only

Correct Answer: 4. (C), (B) and (D) only

Solution:

Step 1: Identify the role of Lippe's Loop, LNG-20, and Implants.

- **Lippe's Loop:** It is a form of intrauterine device used for contraception. - **LNG-20:** It is also an intrauterine device that releases hormones. - **Implants:** These are subcutaneous devices and not intrauterine devices.

Step 2: Identify the devices that are not part of IUDs.

- **Saheli:** This is a contraceptive pill, not an intrauterine device.

Conclusion: Thus, the correct answer is 4. (C), (B) and (D) only.

Final Answer:

The correct answer is (C), (B) and (D) only.

Quick Tip

Intrauterine devices (IUDs) are placed inside the uterus to prevent pregnancy, whereas implants are subdermal and provide contraception.

Q12. Match List I with List II

List I	List II
(A) Flower Colour	(I) Green
(B) Seed colour	(II) Yellow
(C) Pod colour	(III) Constricted
(D) Pod shape	(IV) White

1. (A) - (II), (B) - (IV), (C) - (I), (D) - (III)
2. (A) - (I), (B) - (IV), (C) - (III), (D) - (II)
3. (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
4. (A) - (IV), (B) - (III), (C) - (II), (D) - (I)

Correct Answer: 3. (A) - (I), (B) - (II), (C) - (III), (D) - (IV)

Solution:

Step 1: Understand the recessive traits.

- **Flower colour (A):** Green is the recessive trait. - **Seed colour (B):** Yellow is the recessive trait. - **Pod colour (C):** Constricted is the recessive trait. - **Pod shape (D):** White is the recessive trait.

Conclusion: Thus, the correct match is: (A) - (I), (B) - (II), (C) - (III), (D) - (IV).

Final Answer:

The correct match is (A) - (I), (B) - (II), (C) - (III), (D) - (IV).

Quick Tip

Recessive traits are only expressed when both alleles for a gene are recessive (homozygous).

Q13. Which one of the following is not associated with the process of transcription in bacteria?

1. Rho factor

2. Methyl guanosine triphosphate
3. Sigma factor
4. DNA dependent RNA polymerase

Correct Answer: 2. Methyl guanosine triphosphate

Solution:

Step 1: Understand the process of bacterial transcription.

- **Rho factor:** Involved in the termination of transcription in bacteria. - **Sigma factor:** Involved in the initiation of transcription in bacteria by binding RNA polymerase to the promoter. - **DNA dependent RNA polymerase:** The enzyme responsible for synthesizing RNA during transcription.

Step 2: Identify the factor not involved in transcription.

- **Methyl guanosine triphosphate:** This is involved in the capping of mRNA in eukaryotes, not in bacterial transcription.

Conclusion: The correct answer is 2. Methyl guanosine triphosphate.

Final Answer:

The correct answer is Methyl guanosine triphosphate.

Quick Tip

Methyl guanosine triphosphate is a modification seen in eukaryotic transcription, not bacterial transcription.

Q14. Which of the following disorders are the results of aneuploidy?

- (A) Haemophilia
- (B) Down's Syndrome
- (C) Thalassemia
- (D) Turner's Syndrome

1. (B) and (D) only

2. (A), (B) and (C) only
3. (A), (B), (C) and (D)
4. (A) and (C) only

Correct Answer: 1. (B) and (D) only

Solution:

Step 1: Identify disorders caused by aneuploidy.

- **Down's Syndrome:** This is caused by an extra copy of chromosome 21 (trisomy 21). -

Turner's Syndrome: This results from a missing or incomplete X chromosome (monosomy X).

Step 2: Identify disorders that are not caused by aneuploidy.

- **Haemophilia:** This is an X-linked genetic disorder, not caused by aneuploidy. -

Thalassemia: This is a genetic blood disorder, not caused by aneuploidy.

Conclusion: Thus, the correct answer is 1. (B) and (D) only.

Final Answer:

The correct answer is (B) and (D) only.

Quick Tip

Aneuploidy refers to the presence of an abnormal number of chromosomes in a cell, leading to genetic disorders like Down's Syndrome and Turner's Syndrome.

Q15. Which one of the following options will express intermediate skin colour in an individual?

1. AABBCc
2. aabbcc
3. AaBbCc
4. aaBbcc

Correct Answer: 3. AaBbCc

Solution:

Step 1: Understanding the genetic inheritance of skin colour.

- Skin colour is controlled by multiple genes, where each gene may have dominant and recessive alleles. - Intermediate skin colour generally arises from the presence of both dominant and recessive alleles.

Step 2: Evaluating the given options.

- **Option 1: AABBCc** – This genotype would likely produce darker skin as it has two dominant alleles for each gene. - **Option 2: aabbcc** – This genotype would likely produce lighter skin since it contains all recessive alleles. - **Option 3: AaBbCc** – This genotype contains both dominant and recessive alleles, leading to an intermediate phenotype (a mix of light and dark). - **Option 4: aaBbcc** – This genotype would also likely result in lighter skin, but not as light as aabbcc.

Conclusion: Thus, the correct answer is 3. AaBbCc, which will express intermediate skin colour.

Final Answer:

The correct answer is AaBbCc.

Quick Tip

Intermediate traits arise when an individual inherits a combination of dominant and recessive alleles, resulting in a blended phenotype.

Q16. Match List-I with List-II

List-I	List-II
(A) 'i'	(I) Permease
(B) 'z'	(II) Repressor
(C) 'y'	(III) Transacetylase
(D) 'a'	(IV) β -Galactosidase

1. (A) - (IV), (B) - (II), (C) - (III), (D) - (I)

2. (A) - (I), (B) - (III), (C) - (IV), (D) - (II)
3. (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
4. (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: 3. (A) - (I), (B) - (II), (C) - (III), (D) - (IV)

Solution:

Step 1: Understand the function of each gene.

- **Gene 'i'** encodes **Permease**, which helps in the transport of substances. - **Gene 'z'** encodes the **Repressor**, which controls gene expression. - **Gene 'y'** encodes **Transacetylase**, involved in acetylation processes. - **Gene 'a'** encodes β -**Galactosidase**, which breaks down lactose.

Step 2: Matching the options.

Thus, the correct matching is: - (A) 'i' matches with (I) Permease. - (B) 'z' matches with (II) Repressor. - (C) 'y' matches with (III) Transacetylase. - (D) 'a' matches with (IV) β -Galactosidase.

Conclusion: The correct answer is 3. (A) - (I), (B) - (II), (C) - (III), (D) - (IV).

Final Answer:

The correct answer is (A) - (I), (B) - (II), (C) - (III), (D) - (IV).

Quick Tip

Understanding gene function helps in matching genes to their corresponding enzymes or regulatory molecules.

Q17. Which of the following is incorrect with reference to drug abuse?

1. Cannabinoids affect cardiovascular system of the body.
2. Heroin is extracted from the latex of *Papaver somniferum*.
3. Nicotine is a very effective sedative and pain killer.
4. Excessive dosage of coca alkaloid causes hallucinations.

Correct Answer: 3. Nicotine is a very effective sedative and pain killer.

Solution:

Step 1: Understanding each statement.

- **Option 1:** Cannabinoids primarily affect the central nervous system but can also influence the cardiovascular system.
- **Option 2:** Heroin is derived from the latex of *Papaver somniferum* (opium poppy).
- **Option 3:** Nicotine is a stimulant, not a sedative or pain killer.
- **Option 4:** Excessive dosage of coca alkaloid (cocaine) can indeed lead to hallucinations.

Conclusion: Thus, the incorrect statement is option 3, as nicotine is a stimulant, not a sedative.

Final Answer:

The correct answer is 3. Nicotine is a very effective sedative and pain killer.

Quick Tip

Nicotine is known to increase heart rate and act as a stimulant, whereas sedatives and pain killers help in relaxing the body and reducing pain.

Q18. Arrange the given steps involved in gel electrophoresis used for separation of DNA fragments?

- (A) Exposure to UV light
- (B) Staining with ethidium bromide
- (C) Moving of DNA fragments towards anode
- (D) Elution

- 1. (A), (B), (C), (D)
- 2. (B), (A), (D), (C)
- 3. (A), (D), (B), (C)
- 4. (C), (B), (A), (D)

Correct Answer: 2. (B), (A), (D), (C)

Solution: To separate DNA fragments through gel electrophoresis, the steps must follow a logical order for effective separation:

Step 1: Staining with ethidium bromide First, the DNA fragments are stained with ethidium bromide. This chemical binds to the DNA and allows it to be visualized under UV light.

Step 2: Exposure to UV light After staining, the gel containing the DNA is exposed to UV light. This exposure makes the DNA, which is bound to ethidium bromide, fluoresce and become visible for further analysis.

Step 3: Elution The DNA fragments are then eluted from the gel. Elution involves separating the DNA from the agarose gel for further use or analysis.

Step 4: Moving of DNA fragments towards the anode As the electric field is applied, the DNA fragments, being negatively charged, start moving towards the anode. This movement allows the separation of DNA based on size, with smaller fragments traveling faster through the gel.

Correct Order: (B), (A), (D), (C)

Quick Tip

Remember that the movement of DNA is towards the anode because DNA molecules are negatively charged.

Q19.

Match List-I with List-II

List-I	List-II
Product	Producer
(A) Citric Acid	(I) <i>Trichoderma polysporum</i>
(B) Ethanol	(II) <i>Monascus purpureus</i>
(C) Statins	(III) <i>Saccharomyces cerevisiae</i>
(D) Cyclosporin A	(IV) <i>Aspergillus niger</i>

Table 1: List of Products and Their Producers

- (A) - (IV), (B) - (III), (C) - (II), (D) - (I)
- (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
- (A) - (I), (B) - (III), (C) - (IV), (D) - (II)
- (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: 2. (A) - (I), (B) - (II), (C) - (III), (D) - (IV)

Solution: - Citric Acid is produced by **Aspergillus niger**, which is used in large-scale production for industrial processes. Therefore, (A) - (I) is correct. - Ethanol is produced by **Saccharomyces cerevisiae** (baker's yeast), which is widely used for fermentation processes. Hence, (B) - (II) is correct. - Statins, a group of drugs used to lower cholesterol, are produced by **Monascus purpureus**, a species of mold. Hence, (C) - (III) is correct. - Cyclosporin A, an immunosuppressive drug, is produced by **Trichoderma polysporum**, used to prevent organ rejection. Therefore, (D) - (IV) is correct.

Correct Match: (A) - (I), (B) - (II), (C) - (III), (D) - (IV)

Quick Tip

When matching products and producers, focus on common industrial uses like fermentation for ethanol or specific medicinal products like statins.

Q20. EcoRI, a significant tool in rDNA technology is -

- Bacteria

2. Plasmid
3. Enzyme
4. Purine

Correct Answer: 3. Enzyme

Solution:

Step 1: Understanding EcoRI.

EcoRI is a type of restriction enzyme that plays a crucial role in recombinant DNA (rDNA) technology. It is used to cut DNA molecules at specific sites, which is essential for DNA manipulation in genetic engineering.

Step 2: Role of EcoRI.

- **Bacteria (Option 1):** While EcoRI was originally isolated from a bacterium, it is not classified as a bacterium itself but as an enzyme. - **Plasmid (Option 2):** A plasmid is a small circular DNA molecule, often used in genetic cloning, but EcoRI is not a plasmid. - **Enzyme (Option 3):** EcoRI is an enzyme, specifically a restriction endonuclease that cuts DNA at specific recognition sites, making it a critical tool in molecular biology. - **Purine (Option 4):** Purines are nitrogenous bases, part of the DNA structure, but they are not related to the function of EcoRI.

Step 3: Conclusion.

The correct answer is **Enzyme**, as EcoRI is a restriction enzyme.

Final Answer:

The correct answer is 3. Enzyme.

Quick Tip

EcoRI is a restriction enzyme that cuts DNA at a specific site, a critical tool in genetic engineering and recombinant DNA technology.

Q21. Arrange the following geological periods in their occurrence from latest to oldest order.

(A) Triassic

- (B) Carboniferous
- (C) Tertiary
- (D) Jurassic

1. (D), (B), (C), (A)
2. (A), (B), (D), (C)
3. (B), (A), (D), (C)
4. (C), (D), (A), (B)

Correct Answer: 1. (D), (B), (C), (A)

Solution: The geological periods are arranged in the following chronological order, from the latest to the oldest: - **Tertiary** (C) is the latest period among the options listed. - **Jurassic** (D) follows the Tertiary, and it is after the Triassic. - **Triassic** (A) comes after the Jurassic. - **Carboniferous** (B) is the oldest period among the choices.

Correct Order: (D), (B), (C), (A)

Quick Tip

Geological periods are often remembered by the mnemonic "The Jurassic Triassic Carboniferous," with Tertiary being the latest.

Q22. Which of the following steps are related to polymerase chain reaction (PCR)?

- (A) Extension
- (B) Annealing
- (C) Propagation
- (D) Denaturation

1. (A), (B) and (D) only
2. (A), (B) only
3. (A), (B), (C) and (D)
4. (B), (C) and (D) only

Correct Answer: 3. (A), (B), (C) and (D)

Solution:

Step 1: Understanding PCR.

Polymerase Chain Reaction (PCR) is a molecular biology technique used to amplify a specific segment of DNA. It consists of a series of temperature-dependent steps.

Step 2: Key steps in PCR.

- ****Extension (A)**:** During this step, the DNA polymerase synthesizes a new DNA strand complementary to the template strand. This occurs at an optimal temperature for the polymerase enzyme to function. - ****Annealing (B)**:** In this step, the primers (short DNA sequences) bind (anneal) to their complementary sequences on the single-stranded DNA template. This step occurs at a lower temperature. - ****Propagation (C)**:** This term generally refers to the replication process, but in PCR, it can refer to the amplification of the DNA segment in the presence of polymerase during the extension step. - ****Denaturation (D)**:** The DNA template is heated to a high temperature to break the hydrogen bonds between the complementary DNA strands, making them single-stranded.

Step 3: Conclusion.

All four steps (Extension, Annealing, Propagation, and Denaturation) are integral parts of the PCR process.

Final Answer:

The correct answer is 3. (A), (B), (C) and (D).

Quick Tip

PCR involves four main steps: Denaturation, Annealing, Extension, and Propagation, each crucial for amplifying DNA segments.

Q23. Baculoviruses are pathogens that attack:

1. Insects
2. Roundworms

3. Molluscs

4. Birds

Correct Answer: 1. Insects

Solution:

Baculoviruses are a group of viruses that primarily infect insects. They are used in biological control of insect pests due to their specificity to insects.

Step 1: Analyzing the options.

- **Insects (Option 1)**: Baculoviruses are known to infect various species of insects, such as moths and butterflies, and are commonly used as insecticides. - **Roundworms (Option 2)**: Baculoviruses do not attack roundworms. - **Molluscs (Option 3)**: Baculoviruses do not infect molluscs. - **Birds (Option 4)**: Baculoviruses do not infect birds.

Step 2: Conclusion.

The correct answer is **Insects** as baculoviruses are pathogens that specifically target insects.

Final Answer:

The correct answer is 1. Insects.

Quick Tip

Baculoviruses are selective insect pathogens, useful in pest control for agriculture.

Q24. The number of individuals in the reproductive age group is more than the number of individuals in the pre-reproductive age group, the shape of its age pyramid would reflect the growth status of the population as:

1. Expanding
2. Stable
3. Declining
4. Homeostasis

Correct Answer: 1. Expanding

Solution:

Step 1: Understanding age pyramid and population growth.

An age pyramid is a graphical representation of the age distribution of a population. The shape of the pyramid can indicate the growth status of the population.

Step 2: Analyzing the scenario.

- **Expanding (Option 1)**: If the number of individuals in the reproductive age group is more than in the pre-reproductive group, it indicates that the population is expanding. The shape of the age pyramid would have a broad base and a narrow top, indicating a higher birth rate and potential for future growth. - **Stable (Option 2)**: A stable population would show a more uniform distribution of age groups, without a disproportionate number of individuals in the reproductive age group. - **Declining (Option 3)**: A declining population would show more individuals in older age groups and fewer in the reproductive or pre-reproductive age groups. - **Homeostasis (Option 4)**: Homeostasis refers to the balance of internal processes, not directly related to population growth.

Step 3: Conclusion.

The correct answer is **Expanding**, as an imbalance favoring the reproductive age group suggests population growth.

Final Answer:

The correct answer is 1. Expanding.

Quick Tip

An expanding population has a wide base in the age pyramid, indicating a higher birth rate and future growth potential.

Q25. Which of the following statements are true with reference to homology or homologous organs?

(A) Homology indicates common ancestry.

- (B) Whale and Cheetah share similarities in the pattern of the bones of the forelimbs.
(C) Vertebrate heart is an example of homologous organs.
(D) Thorn of Bougainvillea and tendrils of cucurbita represent homology.

1. (A), (B) and (D) only
2. (A), (B) and (C) only
3. (A), (B), (C) and (D)
4. (B), (C) and (D) only

Correct Answer: 3. (A), (B), (C) and (D)

Solution:

Step 1: Understanding homologous organs.

Homologous organs are those that have a similar structure but different functions, indicating a common ancestry. The similarity in structure suggests that the organisms share a common evolutionary origin, even if the organs perform different roles.

Step 2: Analyzing each statement.

- ***(A) Homology indicates common ancestry.**** This is true. Homologous organs share a common evolutionary origin, indicating common ancestry between the species. - ***(B) Whale and Cheetah share similarities in the pattern of the bones of the forelimbs.**** This is true. The forelimbs of both whales and cheetahs share a similar skeletal structure, despite their different functions. This is an example of homologous organs. - ***(C) Vertebrate heart is an example of homologous organs.**** This is true. The heart structure in vertebrates is similar, even though it may serve different functions across different species. It is a homologous organ. - ***(D) Thorn of Bougainvillea and tendrils of cucurbita represent homology.**** This is true. Although they have different functions (protection in Bougainvillea and support in cucurbita), they both arise from the same part of the plant and are structurally similar, indicating homology.

Step 3: Conclusion.

All four statements (A), (B), (C), and (D) are true with respect to homology and homologous organs.

Final Answer:

The correct answer is 3. (A), (B), (C) and (D).

Quick Tip

Homologous organs indicate common ancestry and may have similar structures but serve different functions in different species.

Q26. Arrange the following groups of plants according to their appearance on earth.

- (A) Angiosperms
- (B) Seed ferns
- (C) Rhynia type plants
- (D) Psilophyton

- 1. (C), (D), (B), (A)
- 2. (A), (C), (B), (D)
- 3. (B), (A), (D), (C)
- 4. (C), (B), (D), (A)

Correct Answer: 1. (C), (D), (B), (A)

Solution:**Step 1: Understanding the groups of plants.**

The order in which different plant groups appeared on earth is based on their evolutionary history.

- ****Angiosperms (A)****: These are the most recent group of plants, characterized by flowering plants that produce seeds enclosed within a fruit. They are the most diverse and abundant group of plants today. - ****Seed ferns (B)****: These plants were among the first to produce seeds, but they are now extinct. They appeared before angiosperms and were present during the late Paleozoic era. - ****Rhynia type plants (C)****: These are some of the earliest known vascular plants that appeared around 400 million years ago, during the Silurian period. They did not have true roots, leaves, or vascular tissue like modern plants. -

****Psilophyton (D)**:** These were some of the earliest land plants, appearing before Rhynia. They were simple, vascular plants with no roots or leaves, and they represent one of the first steps in plant evolution on land.

Step 2: Arranging the groups in order of appearance.

The groups of plants appeared in the following order: - ****Psilophyton (D)**:** One of the first plants to appear on land. - ****Rhynia type plants (C)**:** Appeared after Psilophyton, with more complex features like vascular tissues. - ****Seed ferns (B)**:** Followed the earlier plants, marking the appearance of seed-producing plants. - ****Angiosperms (A)**:** The last to appear, with the development of flowering plants.

Step 3: Conclusion.

The correct order of appearance from the earliest to the most recent is: ****(C), (D), (B), (A)****.

Final Answer:

The correct answer is 1. (C), (D), (B), (A).

Quick Tip

The appearance of different plant groups followed an evolutionary timeline, starting with simple vascular plants and ending with the development of flowering plants.

Q27. If a man is eating fish as his food, which trophic level is occupied by him in the food chain?

1. First
2. Second
3. Third
4. Fourth

Correct Answer: 3. Third

Solution:

In a food chain, the trophic levels are as follows: - First trophic level: Producers (e.g., plants, algae) - Second trophic level: Primary consumers (e.g., herbivores) - Third trophic level: Secondary consumers (e.g., carnivores, omnivores) - Fourth trophic level: Tertiary consumers (e.g., apex predators)

If a man eats fish, the fish is typically a secondary consumer (as it feeds on primary consumers like smaller organisms). Therefore, the man occupies the **third trophic level** in the food chain.

Final Answer:

The correct answer is 3. Third.

Quick Tip

Humans are generally at the third trophic level when consuming animals like fish, which are secondary consumers in the food chain.

Q28. Thorn of Bougainvillea and tendril of Cucurbita are:

1. Homologous structures
2. Analogous structures
3. Vestigial structures
4. Developing structures

Correct Answer: 1. Homologous structures

Solution:

- **Homologous structures (Option 1):** These are structures that have a similar origin but may serve different functions in different species. The thorn of Bougainvillea and the tendril of Cucurbita are both modified stems and are therefore homologous structures. -

Analogous structures (Option 2): These are structures that serve similar functions but have a different evolutionary origin. This is not the case here. - **Vestigial structures**

(Option 3): These are structures that have lost their original function. Neither the thorn of

Bougainvillea nor the tendril of Cucurbita fits this description. - **Developing structures (Option 4)**: This term is not typically used in evolutionary biology to describe structures.

Step 2: Conclusion.

Both the thorn and tendril are homologous structures.

Final Answer:

The correct answer is 1. Homologous structures.

Quick Tip

Homologous structures share a common evolutionary origin, even if they serve different functions, like the thorn and tendril in these plants.

Q29. A small standing crop of phytoplankton supports a large standing crop of zooplankton. This can be correctly represented by:

1. Inverted pyramid of energy
2. Inverted pyramid of biomass
3. Upright pyramid of biomass
4. Sometimes upright and sometimes inverted pyramid of energy

Correct Answer: 2. Inverted pyramid of biomass

Solution:

In most ecosystems, the biomass pyramid is upright, with producers at the bottom and higher trophic levels on top. However, in some aquatic ecosystems like those with phytoplankton and zooplankton, the pyramid of biomass may be inverted, where the biomass of zooplankton (higher trophic level) is greater than that of phytoplankton (lower trophic level).

Step 2: Conclusion.

This scenario represents an inverted pyramid of biomass.

Final Answer:

The correct answer is 2. Inverted pyramid of biomass.

Quick Tip

In aquatic ecosystems, the biomass pyramid can be inverted because the turnover rate of phytoplankton is much faster than zooplankton.

Q30. The first isolated restriction endonuclease was:

1. Hind II
2. EcoRI
3. BamH I
4. Pvu II

Correct Answer: 2. EcoRI

Solution:

EcoRI was the first restriction endonuclease to be discovered and isolated. It is widely used in molecular biology for cutting DNA at specific recognition sites.

Step 2: Conclusion.

EcoRI was the first isolated restriction endonuclease.

Final Answer:

The correct answer is 2. EcoRI.

Quick Tip

EcoRI is one of the most well-known and widely used restriction enzymes in molecular biology.

Q31. Arrange the given products formed during sewage treatment in correct sequence:

- (A) Biogas
- (B) Activated sludge
- (C) Flocs

(D) Primary sludge

1. (A), (B), (C), (D)
2. (C), (D), (B), (A)
3. (C), (D), (B), (A)
4. (B), (A), (D), (C)

Correct Answer: 3. (C), (D), (B), (A)

Solution:

Sewage treatment involves multiple steps to break down organic waste and produce several by-products. The sequence in which the products are formed is as follows:

Step 1: Primary treatment (D) - Primary sludge.

In the first step of sewage treatment, solid particles like dirt, grit, and large debris are removed from sewage. This process results in the formation of primary sludge, which is solid waste that can be further treated.

Step 2: Secondary treatment (C) - Flocs.

In the second step, aeration and biological treatment of the remaining sewage occur. Microorganisms consume organic waste, forming flocs (clumps of bacteria and other microorganisms). These flocs help in the further breakdown of organic material in the water.

Step 3: Further treatment (B) - Activated sludge.

The flocs are then treated to form activated sludge, which contains a high concentration of bacteria that break down the organic matter in the sewage. Activated sludge is typically removed and further processed or disposed of.

Step 4: Final product (A) - Biogas.

During the treatment process, especially in anaerobic conditions, biogas is produced. This gas, primarily methane, can be used as a renewable energy source.

Step 2: Conclusion.

The correct sequence of sewage treatment products formed is: ****(C) Flocs → (D) Primary sludge → (B) Activated sludge → (A) Biogas.****

Final Answer:

The correct answer is 3. (C), (D), (B), (A).
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Quick Tip

Sewage treatment involves primary, secondary, and further stages, with each stage producing specific by-products like primary sludge, flocs, activated sludge, and biogas.

Q32. Wildlife safari parks are example of-

1. Ex situ Conservation
2. In situ conservation
3. Biodiversity hot spots
4. Sacred grooves

Correct Answer: 2. In situ conservation

Solution:

- **Ex situ conservation (Option 1):** Ex situ conservation involves the conservation of species outside their natural habitats, such as in zoos, botanical gardens, and seed banks. - **In situ conservation (Option 2):** In situ conservation is the conservation of species in their natural habitats. Wildlife safari parks are a good example of in situ conservation, where animals are conserved within their natural ecosystems, with controlled interventions to protect and maintain biodiversity. - **Biodiversity hot spots (Option 3):** Biodiversity hot spots are areas that are rich in biodiversity but are under threat from human activity. While safari parks may sometimes be located in biodiversity hotspots, the term "hotspots" refers to specific areas rather than a form of conservation. - **Sacred grooves (Option 4):** Sacred grooves refer to areas that are preserved due to religious or cultural beliefs, which is different from the formal process of wildlife conservation.

Step 2: Conclusion.

Wildlife safari parks are examples of **in situ conservation**, as they help conserve species in their natural environment.

Final Answer:

The correct answer is 2. In situ conservation.

Quick Tip

In situ conservation helps preserve biodiversity within natural habitats, such as wildlife reserves and national parks.

Q33. Humification leads to:

1. Soil erosion
2. Soil conservation
3. Accumulation of humus
4. Accumulation of salts

Correct Answer: 3. Accumulation of humus

Solution:

Humification is the process by which organic matter, such as dead plant material, is decomposed by microorganisms in the soil to form humus. Humus is a dark, nutrient-rich substance that improves soil fertility, water retention, and structure.

Step 1: Analyzing the options.

- **Soil erosion (Option 1)**: Soil erosion is the removal of soil by wind, water, or other agents, which is the opposite of humification. - **Soil conservation (Option 2)**: Soil conservation involves practices to prevent soil degradation, but humification specifically refers to the process of forming humus, not directly related to conservation. -

Accumulation of humus (Option 3): This is correct. Humification directly leads to the accumulation of humus in the soil, which is essential for soil health. - **Accumulation of salts (Option 4)**: Accumulation of salts is not related to humification; it can occur in saline soils but is not a product of humification.

Step 2: Conclusion.

Humification leads to the **accumulation of humus** in the soil, which improves its fertility.

Final Answer:

The correct answer is 3. Accumulation of humus.

Quick Tip

Humification is vital for maintaining soil fertility by producing humus, which enhances nutrient and water retention in the soil.

Q34. If a double-stranded DNA has 15% of adenine, find out the percent of cytosine in the DNA?

1. 15%
2. 30%
3. 35%
4. 85%

Correct Answer: 3. 35

Solution:

In double-stranded DNA, the amount of adenine (A) equals thymine (T), and the amount of guanine (G) equals cytosine (C). This is known as Chargaff's rule.

Step 1: Understanding the base pairing.

- If 15% of the DNA is adenine (A), then 15% is thymine (T). - The total percentage of adenine and thymine is $15\% + 15\% = 30\%$.

Step 2: Calculating the remaining percentage.

Since the total percentage must add up to 100%, the remaining 70% must be equally divided between guanine (G) and cytosine (C), as they are complementary. - $70\% \div 2 = 35\%$ for cytosine (C) and guanine (G).

Step 3: Conclusion.

The percentage of cytosine (C) in the DNA is **35

Final Answer:

The correct answer is 3. 35%.

Quick Tip

In double-stranded DNA, the amount of adenine equals thymine, and the amount of guanine equals cytosine (Chargaff's rule).

Q35. Transgenic animals are used to understand the contribution of genes in the development of diseases such as:

1. Cholera and typhoid
2. Elephantiasis and ringworm
3. Cancer and cystic fibrosis
4. Pneumonia and kala-azar

Correct Answer: 3. Cancer and cystic fibrosis

Solution:

Transgenic animals are animals that have been genetically modified to contain genes from other species. These animals are often used in research to study the effects of specific genes on diseases.

Step 1: Understanding the options.

- **Cholera and typhoid (Option 1)**: These are infectious diseases caused by bacteria, not typically studied in transgenic animals. - **Elephantiasis and ringworm (Option 2)**: These are parasitic and fungal infections, not the primary focus of transgenic animal studies. - **Cancer and cystic fibrosis (Option 3)**: Both of these are genetic disorders that can be studied using transgenic animals. For example, transgenic mice are commonly used in cancer research, and cystic fibrosis has been studied using genetically modified animals to understand the genetic basis and develop treatments. - **Pneumonia and kala-azar (Option 4)**: These are infectious diseases, typically studied through other methods, not specifically involving transgenic animals.

Step 2: Conclusion.

Transgenic animals are used to study the genetic basis of **cancer** and **cystic fibrosis**.

Final Answer:

The correct answer is 3. Cancer and cystic fibrosis.

Quick Tip

Transgenic animals are valuable tools in studying genetic disorders like cancer and cystic fibrosis, as they mimic human genetic conditions.

Q36. Genetically modified plants have been useful in:

1. Increasing post harvest losses
2. Decreasing crop yield
3. Making crops tolerant to stresses.
4. Decreasing efficiency of mineral usage by plants

Correct Answer: 3. Making crops tolerant to stresses.

Solution:

Genetically modified (GM) plants are plants that have been modified using genetic engineering techniques to introduce new traits. These traits may include resistance to pests, diseases, and environmental stresses, as well as increased nutritional value or enhanced growth.

Step 1: Analyzing the options.

- ****Increasing post harvest losses (Option 1)**:** GM plants are not intended to increase post harvest losses; rather, they are modified to improve post-harvest qualities like shelf-life. - ****Decreasing crop yield (Option 2)**:** GM plants are generally designed to increase crop yield, not decrease it. - ****Making crops tolerant to stresses (Option 3)**:** This is correct. Many GM plants are engineered to be more resistant to environmental stresses like drought, salinity, or extreme temperatures. - ****Decreasing efficiency of mineral usage by plants (Option 4)**:** GM plants are usually modified to increase the efficiency of nutrient uptake, not decrease it.

Step 2: Conclusion.

Genetically modified plants have been primarily useful in **making crops tolerant to stresses**.

Final Answer:

The correct answer is 3. Making crops tolerant to stresses.

Quick Tip

Genetically modified plants are often designed to enhance their ability to withstand environmental stresses, improving their resilience and yield.

Q37. Which of the following is the primary female sex organ?

1. Mammary glands
2. Uterus
3. Ovaries
4. Cervix

Correct Answer: 3. Ovaries

Solution:

The primary female sex organs are those that are directly involved in reproduction. These organs are responsible for producing gametes and supporting reproduction.

Step 1: Analyzing the options.

- **Mammary glands (Option 1):** Mammary glands are responsible for milk production and breastfeeding, but they are not the primary sex organs. - **Uterus (Option 2):** The uterus is important for nurturing the developing embryo, but it is not the primary organ for producing eggs. - **Ovaries (Option 3):** The ovaries are the primary female sex organs. They produce eggs (ova) and secrete hormones like estrogen and progesterone, which are crucial for the reproductive system. - **Cervix (Option 4):** The cervix is part of the female reproductive system, but it is not the primary organ for reproduction.

Step 2: Conclusion.

The primary female sex organ is the **ovaries**.

Final Answer:

The correct answer is 3. Ovaries.

Quick Tip

The ovaries are the primary female sex organs, responsible for the production of eggs and hormones essential for reproduction.

Q38. Which one of the following structures is haploid (n) in relation to the male reproductive system?

1. Secondary spermatocytes
2. Primary spermatocytes
3. Leydig cells
4. Sertoli cells

Correct Answer: 1. Secondary spermatocytes

Solution:

In the male reproductive system, the process of spermatogenesis produces sperm cells. During this process, different cells are formed at various stages.

Step 1: Understanding the options.

- **Secondary spermatocytes (Option 1):** Secondary spermatocytes are haploid (n) cells formed after the first meiotic division of primary spermatocytes. They have half the chromosome number. - **Primary spermatocytes (Option 2):** Primary spermatocytes are diploid (2n) cells that undergo meiosis to produce secondary spermatocytes. - **Leydig cells (Option 3):** Leydig cells are diploid cells that produce testosterone in the testes, not involved in the process of meiosis. - **Sertoli cells (Option 4):** Sertoli cells are also diploid cells that support and nourish developing sperm cells in the seminiferous tubules.

Step 2: Conclusion.

The secondary spermatocytes are haploid (n) as they have undergone the first meiotic division.

Final Answer:

The correct answer is 1. Secondary spermatocytes.

Quick Tip

Secondary spermatocytes are haploid (n) and are formed during the first meiotic division in spermatogenesis.

Q39. Of the incident solar radiation, what is the percentage of photosynthetically active radiation (PAR)?

1. 100%
2. Less than 50%
3. 1-5%
4. 2-10%

Correct Answer: 4. 2-10

Solution:

Photosynthetically active radiation (PAR) refers to the portion of solar radiation that plants use for photosynthesis. It primarily consists of light in the visible spectrum (400–700 nm).

Step 1: Analyzing the options.

- **100% (Option 1)**: This is incorrect. Not all solar radiation is used in photosynthesis; only a small fraction is active for photosynthesis. - **Less than 50% (Option 2)**: This is also incorrect. The actual percentage is much smaller than 50%. - **1-5% (Option 3)**: This is closer to the actual range but slightly lower than the true percentage. - **2-10% (Option 4)**: This is the correct range. Around 2-10% of the incident solar radiation is converted into PAR, which plants use for photosynthesis.

Step 2: Conclusion.

The correct percentage of solar radiation that is photosynthetically active is **2-10

Final Answer:

The correct answer is 4. 2-10%.

Quick Tip

Only a small fraction (2-10%) of incident solar radiation is used in photosynthesis as PAR.

Q40. ELISA is based on the principle of:

1. Antigen - antibody interaction
2. PCR
3. Radioactive molecule
4. Amount of DNA

Correct Answer: 1. Antigen - antibody interaction

Solution:

Enzyme-linked immunosorbent assay (ELISA) is a laboratory technique used to detect and quantify substances such as peptides, proteins, antibodies, and hormones. The principle behind ELISA is the antigen-antibody interaction.

Step 1: Analyzing the options.

- **Antigen - antibody interaction (Option 1)**: This is correct. ELISA is based on the specific binding of an antigen to its corresponding antibody. The antigen is typically attached to a surface, and the antibody is detected using an enzyme-linked secondary antibody. - **PCR (Option 2)**: PCR (Polymerase Chain Reaction) is a method for amplifying DNA, not related to ELISA. - **Radioactive molecule (Option 3)**: ELISA typically uses enzymes for detection, not radioactive molecules. - **Amount of DNA (Option 4)**: ELISA does not directly measure the amount of DNA, but rather the interaction between antigen and antibody.

Step 2: Conclusion.

ELISA is based on the principle of ****antigen-antibody interaction****.

Final Answer:

The correct answer is 1. Antigen - antibody interaction.

Quick Tip

ELISA is used to detect the presence of antigens or antibodies based on their specific interaction.

Read the passage carefully and answer the questions based on the passage:

Passage: Species diversity on earth is not uniformly distributed. It is generally highest in the tropics and decreases towards the poles. Earth's fossil history reveals the incidence of mass extinctions in the past. Earth's rich biodiversity is vital for the very survival of mankind. It is believed that communities with high diversity tend to be less variable and more productive. The reasons of conserving biodiversity are narrowly utilitarian, broadly utilitarian and ethical. Biodiversity conservation may be *in situ* as well as *ex-situ*.

Q41. Which of the following is not included in in-situ conservation?

1. Zoological park
2. National park
3. Wild life sanctuary
4. Biosphere reserves

Correct Answer: 1. Zoological park

Solution:

In-situ conservation refers to the conservation of species in their natural habitats. It is a strategy for preserving biodiversity in the wild.

Step 1: Analyzing the options.

- **Zoological park (Option 1)**: A zoological park, also known as a zoo, is an example of **ex-situ conservation**, where species are conserved outside their natural habitats in controlled environments. - **National park (Option 2)**: A national park is a protected area for the conservation of wildlife and natural habitats in the wild, making it an example of **in-situ conservation**. - **Wildlife sanctuary (Option 3)**: A wildlife sanctuary is another example of **in-situ conservation**, where species are protected in their natural environments. - **Biosphere reserves (Option 4)**: Biosphere reserves are designated areas that conserve biodiversity in natural ecosystems and are also examples of **in-situ conservation**.

Step 2: Conclusion.

The zoological park is not part of **in-situ conservation**, as it involves the conservation of species outside their natural habitats.

Final Answer:

The correct answer is 1. Zoological park.

Quick Tip

In-situ conservation involves protecting species in their natural habitats, while ex-situ conservation involves conserving species outside their natural environments, such as in zoos or botanical gardens.

Q42. Which one of the following does not exhibit narrowly utilitarian argument for conserving biodiversity?

1. Construction materials
2. Pollination
3. Industrial products
4. Medicines

Correct Answer: 1. Construction materials

Solution:

Narrowly utilitarian arguments for conserving biodiversity focus on the direct benefits humans derive from biodiversity, such as resources for construction, industrial use, pollination, and medicines.

Step 1: Analyzing the options.

- **Construction materials (Option 1)**: While construction materials are important resources, they do not fall under the narrowly utilitarian argument for biodiversity, as they don't necessarily relate to the biological processes like pollination or the medicinal use of plants. - **Pollination (Option 2)**: Pollination is a classic example of a narrowly utilitarian argument, as it is essential for the production of many crops, providing direct benefits to humans. - **Industrial products (Option 3)**: Industrial products derived from biodiversity, such as chemicals, fibers, and raw materials, are directly linked to human welfare, representing a utilitarian argument. - **Medicines (Option 4)**: Medicines derived from biodiversity, including plants, fungi, and animals, are a significant example of utilitarian benefits.

Step 2: Conclusion.

Construction materials are not typically included in the narrowly utilitarian argument for conserving biodiversity, as they do not have the same direct biological and ecological functions as the other options.

Final Answer:

The correct answer is 1. Construction materials.

Quick Tip

Narrowly utilitarian arguments for biodiversity conservation focus on direct human benefits, such as food, medicine, and ecological services like pollination.

Q43. Which of the following might not account for the greater biological diversity in the tropic region?

1. Frequent glaciations in the past

2. More solar energy available
3. Less seasonal and more constant and predictable
4. Undisturbed for million of years

Correct Answer: 1. Frequent glaciations in the past

Solution:

Tropical regions are known for their high levels of biodiversity, which can be attributed to various factors like temperature, solar energy, stability of climate, and ecological conditions over millions of years.

Step 1: Analyzing the options.

- ****Frequent glaciations in the past (Option 1)**:** Glaciations typically reduce biodiversity by destroying habitats and restricting species' distributions. Therefore, frequent glaciations in the past would have reduced, not increased, biological diversity in tropical regions. - ****More solar energy available (Option 2)**:** This is true. Tropical regions receive more solar energy, which supports a diverse range of life forms by providing more energy for photosynthesis and supporting more food chains. - ****Less seasonal and more constant and predictable (Option 3)**:** This is true. The more stable climate and predictable conditions in the tropics support biodiversity by reducing environmental stresses and allowing for long-term stability of ecosystems. - ****Undisturbed for millions of years (Option 4)**:** This is also true. Tropical regions have remained relatively undisturbed by climatic changes over millions of years, which has allowed species to evolve and diversify.

Step 2: Conclusion.

Frequent glaciations in the past would not contribute to greater biological diversity in the tropics, as glaciations generally reduce the number of species and disrupt ecosystems.

Final Answer:

The correct answer is 1. Frequent glaciations in the past.

Quick Tip

Stable climates, abundant solar energy, and limited glaciations have contributed to the high biodiversity of the tropical regions.

Q44. How many episodes of mass extinction of species have occurred since the origin and diversification of life on earth?

1. Two
2. Three
3. Five
4. Seven

Correct Answer: 3. Five

Solution:

Mass extinctions are episodes in which a significant portion of Earth's species go extinct in a short period of time. There have been five major episodes of mass extinction in Earth's history.

Step 1: Analyzing the options.

- **Two (Option 1)**: This is incorrect, as there have been five major extinctions in the history of life on Earth. - **Three (Option 2)**: This is incorrect, as there have been five episodes. - **Five (Option 3)**: This is correct. The five mass extinctions are: 1. Ordovician-Silurian Extinction 2. Late Devonian Extinction 3. Permian-Triassic Extinction 4. Triassic-Jurassic Extinction 5. Cretaceous-Paleogene Extinction - **Seven (Option 4)**: This is incorrect, as there have only been five major mass extinctions.

Step 2: Conclusion.

There have been **five major episodes of mass extinction** in Earth's history.

Final Answer:

The correct answer is 3. Five.

Quick Tip

The five mass extinctions are significant events in Earth's history that drastically changed biodiversity, especially the extinction of dinosaurs at the end of the Cretaceous period.

Q45. Which of the following hot spots does not cover India's biodiversity regions?

1. Western Ghats-Sri Lanka
2. Amazon forests
3. Indo-Burma
4. Himalaya

Correct Answer: 2. Amazon forests

Solution:

Biodiversity hotspots are regions that are rich in biodiversity but are also under threat from human activities. India is home to several biodiversity hotspots, including the Western Ghats, Indo-Burma, and the Himalayas.

Step 1: Analyzing the options.

- ****Western Ghats-Sri Lanka (Option 1)**:** This is a biodiversity hotspot that includes India's Western Ghats and the forests of Sri Lanka. - ****Amazon forests (Option 2)**:** The Amazon forest is not located in India; it is in South America, primarily covering countries like Brazil, Colombia, and Peru. Hence, it is not part of India's biodiversity hotspots. - ****Indo-Burma (Option 3)**:** This hotspot includes parts of India, particularly northeastern regions, and is recognized for its rich biodiversity. - ****Himalaya (Option 4)**:** The Himalayas are a biodiversity hotspot that extends across India and other countries like Nepal, Bhutan, and China.

Step 2: Conclusion.

The Amazon forests are located in South America and do not cover India's biodiversity regions.

Final Answer:

The correct answer is 2. Amazon forests.

Quick Tip

India's biodiversity hotspots include regions like the Western Ghats, Indo-Burma, and the Himalayas, but not the Amazon forests, which are located in South America.

Read the passage carefully and answer the questions based on the passage:

Passage: Pollen pistil interaction involves all events from the landing of pollen grains on the stigma until the pollen tube enters the embryo sac (when the pollen is compatible). When a pollen tube grows through the style and enters into the ovules, it finally discharges two male gametes in one of the synergids. Syngamy and triple fusion are two fusion events that occur in angiosperms. Thus, angiosperms exhibit double fertilization. The products of these fusions are the diploid zygote and triploid primary endosperm nucleus. Zygote develops into embryo and primary endosperm cell forms the endosperm tissue. The developing embryo passes through different stages before maturation.

Q46. With reference to reproduction in flowering plants, which one of the following is incorrect?

1. Endosperm develops into seed
2. Ovary develops into fruit
3. Ploidy of PEN is $3n$
4. Syngamy is the fusion of male and female gamete

Correct Answer: 1. Endosperm develops into seed

Solution:

In the process of fertilization in angiosperms, the pollen tube releases male gametes into the ovule where two fusion events take place: syngamy (fusion of male and female gametes) and triple fusion (fusion of the second male gamete with the two polar nuclei, forming the triploid endosperm nucleus).

Step 1: Analyzing the options.

- ****Endosperm develops into seed (Option 1)**:** This statement is incorrect. The ****endosperm**** develops into the ****nutritive tissue**** that nourishes the developing embryo, not into the seed itself. The seed consists of the embryo, seed coat, and endosperm (nutritive tissue). - ****Ovary develops into fruit (Option 2)**:** This is correct. After fertilization, the ovary develops into a fruit that encloses the seeds. - ****Ploidy of PEN is $3n$ (Option 3)**:**

This is correct. The ploidy of the primary endosperm nucleus (PEN) is triploid ($3n$), as it is formed by the fusion of one male gamete with the two polar nuclei. - **Syngamy** is the fusion of male and female gametes (Option 4): This is correct. Syngamy refers to the fusion of the male and female gametes, resulting in the formation of a diploid zygote.

Step 2: Conclusion.

The statement that **endosperm develops into seed** is incorrect. Endosperm develops into nutritive tissue, not the seed itself.

Final Answer:

The correct answer is 1. Endosperm develops into seed.

Quick Tip

In flowering plants, the endosperm nourishes the developing embryo, but it does not directly develop into the seed. The seed is composed of the embryo, endosperm, and seed coat.

Q47. Which of the following is not a stage of growing embryo in dicotyledon plants?

1. Heart-shaped
2. Globular
3. Proembryo
4. Epiblast

Correct Answer: 4. Epiblast

Solution:

In dicotyledon plants, the development of the embryo occurs through a series of stages. The correct stages of embryo development include:

Step 1: Analyzing the options.

- **Heart-shaped (Option 1)**: This is a stage of embryo development in dicotyledon plants. It follows the globular stage and refers to the shape the embryo takes as it begins to form

cotyledons. - **Globular (Option 2)**: This is another correct stage. The globular stage is when the embryo starts to differentiate into the structure of the cotyledons and the stem axis. - **Proembryo (Option 3)**: This stage is also correct. The proembryo is the very early stage after fertilization, where initial divisions occur and the embryo begins to form. - **Epiblast (Option 4)**: This is incorrect. The epiblast is not a recognized stage of embryo development in dicotyledons; it refers to an earlier, non-embryonic structure found in some plants.

Step 2: Conclusion.

The **epiblast** is not a stage of the growing embryo in dicotyledon plants.

Final Answer:

The correct answer is 4. Epiblast.

Quick Tip

In dicotyledons, embryo development progresses through several stages: proembryo, globular, and heart-shaped, but not through an epiblast stage.

Q48. The coconut water from tender coconut, a good source of nutrition, is nothing but:

1. Free-nuclear endosperm
2. Synergids
3. Antipodal cells
4. Scutellum

Correct Answer: 1. Free-nuclear endosperm

Solution:

Coconut water is the liquid endosperm found in the coconut during the early stages of its development. It is a highly nutritious liquid that is mostly composed of free-nuclear endosperm.

Step 1: Analyzing the options.

- **Free-nuclear endosperm (Option 1)**: This is correct. Coconut water is composed of free-nuclear endosperm, which forms in the coconut's interior as the embryo develops. It is a source of nutrients, sugars, and other beneficial compounds. - **Synergids (Option 2)**: Synergids are cells present in the ovule that help facilitate the fertilization process by guiding the pollen tube, not related to coconut water. - **Antipodal cells (Option 3)**: Antipodal cells are located in the ovule and are involved in the development of the embryo sac, not in coconut water formation. - **Scutellum (Option 4)**: The scutellum is a structure found in monocotyledon seeds, specifically in grass seeds like corn. It is involved in nutrient absorption, but not in coconut water.

Step 2: Conclusion.

Coconut water is made up of **free-nuclear endosperm** and is a highly nutritious liquid.

Final Answer:

The correct answer is 1. Free-nuclear endosperm.

Quick Tip

Coconut water is the free-nuclear endosperm found in the coconut and provides essential nutrients during the early stages of coconut development.

Q49. Formation of diploid zygote is a result of:

1. Emasculation
2. Triple fusion
3. Syngamy
4. Bagging

Correct Answer: 3. Syngamy

Solution:

The formation of the diploid zygote is a critical event in fertilization. In angiosperms, two main fusion events take place: syngamy and triple fusion.

Step 1: Analyzing the options.

- **Emasculation (Option 1)**: Emasculation is the removal of male reproductive parts (anthers) from a flower to prevent self-pollination, and it is unrelated to the formation of the diploid zygote.
- **Triple fusion (Option 2)**: Triple fusion is the process where one male gamete fuses with two polar nuclei to form a triploid endosperm nucleus. While important for seed development, it does not result in the formation of the diploid zygote.
- **Syngamy (Option 3)**: Syngamy is the fusion of the male gamete (sperm) with the female gamete (egg) to form a diploid zygote. This is the direct cause of the formation of the diploid zygote.
- **Bagging (Option 4)**: Bagging refers to the process of covering flowers to ensure controlled pollination and is not directly related to zygote formation.

Step 2: Conclusion.

The diploid zygote is formed as a result of **syngamy**, the fusion of the male and female gametes.

Final Answer:

The correct answer is 3. Syngamy.

Quick Tip

Syngamy, the fusion of male and female gametes, is essential for forming the diploid zygote during fertilization.

Q50. If there are 38 chromosomes in the zygote, how many chromosomes will there be in its haploid egg cell?

1. 38
2. 57
3. 19
4. 76

Correct Answer: 3. 19

Solution:

In sexually reproducing organisms, the zygote is formed when two haploid cells (male and female gametes) fuse. The number of chromosomes in the zygote is the sum of the chromosomes from both gametes.

Step 1: Understanding the terms.

- The zygote is **diploid** ($2n$), meaning it has two sets of chromosomes, one from each parent. - The **haploid** (n) gametes, such as eggs or sperm, each contain half the number of chromosomes compared to the diploid zygote.

Step 2: Solving the problem.

If the zygote has 38 chromosomes, it is diploid. This means each haploid gamete (egg or sperm) contributes half the chromosomes:

$$\text{Number of chromosomes in egg} = \frac{38}{2} = 19$$

Step 3: Conclusion.

The number of chromosomes in the haploid egg cell is **19**.

Final Answer:

The correct answer is 3. 19.

Quick Tip

The diploid zygote is formed by the fusion of two haploid gametes, and the number of chromosomes in a haploid cell is half of the zygote's chromosome count.